

READ ABOUT THE "LO-WAVE" ONE

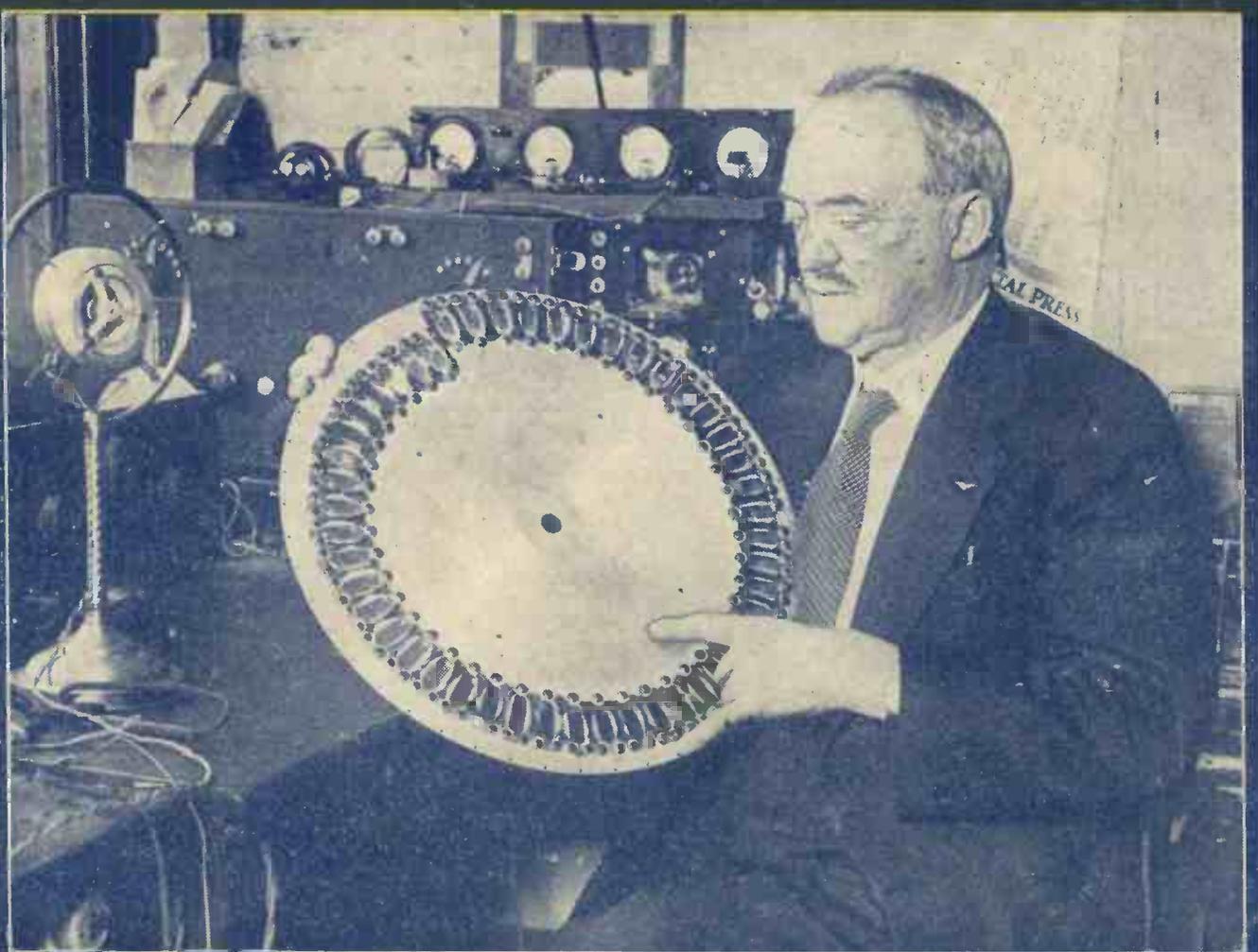
# Popular Wireless

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No. 363. Vol. XV.

INCORPORATING "WIRELESS"

May 18th, 1929.



### Special Features in This Issue

A Rapid Fault-Finder. Screened-Grid Developments  
 Your Tuning Condensers. Indoor Aerials  
 An Auto D.C. Switch. A Noted Amateur Short-Waver  
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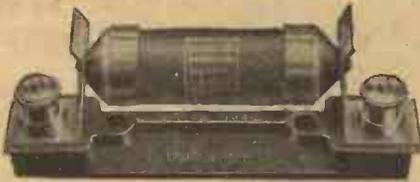
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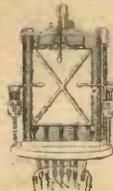
**2.** Around the two stout grid supports is wound the first grid, electrically welded at twenty-five points.

**Cossor makes greatest advance in valve design since the introduction of the Dull Emitter - -**

# RIGID!



**3.** Note the enormous strength and rigidity of the screen. Built on four stout supports, capped by a metal bridge-piece anchored to seonite insulator.

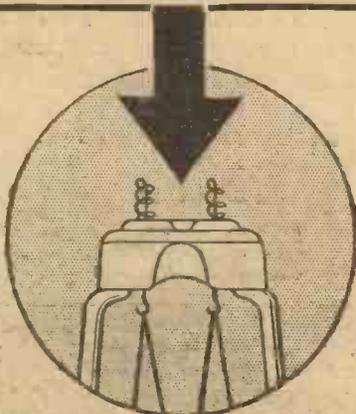


**4.** Finally, observe the construction of the anode. Actually two rectangular nickel plates are used and for greater rigidity each is diagonally ribbed.

The wonderful new Inter-locked Construction employed in the Cossor Screened Grid Valve eliminates all the inherent weaknesses in valve design. Under this system (illustrated here) each element is firmly braced top and bottom. Every joint is scientifically welded. This girder-like construction ensures absolute rigidity. It positively prevents the slightest individual movement of the elements. Even the hardest blow cannot disturb their perfect alignment.

As a result the Cossor Screened Grid Valve retains life-long uniformity of its characteristics. Its Inter-locked Construction (exclusive to Cossor) makes it the strongest and most robust Screened Grid Valve ever produced. Use Cossor in your Screened Grid Receiver — there is no substitute for the Cossor patented system of Inter-locked Construction.

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# Popular Wireless

Scientific Adviser :  
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 A. JOHNSON-RANDALL.

WHO SAID "TELEGRAM" ?  
 HOPE FOR VALVE BARTS.  
 CHINA FORGING AHEAD.  
 NEW U.S.A. STATION.

## RADIO NOTES & NEWS

NO "SATURATION" YET.  
 "RADIO FERIBY."  
 A COMING "STAR."  
 PURE JAM.

### A "Portable" Year.

THE way in which portables are coming to the fore is astonishing, at least to me, as I once cherished the belief that the things would not "take on." Glad I'm wrong. A glance at the trade papers reveals the fact that there are now on the market no less than 116 types by 37 manufacturers. Now all we want is the right type of weather.

### Who First said "Telegram" ?

I WONDER how many people know who was the inventor of the word "telegram" ? It is so familiar that one is apt to think that it "just grewed." Well, they say that Mr. Erasmus P. Smith, of the U.S.A., proposed and introduced this word. That is quite a useful bit of general knowledge, but it is livened up when one knows that this gentleman was the grandfather of Caroline Balestier, the lady who became the wife of Rudyard Kipling.

### They Don't, Do They ?

A SHORT while back I related how an American station which was about to broadcast 5 SW relinquished the idea when 5 SW threatened to transmit gramophone records. I imagined that retreat to be the American comment on such second-hand performances. But I have since heard that sixty stations in the U.S.A. are equipped with what are called orchestraphones, which are something like double phonographs, with records revolving simultaneously. This arrangement is provided so that the stations may broadcast complete programmes of records, music, and announcements complete, supplied by a central distributing organisation.

### The Thanksgiving Service.

IT is understood that the B.B.C. has expressed its readiness to broadcast the Thanksgiving Service in commemoration of his Majesty's recovery, which will probably be held in the Abbey in July. They would not only broadcast this all over their home system, but would also bring 5 SW into operation, so that the Dominions may participate in the service. May I suggest that the good offices of P C J be enlisted also, because that station is received much better than 5 SW in some parts of the world ? I am sure that the proprietors would be delighted to come to an arrangement if asked.

### Belgian Broadcasting.

THE Belgian Government has founded a National Broadcasting Institute which will be controlled by an administrative council presided over by the Minister of Posts.

Strange how radio is so often the perquisite, so to speak, of a letter-carrying department. The annual licence fee is to be seven shillings, plus a luxury tax on valve sets. Transmissions will be effected in Flemish and French on different wavelengths.

### Hope for Valve Barts.

SOME of the nippiest of our Valve Barts. are probably looking round hungrily for new records to shy at. If that is so then they may be thrilled at the news that the Fultograph people have sent a full set of their equipment to Australia, and that therefore it may not be long before they have the opportunity of trying to receive pictures from their go-ahead friends, 3 LO and 2 FC. The prospect sounds fascinating to drive even me to the work-bench again.

### State Broadcasting in Australia.

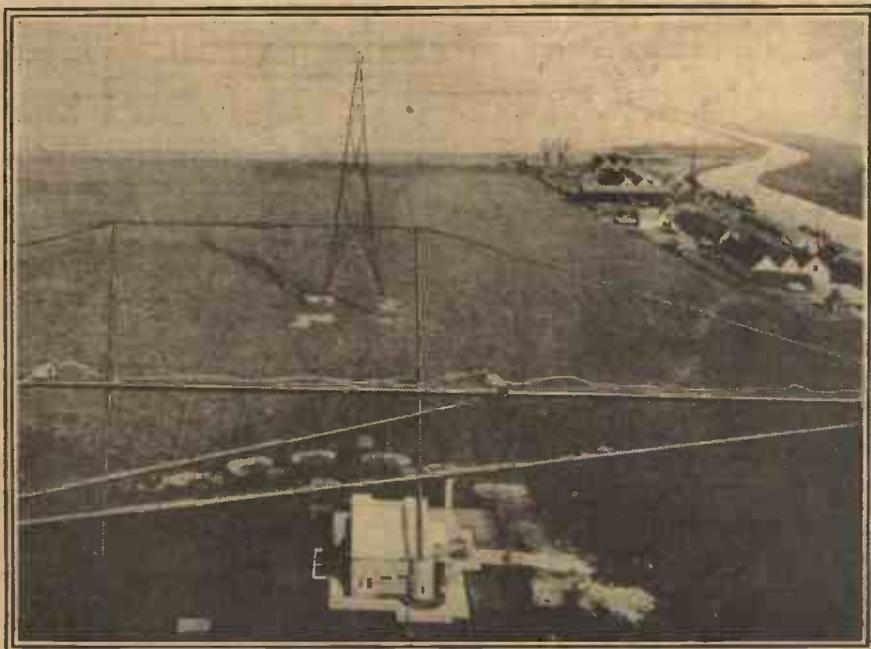
THE Australian Post Office have called for tenders for the supply of broadcasting programmes throughout the country. Evidently the government there have recognised what our authorities have not, that Government departments are not suitable organisations for the exploitation of the amusement industry. The Post Office is to operate the stations and be responsible for all technicalities.

### China Forging Ahead.

IN spite of her civil wars and uncivil peaces, China is managing to keep her radio development going. Since last year the National Reconstruction Council has built twenty broadcasting stations, all of which are said to be working. Four large stations are to be built this year. During April an epidemic of meningitis raged in Shanghai and district, and the authorities used radio for broadcasting health hints.

(Continued on next page.)

### A FAMOUS DUTCH BROADCASTING STATION.



This unusual view shows the station buildings and part of the aerial system at Huizen, Holland.

## NOTES AND NEWS.

(Continued from previous page.)

### New Polish Station.

A NEW station at Posen is by this time probably in operation. It is to be of three quarters of a kilowatt in output, and used for telegraphy as well as broadcasting. The first transmissions are to be experimental, and will be made on 30.5 metres or 38.5 metres, or else under 20 metres. Transmissions will be made in Polish, German, French, and English.

### The Scotsman's Boudoir.

IN order to study sound volumes the B.B.C. have constructed a room at Clapham which gives one a picture of a Scotch architect's idea of a cheap job. It has no windows, fireplace, or furniture. To prevent echo it is padded with felt and cotton wool. I believe this story about research on sound is a bluff, and that the place is to be a safe repository for Chamber Music Charles, Postical Percival, and Education Ethelwald, who fight with Jazz James at Savoy Hill and disturb the Governors' slumbers.

### New U.S.A. Short-Wave Station.

IF the plans of Radio Engineering Laboratories have not gone agley there should by now be a new station, W2XV, "on the air." W2XV is to retransmit local New York stations between 6 p.m. and 11 p.m. (G.M.T.), except on Saturdays and Sundays. It will telephone on 30.2 metres, and telegraph (C.W.) on 20.97 metres. Reports on quality, volume, etc., will be welcomed at 100, Wilbur Ave., Long Beach City, New York.

### A Few Technical Details.

FOR those who like to know more about the transmitter I may add that W2XV will have an output of about 750-1,000 watts on the aerial, using a thermostatically controlled crystal, 100 per cent Heising modulation, and as an output valve the R.C.A. U.V.-861, 750 watts screened-grid type. Telegraphy will be automatic (by tape) and will merely announce that W2XV is testing.

### No "Saturation" Yet.

AN increase of about 30,000 licences during March brought the total in force up to approximately 2,728,000, which shows that in spite of the B.B.C.'s rather austere interpretation of its functions the public interest in broadcasting—and set-making, I may add—is a healthy growth. All the same, an increase of 30,000 in one month after so many years is surely a little wonderful. Who are these people who have just waked up?

### Picture Service Note

IT is perhaps not generally known that the Vienna transmission of "still" pictures by Fultograph on 520 metres are often relayed by Linz on 350 metres. When Vienna is jammed Linz is often found to be coming through well. I understand that in addition to the Koenigswusterhausen transmissions, Berlin (Witzleben) has been transmitting pictures several evenings a week, and this is sometimes relayed by other German stations.

### "Radio Feriby."

MR. BULLIMORE'S letter about the Czecho-Slovakian station he found on Good Friday has brought a number of letters from other readers who had the same luck, the two most interesting being from J. (Leicester) and S.W.W. (Blackwood, Mon.). J. did it on a straight one-valver with reaction and had signals nearly as loud as 5 G.B.'s. By the way, sceptics might note that this reader claims to get six other foreign stations and five English ones—and seems satisfied with his fishing.

### A Coming "Star."

S.W.W. apparently got a full musical programme from "Radio Feriby" on Det. and 2 L.F., and after reporting received a card in acknowledgment. The announcer asked, in several languages, for reports, and from all I hear he is getting them from all over Europe. This station, I

## SHORT WAVES.

Instructions on how to perform conjuring tricks are now broadcast. We can imagine the peculiar silence that will ensue when an optimistic Aberdeen child attempts to borrow a shilling to perform a trick.—"London Opinion."

B.B.C. Porter: "Telephone! Someone's calling the piccolo player!"  
Cornetist (sotto voce): "What are they calling him this time?"

An Ealing listener writes: "The musical (?) part of the broadcasting programme is evidently prepared by certain highbrow cranks."  
But surely it is the brains behind certain 2 L.O.-brows that arrange these programmes?

The following has been suggested as a way in which a married radio announcer might effectively end an argument with his wife:  
"The time allotted for this feature has now expired, and we are closing down. To those of the neighbours who have been listening-in, I wish to announce that this series of lectures by my better half will be continued indefinitely and will be broadcast from time to time from this studio. We are now closing down. Good-night! Good-night!"

Generally the "sun" sets in the West, but not when the set's in the East part of the room.

Waves of a feather jam together.

"One of the latest novelties in wireless sets is a crystal set in a watch case. Tuning of the set is made by opening the back and closing it."—"Western Mail."

And the loud speaker, we suppose, goes in the pocket—that seems to be a favourite haunt of domestic "loud speakers"!

think, may prove to be one of the favourite alternatives to 2 L.O. on its more drivelling evenings.

### A Cry from the East.

A RANGOON reader (A. W. J.) describes the plight of radio amateurs there. The town has an excellent station, and all that is wanted is a crystal set plus one stage L.F. With two valves they get Rangoon only; with three valves, Calcutta—perhaps! So that multi-valve sets are not popular, and they are looking for a short-waver. If A. W. J. can look over a file of our back numbers he will find what he seeks. In any case, the "Sydney" Two is a "cert," and I commend it to his notice.

### The "Lash-up" One.

FROM Leicester H. H. sends me a photograph and a tin box. The former represents the "Phoenix" One—it arose from the ashes of a dustheap; the latter enshrines a variable condenser made from window glass and silver paper. This set is like a dissected frog; all its intimate parts lie exposed on a baseboard. It is the sort of nightmare a Scotchman would make if it could be worked from the mains—someone else's—and from an indoor aerial.

### The Awful Secret Revealed.

I SHOULD have the Scots down on me about this, no mistake. Well, there are two of these sliding condenser things; if you pull too hard you get two half-condensers. The grid condenser is the same, but not grown up. The grid leak is an inch of something from something else, and there is a coil wound on a Cerebos salt carton. The A and E terminals are paper clips. A choke is wound on the bobbin from a flypaper, and bits of celluloid toothbrush handles are bushes for terminals. Also, there is a lot of cardboard and a two-and-threepenny valve—but it all works and gives the Daventrys and some continentals. H. H.—you are the rhino's face-powder! More power to you!

### Pure Jam for Constructors.

DID you notice the advent of the two new "Best Way" Wireless Books? One is devoted to the construction of four types of valve receiver, with one, two, three and four valves; the other describes how four extra special sets are built, including an "S.G. and Pentode Three." The fullest possible details are given, and at sixpence apiece cannot be beaten for value. "P.W.," by the way, still has in print 41 of the 52 Blue Prints of tested circuits it has issued. Look over the list reprinted from time to time and see whether you ought not to pick a few winners before it is too late.

### Broadcasting Over the Way.

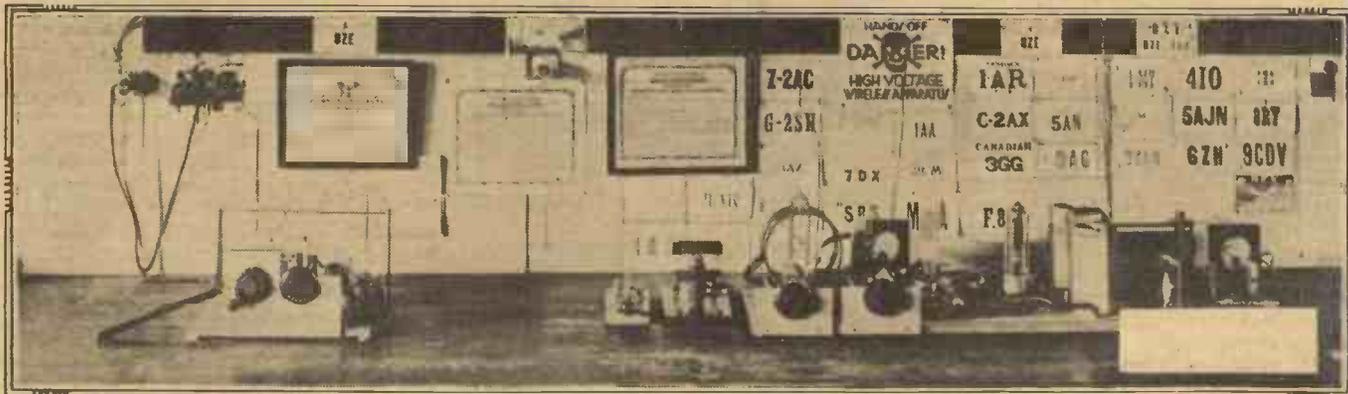
I SHOULD suppose that broadcasting in France has had more adventures than that art has suffered in any other country, due, no doubt, to the lively temperaments of our Gallic neighbours. However, the Postal Department, taking a leaf from our Post Office's book, has put forward plans for stricter regulation of the service and—oh, Jules!—the imposition of a tax ranging from 3s. 4d. to 10s., and to these the Cabinet has agreed. No harm in agreeing. *Toujours la politesse*, or as my nephew somewhat irrelevantly translates it: "Always a female policeman."

