A PORTABLE LOUD-SPEAKER SET

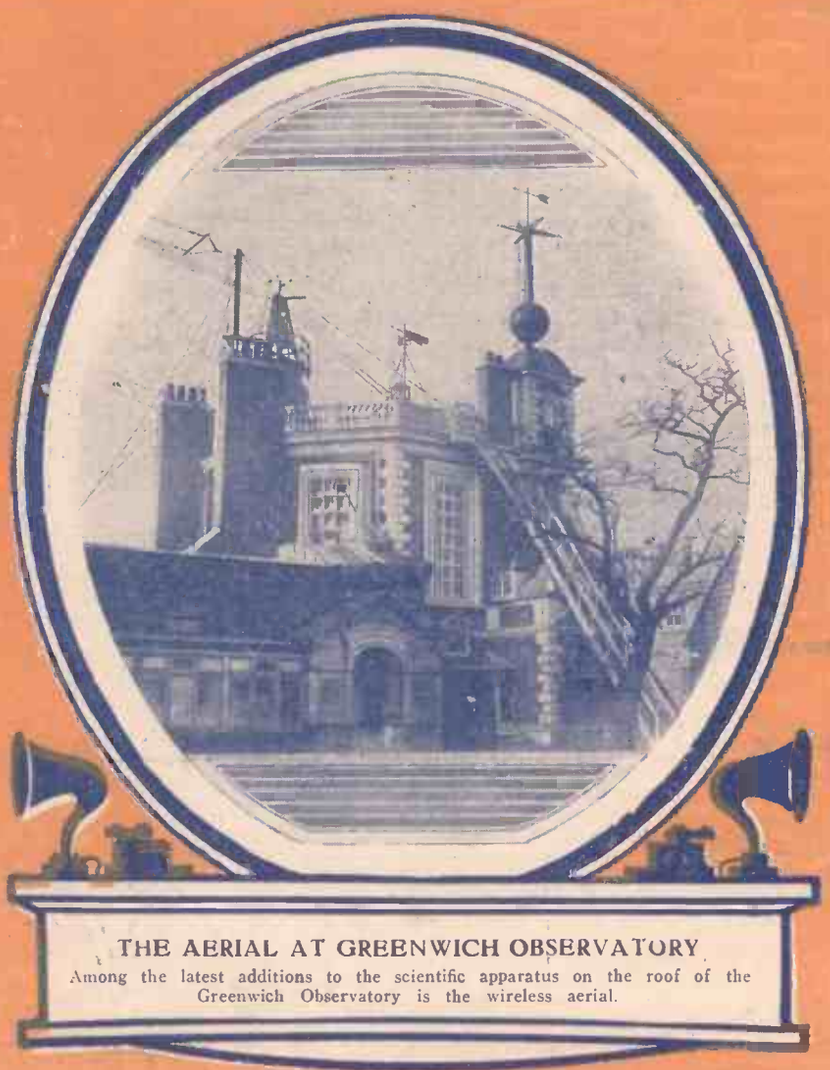
Amateur Wireless And Electrics

Vol. VI. No. 140 SATURDAY, FEBRUARY 7, 1925 Price 3d

PRINCIPAL CONTENTS

WELL ILLUSTRATED

Registered at G.P.O. as a Newspaper



THE AERIAL AT GREENWICH OBSERVATORY

Among the latest additions to the scientific apparatus on the roof of the Greenwich Observatory is the wireless aerial.

Cossor
Bright Emitter

GALVANI.

Wuncell
Dull Emitter

The twitchings of a frog's legs!

UNIMPORTANT and trivial details have often lead to epoch-making discoveries. Just as we are told that the evolution of the first steam engine came from James Watt and the kettle boiling on the hearth, so the twitching of a frog's legs played no small part in the discovery of the first electric battery.

Professor Galvani—a noted Italian Scientist—it is said, had passed a copper skewer through the limbs of a dead frog, and was about to hang them up on an iron nail in his laboratory. As soon as the copper touched the iron he noticed a convulsive twitching of the legs. That this was due to some electrical influence he proved by touching a nerve in the frog's limb with a piece of zinc and a muscle with a piece of copper. As soon as these two metals were connected together a convulsive kick took place. And so came into being the first recorded instance of the electric battery.

From the crude cell fitted with acidulated water of 150 years ago, we come to the modern dry battery and the accumulator—truly a great stride forward.

And in the design of Wireless Valves an evolution no less remarkable has taken place during the past two or three years.

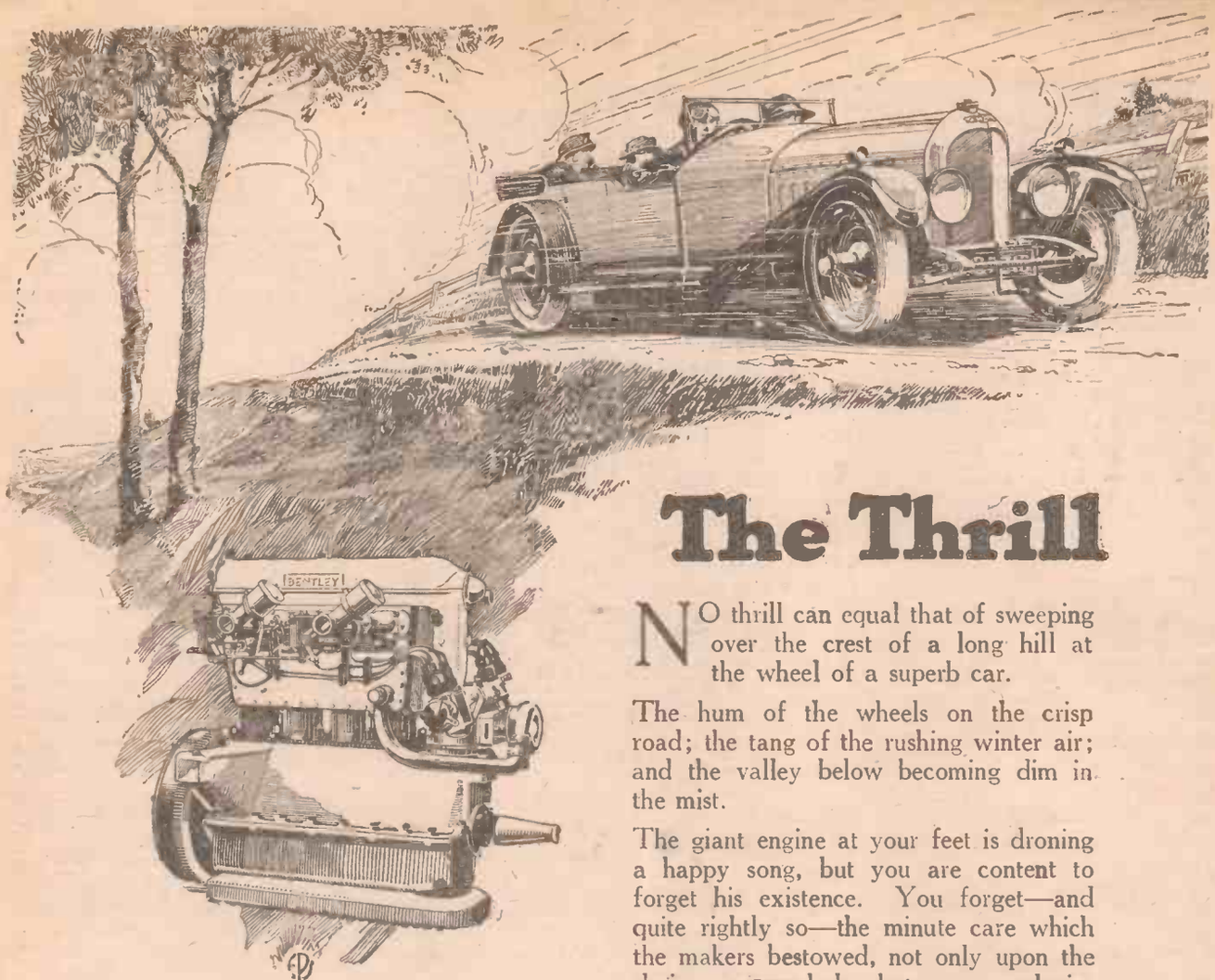
Instead of Valves with a big current consumption glowing at a temperature of upwards of 2,000 degrees, there is now available the wonderful Wuncell Valve that operates with a glow that is well-nigh invisible. This long-life Valve is fully described in a Folder obtainable from any Dealer free of charge, or direct from us.

All Cossor Valves are now reduced in price.

No. 4 of a Series.

Cossor Valves

Advertisement of A. C. Cossor, Ltd., Highbury Grove, N.5. *Gilbert Ad. 2135.*



The Thrill

NO thrill can equal that of sweeping over the crest of a long hill at the wheel of a superb car.

The hum of the wheels on the crisp road; the tang of the rushing winter air; and the valley below becoming dim in the mist.

The giant engine at your feet is droning a happy song, but you are content to forget his existence. You forget—and quite rightly so—the minute care which the makers bestowed, not only upon the design as a whole, but upon each individual component part. And yet it is the care with which the component parts are selected and tested that decides the success of the whole car.

The same is true of a wireless set.

We have specialised for over 12 years on the production of better and still better condensers, because we realise how important it is for a wireless set to have only condensers of the highest possible efficiency.

That is why we advise you, in your own interests, to

Specify Dubilier.

DUBILIER CONDENSER CO LTD

Advt. of the Dubilier Condenser Co., Ltd., Ducon Works, Victoria Road, North Acton, London, W.3. Telephone: Chiswick 2241-2-3.

E.P.S. 90

Amateur Wireless and Electrics

Vol. VI. No. 140 February 7, 1925

WHEN YOUR SET WON'T WORK

Some Helpful Instructions to Enable You to Locate the Trouble

EVERY builder of a wireless set some time or other experiences difficulty with an instrument that positively refuses to function properly. It may be a simple crystal receiver, or it may be a multi-valve instrument, the crystal set that refuses to yield up so much as a single signal, the single-valve instrument that clicks and rattles, the four- or five-valve set that howls. How many times have these difficulties arisen with a newly-made instrument, apparently wired correctly, built of components of undeniable efficiency, and designed in such a manner as leaves no doubt beforehand of excellent results being obtained. And yet it does not work!

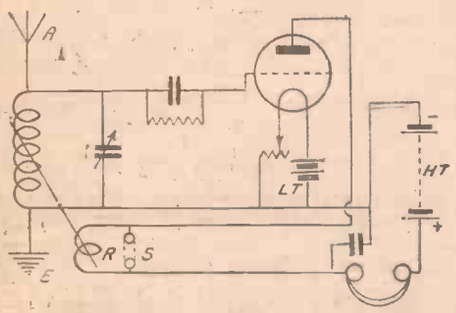


Fig. 1.—Typical Single-valve Circuit.

Fault finding is not only interesting, but, providing the work is tackled in the right manner, so comparatively simple that it is a matter of some surprise to those used to the work to find that such a large number of amateurs take weeks and weeks to put an instrument right, and then only discover the faults in many cases by accident.

Systematic Location

All fault finding should be done by "systematic location"; that is to say, the fault should be traced and not merely looked for. A very small knowledge of theory is usually very helpful in these cases, and the combination of theory with a little practical work should enable any fault to be located in a few minutes. This article deals with the single-valve receiver.

The single-valve set may be said to consist of the following components: An inductance in some form, a grid leak and condenser, a filament rheostat, a valve holder and suitable terminals. To this may be added, in certain circumstances, another coil to produce reaction, a variable condenser for sharp tuning, and, where reaction is used, a by-pass condenser. The circuit shown by Fig. 1 is the one commonly used. The strap S is for the purpose of cutting the reaction coil R out. If the reaction coil is carefully used there need be no fear of causing interference by radiating. It is safe to say that the strength of signals and the range of reception is easily trebled by judicious use of reaction.

Preliminary Tests

In this article it does not particularly concern us as to what particular method is used in arranging the inductance coils. We will presume that the circuit has been wired up as is shown in the diagram, but that results have been so far unobtainable. Now there are two circuits through the valve apart from the L.T. filament circuit which lights the valve. It is obvious that if the valve does not light the connection from the accumulator either inside or outside the set has been broken, providing, of course, that the filament is not broken. To test this, connect the two L.T. terminals to the valve and the valve should light. Providing it does so, place the valve in the socket and, after carefully ascertaining that the L.T. or accumulator leads are wired to the proper pair of valve legs, shown in Fig. 2, turn the knob of the filament rheostat. If the valve then refuses to light it obviously must be the leads from the terminals are broken or have become disconnected or unsoldered from the valve socket, or that the rubbing contact on the rheostat is not in connection with the resistance coil.

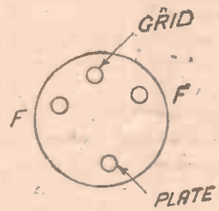


Fig. 2.—Valve Connections.

Having traced the break, connect the high-tension battery to the instrument. It is a good plan to insert a fuse of some description in one of the leads from the H.T. battery. If the H.T. battery has been connected to the filament in some way the fuse will blow and so save the valve. A small pocket-lamp bulb makes an excellent fuse and should be connected as shown in Fig. 3. Having connected the H.T. battery, place the phones on the head and then connect the leads from the phones to the phone terminals. A sharp click should now be heard, due to current from the high-tension battery flowing around the plate circuit of the valve. This circuit consists of the plate or anode of the valve, through the valve to the filament, from the filament to the negative H.T. terminal, thence through the phones to the reaction coil and again to the plate circuit of the valve. The telephones are sometimes connected on the negative side of the H.T. battery, but this will make no difference as far as we are now concerned.

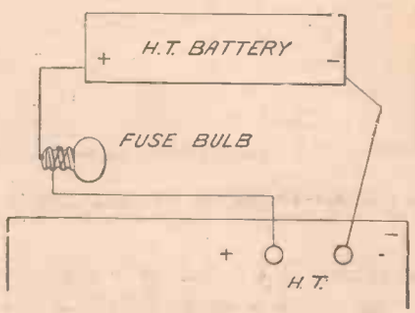


Fig. 3.—Method of Connecting Fuse.

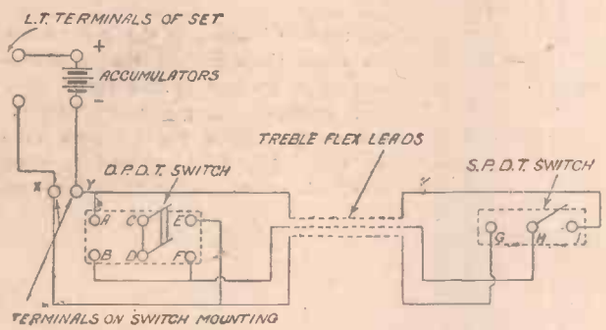
Oscillation

If this click is not heard it may be due to three things: Telephone leads broken, H.T. battery connected wrong way round, or a break in the reaction coil. We are presuming that the valve is O.K. and that the high-tension battery is "up." If the instrument still refuses to function after this test has been carried out the trouble must be in the grid circuit of the valve, which consists of grid leak and condenser, tuning coil, and back via the filament and grid of the valve. Examine these connections and see that there is no break in

(*Concluded at bottom of next page*)

REMOTE FILAMENT SWITCHING

IT is a great convenience when the wireless set is not housed in the drawing-room to be able to switch the filaments on and off at will without going to the trouble of visiting the wireless den for the purpose, for not everybody wishes to hear every item of a broadcast programme. Here is a simple method of arranging a remote control switch which will appeal to those who are so situated. It is not intended that this gear should be used at ordinary times when reception is being done in the wireless room.



Details of Wiring.

A reference to the diagram will show that it can be thrown out of action in a moment by connecting the negative terminal of the accumulator directly to the corresponding terminal of the receiving set. On the table which supports the set a double-pole double-throw switch of suitable size is arranged mounted upon a piece of ebonite and a small wooden stand. Two terminals may be provided on the switch mounting if desired, as shown at X, Y in the diagram.

Deal with the switch as follows. Connect the pivots of the arms together by means of a lead and make a similar connection between the clips B and F. From terminal Y take a lead to the clip A, then one from terminal X to clip C. Attach flex leads to terminals X and Y and to clip F respectively. Run these to the position in which is is desired to have the remote switch.

The remote control is a single-pole double-throw switch, which may be mounted in any convenient position. To make quite sure that you get the connections of this switch right it is as well to use three single flex leads of different colours, twisting them together. That from clip F goes to the pivot of the single switch, the other two from X and Y being connected respectively to G and I, as shown in the diagram.

Operation

It will be seen from the drawing that if the arm of the remote switch is making contact with I, the arms of the double-pole switch must be placed in clips E and F to switch on the filaments. They can be switched off by throwing over either the double or the single switch to the opposite position. Similarly, if the arm of the single switch makes connection between G and H the double-pole switch must be in contact with A and B to switch on, and switching off may then be done at either point.

When it is intended to use remote control the device should be brought into action before tuning is done, for owing to the length of flexible wire required there will be a voltage drop which will have to be compensated for with the help of the rheostats. Provided that the distance between the two rooms is not so great that the voltage falls to something below the required amount for heating the filaments of the valves properly, this remote switch gear will be found a perfectly satisfactory arrangement. Care should, of course, be taken to use flex of heavy gauge to cut down resistance and the effects of "line drop" to a minimum. It is very important that the insulation should be of the best, and for this reason flex with a heavy rubber covering should be employed for the long leads from the switch.

J. H. R.

"WHEN YOUR SET WON'T WORK" (*continued from preceding page*)

the tuning coil. The coil can be tested for continuity by inserting the telephones in series with the accumulator when a sharp click should be heard.

Oscillation Tests

It is advisable to disconnect both aerial and earth before proceeding to see if it is possible to make the set oscillate. The latter test is one of the most important on the single-valve instrument, and is the means of telling whether the set is functioning really as it ought. Slowly move or turn, as the case may be, the reaction coil towards the aerial tuning coil until the set commences to oscillate. The latter can be detected in several ways, but one of the most reliable is to tap the aerial terminal sharply with the moistened finger when a sharp click will be heard in the phones. This is due to the stopping and starting of the oscillations when the set is earthed through the body. If the set has been well designed it should be as silent when oscillating as when it is not in an oscillatory condition, and there should be no sound of hissing or clicking.

If the set refuses to oscillate, reverse the leads on the reaction coil, and try tightening the coupling between the reaction coil and the aerial coil again. It will oscillate one way, but not the other; the correct way must be found by trial. The set should go into oscillation gently and should not burst suddenly into an oscillatory condition. The latter defect may be due to several things, such as too high a voltage of the high-tension battery or, conversely, too low a voltage, valve too bright, connecting the earth end of the aerial-tuning coil to the positive instead of the negative end of the accumulator, badly designed coils giving a poor degree of coupling.

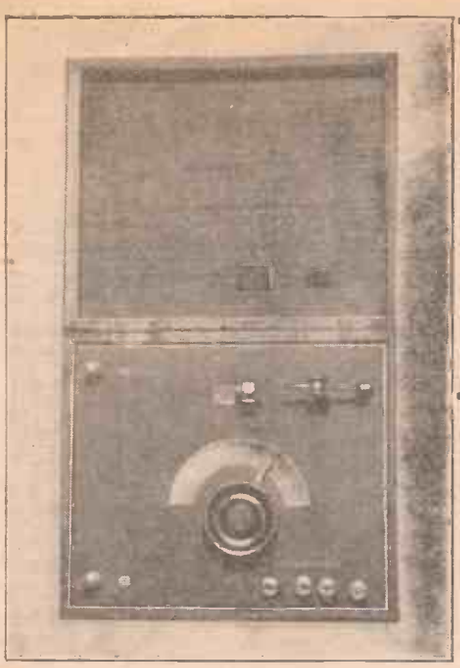
All the above troubles having been rectified, the set should now function properly, and if it still refuses to give satisfactory results the trouble must be either in the valve, batteries or aerial. It should be borne in mind that a valve has been known to light but refuse to function as far as receiving signals is concerned. Such matters as a faulty grid condenser or faulty by-pass condenser are most difficult for the amateur to detect unless they short-circuit altogether, when the continuity test with a pair of phones and accumulator or dry battery will show this up. The by-pass condenser should have perfect insulation, as otherwise it will short-circuit the H.T. battery through the phones.

A fault which is sometimes found on sets and which is easily overlooked is the placing of the by-pass condenser across the reaction coil, the H.T. and the phones, instead of the latter two only. A set wired in this way will receive signals without oscillating, but, of course, the efficiency is lowered somewhat. When designing A.T.I. and reactance coils for a set, they should be wound with the largest gauge wire it is possible to get into the space at one's disposal. The use of thick wire gives a very good adjustment for reaction. If the reaction is coupled very tightly a loud screaming noise will be heard in the phones, and it is often thought that this is when a set radiates. Always bear in mind that it *starts radiating as soon as it starts oscillating*, and this is long before the screaming takes place, which is due to *excessive* oscillation.

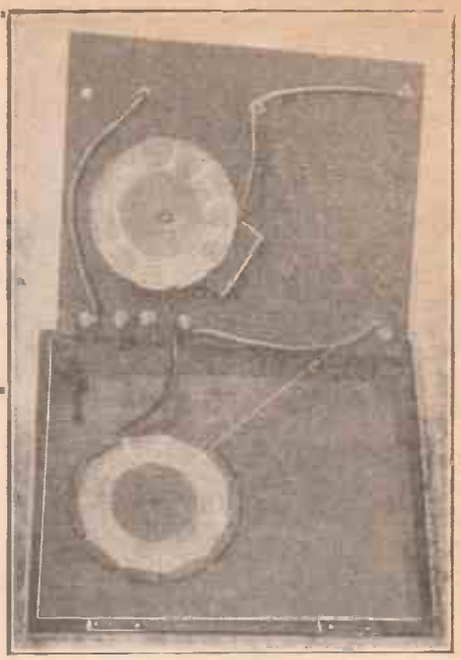
C. S. D.

Besides reducing signal strength, burning your valves too bright will shorten their life.

A CRYSTAL SET FOR HALF-A-CROWN



The Complete Receiver.