### The Morse Nuisance.

A PROPOS my recent note about the way in which the Post Office is steadily reducing the interference from Morse, a Blundellsands reader states that there and in the Scaforth and Waterloo districts of Liverpool a good (or bad) programme can hardly ever be heard because of Morse. I agree that there must be a concentration of ship-shore signalling in those parts, but as I suppose that not the whole population suffers there to such a degree I am wondering whether the complainant has ever asked an expert to look at the circuit of the receiver. Perhaps it might be improved.

ARIEL.

# A Noted Amateur Short-Waver



PROBABLY one of the most successful of the amateur radio transmitting stations, which are run in conjunction with many of the American Universities and Technical Colleges is Station 8 Z E (formerly 8 Y A E), the amateur station owned and controlled by the authorities of Oberlin College, Ohio, U.S.A.

Oberlin College, through the activities of its past students, has made a name for itself in the realms of science. It was at this seat of learning that Professor R. A. Millikan, the now world-famed discoverer of the Cosmic Rays, graduated in physical science in the year 1891.

The college acquired its first permanent transmitting apparatus in 1920. In those days, a good deal of Morse was transmitted, and clear reception of the station at distances approaching 2,500 miles was reported fairly frequently.

### Valve Transmission Commenced.

Then, in 1923, the station authorities began to work with a small valve transmitter. And, finally, in the following year, work was begun in real earnest upon the perfecting of apparatus for short-wave transmissions. Oberlin College began to specialise in short-wave work, and it has kept up its specialisation in that fascinating department of radio ever since.

Such, in brief, is the history of the college's interest in radio. In co-operation with the American Radio Relay League, the amateur station at Oberlin has conducted a lengthy series of experiments in short-wave transmission, particularly with a view to covering distance with these waves. Such pioneer experiments have been more than ordinarily successful, and during the last few years, the station has successfully transmitted speech signals to all parts of Canada, the South American States, Mexico, France, Spain, and even to New Zealand, Australia, and South Africa.

### Three Call-Signs.

During recent times Oberlin College station has been reorganised. It is now one of the very few radio stations which are able to boast of three separate call-signs. The usual call-sign of the station is

\*-----\*

Short-wave enthusiasts will read with interest this description of one of America's foremost amateur stations, particularly on account of the station's association with Professor Millikan of "Cosmic Ray" fame.

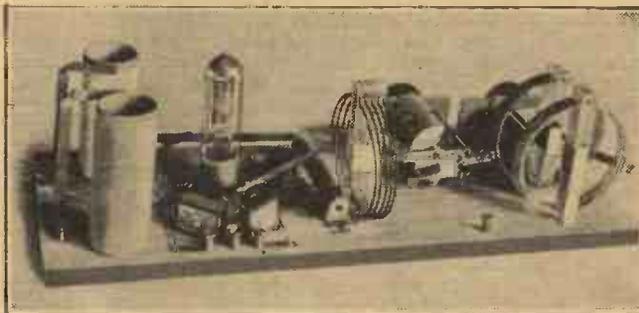
By J. F. CORRIGAN, M.L., A.I.C.

\*-----\*

8 Z E but, for purely technical and experimental work, the station makes use of the call-letters, 8 X T. Experiments in transmission from portable sets are conducted by the station, and for this purpose the call-sign, 8 G X is used.

Part of the station's transmitting and receiving gear will be seen in the heading photograph, which will enable the technical reader to gain a clear idea of the type of apparatus which is employed in the short-wave transmissions and receptions at Oberlin College.

The short-wave transmitter employs a 50-watt oscillator in a Meissner circuit of the four-coil type. A potential of 500 to 1,500 volts of chemically-rectified A.C. is supplied to the plate of the oscillator valve



A view of the short-wave transmitter, showing the oscillator valve and condensers.

after passing through a filter comprising three 1 mfd. condensers and two chokes of 1.5 and 30 henrys inductance respectively.

Surrounding the valve, in symmetrical arrangement, are three by-pass condensers together with the grid condenser. Tuning is accomplished by an aerial series condenser and a secondary condenser. The transmitter is normally tuned to a wave-

length of 120 metres, and waves of this length are flung off into space from a cage aerial system suspended high above the laboratory buildings.

So much, therefore, for the transmitting gear at Oberlin. The college authorities, however, make a keen study of short-wave transmission over long distances, as well as of short-wave reception, and, in view of this fact, the photograph of a favourite type of set in use at 8 Z E (see below) will be of interest to short-wave enthusiasts in this country, particularly as it may be stated that the short-wave transmitter illustrated is one on which several distance-transmission records have been established.

### Conventional Receiver Employed.

The receiving set is, in outline, of the conventional regenerative type. A special point to record about it, however, is that the aerial and reaction coils of the receiver are suspended in air from a glass rod, the reaction coil being controlled from the panel by means of a long glass rod attached to the control dial.

Thus the entire tuning unit is situated at a considerable distance away from the panel controls, and, by means of this system, the majority of incidental capacity effects are entirely eliminated.

The receiver employed is merely a two-valver, one stage of L.F. amplification being employed. Yet, despite its simplicity, it has successfully picked up signals from all parts of the world.

### Peculiar Mascot.

A little pup mascot of the receiver is a constant spectator of all work which is carried out with the set.

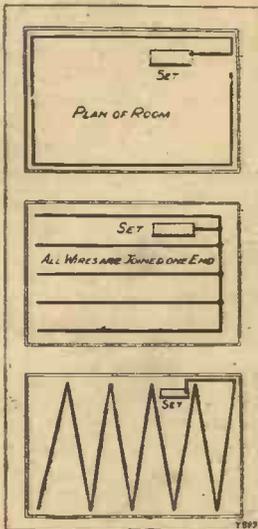
In fact, this little green-eyed mascot, the Chief Operator of the station states, is a very necessary and essential part of the short-wave receiving gear.

All the transmitting and receiving apparatus in use at the Oberlin College station for short-wave work is constructed on the simplest lines possible, and it is considered that this general policy is in many ways responsible for the excellent and well-known results which have in the past been achieved by this pioneer American amateur short-wave station.

**A**LTHOUGH the time for overhauling outdoor aerials and improving same will soon be with us, do not altogether forget the indoor aerial. It must not necessarily be assumed that the man with an outside aerial is better off than the one who only has an indoor pick-up system. Often just the opposite is the case. Some people have an idea that so long as an aerial is out in the open it will give louder signals than one that is surrounded by bricks and mortar.

Actually the material of which a house is constructed has very little bearing on the subject, the advantage of an outdoor aerial chiefly lying in the fact that they can sometimes be higher and often longer. This latter, however, is not always a blessing. With modern sets and especially when working on really short waves a long aerial can be a decided drawback.

A friend came to me recently and complained that he was getting very poor results after erecting an outdoor aerial.



On his old loft aerial he had been wont to get very loud reception on a two-valve set. Without making any special enquiries about the new aerial, which I was assured was quite O.K., I arranged to go round and see what I could do.

It thus turned out that I spent a long time one evening after dark, carefully testing everything connected with his set and find-

ing nothing wrong. Results were, however, decidedly poor. Thereupon, I left the matter for that night and arranged to look at his aerial the next day.

Imagine my surprise, therefore, when on going into the garden the following morning and looking up, I saw nothing but clear sky.

#### What an Aerial!

"What has happened?" I enquired.

"Nothing," was the reply, and I was then shown the new "Outdoor Aerial." It consisted of about six wires of 26 D.C.C. on rings about 1 in. in diameter and about 8 ft. long. To make the thing even more ludicrous it was supported by the top of the door, and, consequently, was only 8 ft. high.

So don't think that a man who has an outdoor aerial is necessarily better off than you are, who can only put up an indoor one. If you make the best of your facilities you may be able to get results as good as the average outside aerial.

## INDOOR AERIALS.

If you can't erect an aerial out-of-doors, good results are still possible with one of the indoor variety, and this article tells you how make the most of it.

By A. S. CLARK.

If you are able to fit the aerial in a loft, you are well away. Should the set be on the ground floor, do not bring the lead-in down inside the house, where it will have to be run along the walls. Try the scheme indicated in one of the diagrams on this page.

You should have no difficulty in finding a small hole or crack through which a wire can be passed. Electron wire is extremely useful for this purpose, as it is very strong and the insulation is not likely to get injured by rubbing against any bricks with which it may come into contact.

Another point you must be careful about is to see that all joints are well made. A twisted joint may give good results for a little while, but it is almost sure to corrode so badly eventually that hardly any contact will be made. The following incident will serve to illustrate this.

#### Effect of Bad Joints.

A set was being fixed up in a house where there was already a loft aerial which had been erected by a previous tenant. The lead from this aerial was dangling through the trap door of the loft, and it was decided to run a wire from this lead-in to the set, just for testing purposes. The wire from the loft to the set was rather long, about 24 feet, so it was decided to try the set on this alone before connecting up with the aerial.

Results were fairly good, but when the aerial was joined on they were no better and the set refused to oscillate. Investigation showed that the loft aerial was a very good one and should have given excellent results.

The trouble was eventually traced to a twisted joint between the aerial wire and the lead-in, which had corroded. On soldering this connection results were all that could possibly be expected. Therefore, always pay great attention to all the joints in the aerial and earth system.

Reference to earths brings us to another point connected with indoor aerials. A good earth connection will sometimes make all the difference. A rather poor indoor aerial with a bad earth may be hopeless, but the same aerial with a good earth will give quite passable results.

Keep the earth lead as short as possible, and make it of heavy insulated wire. It is best to choose a water pipe which runs straight down into the earth. If you are

unable to solder the wire to the pipe, use a proper earth clip and scrape the clip and pipe very bright before attaching.

If the finished connection is completely bound round with insulating tape it will not corrode at all easily, and should give a good connection for quite a long time.

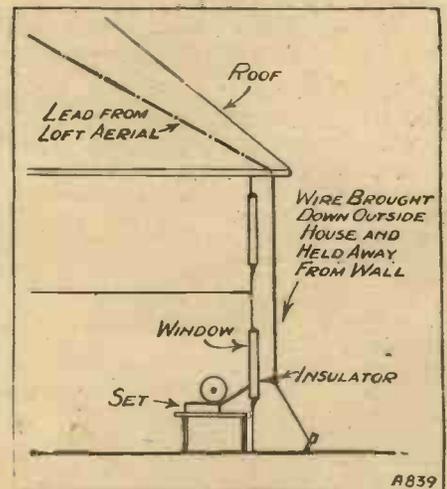
Constructors sometimes think that since they have no access to a loft in which to erect their aerial, that they will have to use a frame aerial. In practically all cases a small aerial consisting of a wire round the room will give results far superior to a frame aerial. A diagram is given showing three ways in which the wire may be fixed. If, of course, it is possible to run the wire along a landing this is to be preferred.

#### Loft Aerial Often Efficient.

There are many ideas which may be tried for an indoor aerial, and the main points to be borne in mind are to keep it as high as possible, and to get a fair length of wire in it. Do not, however, have more than about 60 ft. in all. If the aerial is too long it is almost sure to have a fairly high capacity, which is detrimental to good results, apart from making it difficult to get reaction effects.

Very often the height of a loft aerial is greater than that of an outdoor aerial, since it is not usually possible to get a mast as high as the roof of the house. For aerials in a room it is best to use ordinary, medium-size rubber-covered flexible wire. It is not necessary that it should be supported on insulators.

From the foregoing remarks it will be appreciated that when considering the erection of an aerial, the indoor or loft arrangement must not be neglected. It will



also be appreciated that in some cases the indoor arrangement would prove more efficient and therefore give louder results than the best possible outdoor aerial. Just one warning as conclusion; do not run the aerial parallel or near to any pipes in the wall, or along by bell wires or electric cables, otherwise you will lose much of the power.

You should read  
**MODERN WIRELESS—Britain's Best Radio Magazine**  
*Every Month. Price One Shilling.*

THE introduction of the screened-grid principle of neutralising inter-electrode capacity marks a definite stage in valve development. But, like every other innovation, once its merit has been established, a period of improvement and modification sets in.

Inventors and designers are constantly searching for new points of advantage. Here they succeed in increasing efficiency in operation, and there effect some economy in manufacture, until a stage is reached which, for the time being, represents the nearest possible approach to perfection.

This process is at present going on in the case of the screened-grid valve. Many variations in the original design are already on the market, whilst others are in course of development.

One of the first improvements was to replace the special "horizontal" mounting by a vertical model using a standard four-pin plug with an extra terminal fitted to the top of the bulb. This made it a comparatively simple matter to change over an existing set from ordinary H.F. to S.G. amplification.

**Indirectly-Heated Cathodes.**

Another progressive step was to combine the known advantages of the screened-grid with the use of the so-called "equi-potential cathode." The latter came into general use about the same time as the screened grid, though it was developed along quite independent lines.



# SCREENED-GRID DEVELOPMENTS

Some interesting variations in valve design are in the course of development, and these progressive steps are described in the following interesting article.  
By J. C. JEVONS.

The modern combination of the screened-grid principle with an equi-potential cathode has set up an entirely new standard of valve performance. The new Cosmos Shortpath AC/S valve may be cited as an example. This valve has an amplification factor of 1,200 and an internal resistance of approximately 800,000 ohms. One can get some idea of the progress that has been made by comparing these figures with the standard three-electrode H.F. amplifier having a specified amplification factor of 40 and an internal resistance of 80,000.

Further progress in screened-grid development is illustrated diagrammatically in Fig. 1. This new design of screened-grid amplifier is due to the well-known inventor, Mr. C. S. Franklin. It is intended primarily for push-pull amplification of very high frequencies.

The inventor points out that in the ordinary S.G. amplifier the effects of inter-electrode capacity, although greatly reduced, are not entirely eliminated. This is due to the fact that some capacity exists between the screen and the plate.

**Slight Feed-Back Remains.**

It must be remembered that the screen is inserted between the plate and the grid with the object of preventing capacity coupling between these two electrodes, i.e. preventing any transfer of energy from the output circuit to the input.

Although this main object may be substantially secured, a new capacity effect has been introduced, this time between the plate and the screen. Potential variations occurring on the plate are, therefore, liable to be transferred to the screen, and so set up currents in the external circuit of the latter.

In spite of the fact that there is little impedance in the external screen circuit, there may be sufficient—especially when handling very high frequencies—to set up corresponding voltage variations on the screen itself. These, in turn, are then

communicated to the grid, which in effect means that the latter is only imperfectly screened from the plate. Undesired oscillations may accordingly be set up in spite of the presence of the screen; or, rather, because of its imperfect screening action.

In order to remove this source of weakness, Mr. Franklin, in his new valve, mounts two sets of grids and plates on each side of a central filament, and then inserts a double screen arranged symmetrically with both sets of electrodes.

As will be seen from the figure, a central filament *F* feeds a grid *G* and plate *P* on one side, and a second grid *G*<sub>1</sub> and plate *P*<sub>1</sub> arranged on the opposite side. Screens *S*, *S*<sub>1</sub> are interposed between each plate and grid, and are both mounted at equal distances from the filament.

**Two Screens.**

In practice, the two screens are combined into a single box-like structure which is connected by a single lead *L* to an external battery, or steady source of biasing potential. The leads for the filament and the two control grids are both taken to the bottom of the bulb, whilst those for the two plates are taken to the top, so as to minimise, as far as possible, any capacity coupling between the input and output connections.

Fig. 2 shows the manner in which the valve is used as a push-pull amplifier. Input voltages are applied across the transformer *T* in phase opposition to the two grids

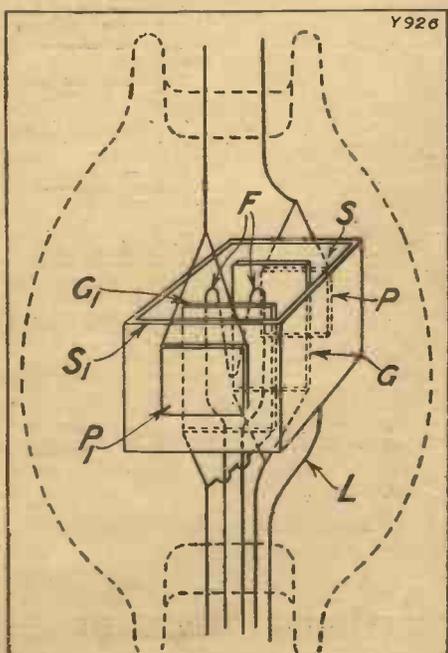


FIG. 1. THE NEW FRANKLIN VALVE.

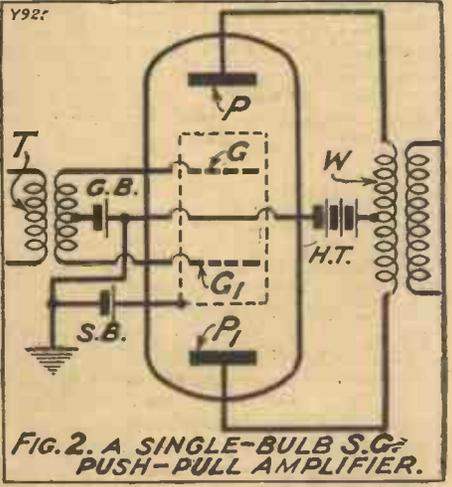


FIG. 2. A SINGLE-BULB S.G. PUSH-PULL AMPLIFIER.

*G*, *G*<sub>1</sub>, the output being combined additively in the transformer *W*.

The plate voltage is supplied from a battery *H.T.*, grid bias from a battery *G.B.*, and screen bias from *S.B.*

Owing to the symmetrical arrangement of the screen and valve electrodes, no residual capacity coupling occurs in this valve even when used for amplifying wavelengths of the order of 20 metres.

**THE "TITAN" THREE.**

The Editor, POPULAR WIRELESS.

Dear Sir,—I feel I must write and tell you what a fine set the "Titan" Three is. Since 1924 I have tried about twenty circuits, and the "Titan" is, taking everything into consideration, the best of the lot.

At first I tried the circuit exactly as per blue print, but have since added a 30-ohm rheostat in H.F. valve negative filament lead. This has improved selectivity a good 20 per cent.

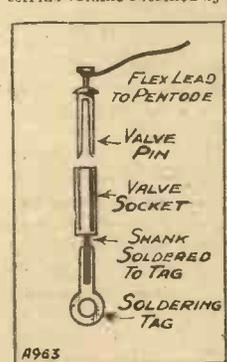
5 X X in these parts, however, does not come in very strongly, and I would suggest that for the benefit of people living so far from Davenport, you give us a four-valve edition of the "Titan" Three. Thanking you for such a fine set.

Yours faithfully,  
J. W. S.

Ayrshire, N.B.

The Editor, POPULAR WIRELESS.

Dear Sir,—As a very satisfied builder of the above set it occurred to me that when not requiring the terrific volume obtained by the use of the "Pentode," it would be a saving in H.T. to simply plug-in the ordinary power valve, providing the change-over could be done easily and without much messing about, unscrewing terminals which are very often inaccessible.



I am enclosing rough sketch showing the method adopted by me which proves very satisfactory, and which costs only a couple of coppers or so to make. An ordinary soldering tag and old valve-socket and pin are all that is required. The valve-socket (or, at least, the shank) is flattened off on one side and soldered on to the tag. This can then be placed under terminal H.T. + 3, and left there permanently.

The flex lead from "Pentode" is then soldered to the valve-pin and plugged into the socket when using the "Pentode." When not using "Pentode," the socket can remain under the H.T. terminal without causing any interference when desiring to use the ordinary power valve. Perhaps this may be of interest to other "Titan" builders.

Yours truly,  
A. WADDINGTON.

Burnley, Lancs.

**THE WONDERFUL "TITAN."**

The Editor, POPULAR WIRELESS.

Dear Sir,—As a constant reader of your valuable weekly I wish to add my testimony to the results obtained with the wonderful set the "Titan" Three. May I suggest now having brought out "Titan" One, "Titan" Two and Three (two types) that we readers and all homo constructors shall soon see the latest and the best of all sets, the "Titan" Four. This also in two types, to enable many old coil-changing sets to be remodelled—say an R.C. coupling and one L.F. stage with plug-in coils, revised to incorporate the "Titan" Coil?

Also an All Europe set with screen-grid valve for those who desire an up-to-date four-valver using the wonderful "Titan" Coil.

RADIO ENTHUSIAST.

Cardiff.

**THE "TITAN" THREE ON SHORT-WAVES.**

The Editor, POPULAR WIRELESS.

Dear Sir,—Having built the "Titan" Three may I be allowed to thank your technical staff for designing a three-valver which will, in my opinion, require a lot of beating for its simplicity of operation.

I should like to inform prospective builders of this amazing set that it is really and truly a one-dial set. After setting the reaction dial, and the switches placed in their respective positions, you turn your tuning dial at a slow speed, and station after station rolls in.

On the long waves a slight alteration may be needed for the reaction dial.

I should like to relate here of my own experiments with the "Titan" Three, which may be helpful to owners of this set.

Wishing to listen-in to the American transmissions on the very short waves on this set, I constructed two coils on similar lines to the "Titan" Coil Unit.

On disconnecting the "Titan" Coil from the set, I placed No. 1 coil in set as follows: Earth to earth, aerial to aerial, grid to grid on valve holder. The coil was wound as follows: On a 2½-in. cardboard former wound with 20 D.C.C. wire, I placed 3 terminals, viz. grid, aerial, earth. Commencing at grid terminal I wound on 9 turns, spaced ¼ in., the end going to the earth terminal. Over these turns I placed round the coil about 14 matches holding them in position with the aid of a small elastic ring. Restarting at the earth terminal on former in the same direction as the first winding, this time the winding is placed over the matches, I wound on 5 turns spaced about ¼ in. apart. This second winding, as in the "Titan" Coil, to be as though

**CORRESPONDENCE.**

**THE "TITAN" THREE  
WAS IT SATURATION?—  
A READER'S REFLEX, Etc.**

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.

It were a continuation of the first winding, that is, the first turn of the second winding starts at, and right above, the 9th turn of the first winding. The end of this I fastened round one of the matchsticks. These five turns were bared of their cotton covering at the 2nd, 3rd, 4th, and 5th turns for tapping purposes. Next, I connected a tapping clip to the aerial terminal on coil. The only other connection to coil is aerial terminal on coil to moving vanes on the "00005 reaction condenser. The operation of taking out the "Titan" Coil and placing this short-wave coil is really easy and takes about three minutes to do.

My second short-wave coil I constructed on similar lines to No. 1 coil, consisted of 5 turns first winding, and three turns second winding.

No other windings are needed for these two coils. The switching terminals and reaction terminals not being required.

My estimation of these coils regarding wavelengths are, No. 2 coil from 20 to 40 metres; No. 1 Coil from 40 to 80 metres.

I have heard K D K A on 62½ metres; a few others—I cannot make out their call signs—on No. 1 coil. On No. 2 coil I have heard 2 X A F and 2 X A D, also several others.

I will be fair by saying that on only one occasion I heard K D K A on 62½ metres via loud speaker. The other stations on various nights were heard via headphones, and I may say prove very interesting.

My set is no super-set, and was made by myself following your specification of parts to the T.

I shall be grateful to hear from any other reader regarding the construction of a coil for reception on the very short waves for the "Titan" Three. Again thanking you, wishing "Titan" owners good luck, not forgetting the Technical staff.

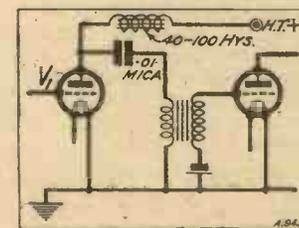
Yours faithfully,  
A. JACOBS.

P.S.—Referring to the above, the times of listening to the American transmissions were from 10 p.m. to about 1.15 a.m. I have been informed that from 1 a.m. onwards reception improves greatly. How do others find this?—A. J.  
Bow, London, E.3.

**WAS IT SATURATION?**

The Editor, POPULAR WIRELESS.

Dear Sir,—I note that Mr. G. Blenkey appears to have had some difficulty in the use of a low impedance valve pre-empting a transformer, and presume the trouble was saturation. If he will try the connections as enclosed sketch I think he will find results quite satisfactory.



I must say that I have never had any trouble with "motor-boating" in a 3 L.F. set, and would suggest that this fault is generally caused by badly matched coupling valves.

With best wishes,  
Yours faithfully,  
STANLEY M. FORSYTHE.  
Dover, Kent.

**MR. BLENKEY AGAIN.**

The Editor, POPULAR WIRELESS.

Dear Sir,—If Mr. Burnard says that he has received 25 American stations on his 0-v-3, and three of his friends say that he has, then obviously it is so. But you must admit that on an anode-bend detector, even with unlimited L.F. amplification, it is rather an extraordinary performance. Mr. Burnard is evidently an earnest DX listener, and his identification of the stations, added, no doubt, by the three wireless enthusiasts he mentions, may therefore be taken as accurate. There are very worthy people, however, as you may know, who would swear to having heard Siam on a crystal set at noon in Peckham Rye (or

Whitby or Boscastle), when actually it was the next-door gramophone slightly heterodyned by an Italian ice cream seller in the street. I am quite convinced in my own mind that not a few of these wonderful results of which one hears have similar explanations. Not Mr. Burnard, though—he qualifies for one of our Valvular Dukedoms.

With regard to his very subtle criticism of my set, the advice which I so humbly offered, etc., he might have spared a moment to read my letter properly before unsheathing his trenchant wit.

I said, giving a very conservative estimate, that I had the choice of at least half a dozen programmes at good strength and quality on a moving-coil loud speaker any night, which means that all stations which fade badly have to be excepted. He implied that I was patting myself on the back for getting half a dozen stations "almost any night." I have no doubt that his ideas of quality differ widely from mine. Any iron-eared Spartan can get dozens of stations on the loud speaker by shoving his head down the horn, cramming on all the reaction he can bear, and using his imagination freely, but I'm afraid that sort of thing fails to amuse me. It would certainly test the sense of humour of the neighbourhood.

About these snags, surely every schoolboy knows (if he reads "P.W.") that a three-stage L.F. amplifier is temperamental, that 2-volt super-power valves can be overloaded, and that an anode-bend detector does have certain limits to its operating conditions. Perhaps Mr. Burnard did not know that a heavy current passing through it lowers the inductance of the transformer primary considerably. Perhaps his hasn't a very high one to begin with. If Mr. Burnard has never heard of or experienced any of these rather obvious things he's lucky.

Good luck, "P.W." Good luck, Stanley E. May you sleep sound in your bed o' nights (after 3 a.m.) now your honour is unsmirched. You stick to America, I'll try and keep a grip on the higher frequencies.

Yours faithfully,  
G. BLENKEY.

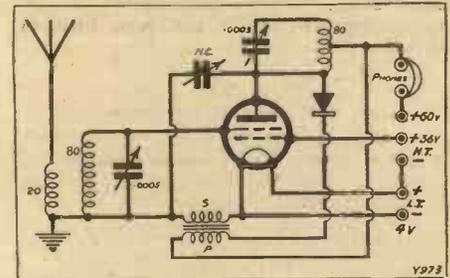
Whitby.

**A READER'S REFLEX.**

The Editor, POPULAR WIRELESS.

Dear Sir,—I have experimented with a good many crystal and one- or two-valve sets, and the most efficient one uses a circuit which seems to be original in many respects. This circuit is as shown: The components are: Valve, "Aneloy Products"; 412 L.F. valve.

Transformer, Ferranti A.F.1, incorporating fixed condenser.



Coils wound on 2-in. formers. Aerial and grid coils on same former.

Condensers and crystal detector of standard makes.

The auxiliary grid of the valve should be connected to the aerial circuit, while the normal grid should be connected to a small value of H.T.

The anode coil is centre-tapped to give greater selectivity. The neutralising condenser seems to stabilise the set. If it is not included, or of too great a value, the set oscillates. If adjusted to a small value, the set does not oscillate, so as to cause interference, in the slightest degree at any reading of the condensers, at the same time the set is sufficiently "live" to pick up distant stations without any special reaction device.

This set is superior as regards clearness and selectivity, and strength on distant stations, than any two-valve set employing det. and L.F. with Reinartz reaction that I have heard. The set is extremely pleasant to handle, owing to the fact that no reaction control is necessary and that instability common to reflex sets is absent. Hoping that this will prove of interest to your readers. I am,

Yours faithfully,  
A. C. EASTELL.

Malmesbury, Wilts.

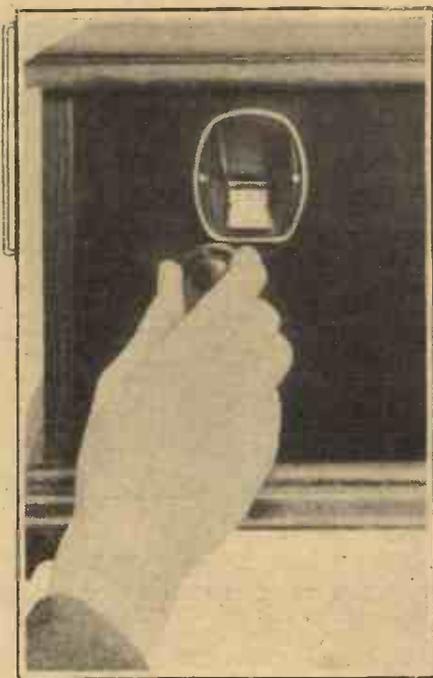
**WINDING THE "TITAN" COIL.**

The Editor, POPULAR WIRELESS.

Dear Sir,—May I be allowed to reply to the letter from Mr. Chas. W. Harvey in your issue for May 4th? I would suggest that the reason why he thinks so many people have got their "Titan" coils wrong is that the method he himself gives is incorrect!

Yours faithfully,  
A. F. TITTERINGTON.

Byfleet.



# YOUR TUNING CONDENSERS

Where does the modern variable condenser score over those early semi-circular vane types? Can a variable condenser affect the sensitivity and selectivity of your set? These and other equally important questions are answered in this article.

By G. V. DOWDING, Grad.I.E.E.

or piece of spring wire, and this ensures a permanent and good contact, but do not let us forget that, to their great credit, there were manufacturers of variable condensers who used these "pigtail" connectors ten and even fifteen years ago.

### Has a Smooth Movement.

Then we shall probably find that the moving vanes are carried on ball bearings, or, at any rate, have a wonderfully smooth movement; smooth, but yet with sufficient resistance, as it were, to enable very definite settings to be obtained with no danger of the vanes slipping round under their own weight. This certainly facilitates adjustment of the component to an extraordinary extent.

Then the vanes themselves are invariably of a peculiar cam shape, whereas in the past ages they were universally of a semi-circular form. The vanes are not so shaped to increase the sensitivity or selectivity of the set with which the condenser is used. You cannot do this by altering the shape of the vanes of a variable condenser. The sole reason for the peculiar shape of the vanes is to spread the stations out.

When we use a condenser having semi-circular vanes the component gives you what is called "straight-line-capacity variation." That is to say, the capacity added to the circuit by the condenser increases proportionally with the movement of the dial. But on the lower wave-lengths the stations are crowded more closely together than on the higher wave-lengths, the reason for this being that the separation between stations is one of frequency and not of wave-length.

### Facilitates DX Work.

A hundred stations can operate at different frequencies without mutual interference over the tiny band of 5 metres right down on the ultra short wave-lengths whereas on the normal broadcasting bands, you cannot get two stations within a five-metre band without them overlapping. So what your logarithmic compensated, straight-line wave-length, mid-line, or whatever it may be termed, variable condenser does is to spread these stations out around the dials more equally.

Instead of getting a station, should your set be powerful enough, at every degree on the dial from ten to twenty, at every three or four degrees up to the forty reading, and then at every ten or so degrees above that, they are more equally spread out so that, to take an example, you find a station at every four degrees over the whole scale, none being closer together than that or more widely separated.

You do not add any stations by this spreading out process, you merely make those available more easy to pick out and to log.

And so with the slow-motion movement incorporated in many modern condensers, and with the slow-motion dials which can be fitted. These enable you to get very close adjustments. They do not add to the power of the receiver, but make it easier for the inexpert or the only moderately expert to get very fine settings.

### And is a Notable Advance

However, in fairness to the modern variable condenser, it must be said that it enables the average amateur to accomplish feats of DX which would otherwise be impossible. An old-stager DX fiend with vernier fingers might be able to do as much, or even more, with a ten-year-old variable, but he could only be regarded as a rank reactionary if he said that he preferred to use such an instrument.

AS with practically everything else connected with radio, the variable condenser of to-day is very different from that used in the early days of broadcasting. I say "very different," although, actually, the difference is more comparative than actual. In appearance and in general design the structure of the variable condenser has undergone considerable changes but, electrically, there has been little or no alteration.

### This is Worth Noting.

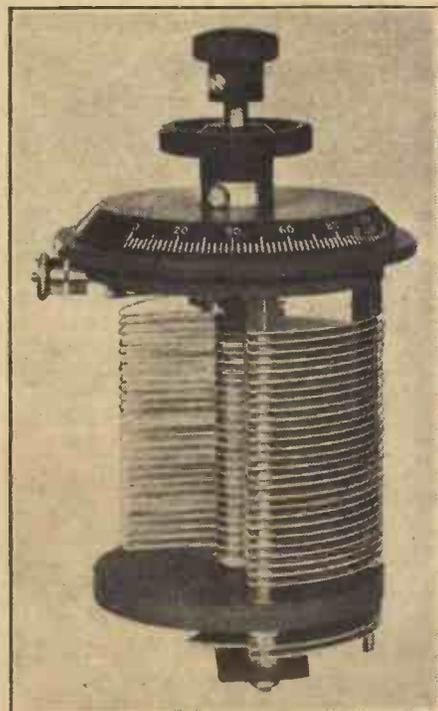
That is to say, the variable condenser of to-day does essentially the same thing as its predecessor. This is a point the amateur should bear well in mind. Given the latest of ultra-efficient receivers, using screened-grid and pentode valves if you like, remove its modern straight-line wave-length mid-line variable condensers fitted with slow motion dials, and insert in their places 1918 condensers having similar maximum capacities, and you will have taken nothing away from the power of the set.

You will have affected neither its selective nor its sensitive qualities, provided that the aged condensers were made of good material, and good material was obtainable in those days. But I must point out right away that the set would not be as easy to handle. An expert might get just as much out of it, but the ordinary listener would find it a different proposition to manipulate.

### The Modern Variable.

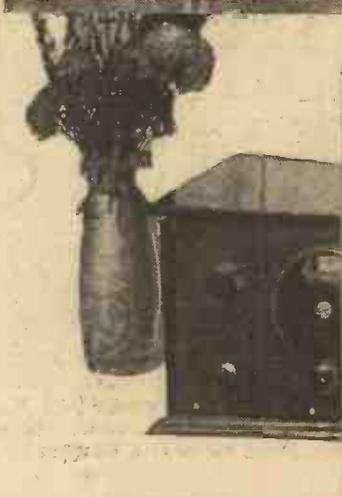
This is, then, very generally speaking, what the modern condenser stands for. That is, ease of control. Let us examine a modern variable condenser in detail and see what refinements the years have given it. In the first place, we find its construction is almost entirely of metal, and that there is very little insulating material in it. The ultimate good effects of this are that hand-capacity effects can be reduced, as also can high-frequency losses. But in the average Det.-2 L.F. set I fear the gain is negligible in regard to the latter.

Then the moving vanes are connected to the frame by means of a small flexible lead,



An old-type variable condenser. Note its ebonite end plates and semi-circular vanes.

The modern variable condenser forms just one example, among the many which could be chosen, of how the designs of radio components have been greatly improved in a few years.



# This Year's Radio Exhibition.

Some details of the great show to be held in London in the Autumn.]

By THE EDITOR.

**D**ETAILS of this year's National Radio Exhibition have just been issued by the Radio Manufacturers' Association. As in past years, the Exhibition will be held at the New Hall, Olympia; but, we are glad to note, the duration of the show this year has been extended to ten days.

The Exhibition will open on Monday, September 23rd, and will close on Thursday, October 3rd, both days inclusive. The Exhibition will open each day from 11 a.m. to 10 p.m.

The plan of the Exhibition is very much the same as it was last year, except that in the middle of the floor there will be a fountain. The bandstand will again be in the same position, but this year the dance floor will have been discarded, as also will be the large space hitherto allotted to the B.B.C.'s exhibit.

#### Radio in Schools.

Additional space, however, has been included in the gallery by absorbing some of the area connecting the gallery with the main hall.

The organisers are adopting the old colour scheme of royal blue and gold, and all stands will have to conform to the general appearance and decoration.

Lecturing before the Royal Society of Arts recently, Mr. Lynton Fletcher referred to the progress of broadcasting in schools. He pointed out that broadcasting in schools started as long ago as September, 1924,

and during the last four and a half years considerable progress has been made.

Careful examination has been taken of the work done and numerous demonstrations given, and a National Council for School Broadcasting has been set up under the chairmanship of Mr. H. A. L. Fisher.

#### The Personal Touch.

Many of our readers will learn with surprise that in connection with this school broadcasting, forty-four whole-time advisory engineers have been appointed. It is their duty to advise schools on what receiving sets to buy, how to make the best use of them, operate them, and maintain them satisfactorily.

According to Mr. Fletcher, without these engineers the whole scheme for broadcasting in schools would more or less be useless, for it is part of the scheme that the talks should be received so clearly that every child can hear every word broadcast distinctly and without any undue effort.