Back of Panel.

THE main objectives in the construction of the receiver described below were simplicity and neatness. The construction is perfectly straightforward, and nothing in the design has been sacrificed at the expense of efficiency.

Components

The components required are as follow: A cigar box measuring 5¼ in. by 6¼ in. inside; ebonite panel, 5¼ in. by 6¼ in. by $\frac{3}{16}$ in.; crystal detector; six terminals; piece of fibre or ebonite, 2 in. by 1¼ in.; two basket-coil formers, 3 in. in diameter; 2 oz. of No. 26 wire; 18 in. of flexible wire for connecting up.

The Box

The cigar box had fillets glued into the four corners to allow the panel to sink flush with the lid closed.

The box was then stained and varnished, and laid aside to dry whilst the other work was proceeding. The panel was drilled to the drilling plan (Fig. 1), and panel transfers attached.

The Tuner

The tuner consists of two basket coils, one passing across the face of the other. Both coils are wound in the same direction with 30 turns of No. 26 wire on 3-in. formers with 11 slots. A piece of fibre measuring 2 in. by 1¼ in. was cut and drilled with two ⅛-in. holes, one at each end, as shown in Fig. 2. One of the basket coils is secured to this arm by means of a small brass screw and nut.

A rotary switch arm with an indicating pointer substituted for the copper contact piece was next fixed into the panel, the opposite end of the fibre arm carrying the basket coil being rigidly clamped between the two lock-nuts, as shown in Fig. 2.

The height of the crystal-detector should not exceed 1 in. overall.

The Wiring

The wiring was carried out with lighting flex, according to the wiring plan shown by Fig. 3. The coupling connection between the basket coils is made by means of a short length of flex soldered at each joint. This obviates future trouble in the way of broken connections.

The second coil is screwed to the bottom of the box with a $\frac{3}{16}$-in. wood screw, in such a position as to allow the movable coil to pass smoothly across its surface.

The telephone terminals are arranged to take either one pair of telephones or two pairs in series. When only one set is in use the leads are connected to the two outside terminals. When two pairs are in commission, one lead from each set of phones is connected, one to each outside terminal, and the remaining phone tags going to the two inside terminals, which are bridged together, thus putting the phone sets in series. By utilising nickelled metal parts and transfers for the scale and lettering an extremely pleasing appearance was obtained on the finished receiver.

Tuning In

The tuning is simplicity itself. The catwhisker is set roughly in position, and the tuning arm is then rotated through the scale until maximum volume is secured. A final adjustment of the catwhisker will usually effect an improvement, after which the tuning should be left alone.

W. A. A.

TUNING COILS

MANY amateurs consider that the standard solenoid coil tapped in "tens" and "units" is the best type of tuner to cover a large band of wavelengths.

It should be remembered, however, that owing to the mechanical arrangement of such a system of tappings many losses are bound to occur.

There are dead-end losses in the unused turns, losses due to capacity between leads, dielectric losses between the tapping studs, and losses in the tapping switch.

With a plain untapped coil losses can only occur at the contact points of the condenser used for tuning, and these are negligible.

M. A. L

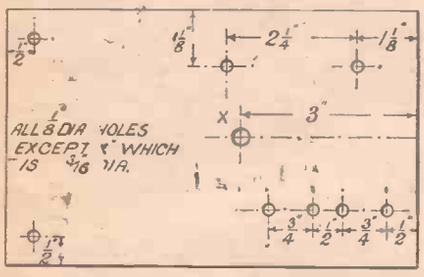


Fig. 1.—Drilling Plan of Panel.

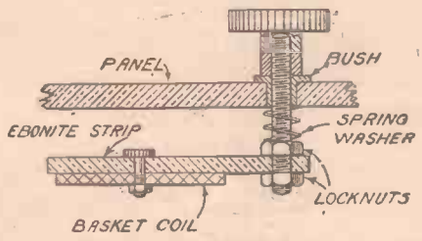


Fig. 2.—Tuning Device.

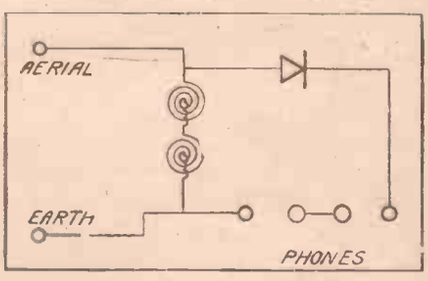
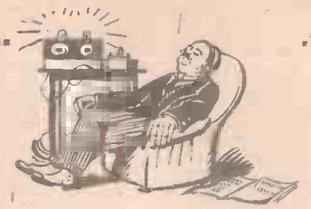


Fig. 3.—Details of Wiring.

IF I WERE "THERMION"!



ONE sometimes dreams that one's ambitions are realised. Have you never dreamt that you are conversing with New Zealand? Have you never dreamt that you are the hero of Mars-reception, that you have exploded the Heaviside theory, or proved it, as the case may be? Have you wakened regretfully to find that the mysterious electron is still the mysterious electron?

Did I awake one morning having locked up in my wave-trap all the ripples that had ever been disturbed by the B.B.C.? Was it I who was about to hire them out in bundles of ten for three transmissions daily?

Though it is my ambition to be "Thermion," I have not yet dreamt it. When I do the vision will no doubt come somehow like this:

ON YOUR WAVELENGTH!

Reaction in the Morning.

Statics and Dynamics

X's were particularly bad last night. Signals that have been extra strong (such as the onion odour signalling Saturday's supper) were 'xtra weak. X X at 30s. a firkin was wishy-washy. X X X X X, Old Barkshire strong, was certainly good—loud-speaker quality; more than a glass had a damping effect, though, with reaction in the morning. From 8 till 10 p.m. I poured in 5 X X at both ears, and still kept my balance.

A Burst of Oscillation

Wanted: An all-round wireless man
To stand any amount of hard knocks,
Built on the strong and silent plan,
And at the rhyming bard mocks;

Well versed in morse and other codes
(And this particularly tell 'em),
With capacity small between 'lectrodes,
And none in the cerebellum!
(*Endorse his licence!*)

Chelmsford and Radio-Paris

What is all this fuss about separating Chelmsford from Radio-Paris. Why separate them?

The Amateurs

These young fellows appear to be giving the ether a bigger shaking than it really deserves. F L's transmissions are now heard on the other side of the Seine. His fish-market quotations make one quite poetic. 5 T I burst forth last night with great gusto. In fact, he requires the soft pedal on my set; in other words, more resistance than capacity in the coupling. L O 2 carries out rum little tests with a fellow from Fan Sanfrisco. The Fan suffers from under-nourishment or a bad cough. It must cost him a lot to keep himself in diaphragms. By the way, I'm glad to see a reprint of the Phonetic Alphabet for Call Signs. These should be committed to memory and used on all informal occasions. Sugar-Beer-Robert has been sprouting very well indeed, though his tone may be a little too Toney for some. Five-Nuts-Orange: tricky reception, station generates quite a lot of juice, the pip-pip-pips require screening.

Things I Want to Know

Is
An atmospheric made in Berwick,
And a static in an attic?
Are condensers really dense?
Is a grid a sort of fence?
Is John Henry calling still?
Come milliamperes from a mill?

Are
X's kisses minus bait?
Do incubators insulate?
If sausages are made in skin,
How do they get the mush-mush in?
And one last thing I do implore,
Ain't it goin' to rain no more?
(*Take his licence right away!*)

My Aerial.

The Growth of Aerial Masts

Have you noticed it? I don't mean in numbers, but in height. Instance my own. First mast was the clothes-post (wife suspicious). This sufficed for a fortnight. Clothes-prop was then requisitioned (wife huffy), which, together with clothes-line added to clothes-post, made a sound if disreputable pole of 12 ft. This conveniently fell during the first storm. I then tied on to it a 14-ft. piece of bamboo, price 2s. 6d. (to the man I borrowed it from); total height 24 ft. Whilst tying some pink ribbon on my latest 50-footer I fell and broke a resolution, since when my neighbours have been pleased to name my observatory, "I-fell Tower."

Addled Adds

Have you observed the number of makers who proclaim a "bell-like" reproduction? What kind of bell do they mean? Big Ben, a bicycle bell, or the one in a teashop which you tap-tap-tap, thus drawing to yourself the attention of everybody under the roof except the waitress. On the whole, advertisers are too modest Here is an example of what might be:

Everybody Except the Waitress.

Crystalised Wireless

Fit our crystal and hear all over the world. Better than a five-valve set. The volume of pure, clear, truthful and faithful bell-like sounds that issues from the Talker anywhere within 5,000 miles of your local when using our far-famed "Flybinight" (with invisible whisker) must be heard to be believed.
That should attract potential buyers.

* * * * * *

There was a little valve and it had a little——

(*Snatch that pen away quick!*)

* * * * * *

What's that? Get out of this chair? I'm not "Thermion"? I never said I was; I've only dreamt it. C. T.

P T T (Paris (450 metres) has just celebrated its second birthday. The principal events in the station's history during the past year were the funeral of Anatole France, the great Roubaix fêtes and the Geneva League of Nations addresses.

In order to discover whether the eclipse has any effect on wireless communication generally exhaustive tests were made on Saturday, January 24, in nearly all the countries of the world.

NOTTINGHAM RELAY STATION

The Engineer-in-charge, Mr. A. Fielder.

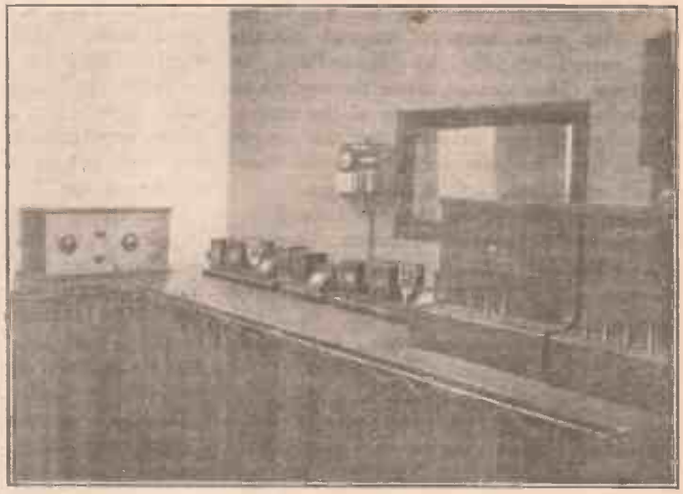
The Station Director, Mr. Edward Liveing.

AMONG the most progressive of the ten B.B.C. relay stations is Nottingham, which has only been in existence a matter of four months, being the last but two to be established.

In this short time the daily transmissions have grown from half-an-hour's music perhaps Nottingham leads the way in the matter of station innovations. The earnest hope is being expressed on all sides by the listening public that 5 N G will before long be given the status it not only deserves, but by reason of the great population it serves—namely, that of a main station.

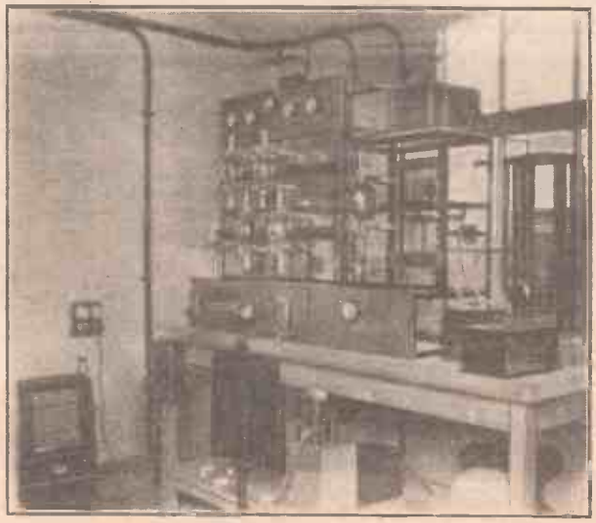
The power could very well be increased without interfering with any other broadcasting station.

Without exaggeration, another 100,000 listeners could easily be added to the already very creditable list of licensees. The city is also rich in artistes; in fact it is one of the finest centres in the whole of the country for anything required in the compilation of a main B.B.C. programme. Mr. Edward liveing, B.A., has been the station director from the inauguration, and his happy band of listeners, who frequently give vent to their whole-hearted appreciation in critical letters sent on programmes arranged, will revel in the



relayed from a local picture-house, together with the evening programme from London, to a bill of fare locally provided from 3.30 to 6.55, followed by the full London programme. In a week or two the transmissions are to be extended by the addition of three one-hour gramophone and pianola recitals in the morning each week, and it is hoped before the spring to have these every day in the week.

It will be generally admitted that this is not at all a bad record for four months' operation, and the fact that such a happy state of affairs has been brought about is due to the hearty co-operation of the programme and the engineering sides of the station. No stone has been left unturned to bring 5 N G up to concert pitch, and



The three photographs show respectively the studio, the control room and the transmitting apparatus.

day when they see his untiring efforts on their and the company's behalf rewarded by the transformation of 5 N G from a relay to a main broadcasting station.

Mr. Liveing was the first to introduce the telephone Wireless Debate into this country, for it was on Christmas Eve at 5 N G when, at the conclusion of a tutorial class talk in the studio, listeners rung up the station on the Post Office telephone and put their question to the class leader, their remarks being heard by other listeners by means of a loud-speaker placed before the microphone. The innovation was a great success, and is to be extended during the present session. The London authorities were delighted with the experiment.

(*Concluded on page* 240)

CHANGING FROM CRYSTAL TO VALVES

THIS is an adventure which inevitably happens to all wireless enthusiasts at some period or other, generally during the early stages. And it is one upon which it is not advisable to embark without mature consideration and deep thought.

The problem facing one who proposes to change from a crystal set to a valve set may be viewed from two angles. If viewed from the angle of the wireless salesman in the local emporium it presents no difficulties at all, being merely a matter of investing forty pounds in a set, ten pounds in valves and incidentals, five pounds in an accumulator and a couple of pounds in H.T. batteries.

If viewed from the point of view of the man who intends to make the change it is an entirely different matter. I have not yet seen a comprehensive paper treating the subject in such a way as to advise the adventurer.

The Question of Cost

The first thing which strikes one is the fact that most users of crystal circuits are bound rigidly by limitations of economy. They cannot allow themselves to listen to the honeyed words of the immaculate gentleman in spats for the simple reason that he invariably talks in "tenners" where we think in halfpence.

Then to whom are they to listen?

That is a delicate question. Anyone knows that he who tacitly holds himself out as a possible listener to wireless jargon finally suffers a fate like that of "The Old Soldier"—he never dies, but simply fades away.

It is just possible that there may be, somewhere, men who can give a little advice on wireless matters without taking the unfortunate victim by the ear and leading him, metaphorically, to the slaughter-house of demonstration. But it is scarcely worth while to risk it.

There is one place where the dubious inquirer may safely look for information: That is in the pages of wireless periodicals. The man who writes, though just as bad as anyone else when allowed to talk, is strictly kept in check by the limitations of the space allotted to him. He must get to the point right away and finish with it.

Which reminds me that I am doing the exact opposite.

It may be taken as a rule that there is nothing to be saved on either accumulators or high-tension batteries. The prospeaker will cost anything from twenty-five shillings, let us say three pounds. for the latter. Cheap accumulators do not make for economy in the long run.

Materials

Telephones we can leave out, as he probably already has these. A loud-speaker will cost anything from twenty-five shillings, let us say three pounds. I am assuming that one of the chief reasons for the change from the crystal is a wish to achieve loud-speaker results.

Now for valves. These will cost up to thirty shillings each. They may be purchased for less, but the initial economy is not a business proposition. One invariably purchases decent valves in the long run after being afflicted with pops, gurgles, sagging filaments and a host of other pernicious characteristics of the cheap valve.

We find that we require ten pounds for incidentals. This is a fairly standard figure. Now let us consider the set.

There are various ways of acquiring a set. Borrowing and begging are not to be recommended to the average enthusiast. He will get enough of both later on—as the victim.

Purchasing has its advantages if one happens to be lazy, but that is about all. The two best methods are to either build a set oneself or get a friend to do the job. The latter is certainly the better, for then one can curse the friend when the set refuses to work instead of having that guilty feeling oneself.

Anyhow, someone is going to build it.

The first thing to do is to build an efficient note magnifier of two stages if you are going to use a loud-speaker. It may be a good plan to stick to the phones at first and build the loud-speaker unit later, but we will consider it here first.

For this you will need the usual ebonite, two valve holders, two rheostats, two jacks, and a couple of transformers. The cost will be about four pounds sixteen shillings, allowing three pounds for the two transformers.

To construct the note magnifier, drill panel; insert parts and screw down; wire up, if possible, without using insulating sleeving.

The circuit is simple. Connect the two valves in series via the transformers and shunt the primary of the first transformer with a telephone condenser. Put the jacks so as to break the circuit between the output of the valves and the input of the transformers.

This is assuming that you are going to connect your telephones and loud-speaker direct to plugs, which is the easiest practice.

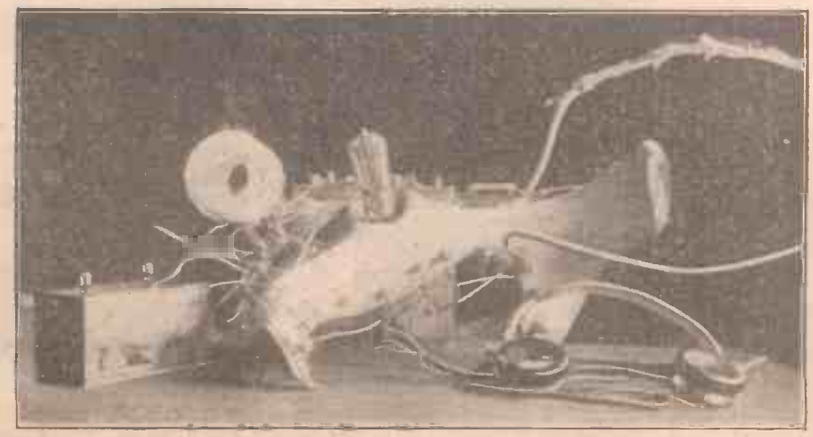
A note-magnifying panel, properly constructed, should last a lifetime. Unlike the high-frequency side of the set, it need not be changed every time you want to try a new circuit.

The Best Set

The set proper should consist of one stage of H.F. amplification and a detector. A straightforward circuit with either one tuned transformer or a tuned anode will work best with reaction on to the transformer or the anode coil. Another three pounds will cover the cost of this. Skilfully handled, you should bring in all the B.B.C. stations, along with Madrid, Rome, Paris and Brussels. If you use a tuned transformer you will have a much wider scope, for the transformers will be interchangeable with the coils.

If you are going to be content with getting increased distance over your crystal set then you need only the two valves, one H.F. and one detector. You can build this right away for three pounds, including the valves, and add the loud-speaker unit later if you wish. Including the cost for accessories, this works out at thirteen pounds for the change—and ten pounds of that is going to be spent on stuff that will do for any type or size of set you are likely to build at some future date.

F. C. D.

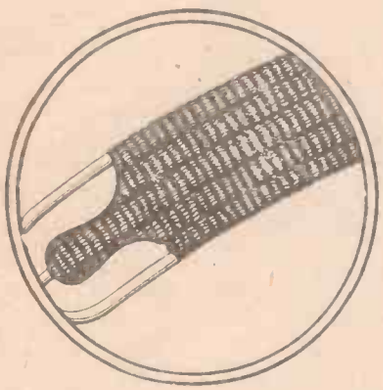


THE CRAZE FOR NOVELTY

The builder of this set is Mr. A. G. Headeck, of Ashford, Kent. He considers bone to be an excellent material to use in place of ebonite!

All Brandes products carry our official money-back guarantee, enabling you to return them within 10 days if dissatisfied. This really means a free trial.

The unusual constructive theory of Brandes *Matched Tone* Headphones secures a tremendous improvement in accurateness, sensitivity and volume. A simple explanation is this: Strike the same note at the same instant on any two musical instruments of the same kind. It's a hundred chances to one against both notes being of the same strength and pitch. Consequently, it jars, and you would much rather hear one alone. If both notes were exactly similar, it would be pleasing, and you would have greater volume and clarity. Brandes, with both receivers matched to exactly the same degree, achieve this desired end. *Ask your Dealer for Brandes*



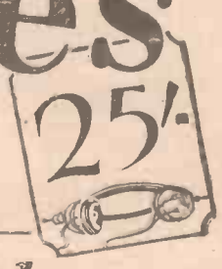
The headbands are made of piano wire covered in soft, corded webbing. At both ends the wire is firmly clamped together so that the original shape may be easily bent to fit the natural line of the head without fear of injuring the headband. They mean comfort without hard and irritable constriction.

British Manufacture (B.B.C. stamped.)

The *Table Talker* is another Brandes quality product at moderate price. Its full round tones are wonderfully clear and pleasing. The horn is matched to the unit so that the air resistance produced will exactly balance the mechanical power of the diaphragm. This means beautiful sound-balance. Gracefully simple of line, it is finished a shade of neutral brown. **42/-**

Brandes

The Name to know in Radio



Superior "Matched Tone" Headphones

TRADE MARK

On Your Wavelength!

The Eclipse

THE solar eclipse on Saturday week excited wide interest among wireless enthusiasts, both professional and expert, all over the world. Special transmissions were arranged both here and in America to test what effect the eclipse would have upon reception.

Soon after 2.35 p.m. I picked up W G Y's carrier and speech was heard. Unfortunately interference from 2 L O, who seemed to be working with unusual strength, prevented this station being heard well. Several German stations, also transmitting round about 380 metres, were heard. Most of these stations became stronger as the period of the eclipse proceeded. There was a considerable amount of morse about and some mush. Northolt appeared to be working, though fortunately there were some silent periods.

On the short wave I heard two stations; one on about 70 metres was transmitting dance music and was loud enough to be switched through to the loud-speaker. Two other stations, one of which appeared to be K D K A, were heard on this short wave, making three in all. In addition, there appeared to be a number of very powerful amateurs working morse down below 75 metres.