There is a considerable controversy still raging concerning the utility of broadcasting in schools. Some critics maintain that it is a valuable supplement to ordinary lessons, and that broadcasting should be utilised in every school.

But, on the other hand, it is maintained that broadcasting is merely a distraction which has not any permanent value as a medium for instructing school children, and that broadcasting, in fact, can never approach the value of the personal touch exercised by the schoolmaster or schoolmistress.

But, nowadays, some of the remote villages fitted with wireless sets are certainly benefiting their pupils by the utilisation of radio, for, apart from the stereotyped lessons of the ordinary school, broadcasting does help to inculcate in the minds of the pupils some appreciation of cultural subjects, such as music, painting, poetry, etc., which perhaps even the teachers themselves are rather vague about.

#### The Listener Pays.

The idea, however, that the loud speaker will replace the teacher in person is a fallacy, and the idea that broadcasting should be made a regular part of the curriculum in every school is rather overdoing it. It is all right for some schools, but it is essential that such methods should be used with discretion and moderation.

Mr. Stobart, the B.B.C.'s educational authority, urges teachers to regard the programme as an *à la carte* meal, and not a *table d'hôte*.

Of course, there still remains the important question, "Why should listeners' money be used for this State-aided method of education?" It was not part of the understanding when broadcasting began in this country that listeners' money should be in part utilised for supplementing the national educational authorities, just as it was not part of the bargain when the listeners agreed to pay 10s. a year for their licence fee that the Postmaster-General should nip in and take a share for the benefit of the Post Office.

#### A Revised Charter?

Let us hope that when the General Election has come and gone, some of these little problems and petty annoyances in connection with broadcasting will be cleared up. Certain it is that if the Conservatives are returned to power, the broadcasting charter will be revised; and, in fact, we understand from a very excellent authority that plans are already being prepared on these lines—and, incidentally, in connection with broadcasting in general—which will clear up many of the little anomalous problems which exist with irritating persistence to-day.

## PRACTICAL PARAGRAPHS

A noticeable alteration in the reproduction from the loud speaker can often be obtained by moving the instrument nearer to or farther from a wall, or by placing it in front of a curtain instead of in front of a flat wall surface.

Quite a good home-made anode resistance can be made by rubbing a very thin layer of Enamel-stove polish on a sheet of "P.W." paper, and then cutting it into a strip measuring  $2\frac{1}{2}$  in. by  $\frac{1}{2}$  in. wide.

Generally speaking, the resistance of a grid-leak should be about four times that of the anode resistance in the preceding stage.

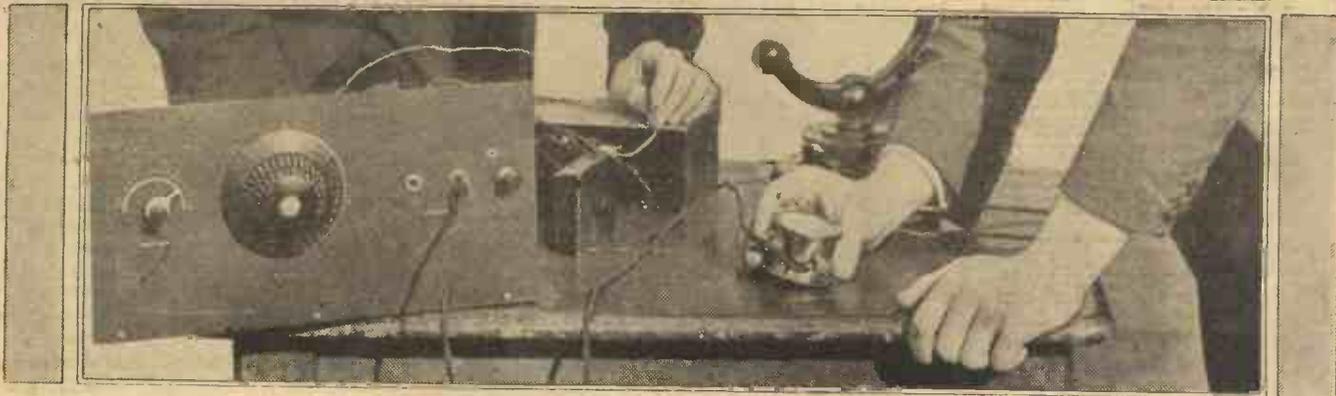
The difficulty in obtaining smooth reaction control, particularly at the top of the scale, is very often due to the use of an unsuitable radio frequency choke.

## NEXT WEEK!

Be sure to secure your copy of "P.W." and read all about a simple and effective amplifier called

## THE PLUS-FORMER

# A RAPID FAULT-FINDER



IT is strange to find at this time of day what numbers of wireless enthusiasts there are who for some queer reason or other will not avail themselves of the services of that most helpful of all wireless instruments, the little milliammeter. Time after time one receives an S.O.S. message from a friend whose set will not work, finding on arrival at his house that he has spent hours in trying to trace out the reason why signal strength is weak or, perhaps, why signals are absent altogether.

In the majority of these cases, from one to five minutes' work with the milliammeter runs the fault to earth and enables the set to be put at once into working order again.

The wireless man does not need an expensive laboratory instrument. All that he requires is an inexpensive moving-coil milliammeter reading with fair accuracy from 0 to 20 or 0 to 25. The cost of this will leave some change out of a £1 note. Without it one is completely in the dark about what is going on inside the set, and when a fault occurs one has as often as not no idea whatever of where to begin the search for the cause of the trouble.

## A Perpetual Check.

With a milliammeter one can have a perpetual check on the set's performances, for it will show the condition of valves and batteries; it will detect some of the commonest causes of distortion and it will show instantly when anything is wrong. Fault-finding becomes in nine hundred and ninety-nine cases out of a thousand an absolutely simple and straightforward business, which does not give rise to fruitless work or to the scoring of black marks in the Recording Angel's book.

The best advice that one can give to the man who does not possess a milliammeter is to purchase one without delay; the next best piece of advice is to provide for it two short leads, the positive fitted with a socket that will take a wander-plug, and the second with one of these plugs. The leads need not be kept permanently attached but they should be in a handy place should an emergency arise.

Remove the high tension negative lead from the battery, fit its plug into the socket and place the socket attached to the other

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**You can see at a glance whether your set is working properly or if your batteries are O.K. if you know how to interpret the readings on one little instrument.**

**By R. W. HALLOWS, M.A.**

\*-----\*

lead of the milliammeter in the zero socket of the high-tension battery. Read carefully the current recorded when the set is working properly and make a note of it. The milliammeter may now be disconnected, but a record of its reading must be kept for future use.

## Commencing the Hunt.

Now let us suppose that the set is not quite up to the mark. Instead of trying one thing after another with no very definite idea of what one is doing, but hoping for the best, the first step is to connect up the milliammeter as before. Does it show a normal reading? Generally, if the set is below par, it will not.

The first and most obvious cause of a low reading is run-down batteries; therefore they must be tested out before anything else is done. If they are found blameless then one of the valves is not passing its proper current.

Which is it? By switching off all except

in the holder. Should this produce results our task is ended; otherwise we must test out the filament circuit first of all and then the plate circuit.

Too high a reading indicates in the majority of cases a run-down grid battery. If this battery is tested and found in good order we must look for a disconnection in the grid circuit of one of the valves, probably on the low-frequency side, though it may be the rectifier if this is of the anode-bend type.

Even tests of actual components in plate or grid circuits can be carried out with the help of the milliammeter, though it is impossible to enter into details in the present brief article of the methods employed.

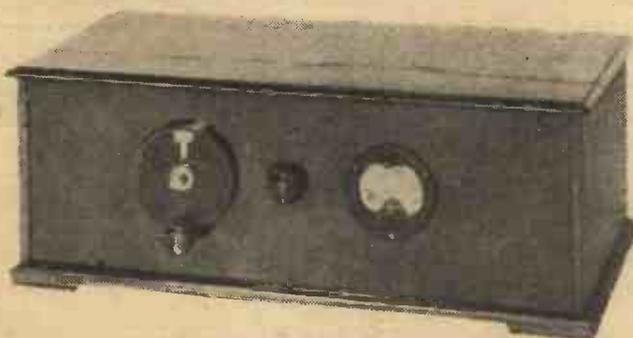
An actual instance will show what an enormous saver of time and trouble the milliammeter is. The case concerns a three-valve set with one high-frequency stage, an anode-bend rectifier and a transformer-coupled low-frequency stage. On the previous evening it had been working perfectly; when it was switched on again it was absolutely mute.

## A Peculiar Case.

In this particular case the set belonged to a friend who had spent some little time in endeavouring unsuccessfully to trace the cause of the trouble. The normal high-tension current was not known. The milliammeter showed a respectable total reading, but as a first precaution each valve was tried out separately in its own holder.

It was found that the detector valve gave a zero plate current reading. Another valve was tried in the holder with the same result. The filament fixed resistor was made to wobble slightly with a finger. In some positions current was now recorded, in others there was none. The trouble had been located at once and as soon as the resistor had been changed the set worked as well as ever.

I could give literally hundreds of other instances in which the milliammeter has provided a short cut to the location of faults that might otherwise have proved completely baffling. It is an instrument that no wireless enthusiast can afford to omit from his kit.



A milliammeter can with advantage be mounted on the panel of a set, and left permanently in circuit. You have then a means of keeping a constant check on the operation of your set.

one—or pulling all but one out of their sockets when there are not separate rheostats or switches—we shall probably find that one of them shows no reading at all on the milliammeter. Clearly either its filament or its plate circuit is at fault. The filament may be broken. Try another valve

## LATEST BROADCASTING NEWS.

## GENERAL ELECTION PROGRAMMES.

**HOW TO KEEP COOL—BRISTOL UNIVERSITY CONCERT—PROGRAMMES FOR PORTABLES—SCARBOROUGH ON THE AIR—"Q" BOAT STORIES—BRUCE BROADCASTS.**

## General Election Programmes.

IN addition to the flood of oratory from politicians, which has done little or nothing to brighten the programmes during the past few weeks, several of the provincial stations are arranging talks of topical interest for listeners round about the date of the General Election.

These talks will have nothing to do with politics, of course, but will deal with voting matters generally and contain historical data about the franchise. Stations in the Northern grouping are going one better on Saturday, June 1st, in giving a play by Edwin Lewis, entitled, "Bill Brown, M.P."

It is written in the "Owdham" dialect, so perfectly understood in the North. It has this point in its favour, that it will not influence a single vote because the Election—except perhaps the shouting—will be over.

Birmingham is arranging a revue, called "Vote-ville," for broadcast on Election Day, May 30th; but here, again, no one is likely to be influenced in selecting the square in which to put their cross at the polling booth. The revue is described as "a Conservative Labour treated with Liberal independence," which, most people are likely to agree, is too confusing for anything.

## How to Keep Cool.

How to keep cool in hot weather is the subject of a talk to be given from London by Mrs. Robert Noble, on Saturday, June 1st. The B.B.C. appears to have arranged for that day to be unusually hot in order to give topicality to Mrs. Noble's effort. But, even if it happens to be snowing, there will be more than 1,000 defeated Parliamentary candidates considering their bills, and how to keep payments within legal limits.

## Bristol University Concert.

Bristol University students will give a concert of folk-songs and madrigals for the benefit of Cardiff listeners on Tuesday evening, May 28th. Mr. A. S. Warnell will conduct, and there will be pianoforte solos by Mr. H. Sater.

## Programmes for Portables.

Mr. George Crossmith, always the advocate of the light touch, particularly during the summer months, was this year strengthened by being approached by a deputation of manufacturers of portable sets. After a terrific struggle against the forces of reaction and education, the great "G.G." scored a magnificent triumph, and is now able to tell his numerous friends and followers that, from early in June to the middle of September, there will be real light programmes from 2 L O and 5 G B daily from 4 p.m.

He naturally wanted it earlier, but the present concession is a great advance on previous practice. The education wallahs at Savoy Hill have retired sulking to their tents.

## Scarborough on the Air.

The next of the special summer programmes which stations in the Manchester group are relaying from famous Northern resorts is to be broadcast on Friday evening, May 31st, the town selected being Scarborough. It will include a concert from the Spa by Alick Maclean's well-known orchestra, which will doubtless provide a first-class entertainment. Other towns from which concerts will be given in the near future are Harrogate and Llandudno.

## "Q" Boat Stories.

There are many stories about the War which have still to be told, and none are more fascinating than those associated with the work of those mystery vessels known as "Q" boats, whose job was to fight the German submarines. Cardiff Station has done well to induce Captain C. E. Harris, the navigator and sailing-master of the smallest "Q" boat in the service, a ketch named "The Record Reigh," to come to the studio on Saturday,

June 1st, and relate some of his thrilling experiences. Cardiff, by the way, is providing more vitality and originality in many of its own talks than is true of most of London's productions in this line.

## Bruce Broadcasts.

Further details are now available of the broadcasts, mentioned in our last issue, of the official celebrations in connection with a centenary of the granting of Edinburgh's Royal Charter by Robert the Bruce. The chief feature is to be a municipal luncheon on Tuesday, May 28th, in the Music Hall, at which the principal speaker will be the Marquis of Linlithgow, whose remarks are to be broadcast from Scottish stations.

It is likely that the function will receive added importance by the attendance of, and speeches by, the Duke and Duchess of York, who will be in Edinburgh that day in connection with the unveiling of the statues of Wallace and Bruce at the gateway of Edinburgh Castle.

Arrangements have been made to broadcast a running commentary on the unveiling ceremony, which is to be performed by the Duke of York at noon, together with speeches, music by the bands, and songs by a choir of 500 children.

Later the same evening all Scottish stations will broadcast an extract from the Commemoration Pageant of the Six-Centenary of Edinburgh, which has been written by Lady Margaret Sackville and which is being staged by the Education Authority. The scenes to be broadcast represent the actual granting of the City Charter on May 28th, 1329, and an audience granted by Mary Queen of Scots to the burgesses of Edinburgh,

## PRESIDENT'S SON GETS RADIO JOB.



Herbert Hoover, Junr., son of the U.S. President, has recently taken up the duty of supervising radio equipment on a fleet of airplanes at Los Angeles, California.

## TECHNICAL NOTES.

By Dr. J. H. T. ROBERTS, F.Inst.P.

## TESTS OF EXPONENTIAL HORNS

BLINDFOLD EXPERIMENTS—PENTODE HINTS—"SCRATCH," ETC., ETC.

## Tests of Exponential Horns.

I REFERRED in these Notes some little time ago to the exponential type of loud-speaker horn, and as this matter was evidently of interest to a large number of my readers, I think I may perhaps refer to it again, as I have just received a report of a meeting of the Newcastle Radio Society which was held a week or two back in the Physics Laboratory of the Armstrong College, Newcastle-on-Tyne.

At this meeting a very interesting experiment was carried out. There were about three hundred people present and a number of loud speakers, including moving coil, cone, linen-diaphragm and horn speakers,

were arranged so that one after another could be connected to an electrical pick-up and amplifier operating in connection with the gramophone.

## Blindfold Experiments.

All the loud speakers were hidden from the audience behind a screen, but were operated in succession and identified by numbers, the names not being revealed until the decision as to relative merits had been arrived at by the votes of the audience. Some of the speakers were made by experimenter members of the society, whilst others were commercial models.

(Continued on page 337.)



## AN AUTO D.C. SWITCH.

(Continued from previous page.)

note whether the round-headed screws are making good contact with the two diagonally opposite angle contacts.

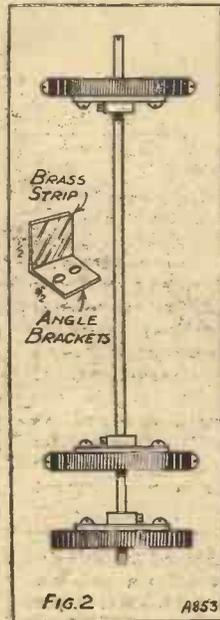
If all is not in order, then slightly bend the angle contact until this is the case.

Reassemble the whole unit, leaving off the side with the mains adaptor and rotate the discs until the contact screws are in a line and pointing to the top. Now rotate the low-tension disc until it makes contact with the two fixed contacts which will eventually be joined to the L.T. terminals on the set.

### Fixing the Stops.

The back disc (H.T.) should be rotated, keeping the L.T. disc in position until it just makes contact with the two fixed contacts which will eventually be joined to H.T. eliminator terminals.

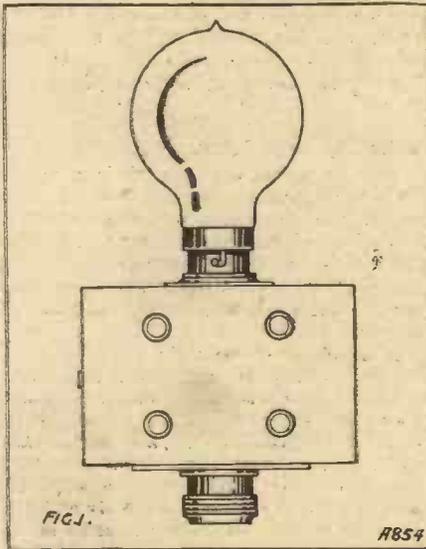
The reason for this is so that the H.T. is switched off before the L.T. If all is O.K., screw up the grub-screws on the Mecano bush-wheels, and solder these latter to the spindle.



Obtain a suitable lamp for the holder, in accordance with the accompanying table. Join up the accumulator, H.T. eliminator, set, etc., as per Fig. 3, and switch over to the position where the set is in operation. Pull out the L.T. switch on your set and results should be obtained.

When switching off do not touch the L.T. switch on the panel, but merely place the knob on the unit in the "charge" position, the charging lamp will then light and the accumulator will be on charge.

If at any time the accumulator should be fully charged, due to the rate of charge being considerably in excess of the rate of discharge, place the operating knob on the unit in the midway position between the "set on" and "set off" position.



Place the operating knob on the spindle and examine the various contacts and positions.

It is now time to fix the two stops. These prevent the contacts from being turned too far and so breaking off the connecting wires. Note the small flat surface which must be filed on the spindle to prevent the knob from turning after the stops have been arranged.

### Final Assembling Details.

Remove the operating knob (it can easily be replaced without having to readjust it, for the flat filed on the spindle provides it with a definite position), take off the end checks and then examine the wiring diagrams. Some of the wires, especially those going to the lower contacts, will have to be fixed while the unit is in pieces, for it is hardly possible to get a soldering iron down into the "works."

For wiring up use good quality rubber flex, and, if possible, obtain some of the

new gutta-percha flex wire now obtainable from certain manufacturers.

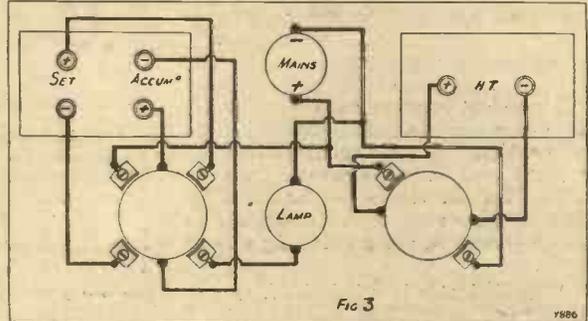
After the device has been reassembled, join an accumulator across the mains input terminal, and test the various output terminals with a small lamp. When testing the accumulator on charge position, do not forget to short the lampholder on the unit.

### CARBON LAMPS.

Ampere Current	25 v.	50 v.	100-120 v.	200-230 v.
	c.p.	c.p.	c.p.	c.p.
25			8	16
5		8	16	32
1.0	6	16	32	60

### METAL LAMPS.

	25 v.	50 v.	100-120 v.	200-230 v.
	w.	w.	w.	w.
2.5		15	25	50
5		25	50	100
1.0	25	60	100	200



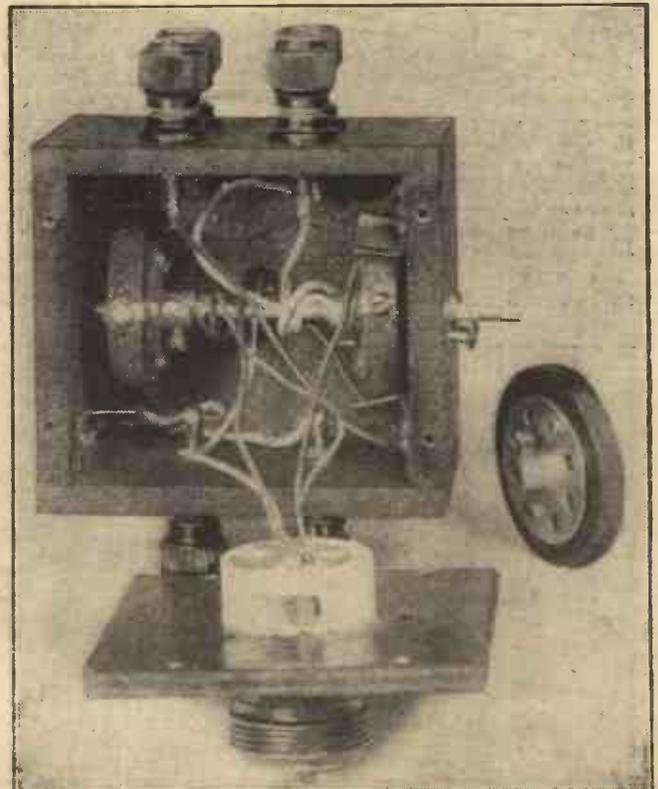
As the electrodes in a pentode valve are necessarily very close together it is usual to provide a fuse in the priming circuit, which is connected to H.T. +, to safeguard the H.T. supply if the electrodes should accidentally come in contact with each other.

A pentode valve will often stand rather more negative grid bias than the makers' characteristic curve would suggest.

## FOUR PENTODE TIPS.

Where a pentode replaces an ordinary output valve it is necessary to make provision not only for the extra connections to the additional electrode but also for an output transformer of suitable impedance.

An ordinary flash-lamp makes an excellent fuse for the H.T. supply to a pentode.



Slack must be left in the wiring in order to allow the moving parts to move freely.

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36-volt .. .. .	.. .. .	4/6
60-volt Super Power .. .. .	.. .. .	13/6
9-volt Grid Bias .. .. .	.. .. .	1/6
4½-volt Pocket Battery (4/6 a dozen)	each	5d.
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(Managing Director : THOS. N. COLE.)

**H**AVE you ever wondered why it is that you never seem to see any designs for single-valve short-wave sets? Perhaps you have not noticed the fact, but a fact it is: the writer of this article cannot remember ever to have seen such a design, so they must be at any rate scarce.

Well, the reason is probably that the real stunt in short-wave work, the spectacular feat which appeals to everyone, is the reception of the American stations, which calls for two or three valves on most occasions.

A short-wave single-valver could only be expected to do it when conditions were exceptionally good, hence it has been assumed, perhaps hastily, that no one wants such a set.

Is it a fair assumption? We have begun to doubt it lately, and on thinking the matter over it seems pretty certain that it is something of a mistake to encourage the beginner to think that it is no good to make a start in short-wave work with a small set.

#### An Easy Start.

If it were true it would mean that he cannot make a start until he can afford the time and cash involved in building a two or three-valver, which is usually in addition to the set he already uses for broadcast reception.

Why should he not do on short waves exactly as he does in broadcast reception, that is, start with a small set and learn the ropes in that way at small cost and trouble?

Is it reasonable to assume that because a one-valver will not receive America unless conditions are exceptional, therefore there is no interest in using such a receiver? Surely not! There are plenty of interesting transmissions which can be heard with even so small a set, and, as a matter of fact, it will probably do more in proportion than will a single-valver on the broadcast waves.

Most positively, then, there is lots to be heard with one valve on short waves, and we consider it is a most excellent way of making a start. Moreover, if you make such a set and learn to handle it to the best advantage you have the basis of a bigger outfit of high efficiency. If the single-valver is a good one you have only to add a one or two-stage L.F. amplifier to have a receiver equal to almost any of the larger types, without scrapping anything.

Evidently, then, there is a need for a design for an efficient short-wave single-valver. Now let us see what has been done in the one we have prepared for readers of "P.W." who may be thinking of making a beginning on the lower waves.

#### Special Refinements.

First of all, it had obviously to be really efficient, since one of the main ideas was that it should stand as the essential part of a bigger receiver when a low-frequency amplifier was added later. To be satisfactory under those conditions it must evidently be highly efficient and have enough refinements to please a user grown more experienced and critical.

Well, you will find that although this little set looks, and is, particularly simple, yet all the essentials are present, and it will give a very good account of itself. Moreover, it is very easy to handle, as short-wavers go. It is easier to get smooth reaction with it than with most circuits, a point specially helpful to the beginner, and hand-capacity effects are about as little trouble as they can be made without going to great elaboration.

This question of ease of handling reminds us to issue a gentle warning to the beginner in short-wave work not to expect matters to be quite so simple as on the broadcast wave-lengths. Most decidedly they are not: operating a short-waver definitely calls for practice and a rather delicate touch.

#### Learning The Trick of It.

Anyone can do it who possesses an average amount of patience, but it is no use to expect to be able to work a short-wave set properly at the first attempt. A little practice will certainly be needed before anything like ease is achieved. Tuning is absolutely razor-sharp, and so you have to learn to turn the variable condenser very slowly indeed. Moreover, a really good slow-motion condenser or vernier dial is absolutely essential.

Hand-capacity effects in a good short-waver should not be really troublesome, but they will generally be distinctly perceptible on the shortest waves of all, and a little skill is needed to allow for them. Actually, the reaction condenser is the only spot where they should be discoverable at all in the present set, and

# The LO-WAVE ONE



even there they are much less noticeable than usual.

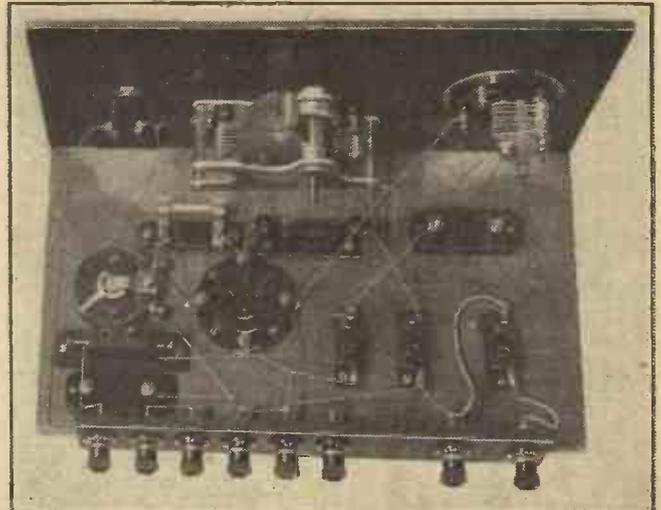
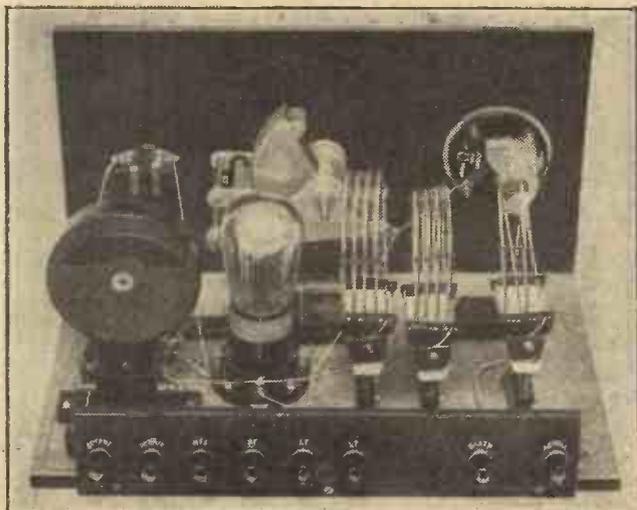
If you look at the circuit diagram you will see the main reason why this set is particularly well-behaved, the secret being in the reaction arrangement. This is the scheme known as "throttle control," which has special advantages in the way of reduced hand-capacity troubles, and extra smooth control, which make it very useful in a short-waver.

A set specially designed to form the easiest and simplest introduction to short-wave work. Although it only employs one valve it will enable you to hear amateur transmissions and short-wave broadcasting stations from great distances, and by adding a low-frequency amplifier later you can build up a larger and more powerful set as you progress.

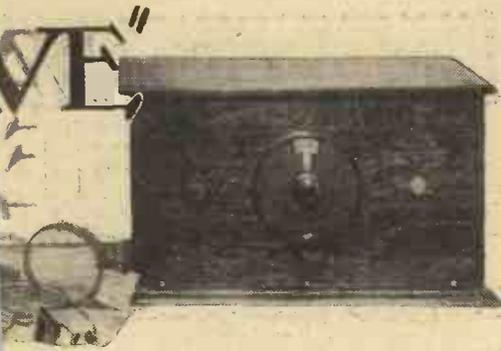
Designed by the  
"P.W." RESEARCH DEPT.

The reaction coil, you will see, is connected in series in the plate circuit of the valve, and since it is placed right up against the tuning coil the effect would naturally be to make the valve oscillate continuously if we did not take steps to provide some sort of control.

Accordingly, a high-frequency choke is also placed in series in the anode circuit, and so chokes back the reaction currents that the valve does not oscillate. Then,

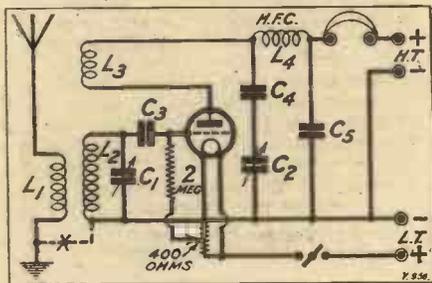


These two inside views show that although the set is so simple it incorporates the special refinements so desirable in a shortwaver. Note the potentiometer for the detector, the flex leads to the aerial coil (to permit variation of coupling), and the plug-in coil used as an H.F. choke.



to get a controlled amount of reaction we connect a small variable condenser so that it acts in effect as a by-pass across the H.F. choke.

This reaction condenser is the one marked  $C_2$ , and you will see that it provides a path down to filament for the reaction currents without going through the H.F. choke. The fixed condenser  $C_4$ , in series with the reaction condenser, by the way, does not play any active part in the working of the circuit. It is merely a "stopping" condenser intended to prevent a short of the



H.T. battery should the plates of the reaction condenser happen to touch.

Two other features which help to make the set handle nicely are the fixed condenser  $C_3$  and the potentiometer. The former reduces body-capacity effects by preventing H.F. currents from making their way into the 'phones, while the latter is a great help in getting smooth reaction.

**Easy Reaction Adjustment.**

This, of course, is absolutely essential in a short-wave set, and without a potentiometer means careful choice of a valve, adjustment of H.T. voltage, and picking the right size of reaction coil. When a potentiometer is fitted, on the other hand, all that one does is to choose a reaction coil of

roughly the right size, apply about 60 volts H.T., and then a very few moments spent adjusting the "potmeter" will produce perfectly silky reaction. Reaction, by the way, is usually smoothest of all with the potentiometer slider right round at the negative end, but signal strength is usually improved by bringing it back as far as you can towards the positive end without making reaction poppy.

So much for the general details of the set. Constructional matters, you will see from the photos, are very straightforward indeed, and there is little to be said. Just one point requires mention, however, and that is to point out that the socket for the aerial coil ( $L_1$ ) should be fixed with only one screw, and preferably wired up with flex.

The idea is to arrange matters so that the aerial coil can be turned, if desired, at an angle to the secondary coil ( $L_2$ ). Normally, of course, the two are placed side by side, but if you find a "flat spot" in the tuning range, i.e. a place on the dial where it is very difficult to get reaction, you can cure it by weakening the coupling.

**Important Details.**

Operating details are specially important in a short-wave receiver, because real success is absolutely dependent on getting things just right. Reaction, obviously, is the key to the whole matter, and we have already gone over the main factors in discussing the use of the potentiometer. There remains, however, the question of the type of valve to use. Not so long ago it was the fashion to use a power valve as a detector on short waves, simply because it was easy to get it to oscillate.

Nowadays we have got over the reaction difficulty in other ways, and so we can use a valve which is really a better detector—namely, the H.F. type. Almost any of these will give good results, but some of the improved 2-volters are perhaps the best of all in this circuit.

Next, about coils and coil sizes: You require some of the special short-wave plug-in coils, such as the Atlas and Igranic, and to cover all the interesting wave-lengths you want sizes 2, 4, 6 and 9 (these numbers are the turns in each coil). A spare

No. 4 is also useful, but not by any means essential. There are two main wave-bands to be covered, namely, 20 to 35 metres, and 40 to 60 metres or thereabouts, these two ranges embracing nearly all the interesting stations.

For the 20- to 35-metre band the aerial coil should be either the No. 2 or the No. 9. The former is usually best, but try also the larger one set at various angles. For the secondary the No. 4 is correct, with the No. 6 or another 4 for reaction.

**The Best Coil Sizes.**

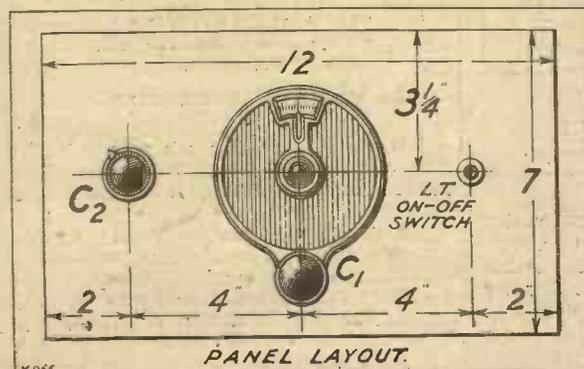
This combination will actually tune up higher than 35 metres, but efficiency falls off above about that wave, and it pays to change to a larger size for the secondary and so get the higher waves with less capacity across the coil, i.e. with the tuning condenser at a lower reading.

For the 40- to 60-metre range, therefore, try the No. 2 as  $L_1$ , No. 6 as  $L_2$ , and No. 4 or 9 as  $L_3$  (reaction). If No. 9 gives satisfactory reaction, try the No. 4 as  $L_1$ , setting it at various angles if "flat spots" prove troublesome.

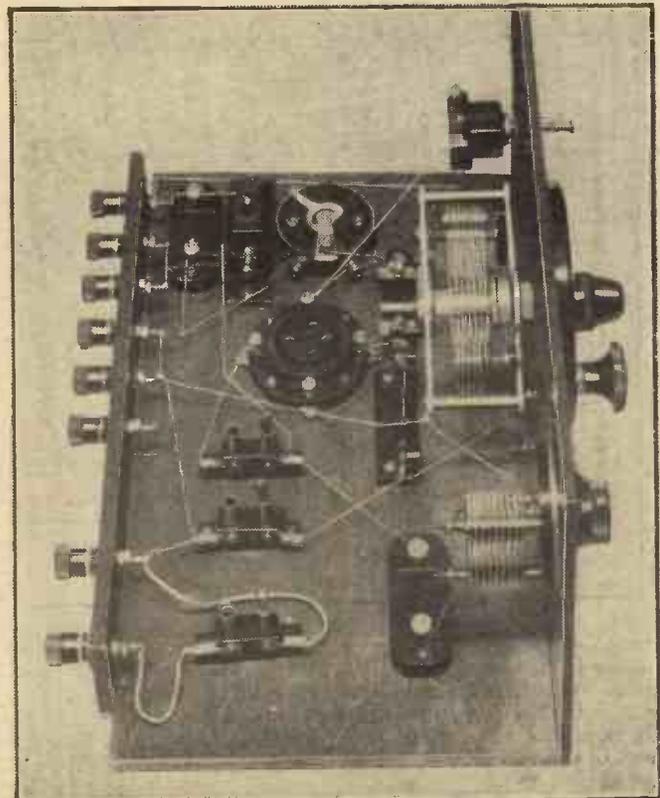
While we are dealing with questions of coil sizes it may be as well to mention that one of the attractions of this little set is that it can be used on the ordinary broadcast wave-lengths simply by inserting suitable coils of the usual sizes. You can thus make it your main receiver if you like, with a low-frequency amplifier to be added later for loud-speaker work.

Finally, one or two miscellaneous points: You will see a dotted connection in the circuit diagram, which indicates an optional connection. This is a lead which earths the battery circuit, and it is worth trying with and without it, because it sometimes helps

(Continued on next page.)



The lay out of this set makes it particularly easy to keep all the leads very direct and nicely spaced. Particular care should be devoted to the wiring of the tuned circuit, especially the "grid" side of it. Above all, make sure of perfect soldered joints and very tight "screw-down" ones.



## THE "LO-WAVE" ONE.

(Continued from previous page.)

to reduce hand-capacity troubles a bit further to omit it.

The H.F. choke in this set is simply an ordinary plug-in-coil, and you will find a No. 60 or thereabouts will suit in most cases. It is not at all critical, however, and almost any small size will do.

If you have a range of plug-in sizes it is interesting to try different ones for the choke because you may find that some sizes give slightly smoother reaction than others. The difference is only very slight as a rule, so it is not worth worrying about if you only have a few coils.

When it comes to ordinary broadcast

$L_1$ , 75 or 100;  $L_2$ , 250;  $L_3$ , No. 50 to 150, according to the size of coil available for use as a choke. The correct choke theoretically would be quite a large size, such as a No. 300 or 400, when a No. 100 or thereabouts would be used for  $L_3$ . Few people, however, have such large sizes available, and a smaller one, e.g. a No. 100, will serve, but this makes the circuit oscillate more easily, hence a smaller reaction coil must be used in this case.

This explains our remark above about the various sizes for  $L_3$ .