The Effects

So much for the stations heard. Now for a consideration of the general effect obtained.

There is little doubt that strength increased as the eclipse developed. I noticed no undue tendency towards fading, though personally I had not expected it. There appeared to be very little to notice on the longer wave band except that stations were audible which are not usually heard during the daytime. But on the short waves a distinct difference of conditions was apparent. It began with a minor crackling effect rather like a poor H.T. battery, and, gradually getting worse, soon appeared as what the Croydon operator terms "night effect." This crackling was so bad at times as to render good reception an impossibility; it persisted long after four o'clock.

Most listeners to the short-wave stations on Saturday afternoon will have noticed how clearly Croydon was to be heard on a harmonic. This is the first time I have heard Croydon down here.

The net result of the experiments seems to have been that during the eclipse signal strength was stronger than it would normally have been. Contrary to expectations, fading was not unusually prevalent. Considerable electrical disturbance of the atmosphere was created, differing from normal static since it appeared to be worse on the low than the high wave band.

What conclusions the experts will draw from these facts I do not know. I rather imagine they may be led to look for the cause of fading in a different direction to that which has so far engrossed most of their attention. Possibly also the well-known phenomenon of "night effect" may be cleared up. It is for the wireless man to get the facts in this case, but for the astronomer and others to deduce the theories.

K D K A

One point regarding Transatlantic reception during the eclipse is perhaps worth mentioning. Claims have been made in the press that K D K A was heard on the short wave. It appears that many people claim to have picked this station up, but it is actually very doubtful if they did. Several experts who tested for this station picked up a faint carrier wave which they were unable to solve; a few actually did solve it with difficulty, but were unable to obtain sufficient volume to establish the station call sign. In one case a cable was sent for verification to K D K A, whose reply will no doubt come in due course.

But none other than the most extremely sensitive sets would have picked up this transmission. The transmission which many people picked up on the 60-odd metre wave was considerably higher than 60 metres, and apparently emanated from the Swiss station at Zurich. Anyone caring to work out the harmonics of Zurich will find that the eighth is very close to K D K A. It is a curious fact that this Swiss station came in at loud-speaker strength on the short wave, whereas it was by no means good on its natural wavelength.

So whether K D K A actually was heard in England during the daytime remains yet to be proved. If she was, then it could only have been in exceptional cases.

Daylight Long-distance Reception

It seems doubtful if some enthusiasts are fully aware of the possibilities of daylight reception of distant stations. It appears to be the general idea that during the daytime only British stations can be received in England, and these with difficulty, by an ordinary set. This is quite definitely not so. While I write, at 11.30 in the morning, a German station is delivering news on my loud-speaker. The station in question is probably Hamburg since the wavelength is approximately 390 metres. And this is by no means the only Continental station which may be heard during daylight hours. While American stations are probably beyond the range of anything but an exceptionally-sensitive set during daylight, most "fans" should be able to manage a good many German stations on days when the conditions are favourable—which means generally muggy and wet.

Oscillation

The problem of oscillation appears to be interesting the American listeners equally with British. A special test has recently been carried out in the States in order to ascertain exactly how much interference an oscillating receiver can cause and over what area it would be heard. The results were somewhat staggering. Listeners in a certain city were divided into two classes, half of them being asked to deliberately oscillate while the other half listened. The oscillations were heard over a quarter of the American continent, and one report even came from as far distant as South America.

In a second test designed to check the first, three receivers were arranged so as to oscillate and produce a note which could be identified. The final results clearly proved that an oscillating receiver will interfere with reception anywhere within a radius of 25 miles of its source, and will be heard without causing great interference within 50 miles. When more than one receiver is oscillating the effects can apparently be heard for several hundreds of miles. The moral is that the man next door is not always responsible for your trouble, even if he does use reaction on a single-circuit tuner.

Standardisation

I have often thought what a pity it is that manufacturers cannot come to some agreement with a view to a certain amount of standardisation in wireless component parts. It was brought home to me particularly the other day when I was fitting a new aerial tuning condenser to a set which had given good service for several years. In the days when this set was made it was almost universal for the A.T.C. to have a capacity of .001 microfarad. We know better now and use condensers of about half this size. The old component was fixed to the panel by means of a couple of screws. Do you think that the holes made for them coincided with those in the top plate of the new one? Of course they did not. But it would surely be quite easy for an agreement to be reached that the fixing screw holes in all variable condensers should be, say, 1½ in. apart and at a definite fixed distance from the centre.

Exactly the same comment applies to low-frequency transformers of various kinds, and when we come to high-fre-

On Your Wavelength! (continued)

quency transformers of the mushroom or plug-in type we find confusion even worse confounded, for here there is no one rule for connecting the ends of the windings to the various pins. If you wire your set for transformers of one make you will probably find that others do not do at all. Here is a glaring case of lack of standardisation which should receive attention.

Screw Sizes

Another point which always annoys me about components is this: I suppose that ninety-nine per cent. of those who build their own sets use 4 B.A. screws to the exclusion of all others. They have the appropriate drills and taps, as well as a good stock of screws of various lengths. Yet when they come to mount components they discover more often than not that the clearance holes made for the fixing screws are intended for either 5 or 6 B.A. There is absolutely no point whatever in making the fixing holes of either of these sizes in the vast majority of cases, and it would be a very good thing if manufacturers would make the No. 26 drill, which produces a 4 B.A. clearance hole, their standard tool.

One-hole Fixings

Matters are *apparently* simplified by the use of the one-hole fixing for condensers, rheostats, variometers, variable grid leaks and so on. When making up a panel the other day I thought that I would save myself a heap of trouble by using components provided with this type of mounting. I therefore laid in a stock of them and did the required drilling. But when I came to tackle the fixing I found that I was in rather a dilemma. In every case the makers had taken it that no one ever used anything thicker than a ¼-in. panel. Now this was a large set and I had cut the panel from ⅛-in. ebonite. The result was that when I pushed the screwed portion of the one-hole fixing through the panel it did not protrude sufficiently to enable the nut to obtain a grip. So far from saving myself trouble I gave myself a very great deal of work, for I had to counterbore each of the holes so as to let the nut in a little way in order to enable it to obtain a hold. It would be a very great advantage if the screwed bushes used in one-hole fixings were made with the threaded portion considerably longer than is usually the case. You can always file down a bush that is too long, but I have never been able to discover any method of lengthening one that is too short! And, after all, lots of people do use ⅛-in. or even ⅜-in. ebonite for large panels.

Frame or Outside Wire?

I have often seen it predicted that before so many years have passed the outdoor suspended aerial will be a complete back number, so far, at any rate, as amateur reception is concerned. One of the chief objections to the outdoor aerial is that if there are any atmospherics going it gives you your full share of them. It is also seriously affected by interfering signals on the same, or almost the same, wavelength as the transmission that you wish to receive. With the frame aerial a very much greater amount of freedom from interference, whether of natural or of a human origin, can be obtained. In fact in the summer-time when the crackles and fizzles have been too bad for reception on the outside wire I have often been able to get quite good results with a small frame. The only objection to the frame is that it cuts down to a very large extent the range. This can be made up for in most cases by adding one stage of high-frequency amplification. The frame is extraordinarily selective, provided that it is used in a room within whose walls there is no great amount of iron or other metal. Normally, maximum signal strength is obtained only when the frame points directly towards the station that is being received, and another station lying in a different direction can be tuned-in to the exclusion of the first by a slight rotation of the frame. I am a firm believer myself in the frame aerial, and I strongly advise any reader who is troubled by interference to give it a trial.

The Crystal Merchants

On reading some of my past writings in these columns I have discovered a frightful omission. I seem to have partly overlooked the claims on my attention of the vast army of crystal users. Their name is legion, for I am credibly informed by a Post Office official that 50 per cent. of the aerials in this country have crystal sets tethered to the business end of them. Well, well, I must apologise, for I can quite understand that my talks on Eiffel Tower musical transmissions or Burns night from Glasgow must be very tantalising to the crystal user, possessing as he generally does only a piece of part worn galena and a 15-ft. aerial buried in the heart of London. Even the merits of "adding a valve" must be lost on him, for his pockets are often as limited as his gear. It is surprising what fascination a crystal set possesses, and even more surprising what one can hear with suitable gear. Those persons with a crystal set living in a large town are often more favourably situated than country cousins possessing multi-valve sets, for, in addition to local broadcast, they have also a wide selection of amateurs to receive. Re-radiating valve sets also often provide an unexpected variation by giving the gratified crystal merchant an unexpected re-transmission of one of the distant stations. Unfortunately re-radiating valve sets may also provide unwanted interference to the long-suffering crystal user and utterly spoil his programme.

Expectation of the Unexpected

On the whole, one can't help but envy the crystal user who, in spite of delightful uncertainty and doubts, may one day discover a super-sensitive piece of crystal which will take the place of one of our dull-emitter valves. Until then he is always in such a state of continual expectation of the unexpected that he cannot possibly leave the catwhisker to take care of itself, and the fascination of "whisker-wangling" is always with him. That is where the crystal merchant scores, for it is all too simple with a valve set.

Choral Music

Personally I am not fond of part singing, whether in "fours" or mass, and from broadcasting standpoints choral music should be rigorously avoided, but for those who do, and do not mind "that gramophone feeling" there is an exceptional opportunity to-night of hearing Elgar's biggest composition, *The Dream of Gerontius*. It will be performed by the Hallé Orchestra, under Mr. Hamilton Harty, at the Free Trade Hall, Manchester, and be broadcast from 5XX.

A similar opportunity will be given on Saturday, when Bournemouth via 5XX broadcasts Sullivan's *Golden Legend*. An exceptional cast has been obtained, including Miss Edythe Kinch, Miss Gladys James, Mr. Gwynne Davis and Mr. Robert Mott.

Those Dear Anniversaries

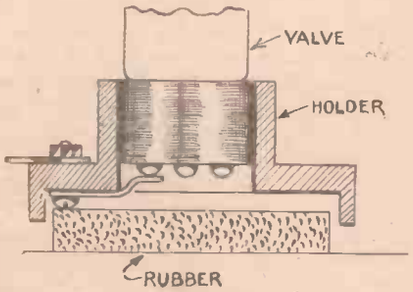
With all those anniversaries flying around, it was only to be expected that Manchester would seize upon the Dickens' birthday to hold a special programme, and on Saturday night I shall be a composite between Mr. Asquith and Mr. Micawber, "waiting to see" "something to turn up." I understand the programme is to be arranged by the Manchester branch of the Dickens Fellowship, which was founded in October, 1902, and has as its life presidents Sir Henry F. Dickens, K.C., and Mrs. Kate Perugini, the only surviving children of Charles Dickens.

THERMION

PRACTICAL ODDS AND ENDS

Wecovalve Holders

WHERE "Weco"-valve holders of the bayonet-catch type are used, trouble frequently arises from bad contacts between the holder and the valve. This is usually due to overheating the tags when soldering the connecting wires. The heat



Details of Valve Mounting.

softens and warps the ebonite of the holder, so that the contact spring is no longer held in the correct position.

Where this has occurred, the trouble may be completely cured by slacking the holder away from the panel, tightening the four little screws which hold the soldering tags and contact springs, and then inserting a round disc cut from a piece of fine rubber sponge under the holder and bolting the holder down again on the panel.