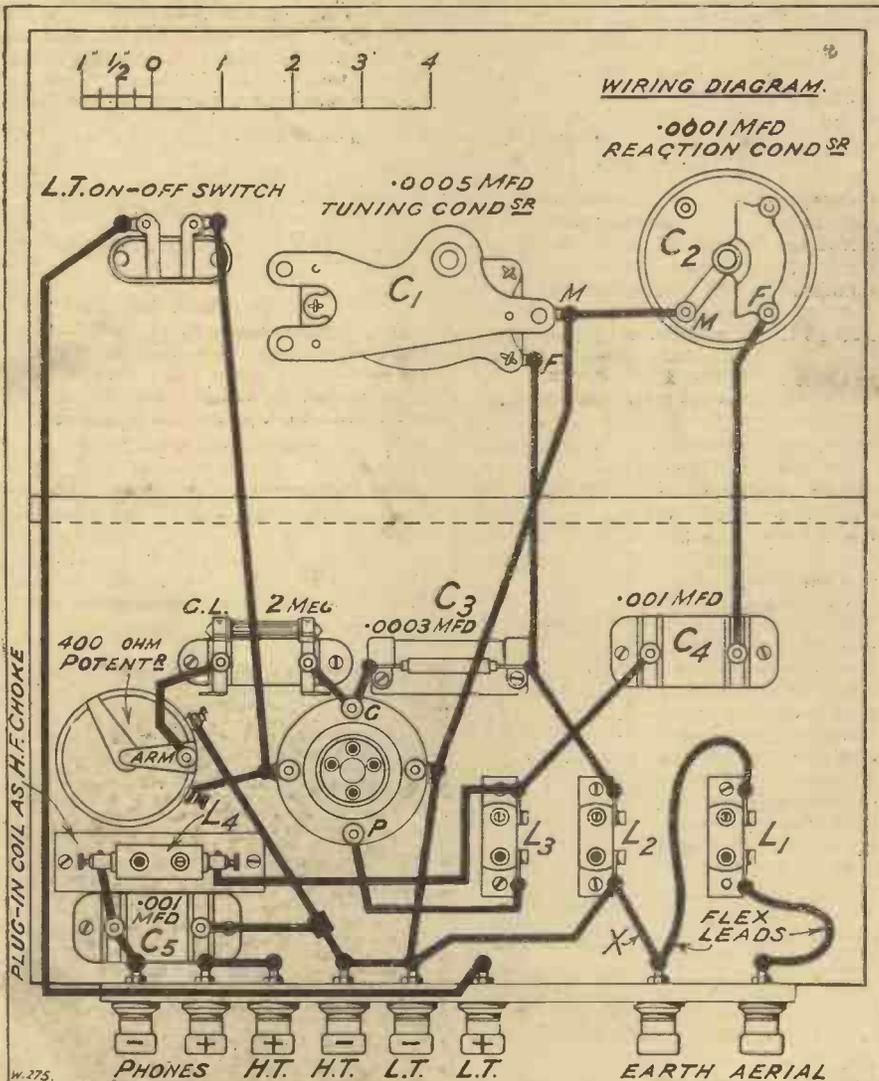
Now a hint or two about where or when to search for short-wave stations. Regular transmissions from short-wave broadcasting stations you will find detailed in "World Radio," and with the aid of the times and wave-lengths given therein and the details we have given on coil sizes you will soon be able to pick up the stronger ones

## RADIO JOTTINGS.

The reason that many present-day transformers are smaller and yet efficient is that they employ a new metal which was not available in the days when small transformers meant "tishy" performance.

The extra terminal on the top of the latest type of S.G. valve is the actual plate or output connection, that leg of the valve which is connected to the P. terminal of the valve holder being joined inside the valve to its screening plate.

The usual method of indicating a pentode valve in a theoretical diagram is to use the conventional signs for filament and plate but to show three grids between these, instead of one.



### COMPONENTS REQUIRED.

- 1 Panel, 12 in. x 7 in. x 1/4 in. or 3/8 in. (Resiston, "Kay Ray," Ripault, Trelleborg, Becol, etc.).
  - 1 Cabinet to fit, with baseboard 7 in. deep (Pickett, Raymond, Camco, Gilbert, Peto-Scott, Lock, Arterial, Caxton, Bond, etc.).
  - 1 .0005-mfd. variable condenser, slow-motion or with good vernier dial (Igranic Lokvane condenser, and Indigraph dial in original. Any other good make, e.g. Lotus, Lissen, Utility, J. B., Cyldon, Ormond, etc., can be used. NOTE.—If the set is for use on short waves only, a .00025 or .0003 mfd. is to be preferred instead of a .0005 mfd., since tuning is made a little easier).
  - 1 .0001- or .00015-mfd. reaction condenser (Peto-Scott, J. B., Cyldon, Ormond, Lissen, Burton, Dubilier, Bowyer-Lowe, Raymond, etc.).
  - 1 L.T. switch (Igranic, Benjamin, Lissen, Lotus, Wearite, Burne-Jones, Bulgin, etc.).
  - 4 Single-coil sockets (Lotus or similar type).
  - 1 Spring valve holder (Lotus, Igranic, W. B., Pye, E. T. H., Benjamin, Burton, Formo, etc.).
  - 1 200- or 400-ohm potentiometer (Lissen, Igranic, etc.).
  - 2 .001-mfd. fixed condensers and 1 .0003-mfd. (Dubilier, Igranic, Lissen, T.C.C., Clarke, Mulard, Goltone, etc.).
  - 1 2-meg. grid leak and holder (Lissen, Dubilier, Ediswan, Pye, Igranic, Mulard, etc.).
  - 1 Terminal strip, 10 in. x 2 in. x 1/4 in., and 8 terminals (Igranic, Eelex, Burton, Belling and Lee, etc.).
- Wire, flex, screws, etc.

reception. of course, you require a much larger coil for the choke, and for the lower wave-band (250-550 metres) a No. 250 is suitable. For this wave-band, by the way,  $L_1$  should be a No. 25 or 35,  $L_2$  a No. 60, and  $L_3$  a No. 35 or 50 or, indeed, almost any small size.

For the long wave-band (1,000-2,000 metres) these are the correct coil sizes:

Finding amateur stations is not so simple without a hint as to how to set about it. Well, you will find most of the amateur telephony transmissions on the No. 6 coil as  $L_2$ , with  $L_1$  and  $L_3$  as specified previously. With this combination you will probably come upon amateur stations at quite a number of readings over the first third of the dial or thereabouts.

If you save your old panels you will find that terminal strips and similar handy accessories can be turned up from them in a few minutes.

Such points as terminal shanks, soldering tags, etc., should be filed and tinned before the set is completely assembled, as the operation is much easier at this stage than when the components are all screwed into place.

Apart from their unsightly appearance, long leads have the disadvantage that they may cause oscillation trouble due to feed-back.

FROM THE TECHNICAL EDITOR'S NOTE BOOK

# Tested and Found-?



**TWO USEFUL TERMINALS.**

**L**ECTRO-LINX, LTD., have sent us samples of their Clix Ring and Clix Hook terminals. These sell at 2d. each. As its name indicates, the hook terminal is of hook shape and is as easy to fit into position as a spade terminal, but no easier to pull off than a ring terminal.



The "Celestion" loud-speaker people recently demonstrated their production in this striking manner on the River Thames.

The ring terminal has a slot in addition to the usual circular hole. Either of these two items can be supplied nickel-plated or lead-coated according to requirements, at the same prices.

Lectro-Linx, Ltd., certainly do not stand still. Samples of new productions arrive from this firm with almost monotonous regularity, and the surprising thing is that every new device fulfils some definite function and comprises those valuable features that seem so obvious once you have seen them, and yet you wonder why they have not been thought of before.

**"METAPLAC" WIRELESS PANELS.**

Messrs. Borst Bros., Ltd., of Shoreditch, London, recently sent us one of their "Metaplac" panels. One type of these panels consists of plywood faced with aluminium. They are designed to take the place of aluminium panels and ordinary baseboards in sets necessitating screening.

They are supplied polished or unpolished in any sizes ordinarily used, and in varying thicknesses, the most usual being  $\frac{3}{8}$  in. and  $\frac{1}{4}$  in. The sample panel sent us has been standing by for some time and has rather badly warped. Attempts to straighten it started to introduce kinks. Had the panel been used right away it is possible that the warping would have been prevented.

Messrs. Borst Bros. also sent a small portion of "Metaplac," comprising aluminium sandwiched between two wooden layers. This would probably be more proof-against warping!

**"RELIANCE" BATTERIES.**

Amaree, Ltd., of Clapham, London, who are the importers and proprietors, recently sent us a range of "Reliance" brand batteries. This range included a 105-volt H.T. battery, which retails at 10s. 6d., a large capacity  $1\frac{1}{2}$ -volt dry cell, which sells at 2s. 3d., and some pocket lamp  $4\frac{1}{2}$ -volt batteries that are sold at 4 $\frac{1}{2}$ d. each.

We very carefully tested the whole range, and, with the exception of one  $4\frac{1}{2}$ -volt battery, we found them to be in excellent condition. The prices are attractive, a 66-volt battery at 6s., and a 9-volt grid bias battery at 1s. 1d. are propositions that command attention.

**AN INTERESTING CATALOGUE.**

Mr. F. L. Lesingham, of Victoria Street, London, S.W.1, recently sent us a copy of the new illustrated catalogue just issued by his principals, Messrs. Eloden, Muller & Co., G.M.B.H. In the main the catalogue deals with Eloden loud speakers, and there are interesting photographs of it in use.

Some of these show views of the Graf Zeppelin, in which one of these loud speakers was installed for the entertainment of the guests during the great transatlantic trip.

**MAKING ACCUMULATORS UNSPILLABLE.**

Jelectro is a new substance made by Jelectro Laboratories of Edgware Road, London, which has the power to solidify the electrolyte of an accumulator. Thus, by mixing this Jelectro with the acid in accordance with the instructions supplied, the result is a sort of jelly which is every bit as efficient as the original acid, but which cannot pour out on the carpet. Sufficient Jelectro for solidifying the acid in a 20-amp. hour cell is available in a 6d. bottle.

**A WORLD TIME INDICATOR.**

J. J. Willis & Company, of Ipswich Road, Norwich, have produced a small device which answers all questions of relative time at a glance without any calculations whatever. By turning a small dial you can at any moment see what time it is anywhere in the world.

This dial also shows you whether it is night or day at any place and whether it is probable that broadcasting is being carried out. The price of this time device is 1s. 6d. and the radio amateur should find it of value.

**LOUD SPEAKER FOR PORTABLE SETS.**

Mr. Frederick Squire, of Stoke Newington, has added to his range of useful loud-speaker productions with a universal

aluminium cone cradle for portable sets. This casting is supplied with a Kraft paper cone mounted. Four lugs are moulded in the casting, making it easy to fit the assembly into a cabinet.

Mr. Squire also supplies a small moulded base which can be screwed into a hole in the aluminium frame, thus making the assembly a complete table loud speaker of unusual although attractive appearance.

We tested the speaker in this form (and fitted with a Blue Spot unit) and were surprised by the remarkably realistic results given by such a modestly-priced article. This Squire "Universal" Cradle, complete with a Kraft cone, costs only 18s. 6d. (without a unit), and the little base 3s. 6d.

Traders and manufacturers are invited to submit radio sets, components and accessories to the "P. W." Technical Department for test. All tests are carried out with strict impartiality, under the personal supervision of the Technical Editor, and readers are asked to note that this weekly feature is intended as a reliable and unbiased guide as to what to buy and what to avoid.

A set of four oxy-silver chains for hanging the speaker from the ceiling is also available at 3s. 6d.

The "Universal" will take any normal unit.

**E. K. COLE, LTD.**

In a recent advertisement in POPULAR WIRELESS that famous trade name "Ekco" was erroneously printed as "Ecko." And in apologising on behalf of our printers for this regrettable mistake, we should like to draw our readers' attention to the importance of correctly writing such trade names when ordering radio goods. "Ekco" is, of course, composed of the first four letters of E. K. Cole, Ltd., and on this account should be easy to remember. E. K. Cole, Ltd., of "Ekco" Works, Leigh-on-Sea, are noted for their fine mains units and receivers.



Mr. Squire "Universal" Cradle complete with unit and diaphragm.



All Editorial communications to be addressed to the Editor, POPULAR WIRELESS, Tallis House, Tallis Street, London, E.C.4.

The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts or 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.

The constructional articles which appear from time to time in this journal are the outcome of research and experimental work carried out with a view to improving the technique of wireless receivers. 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 specialities 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.

## QUESTIONS AND ANSWERS.

### USING 'PHONES WITH L.F. CHOKE OUTPUT.

M. F. (Salisbury).—"Is it possible to use a low-frequency choke, such as the secondary of a burnt-out L.F. transformer, in conjunction with large condensers for telephones? Although I have often seen the method referred to, it has always been in conjunction with a loud speaker handling the output from a powerful set, and I am wondering whether there is any reason why telephones should not be used in this way?"

"The reason that I should like to try it is that, although on ordinary broadcasting my set works well, when I change the coils for short wave-lengths I am troubled with hand capacity, and I think this is due to wearing the telephones. I thought perhaps L.F. choke output would cure the trouble, if there is no objection to using this."

The use of an L.F. choke and condenser for output coupling is just as applicable to telephones as to loud speakers, and will be found to work perfectly satisfactorily. Moreover, as short-wave signals are not usually very loud, it is possible to use the secondary of a burnt-out transformer to act as this choke, although this secondary would be quite unsuitable for use in the plate circuit of a power valve from which an output of undistorted music was required at good volume.

You can easily try the method by connecting each terminal of a 1-mfd. fixed condenser to one of the "telephone" terminals on the set, and joining the L.F. choke across the 'phone terminals. The telephones themselves are then connected to the two remaining condenser terminals, thus completing the output circuit.

Although this will give an L.F. choke-capacity output coupling, we are not sure that it will cure the hand-capacity troubles, and although it is not possible to say without further details of your circuit, we are inclined to think that two H.F. chokes would be better. These could be put in series with the 'phone leads themselves, that is to say between the telephone leads and the telephone terminals.

### MUSIC FROM NEXT DOOR.

W. J. C. (Hackney Road, E.2.).—"I was listening on Sunday to Daventry 5 XX, when I was struck by a fox-trot coming through quite plain. I was puzzled by the quick time it was playing. I tried to cut it out, but found it impossible. I changed all my coils, but it still came through. I have a three-valve set, with an aerial 30 ft. high, 50 ft. long, single wire. After some time I discovered that my neighbour next door was playing a gramophone with a pick-up. I was getting his music through my machine. It seems rather interesting at

present, but can I cut this out, as it may be a nuisance later?"

Your case is certainly an interesting and unusual one. Possibly it was partly due to the particular adjustment at which your neighbour's set was working at the time, and you may find that when he plays the pick-up with a different adjustment of his receiver you will not be troubled by radiation from his aerial in this way.

This is especially true if he is using reaction upon the aerial circuit, but apart from any adjustments or alterations to his set, the most effective way of cutting out mutual interference of this type is to try to get your aerials farther away from each other. We expect that at present the two aerials run close to one another, and probably there is not much scope for altering the masts, etc., because of the lay of the

## "P.W." TECHNICAL QUERY DEPARTMENT

### Is Your Set "Going Good"?

Perhaps some mysterious noise has appeared, and is spoiling your radio reception?—Or one of the batteries seems to be run down much faster than formerly?—Or you want a Blue Print?

Whatever your radio problem may be, remember that the Technical Query Department is thoroughly equipped to assist our readers, and offers an *unrivalled* service.

Full details, including scale of charges, can be obtained direct from the Technical Query Dept., POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

A postcard will do: On receipt of this an Application Form will be sent to you free and post free immediately. This application will place you under no obligation whatever, but having the form you will know exactly what information we require to have before us in order to solve your problems.

**LONDON READERS PLEASE NOTE:** Inquiries should NOT be made in person at Fleetway House or Tallis House.

ground. But perhaps you could get your aerial a good deal higher than his, or alternatively a good deal lower, and this would help to prevent the trouble?

The idea is to keep the aerials as far apart and as nearly at right angles as possible, so if his aerial comes down from a high pole at the bottom of the garden to the house, try and make your aerial slope up from a low pole at the bottom of the garden to a high pole at the house end. Or vice versa. Anything which gives greater separation of aerials will tend to cut out the interference.

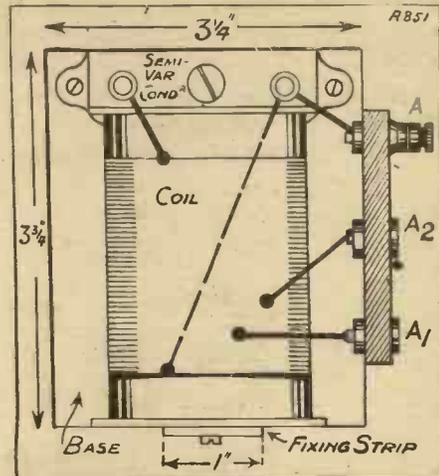
### THE "P.W." STANDARD WAVE-TRAP.

C. M. (Woodford Green).—"I should like to make up one of the 'P.W.' standard wave-traps for myself. Would a 2-in. former be O.K., and if so how is it mounted and what wire should be used, etc., etc.?"

The "P.W." Standard Wave-trap, a plan of which is shown herewith, is assembled upon a small wooden baseboard measuring 3½ in. by 3½ in., and about ¼ in. thick, the intention being that this baseboard shall be screwed down directly upon the wooden base on the receiver.

The coil is mounted on this in a horizontal position, with its centre at a height of 2 in. above the bottom of the small baseboard. This point of the height of the coil is of importance in cases where the trap is screened, the position of the trap inside whatever screen is used naturally being a matter which must be watched.

The coil is wound upon a piece of ebonite, Paxolin, Pirtoid, or similar insulating material, 2 in. in diameter and 3 in. long, and this can be mounted in any convenient fashion which does not entail the use of



large pieces of metal. One method is to fix an ebonite end disc into the tube and attach this by means of a screw to an upright strip of 3-ply wood, whose lower extremity is similarly secured by means of screws to the edge of the little baseboard.

The coil consists of 64 turns in a single layer, of 28 D.C.C. wire. As the coil is wound, tappings are made in the 16th and 24th turns, these being the alternative positions for the aerial tap, the ends of the winding being secured by the simple procedure of passing them through two small holes drilled in the tube at the correct points. The two tappings may be made in a variety of ways.

For example, the whole coil can be wound without making any tappings whatever, and then the 16th and 24th turns can be prised up slightly with the blade of a pocket knife, and two short pieces of matchstick about ¼ in. long slipped under them. The wires thus lifted up can be scraped bare of cotton covering by means of a knife, and the appropriate ends soldered on to them.

Mounted upon the baseboard immediately beneath the end of the coil is a small variable condenser of the compression type, which is now becoming so popular for work of this sort, the capacity of this component depending upon the wave-length of the station it is desired to eliminate.

If the wave of your local station is below 400 metres, a .00025 mfd. or .0003 mfd. will be required, while if it is 400 metres or over, one of .0005 mfd. should be chosen. The alternative capacities of .00025 or .0003 mfd. have just been given because in some makes only a .00025 mfd. is available, whereas in others .0003 mfd. is produced and, as a matter of fact, either will serve.

These components have a screw-down adjustment, which can be performed by means of a screwdriver, and, of course, the condenser can be left permanently set to the correct capacity once this has been found.

Screwed to the edge of the baseboard of the trap is a small piece of ¼ in. thick ebonite, 2½ in. by 1½ in., carrying a terminal and two sockets, such as the Clix or Belex types, these being for the external connections to the trap.

In use, the lead from the set to the trap will be connected to the terminal, while the aerial lead will terminate in a plug which will be inserted in one or other of the sockets, according to the number of turns on the coil which it is desired to use for coupling purposes.

### USING A D.C. UNIT.

F. M. J. (Hampshire).—"I have an H.T. unit built up from a 'P.W.' Blue Print, for use with D.C. mains. I built it up ready for use when I got into my new house, and after it was finished I had it tried out at a shop and it worked O.K.

"Since moving into the new house, however, I tried to instal it, and found that I had lost the blue print with the directions on, and consequently I am not quite sure how it should

(Continued on page 330.)

## TALKS AND TALKIES

Every fact that comes to light proves how supreme and eminent the Exide Battery is. Here are two more such facts. The Exide Battery is being used in the reproduction of every Talking Film on view in England to-day. And at the General Election in May it will be the Exide Battery which will amplify speeches for the political parties. Do you realise that you can have this same Exide Battery in your own set and enjoy the purity of tone and steadiness of service which an Exide Battery always gives?

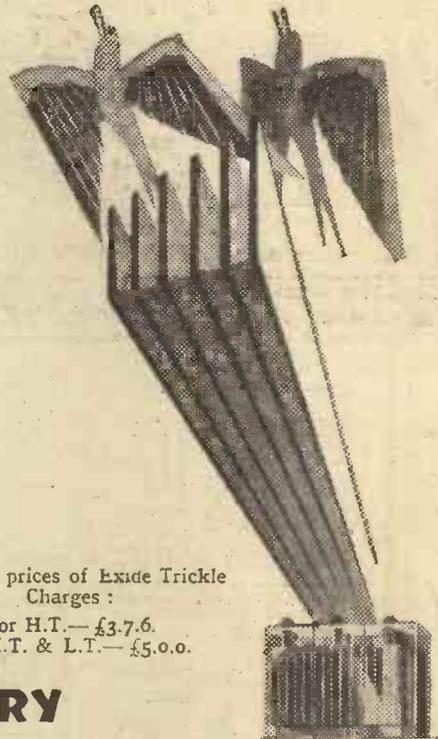
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Note the prices of Exide Trickle Charges:

For H.T.—£3.7.6.  
For H.T. & L.T.—£5.0.0.

G15

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A New Story by

**ETHEL M. DELL**

Begins in this issue

# RED

MAGAZINE 7<sup>D</sup>.

IMPORTANT  
ANNOUNCEMENT  
concerning

# Brown

## LOUD SPEAKERS

IN view of the fact that a new range of Brown Loud Speakers is now in course of production and will, at an early date, be placed on the market, the following Brown Instruments have been withdrawn from production and credit has been allowed on supplies returned by our customers:—

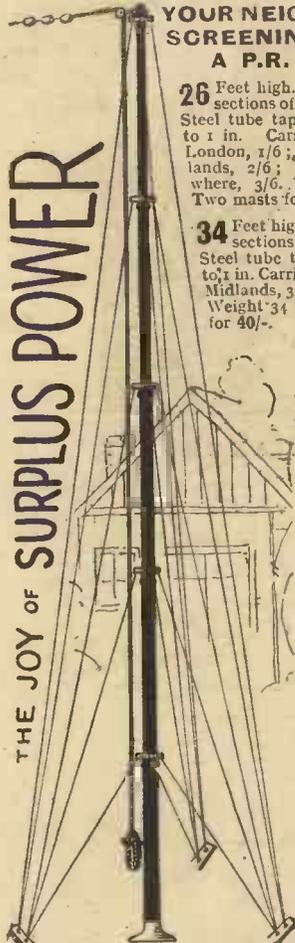
Type H.3.  
Type H.3.Q.  
Disc Type.  
Cabinet Type.  
C.T.S. Unit and Accessory Set.

**S. G. BROWN, LTD.,**  
Western Avenue, N. Acton, W.3.

# A HIGH MAST IS EQUAL TO TWO EXTRA VALVES

Everybody knows that to have a high aerial is to get extra powerful signals. The difficulty of fixing up a high aerial is banished if you fit a

## P.R. PATENT STEEL MAST BANISH INTERFERENCE GET AWAY FROM YOUR NEIGHBOUR'S SCREENING WITH A P.R. MAST



**26** Feet high. In 3 sections of 1 1/2 in. Steel tube tapering to 1 in. Carriage, London, 1/6; Midlands, 2/6; elsewhere, 3/6. Weight 24 lbs. Two masts for 28/6.

**34** Feet high. In 4 sections of 1 1/2 in. Steel tube tapering to 1 in. Carriage, London, 2/-; Midlands, 3/-; elsewhere, 4/-. Weight 34 lbs. Two masts for 40/-.

### The "Super" Mast.

**42** Feet high **29/6**

In 5 sections of heavy 1 1/2 in. Steel tube tapering to 1 in. A real bargain. Carriage, London, 2/6; Midlands, 3/6; elsewhere, 4/6. Weight 46 lbs. Two masts for 55/-.

### P.R. MASTS

are made of British Steel in 9 ft. lengths, from 1 1/2 in., tapering to 1 in., and are supplied with cast-iron bed plate, steel ground pegs, stay rings, galvanised steel flexible wire stays cut to lengths, pulleys, bolts and fullest erecting instructions. No further outlay necessary.

### NO HOLES TO DIG. ONE MAN'S JOB.

Any intelligent man can assemble and erect a P.R. Mast in a couple of hours. The Mast being tapered, it is easy for anyone to raise it from the ground into position. The wire rope is sent out to size—a saving of endless worry.

Minimum Radius **3 ft. 6 in.** **GUARANTEE** Money refunded without question if not satisfied. **The easiest Mast to erect**

**PAINTING.** Any protective coating applied before despatch gets so damaged by the Carriers that it is essential to paint the Mast before erection. All P.R. Masts are sent out oxide-finished ready for painting. One coat of P.R. Colloid covering applied—a 10 minutes' job—to all parts of the Mast when ready to erect sets dead hard in an hour and protects it against all weathers.

**PRICE OF ACCESSORIES.** P.R. Colloid Covering sufficient for a Mast—with brush, 2/6. Halvard Log Line—Ryland's patent rot-proof. For 26-ft. Mast, 1/6; 34-ft., 2/-; 42-ft., 2/6. Per 100-ft., 3/-. Note—Double length supplied to make lowering of Aerial easy.

**A HIGHLY EFFICIENT AERIAL.** P.R. Aerial is made of 14-28 High Conductivity Pure Copper Enamelled Wire—each strand insulated from its neighbour to give the highest signal strength obtainable. 100 ft., 4/3; 50 ft., 2/3.

**P.R. MASTS** C.O.D. Telephone: City 3788. 17-62, PATERNOSTER SQUARE, LONDON, E.C.4. Opposite G.D.O. Tube.

**IF YOU USE VALVES** it will pay you to write to us for particulars of the famous 3/6 range of P.R. valves. Each valve has a written guarantee of life and performance.

## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 328.)

be put into service. What is the method of connecting up?"

After an examination of the wiring has shown that everything is in sound condition, all joints firm, etc., you should connect the flexible leads from the unit to a lamp socket adaptor and plug into a light socket with the light switch off. Then connect the earth terminal on the set to one of the earth terminals on the unit, and the remaining earth terminal on the unit to the actual earth lead.

If your set has only two positive H.T.appings, only two corresponding positive terminals need be used on the unit. Connect the H.T. negative on the unit to H.T. negative on the set. Switch the set (if this is fitted with switches) so that the minimum of valves are in use, and then close the main switch.

Signals should now be heard in the loud speaker or phones as usual. If signals are not heard, switch off at the mains again, turn round the adaptor in the lamp socket, and try again. The unit should now work satisfactorily.

**NOTE.**—As a unit of this type is rather different from a wireless set, remember that: (1) A hum may be due to a dirty or defective switch contact somewhere in the lighting system of the house; (2) it is inadvisable to attempt to alter the electric light mains wiring unless you really know how to do this; (3) this H.T. unit is totally unsuitable for

Every phase of radio is covered in the MAY issue of

## MODERN WIRELESS

The special contents of this number include several fine how-to-make descriptions and many articles for the listener and experimenter.

The authors include such well-known names as:

PERCY W. HARRIS, M.I.R.E.

Lt.-Comdr. The Hon.

J. M. KENWORTHY, M.P.

C. E. FIELD, B.Sc.

G. V. DOWDING, Grad.I.E.E.

ETC., ETC.

And there is a fine supplement dealing with

RADIO AND THE GRAMOPHONE.

**SECURE YOUR COPY NOW.**

lighting the valve filaments; (4) an ordinary cheap voltmeter will not correctly measure the voltage output from a unit of this type.

### HIGH-RESISTANCE VOLTMETER.

"RESIDENT" (Kentish Town, N.W.)—  
"Why is it that high-resistance voltmeters are always recommended as against the cheap low-resistance kinds?"

The advantages of a high-resistance instrument can be explained in the following way. Any voltmeter, whatever type, is an instrument for measuring the pressure or voltage across two particular points. In order to do this, it has to be connected across these two points, and the thing to remember is that as soon as it is connected across the points in question the mere fact of joining it up is bound to alter the pressure there, for the voltmeter itself has provided another pathway for the current to flow!

It will now readily be seen why a high-resistance voltmeter is better than a low-resistance one. The former passes but little current, and does not materially affect the conditions which are prevailing there, but a low-resistance voltmeter will be taking a comparatively high current from the circuit, and thus it actually lowers the pressure which it is supposed to measure and thereby gives a misleading reading.

### AERIAL COIL WINDINGS.

T. S. C. (Manchester).—"I have an ordinary six-pin former, and wish to wind one of the standard aerial coils on this. What is the wire to use, and how many turns?"

For the 250 to 550-metre band the usual arrangement is 90 turns of No. 30 D.S.C. wire. The turns are spaced 40 to the inch, and tappings are provided at 10 and 15 turns from the bottom end of the winding.

(Continued on page 332.)

# BROWNIE WIRELESS

## 9/6 POPULAR TRANSFORMER

When planning your new set ensure perfect amplification by including a BROWNIE POPULAR TRANSFORMER. The core iron and the windings which are the very finest obtainable are assembled in the famous Brownie Factory; while all the delicate parts are protected by an attractive moulded Bakelite casing which seals the whole transformer against any atmospheric interference. Send P.C. to Dept. 22 at address below for free booklet, "Wireless Without Worry."

**BROWNIE WIRELESS Co. (G.B.) Ltd.**  
Nelson Street Works,  
Morningside Crescent,  
London, N.W.1

# BROWNIE

### HEADPHONES REPAIRED 4/-

Transformers 5/-. Loudspeakers 4/-. All repairs re-magnetised free. Tested guaranteed and ready for delivery in 24 hours.  
Discount for Trade. Clerkenwell 9069.  
E. MASON, 44, East Rd., City Rd., N.1.

## MAKE YOUR WIRELESS CABINET THE OSBORN WAY

A Jacobean Wireless Cabinet of a very neat design, with panelled doors and ends, a large space at the bottom for accumulators. 3 ft. high, 2 ft. wide and 1 ft. 4 in. deep. Opening front and top. To take a panel 21" x 7" or 8". A wooden frame is supplied free should the size of your panel be smaller.

Machined ready to assemble in Oak £1 15 0  
Assembled ready to Polish, in Oak .. £2 7 6  
Assembled and Polished, in Oak .. £3 0 0

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The Regent Works, Arlington Street, London, N.1.  
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Saturdays, 4.30 p.m.  
And at 21, ESSEX ROAD, ISLINGTON, N.1.  
Open until 8 p.m. WEEKDAYS, 9 p.m. SATURDAYS.  
Telephone: Clerkenwell 5639.

## RELIABILITY WIRELESS GUIDE No. T296

A Complete List of all that is best in Radio at Keenest Prices. Trade Enquiries Invited

**J.H. TAYLOR & Co**  
4, Radio House, MACAULAY STREET, HUDDERSFIELD. Phone 341.

**PLEASE** be sure to mention "POPULAR WIRELESS" when communicating with Advertisers. **THANKS!**

**ON  
GUARD**



**AGAINST  
DISTORTION**

The House of Ferranti has produced another great aid to true radio reproduction—the Ferranti Valve Tester.

To secure accurate knowledge of so many variables—High Tension, Low Tension, Plate Currents, Grid Bias, constantly-changing valve characteristics—this unique instrument is invaluable.

Indicates Plate Volts, Plate Current, L.T. & G.B. Voltages, under actual working conditions, at the turn of a switch.

PRICE £5.15.0.

**FERRANTI**

FERRANTI LTD. HOLLINWOOD LANCASHIRE

**You too can have an  
all-electric radio**



Use your A.C. electric mains to modernise your receiver.

Fit a Philips Trickle Charger to your radio set, and then when you switch off the set for the night, you automatically switch on the Charger to recharge your L.T. accumulator slowly, until the Set is used again. The switch incorporated also switches on and off the H.T. Supply Unit (if used).

Ask your Radio dealer to show you a Philips Trickle Charger for your A.C. Mains, and save yourself time, money and trouble.

PRICE 55/- COMPLETE.

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H.F., Det., B.C., 5/2 each;  
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'0005 variable 4" slow-motion dial, 16-volt Grid Bias, Binocular H.F. Choke, '0001 Reaction with Knob, Special Indoor Aerial complete, Set of 12 Plugs and Sockets (red and black), 2 Fuse-holders and Bulbs, 4- or 5-way L.T. Battery Cord, 100 ft. best Copper 7/22, 100 ft. Insulated Aerial.

## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 330.)

### THE ADVANTAGES OF BINOCULAR COILS.

K. F. (Clacton-on-Sea).—"I am enclosing a description of the receiver from which you will see it is a very compact one, and not at all expensive when the results which it will give are considered. But it is about this question of expense that I should like your opinion, on the question of coils.

"As you will see from the list of parts, it says 'binocular' coils must be used, but as I do not possess any binocular coils, and as I have a very good set of the ordinary standard ones with just the same connections, I am particularly keen to use these if it is at all possible instead of the binoculars. What are the advantages of the binocular coils supposed to be, and do you think I could get as good results from the others, which I have previously been using in a different set?"

The binocular coil has several things to recommend it, its chief advantage being that by special arrangement of the direction of its winding a comparatively localised magnetic field is produced by this type of coil.

As you probably know, or as you will certainly realise when you consider how coils may be coupled together, the action of a tuning coil is not confined to the actual coil itself, but takes place partly in the space surrounding that coil. The extent to which the surrounding space is affected by the current flowing in the coil is partly dependent upon the form taken by the windings, and a binocular coil, like the astatic coil, is wound specifically for

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### MODERN WIRELESS

purpose of reducing the active magnetic area of the coil, thus making it magnetically compact and comparatively non-interfering.

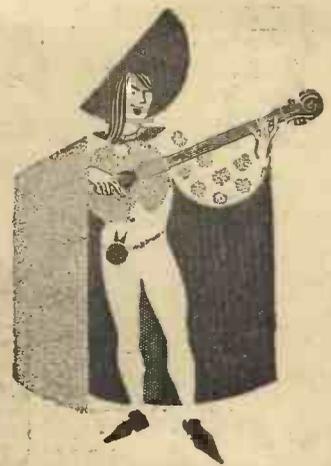
In the case of the particular set which you have in mind it is quite essential to use a binocular type of coil if the full results are to be obtained. This is because the screening of the set has been carried out on the assumption that the aerial and H.F. tuning coils may be placed quite close together, and to certain necessary metal parts of the receiver, and it is only possible to do this if coils are used in which the magnetic field has been reduced to as small a space as possible.

By using ordinary coils in this receiver you would no doubt "get results," but they would be far below those obtainable with the binocular types of coil for the reasons mentioned above, and we therefore do not recommend you to try and use them unless you modify the set accordingly, making the space wider between the screens and the whole of the high-frequency wiring less compact than as at present arranged. In order to do this efficiently you would need to be an experienced set designer, and therefore we think that the only way out of your difficulty is to obtain binocular coils and stick to the layout specified by the set-designer.

### BACK NUMBERS OF "P.W."

"In what number of 'P.W.' was the 'Holiday' Two described, and where should I send for back numbers?"

The "Holiday" Two was described in detail in "P.W." No. 356 (March 30th, 1929, issue). Back numbers are obtainable direct from The Amalgamated Press, Back Number Department, Bear Alley, Farringdon Street, London E.C.4. Price, 4d. per copy.



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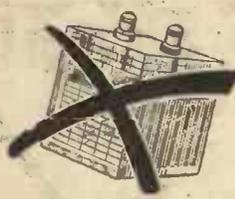
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<b>3/6</b> Each. Postage 1d.	PR 2	2	.095	28,000	13	H.F. Det.
	PR 3	2	.095	15,000	8	L.F.
	PR 4	2	.095	120,000	32	R.C.
	PR 9	3.5-4	.063	18,000	14	H.F. Det.
<b>POWER</b> 7/6 Each Postage 1d.	PR10	3.5-4	.063	10,000	2.7	L.F.
	PR11	3.5-4	.063	88,000	40	R.C.
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	PR18	5-6	1	9,500	9	L.F.
<b>SUPER-POWER</b> 12/6 Each Postage 1d.	PR20	2	.15	7,000	6	Power
	PR40	4	.15	7,000	6	"
	PR60	6	.1	5,000	6	"
	PR120	2	.3	2,750	4	S.P.
	PR140	4	.2	2,500	4	S.P.

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## RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from page 332.)

### CHANGING OVER TO ANODE-BEND RECTIFICATION.

F. H. R. (Peacehaven).—I have a powerful four-valve set, H.F., Det., 2 L.F., employing the old-fashioned tuned anode system of high-frequency amplification. This has been very satisfactory, but I have a fancy to employ anode-bend rectification instead of grid leak, the grid at present being wired as follows:

"Grid of the detector goes to the condenser and to one end of the grid leak. The other end of this grid leak goes to L.T. positive lead and filament of valves. How should I alter this for anode-bend rectification?"

All you have to do is to find that end of the grid leak which is at present connected to the L.T. positive leg of the valve, and affix instead to the grid leak a flexible lead terminating in a black plug. This plug must now be plugged in to a grid-bias battery, the positive end of which is connected to the L.T. negative wiring.

Generally speaking, the value of grid biasing in such cases is not very critical for anode-bend rectification, though this depends somewhat upon the H.T. voltage which is used on the plate of the detector

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are fully described in the current number of

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### "SIMPLICITY" THREE

a magnificent wave-change receiver of the very latest design. Then again we have the

### "FLATDWELLER" FOUR

which is just the set you want if you cannot or do not want to use an outdoor aerial

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valve. It is advisable, however, to have the grid-bias battery tapped at every 1½ volts, and the maximum value need not exceed 4½ volts.

### SWITCHING THE SET ON FROM THE GARDEN.

"INVALID" (Somersetshire).—"Some time ago in POPULAR WIRELESS (I think it was the end of last summer), I saw a scheme for a remote control by means of which the set could easily be switched off from the garden. I did not take much notice of it at the time, but since then we have been unfortunate enough to have my father ill, and now that the good weather is here (we hope!), we are to get him out of doors as much as possible.

"As the wireless is a great blessing to him during his enforced idleness, I should like to make up the remote control device of this kind, if you can tell me what number of 'P.W.' it appeared and, if the device is inexpensive, where I could get a copy of this number?"