The disc should be cut to fit in the recess on the under side of the holder and should be about ¼ in. thick. The figure shows the position of the disc before bolting the holder to the panel.

When the holder is bolted down the sponge is pressed up into the holder and keeps the contact springs hard up against the valve contacts. The valve can, of course, be taken out and replaced as before.

Celluloid

BASE celluloid acts as an excellent insulating medium and can be very easily made.

It is made by dissolving scrap celluloid (old combs, photograph film and broken hair slides) in acetone. It is best to first scrape the celluloid before dissolving it in order to get rid of any gelatinous emulsion.

The cleaned strips of celluloid should then be shaken in a bottle with acetone. If the mixture is too thick more acetone should be added, and vice versâ.

It dries very quickly when applied (more so than shellac) with a beautiful gloss. C. J. T.

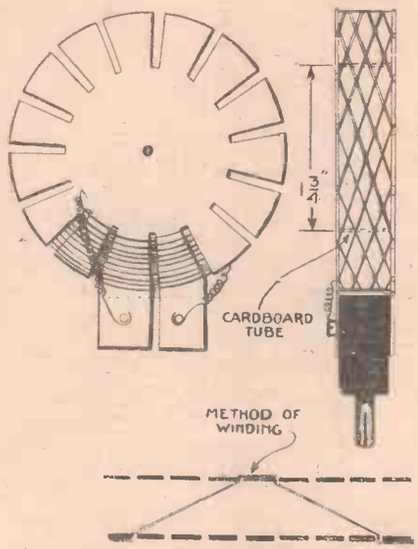
Making Your Own Coils

THERE is really nothing very difficult about winding your own coils if you go about it the right way. Here is a way of making and mounting honeycomb coils.

Any suitable material may be used for the formers so long as it is thick enough to prevent bending when the winding is begun. Fibre sheets about $\frac{1}{16}$ in. thick are quite good.

When the sheets have been cut in the manner shown in the diagrams a piece of cardboard the width of the plug you wish to mount on is cut and bent round in a circle the same diameter as the centre of your former, 1¾ in. Two short pieces should be left as shown in the figure to enable the coil to be mounted.

A hole is made through the centres of the formers and, after your ring of cardboard has been placed between them, they are clamped together with a small bolt,



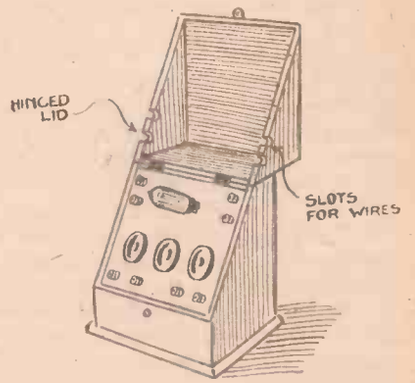
Method of Winding Coils.

which is removed when the winding is finished.

The method of winding is simple. Starting from any slot, you miss three segments or two slots, as shown. A. L. E.

Protecting the Valves

MANY wireless receiving sets afford no protection to the valves, which are expensive items. Sets that are kept in rooms where there are children or where they are likely to be damaged by other causes should be given some form of cover, which incidentally also protects them from dust. The writer has made the cover shown in the illustration, which gives an efficient protection for a sloping panel-type of set. Semicircular holes are cut at



Arrangement of Hinged Cover.

the sides to obviate the necessity of disconnecting wires, and two small hinges at the top permit of the cover being opened and closed as desired. S. J. B.

Panel Hints

QUITE a good way of finishing off a panel is to use some Vim or similar cleanser on a wet cloth. When the surface is well matted, finish by rubbing in one direction only, using more water and less cleanser. Swill the panel well under a running tap to clear out all the grit from the holes.

Polishing may be done by rubbing with jeweller's rouge and turpentine, but it is a lengthy process, and a very good finish is obtained by polishing with a linen rag and just a trace of linseed oil.

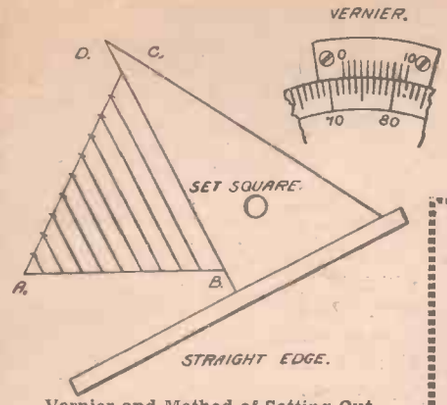
It oftens happens when changing components in a set that fresh screw holes have to be made, and the problem is to fill up the old holes so that they will not show.

Quite good plugs can be made from the so-called "ebonite" knitting needles.

The holes should be drilled out so that the needle is a tight fit. A little Seccotine can be smeared in the hole and the needle pushed in and cut off close with a sharp knife or saw. A smooth file and a piece of fine emery-cloth completes the job.

The plug will take a polish, but probably it is best to leave the panel with a matt finish when the repair can hardly be detected. J. H. S.

A VERNIER FOR INSTRUMENT DIALS



Vernier and Method of Setting Out.

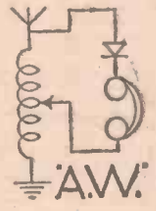
IT has often surprised the writer that the simple expedient of providing a vernier of the type forming the subject matter of an experiment in elementary science classes has not been adopted for indicating minute movements of, for example, the vanes of a condenser.

As dials and their divisions are now practically standard, it would be a simple matter for a manufacturer to make a suitable vernier. To those who do not understand what is intended, it may be explained that a vernier can be made in the case of a scale where units are divided into ten divisions, by marking off nine of the divisions on a piece of paper and dividing the distance marked off into ten divisions. Each of the parts of the vernier will then be less than a part of the scale by one-tenth of the latter. If, for example, 40 degrees and a part of a condenser scale are in use according to zero on the vernier, and the seventh line on the vernier coincides with a division on the scale, the indication is that the fraction is seven-tenths of a part of a division on the scale. Consequently the reading in degrees is 40.7 degrees.

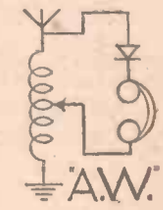
The application of a vernier to a condenser scale is shown in the diagram. It should be noted that invariably a condenser scale is not marked in units, but the divisions of the scale correspond to two units. The length of a vernier is then four and a half divisions of the scale, which corresponds to nine-tenths of the distance between the divisions indicating tens. The reading of the particular vernier illustrated in the diagram is 72.2 degrees.

For those who are not acquainted with geometry and do not know how to divide a given line into an equal number of parts, it should be explained that if a line to be divided into the requisite number of parts is drawn on a piece of paper, with the exact length of the total number of parts (let this be represented by line AB) and another line is drawn at an angle thereto (line AC of the figure) and marked off by a number of arcs of any length, the number corresponding to the number of parts into which the line AB is to be divided is shown. A line DB is drawn passing through the point where the last of the said arcs cuts the line AC and joins the line AB at B. A series of lines drawn parallel with the said line DB, and passing through the points where the said arcs cut the line AC will, if drawn carefully, divide the line AB into the required number of parts. In Fig. 2 AB has been divided into ten parts of equal length. In order to draw the lines exactly parallel one to another it is essential that a set-square or its equivalent be used with one of its faces arranged against a straight-edge as shown in the sketch reproduced above.

H. J. H.



THE "A.W." CROSS-WORD CIRCUIT



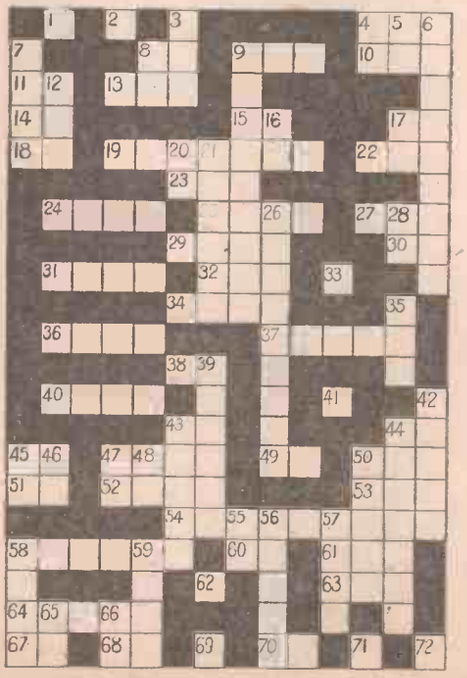
CLUES

ACROSS

1 Nothing.
2 Beheaded, lays (down). 3
1, 2, and 3 Single.
4 Newcastle.
8 Excellent.
9 Honeycomb maker.
10 Urgent!
11 End of coil.
13 Aerial should not.
14 Depart.
15 Not switched off.
17 3·14159.
18 Indicates half watt
19 A type of coil.
22 The end of aerial.
23 Metal bar.
24 Telegraphic message.
25 You see one, too!
27 A Welsh station.
29 Swell, beheaded and curtailed.
30 Middle of States.
31 Spiral 24.
32 Nearly not so much!
34 Part of set you made.
36 Melody.
37 Kind of news.
38 Threads.
40 1, 2 and 3 across.
43 Electro-plated.
44 More than half set.
45 Where 5 X X is.
47 Not difficult, backwards!
49 Simultaneous broadcast.
50 ⅝ of an insulator.
51 Atmospherics.
52 Rough ridge.
53 Part of telephone.
54 Connecting ends.
58 Makes and breaks.
60 Half load.
61 Almost ugly!
63 Drink, listening to Tree
64 Escapes.
67 Portion of Hull.
68 A valve.
69 Personal.
70 Half size.
71 and 72 Price of AMATEUR WIRELESS.

DOWN

3 Insulator.
4 Some of Glasgow.
5 Negative.
6 Please don't do it!
7 Aerial should be.
8 Part of valve.
9 Send messages, etc., into space.



The solution will appear in the next issue.

CLUES

DOWN (*continued*)

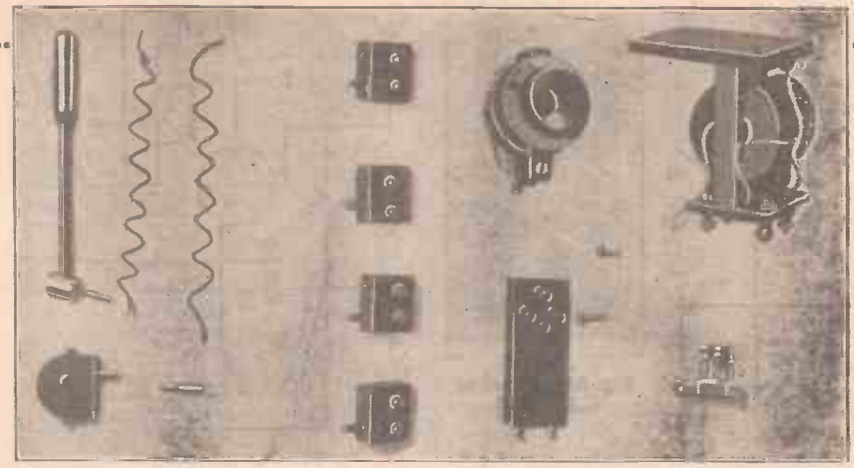
12 Accumulator voltage.
16 In tanks.
17 Dad.
20 Near.
21 Connect.
26 Isolates.
28 Half watt.
33 and 41 We shall, some day, besides hear.
35 ⅝ of electrical unit.
39 Unit of current.
42 What we buy wire on.
43 Where circuit is completed.
44 Used to keep dry.
45 Some of Swansea.
46 Part of Chelmsford.
47 Why be?
48 Begins suddenly.
50 Platform.
55 Piece of rope.
56 Many in back gardens.
57 Small lumps of coal.
58 Often covers wire.
59 A kind of hardening.
62 and 69 Quality of AMATEUR WIRELESS.
65 Middle and end of Edinburgh.
66 Half Pittsburg.

We do not propose to offer a prize for the solution of this puzzle, but our readers will no doubt be interested in the application of this popular craze to wireless. It will be observed that the design of the puzzle forms the simple crystal circuit shown in the heading.

Norwich Council has asked the B.B.C. to consider erecting a transmitting station at Norwich.

AN EXTENSIBLE UNIT SET.—V

The L.F. Amplifying Panel



Figs. 28a and 28b.—Component Parts of L.F. Amplifying Panel and Reaction Unit.

IN this article is explained the construction of a low-frequency unit to be added to the two units already made. A shell will be required to take this panel in the same way as the others. The only difference is that no coil holder is required to take a honeycomb tuning coil. We therefore can proceed straight away with the assembling of the components to be used on the panel itself.

The parts required are pictured in Figs. 28a and 28b and consist of: One ebonite panel 18 in. by 4 in.; one ebonite panel 2½ in. by 2 in.; one L.F. transformer; one rheostat; one valve bracket; one double-pole double-throw switch; four coil holders; four 4 B.A. ½-in. countersink-head screws; two 6 B.A. countersink-head screws; 13½ in. 2 B.A. screwed brass rod; tinned copper connecting wire and insulating sleeving.

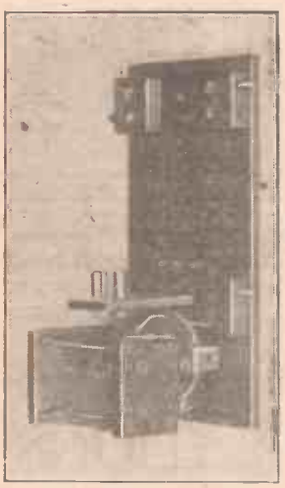


Fig. 29.—Back of L.F. Panel.

With the components at hand the panel must be drilled according to the diagram Fig. 35. Here is the drilling key: A, 4 B.A. clearance and countersunk; B, 6 B.A. clearance and countersunk; C, 6 B.A. clearance; D, ¼-in. clearance.

It must be noted that the transformer bracket is mounted on the opposite side of the panel to that in the "Dual" unit already described. In each case this allows room for the transformer to extend a short distance behind the detector panel if the overall length exceeds 4 in. In the set pictured this was not really necessary. Two different types of transformer have been employed to show the adaptation of different mountings. However, the constructor may please himself as to whether he adopts these or others of the many good makes now on the market.

The transformer bracket is a piece of ebonite 2½ in. by 2 in. by ¼ in., drilled and tapped 6 B.A. in its shorter edge to a depth of ½ in. and ½ in. from each corner. This can also be drilled as required to mount the transformer. In most makes this is by four screws through holes in the base. Accommodation must be left for the rheostat which goes between the transformer and front panel, as shown in Figs. 29 and 30. The instrument can then be permanently attached to its bracket.

The four coil holders, which act as unit connectors, can next be tapped 4 B.A., taking care that there will be no discrepancy in height between the two panels when they are plugged together. When the connectors have been securely fastened to the front panel the other components can be assembled. First the switch, then valve bracket, rheostat and transformer (see Fig. 29), noticing particularly the way in which the rheostat is mounted so that it will clear the other components.

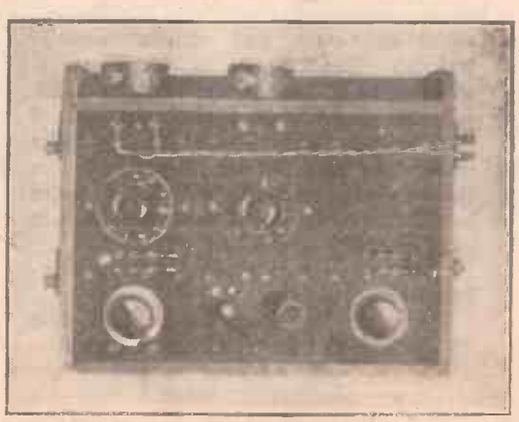


Fig. 31.—H.F. Detector and L.F. Units.

Wiring the Unit

Wiring is carried out with No. 24-gauge tinned-copper wire covered with systoflex sleeving. Fig. 33 is a pictorial sketch showing the back of this panel wired up. Fig. 36 is the theoretical circuit including the circuit of the first two units. This is shown in order to make the functioning of the circuit as a whole more clear. Note that the double-pole switch cuts in or out the low-frequency unit. The illustrations make the wiring simple enough to require no verbal explanation.

Fig. 30.—Another Back of Panel View.

The Set in Use

Fig. 31 is the Unit set *en bloc* as so far built. There are three valves functioning in a straightforward manner as radio-frequency amplifier, detector and audio-frequency amplifier. There is also a reflex to the first valve which enables it to be used to amplify at audio-frequency when a loud-speaker is employed. The connection between the third and first valves is made by a length of flex, which is clearly seen in Fig. 31. The loud-speaker is connected as before to ter-

minals at the base of the first valve. The addition of the audio-frequency stage of amplification does not complicate the tuning in any way. Likewise this stage may be brought into action or not as required by a throw of the switch.

It should be noted that because the loud-speaker is incorporated in the high-frequency circuit (see Fig. 34), when following "dual" amplification the headphones may not be used in its place with success, as such application would result in a capacity-to-earth effect through the headbands and thence through the body of the operator.

On local reception the loud-speaker can be put in place of the headphones on the terminals at the extreme right when good strength will be obtained. It is better, however, to make use of the two stages at one's disposal and tune down to a comfortable loudness, as by so doing the set is not being run "all out," so to speak, and the resultant reception will be notable for a complete absence of distortion.

DAVID GREY.

(To be continued)

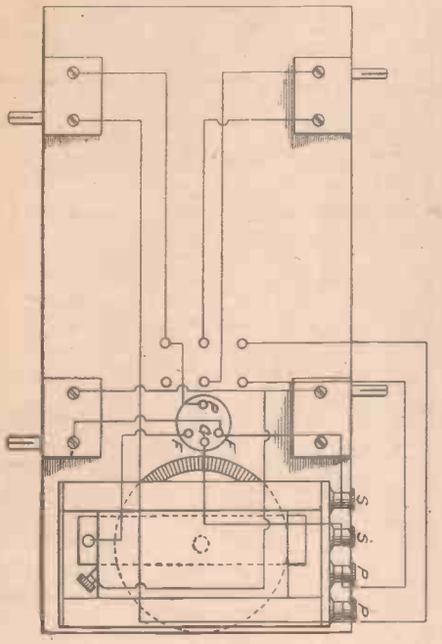
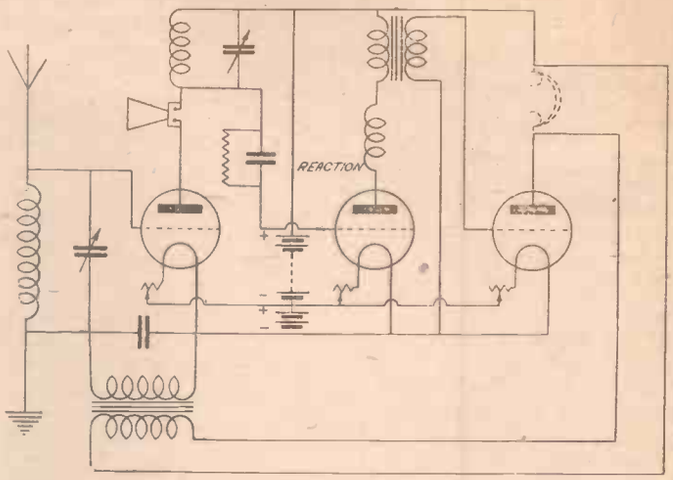
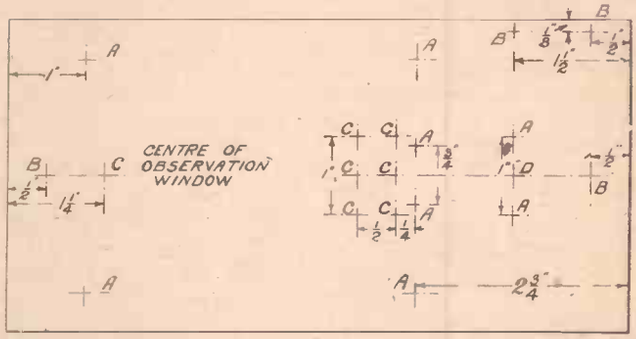


Fig. 33 (above).—Wiring of Back of Panel. Fig. 34 (top, right).—Circuit Diagram. Fig. 35 (opposite).—Drilling Plan of Panel.

Fig. 32.—Front of L.F. Panel.

"THE EXTENSIBLE UNIT SET"





D.X. RECEPTION: A FEW SUGGESTIONS

THE first thing to bear in mind in connection with long-distance reception is the simple fact that the signals picked up by the aerial are so extremely weak that the set must be unusually sensitive to make the sounds audible in the phones at all. It follows that unless sufficient energy is passed on to the rectifier nothing will be heard; hence in the large majority of cases high-frequency amplification is essential to magnify the impulses received by the aerial until they are sufficiently strong. By the way, the crystal is quite unsuitable in a multi-valve set because it is unable to handle the large amount of energy satisfactorily; after a time it seems to become choked up, and signals become muffled and distorted. This kind of thing often occurs in reflex sets which make use of crystal detectors and a good deal of distortion is thus caused.

Damping

It is important to keep down the damping in the grid circuits; this damping is the result of several causes—coils wound with too fine a wire, a high-resistance aerial and earth, and various forms of leakage. The remedy in every case is obvious; coils for all wavelengths below 500 metres should be wound with No. 18 wire or even thicker. On the very short wavebands, such as 100 metres, No. 15 should always be used; in fact it is better in this instance to wind the coil with bare wire carefully spaced.

The Earth

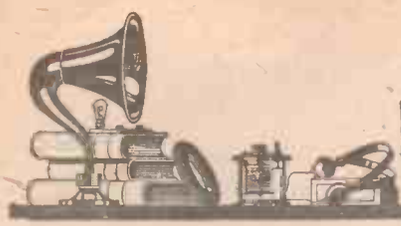
The earth is more often at fault than the aerial; in both cases all connections should be well soldered to reduce the resistance present in all joints. The earth should consist of a couple of copper plates buried in damp earth 2 ft. below the surface of the ground, a roll of wire netting or (even better) a long strip of copper tape placed directly underneath the aerial. The great thing is to keep as large an area of metal as possible in the soil.