The device in question was quite suitable for your purpose, and as it is remarkably cheap, we should certainly try and build it. The article was called "A Cheap and Efficient Remote Control," and was published in the August 11th, 1928, issue. (Applications for back numbers should be made to The Back Number Department, Bear Alley, Farringdon Street, London, E.C.4. The charge is 5d. per copy.)

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## WATES VOLT-AMP RADIO TEST METER

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# THE WIRELESS : : : : CONSTRUCTOR

June Issue

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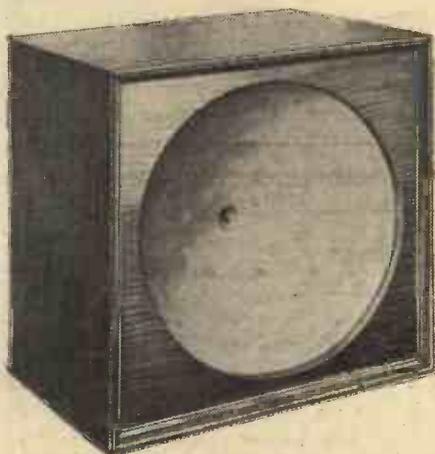
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If you decide to keep it—Remember your judgment is final—remit the balance, 30/-; or, if you prefer it, 2/6 a week for fourteen weeks. C.O.D. 5/6.



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## SHORT-WAVE NOTES.

By W. L. S.

"G.T.U." of Accrington, who set himself up as a short-wave sceptic in "Ariel's" Notes and News a little while back, seems to be the subject of a fair amount of correspondence. "P.W.V.B." gives, chiefly for his benefit, a list of stations received between April 21st and April 26th, including 7 L O (Nairobi), 3 L O (Melbourne), two Java stations, W 8 X K (Pittsburg), W 6 X N-K G O (California), C J R X (Winnipeg), etc., etc., *ad lib.* These are all, of course, broadcast programmes, and "P.W.V.B." states offhandedly that he received "another 10 stations" from U.S.A. during the course of a run round the dial.

I am afraid "G.T.U." will soon find himself without a leg to stand on. Another correspondent says that he receives W 8 X K's church service on Sunday evenings with the regularity of a local station programme. He finds W 2 X A F most consistent, however, as regards signal strength, although W 2 X O, the 21-96-metre station, is frequently stronger than the other.

### A Newcomer.

A newcomer is the Drummondville (Quebec) Beam Station, which apparently broadcasts market quotations and dance music occasionally, although he appears irregular from what correspondents say. I have not heard him myself, so that I cannot say definitely what wave he uses or when his programmes may be counted upon.

Mr. K. Franklin, of Folkestone, is another member of the "H.A.C. Club," Monte Grande having filled the breach with him. He gives his wave-length as approximately 30.5 metres, which, I think, is very close to the correct figure.

One gentleman is rather perturbed at discovering from a gazetteer that Monte Grande is in Italy! This is not the same one, fortunately, otherwise several optimists' dreams of fame would be shattered.

I had a remarkable demonstration this week of the way one can get lost on short-waves. A gentleman of my acquaintance had built his first short-waver and was voting the set a complete failure.

### Set Really O.K.

One glance at the set showed me that it was working splendidly, various Morse stations coming in with tremendous punch. He happened, however, to have a bunch of home-made coils that covered all the wave-lengths except the interesting bunch round about 30 metres, and the other band from about 19 to 22 metres, thereby missing everything of interest except 5 S W and W 8 X K, whom he took to be another British station.

Once I had identified the wave-lengths he had covered by the Morse stations he was getting I wound him some suitable coils, and he is now wondering what ever made him despair!

A good wave-meter is a great thing for short-wave work, and time spent on the construction of a reliable instrument will be better repaid than any other time ever spent on construction.

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# ANSWERS

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## TECHNICAL NOTES.

(Continued from page 320.)

The result of the test evidently confirmed the view of the sponsors of the exponential horn as the voting turned out to be very largely in favour of the Utah exponential horn. It is perhaps only fair to add that the loud speaker which won the contest was of the type I referred to previously, and was supplied by Messrs. Payne and Hornsby, of 7, St. Andrews Buildings, Gallowgate, Newcastle-on-Tyne.

There seems to be a considerable field for these exponential horns and whilst, of course, opinions differ as to the merits of horn speakers and speakers of other types, I should say that amongst loud-speaker horns, at any rate, the exponential horn has many advantages over its competitors. The exponential type of horn is largely used in cinemas, halls and so on, where considerable amplification is required. Incidentally Mr. Payne, of the above-mentioned firm, was "Uncle Tom," first Station Director of the Newcastle B.B.C. station. He will be pleased to supply any information required by readers in connection with exponential horn loud speakers.

### Pentode Hints.

Those of you who are now devotees of the pentode will probably have learned by experience that this type of valve is quite elastic in the matter of H.T. voltage and also grid bias. In fact, whereas you might think by looking at the characteristic curve that you were obliged to stick to a particular value of grid bias, you will often find by experiment that you can use a much higher value of G.B. and still obtain perfectly good results whilst, of course, at the same time you cut down your consumption of H.T. current.

For example, taking, say, 140 to 150 volts on the plate and the screen grid and, say,  $7\frac{1}{2}$  volts negative bias the average pentode will consume 18 milliamps or even more. But if you increase this value of grid bias you can cut down the H.T. current to something like half that amount and still get results which, for ordinary practical purposes, are hardly distinguishable from those obtained when working under the conditions specified by the manufacturers of the valve.

### "Scratch."

Needle-scratch, which has always been the bugbear of gramophone reproduction, has during the past few years been very much reduced, mainly owing to the improvements in methods of recording and duplication of commercial records. The record which one buys to-day, even when played upon an old-fashioned gramophone, is undoubtedly very much superior to the record of, say, ten or even five years ago.

At the same time, the advent of electrical pick-up and reproduction enables us to use electrical means also for the further minimising of the needle-scratch. As you know, various types of so-called "filter circuits" have been devised which are intended to cut down the frequencies which correspond to the scratch. Unfortunately, it is not at all easy to say just what frequencies will be met with in the scratch sounds and in any case these vary from time to time and under different conditions.

(Continued on next page.)

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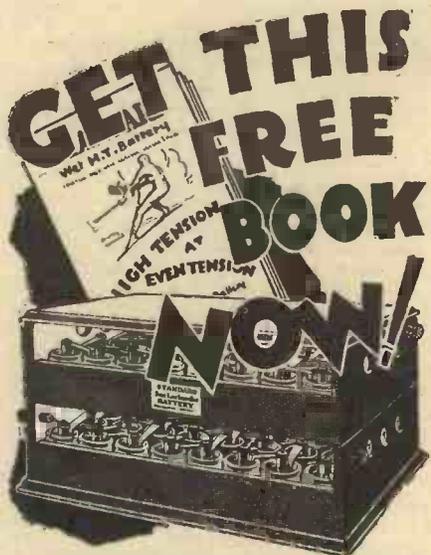


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## TECHNICAL NOTES.

(Continued from previous page.)

Furthermore, any system of filtering designed to cut down particular frequencies is apt to have the effect of cutting down other frequencies than those intended. It is true that with properly designed filter circuits the "filtering out" is very much greater in the case of the intended frequencies than with other frequencies, but the influence upon the remaining frequencies may still be quite marked.

### Overtones.

An excellent article in this journal a short time back dealt with the subject of overtones, or "harmonics," as they are sometimes called, and arising out of that I would like to say something as to the importance of overtones in the sounds which we hear. In the first place, as you know, the overtones consist of higher frequencies than the fundamental note.

For instance, if the middle "C" of the pianoforte is the note produced by a string vibrating 256 times per second, the string which vibrates at 512 vibrations per second—that is, at twice the fundamental frequency—will produce a note which is an octave above the first note. The octave is the simplest of the overtones; the other notes in the scale have frequencies bearing various definite relations to the frequency of the fundamental.

### Pure Notes.

Now when a musical note is produced it is almost invariably accompanied by one or more—usually more—overtones and it is, in fact, quite a difficult matter to produce a note which contains no overtones—a "pure note," as it is called.

A musical sound has three main characteristics, which are first *pitch*, second *loudness*, and third *quality*. The pitch of the note, as you know, is what makes it a "high" or a "low" note, and the loudness of a note requires no description. The *quality*, however, is a very interesting characteristic of a note and, although you may not be aware of it, the quality depends upon the wave-form of the sound and the wave-form in turn depends upon the number and the frequency of the overtones.

The quality of a sound may be popularly described as the property which enables you to distinguish the sounds of different instruments. For instance, you have no difficulty in distinguishing the sound of a violin from that of the human voice, and this you do by the difference in the wave-form or *quality*.

So it comes to this, that the presence of the overtones or harmonics is really an extremely important factor in the artistic or aesthetic effect of musical sounds and corresponds in a general way to the effect or colours upon the eye. You would find it very wearisome if you saw everything merely in black and white, without any colour, and in the same way musical sounds would lose practically all their charm if they consisted simply of pure notes.

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Where the mains are available, of course, the "no battery" outfit is already within reach, without any waiting for "the set of the future." Highly efficient schemes have been worked out for all-mains sets, and of their general superiority to the equivalent battery-fed type no one can have any doubts who has tried a good one.

Just to be rid of all need to worry about batteries, keeping a watch on the H.T. and getting the L.T. charged at proper intervals, and so on, is worth a good deal, but this is not the whole extent of the attractiveness of the all-mains set. Where the mains are of the alternating variety it has the further important advantage of enabling us to use the special A.C. valves now on the market.

**Special A.C. Valves.**

These valves (the "indirectly-heated" type) possess distinctly better characteristics than the corresponding battery types; so much so that a two-valver such as the one forming this week's White Print gives results not far short of the standard of a three-valver using ordinary valves. Indirectly-heated A.C. valves have, instead of the usual filament, a little heater element which is supplied with low-voltage alternating current by means of

# THE "P.W." "WHITE PRINTS."

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White Print No. 24 :: :: An All-Mains Two-Valver.

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a small step-down transformer. This element heats a specially prepared tube which surrounds it, and it is this tube which represents the "filament" of the valve. The set we have chosen to represent

the A.C. all-mains type in this series is not a very large one, but in consequence of the high efficiency of the special valves will give exceedingly good results. The circuit is a "Det. and 1 L.F.," with a form of Reinartz for the detector and a transformer coupling to the L.F. valve. The valves actually used in the original were a Cosmos AC/G as detector and AC/R as the second. A comparatively simple H.T. supply circuit is built into the set, with the necessary power transformer, rectifying valve, etc.

The detector, you will see, is to be provided with positive bias on the grid, and a 1½-volt battery (i.e. a single small dry cell) is required, connected as indicated on the diagram overleaf. The power valve requires about 9 volts bias from a separate battery. The H.T. on the detector is adjusted by placing the plug in a suitable socket in the potential divider.

**The Power Unit.**

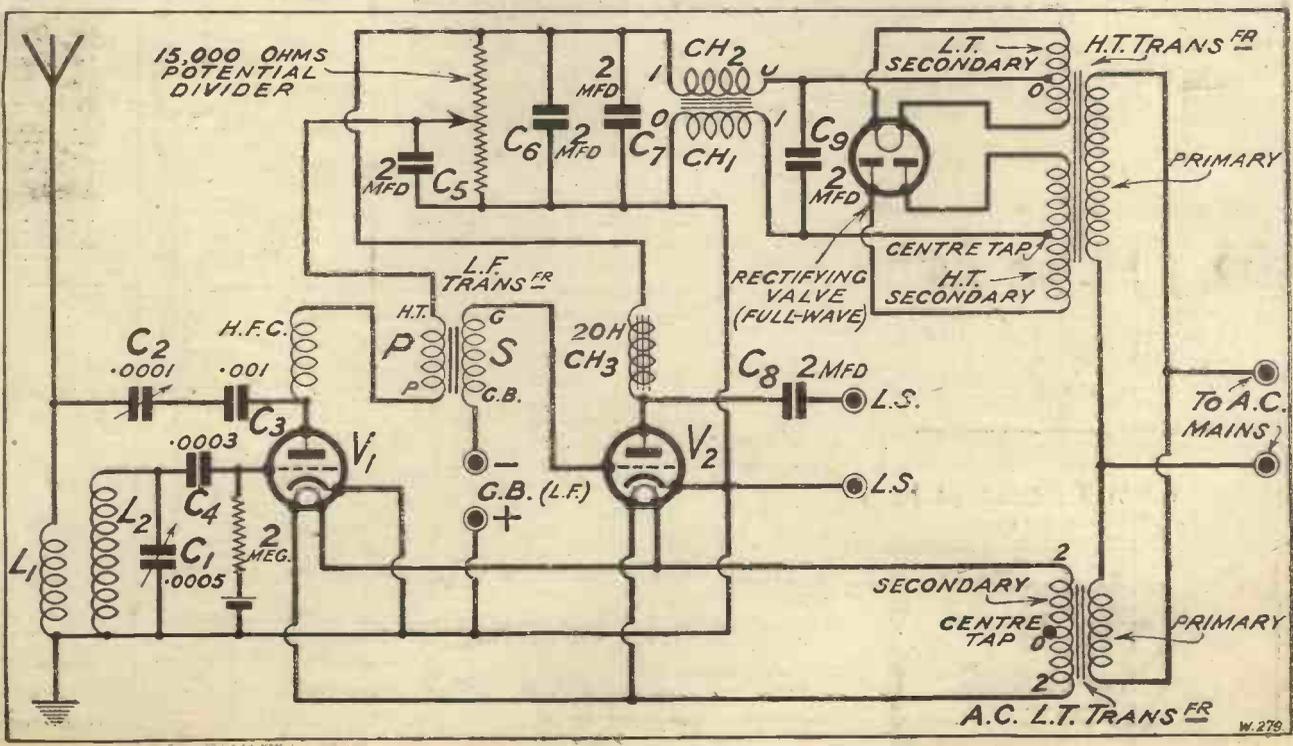
Now about the main power transformer. This must be of the correct rating to suit your mains, and must have two secondary windings, both centre-tapped. One of these (marked L.T. on diagrams) should give the voltage and current for the particular rectifier you intend to use, while the other (H.T.) should give from 150-0-150 volts to 180-0-180 volts.

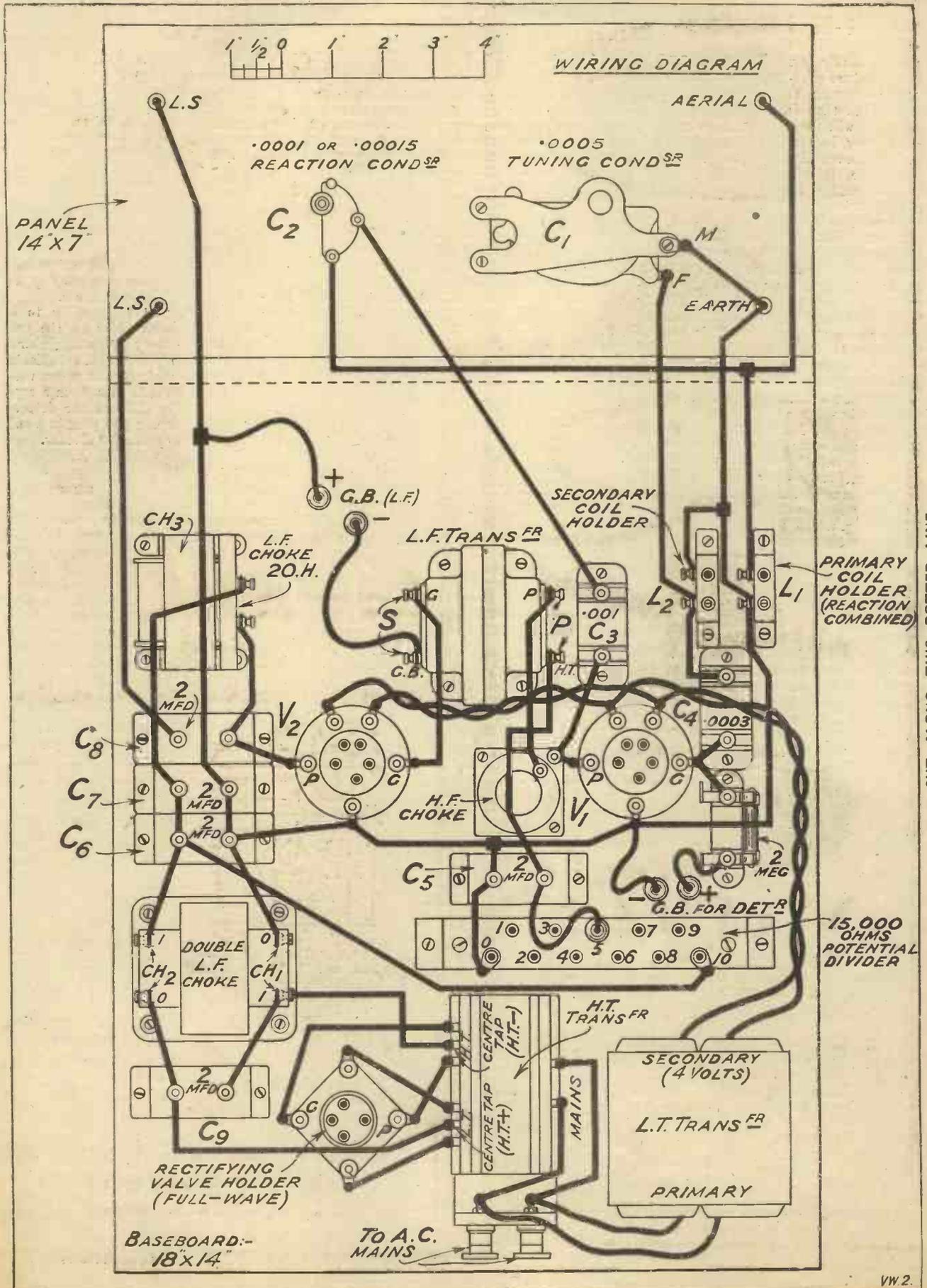
The 4-volt transformer, which supplies the "heaters" of the valves you may find is provided with a centre tap on the L.T. winding. This is not necessary, and was not used in the original set.

Coil sizes in the detector circuit are just the usual ones: L<sub>1</sub>, 25 or 35 (75 or 100 for long waves); L<sub>2</sub>, 60 (250 for long waves).

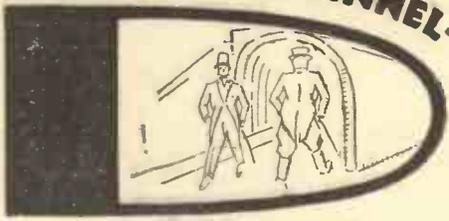
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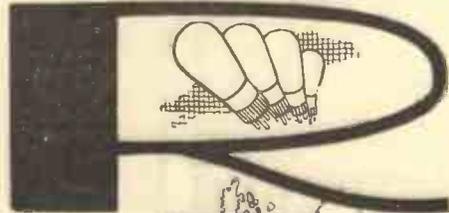




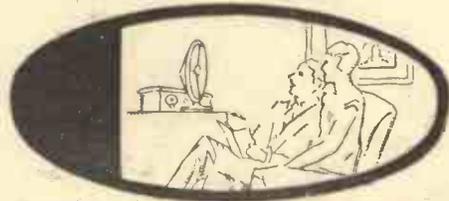
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