Leakage in wireless sets may be direct or indirect. In the former case the panel itself is leaky and current escapes across the surface; in the latter there is leakage by capacity, by the condenser effect set up between two wires or components mounted too near each other. Ebonite which is above suspicion should always be used.

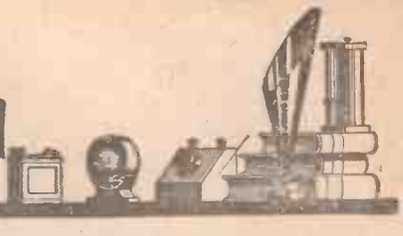
Phones

Lastly, always buy the best phones you can afford; remember that cheap headphones often turn out to be very expensive in the end, while a good pair will last for years.

G. J. M.



OUR INFORMATION BUREAU



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, lay-outs, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 248).

Leclanché Batteries

Q.—Can I use Leclanché batteries for lighting the filament of a valve set?—R. L. (Hampton).

A.—Unless the valves are of the dull-emitter type (when primary cells can be successfully used) Leclanché batteries cannot be used, as the voltage falls off rapidly with the comparatively large current required for the purpose. —U.

Rheostats

Q.—What length of resistance wire (No. 25 Eureka) is necessary for a filament rheostat? Please give particulars of a 1/1 telephone transformer.—L. A. (Lowestoft).

A.—Four yards of wire wound in the usual spiral form will be necessary. The telephone transformer should have an iron core ½ in. diameter and 3 in. long. The primary consists of 3 oz. of No. 42 d.c.c. and the secondary 4 oz. of No. 34 d.c.c.—U.

Buzzer Setting of Crystals

Q.—How can I find the best point on my crystal by means of a buzzer and a dry cell? —K. V. (Hornsey).

A.—The buzzer should be connected to the cell, and forms a miniature transmitter with which adjustments may be made. If the buzzer and cell is placed near the set, noises will be heard in the phones, and the catwhisker should be adjusted until the loudest buzzings are heard. This will be the best point for broadcast reception. If the buzzings are not sufficiently loud, the earth-lead may be wound once or twice round the buzzer.—U.

Fibre Panels

Q.—Is red fibre any use as an insulator in wireless?—R. C. (Portsmouth).

A.—Most fibres, even those that are vulcanised, are liable to leak, owing to the fact that they absorb moisture. The finished effect of fibre is not so neat as when ebonite is used, and fibre panels are liable to warp.—U.

Accumulator Neglect

Q.—My set is used very irregularly, and I should like to know if the accumulators are harmed by being allowed to stand idle.—K. R. (Forest Gate).

A.—If the cells are out of use they should be charged every two months, or even more often. Should the accumulator be put away for a long time, it is advisable to empty out the acid and leave the cells dry. When putting the battery into use again it should be filled up with acid of specific gravity 1.25 and given a long charge, which should be continued until the cells have gassed for about six hours.—U.

Tapped Inductances

Q.—Why is it often possible to hear signals on my crystal set when the switch arm is on two tapping studs at once?—K. S. (Shepherd's Bush).

A.—With this type of aerial inductance it may so happen that the wavelength of the coil is brought more nearly equal to that of the signal when the arm is on two studs at once; and so signals are, of course, received. It would not be found that better results were obtainable by bridging the two studs, and placing the switch arm on another stud.—U.

Reaction Coils

Q.—Does the use of a reaction coil increase the natural wavelength of the A.T.I.?—T. D. (Perth).

A.—The use of a reaction coil will increase the wavelength range of an A. T. I. by virtue of the mutual inductance that exists. Only a slight coupling of the two coils should be made, and the change should hardly be noticeable.—U.

Carborundum and Potentiometers

Q.—Please give particulars of a potentiometer for use with a crystal set.—K. T. (Cheltenham).

A.—A former 1½ in. in diameter should be wound to a distance of six inches with No. 36 S.W.G. Eureka wire.—U.

Variometers

Q.—How does a variometer act?—H. A. (Oldham).

A.—The effect of coupling the two coils of a variometer is to increase the inductance of each, and if the coils are connected in series, the total inductance of the two coils can be varied by varying the coupling between them. This is all that takes place in a variometer, and roughly, we are able to vary the total inductance of the circuit from the sum of the two inductances to the difference between the two.—U.

A POPULAR WIRELESS ARTIST

Nelson Jackson, well known to listeners-in.

Step-down Transformers

Q.—What is a step-down transformer?—W. K. (Stretford).

A.—A step-down transformer is one in which the windings are so arranged that the voltage induced in the secondary will be less than that applied to the primary.—U.

Sulphating

Q.—What is the cause of the large white deposit in my accumulator, and how can it be removed?—L. R. (Liverpool).

A.—This coating of the plates is known as sulphating, and is due to insufficient charging, over-discharging or allowing the battery to stand in an undischarged condition. The best cure for sulphating is charging at a very low rate, not exceeding half the normal charging current. Sulphating can, however, only be cured if it has not gone too far.—U.

Telephone Transformer

Q.—Please give details of an 8/1 telephone transformer.—P. P. (Nottingham).

A.—An iron core 3½ in. long and ½ in. diameter will be necessary, and on this should be wound ¼ oz. of No. 38 d.c.c. (about 1,200 turns) for the secondary, and 3½ oz. of No. 42 d.c.c. for the primary.—U.

Aerials

Q.—Which type of aerial do you recommend? I find it impossible to erect an aerial longer than 25 ft., and I am undecided whether to put up a single- or a double-wire system. What kind of wire should be used for the lead-in? —R. T. (Windsor).

A.—The double wire would be more satisfactory when you have only such a short length of space available. The same wire as the aerial will be suitable for the down lead.—U.

Phone Condensers

Q.—What capacity condenser should I use across the phone terminals of my single-valve set, and how many foils are necessary?—H. R. (Wellington).

A.—This condenser should have a capacity of about .001 microfarad, and six foils with an overlap of 2 sq. cm. should be employed. —U.

Flewelling Condensers

Q.—How many foils and what thickness of mica will be needed for the three large Flewelling condensers?—A. R. (Hull).

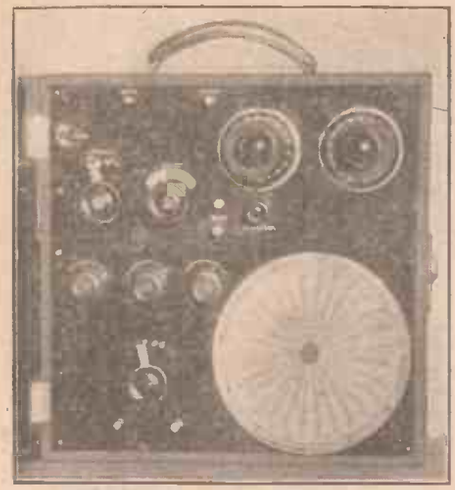
A.—For the condensers you will need mica as dielectric .002 in. thick, and 11 foils 2 by 3 cm. overlap.—U.

Series Tuning Condensers

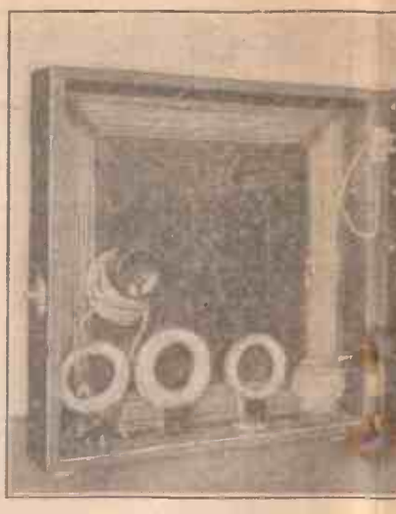
Q.—Why is it that when the condenser is in series with the A.T.I. signals are reduced in strength?—P. S. (E.10).

A.—The aerial condenser should have a value of .001 microfarad. If the capacity is too small, a reduction in the strength of the signals may be expected, especially when you have a large capacity aerial. It is necessary that the minimum capacity of the aerial tuning condenser should be comparatively high, as even when the A.T.C. is at zero the aerial currents have to be by-passed through it to earth.—U.

A PORTABLE LOUD-SPEAKER SET



The Front of the Set Open.



The Receiver R

THE receiver about to be described was designed in order that the writer might have a truly portable set that would work a loud-speaker up to a distance of thirty miles on an improvised aerial and up to four miles on a frame aerial.

Many portable sets are not wholly self-contained; one either has to take a separate loud-speaker or bulge one's pockets with phones, aerial, battery, etc. In the set described below all these accessories are included.

The Circuit

The circuit (see Fig. 1) consists of one H.F. valve, detector and one L.F. valve. A neutralising condenser is used to stabilise the high-frequency circuit, operating on the bridge system. The reason that this type of stabilisation was employed rather than the transformer method was in order that the circuit could equally well be used as an ordinary tuned-anode on the higher wavelengths, also no special sockets have to be constructed.

The arrangement is similar to one having a separate neutralising coil (see Fig. 2a, page 230); in that method the earth potential ends of the two coils are connected through the large Mansbridge condenser bridging the H.T. battery, therefore these may be equally well joined together. We then have the circuit Fig. 2b (see page 230).

Instead of having two separate coils, however, one coil is wound and a tap taken off at some suitable point which is variable, inasmuch as the larger the stabilising coil is in ratio to the anode coil, the smaller the capacity of the neutralising condenser, and vice versâ.

For broadcasting, a suitable coil would by any low-capacity method consist of 60 turns for the anode and 40 turns for the stabilising coil. In order to save space the latter may be wound with a finer wire, say No. 28 and 22, the stabilising coil being wound on first.

When the coil is completed it is mounted on an ordinary coil plug and the centre tap taken off by means of a short length of flex attached to a clix plug, another clix being mounted by the side of the coil socket.

The connections are as follow: The beginning of the fine-wire coil to the neutralising condenser, the beginning of thick-wire coil to H.T. and the end of thick-wire coil to anode.

The great point about using this type of circuit is that a negative bias may be given to the H.F. valve without fear of self-oscillation.

Plug-in coils are used throughout and it is recommended that experimenters wind their own with not less than No. 23 wire. Most commercial coils are constructed of No. 26 or 28, which, to the writer's mind, is too thin for the best results to be obtained; there is, however, a very good coil that has been placed on the market, using bare No. 22 tinned wire, which should prove very efficient.

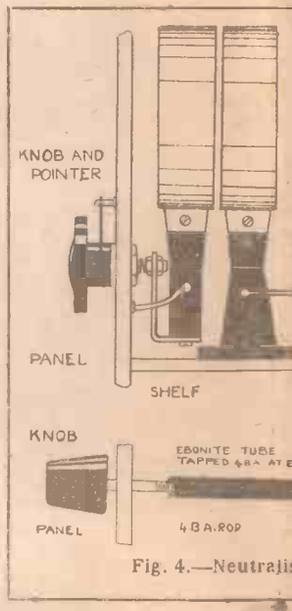


Fig. 4.—Neutrali

Reaction is provided on the aerial, this giving greater selectivity, although on the shorter wavelengths this may be dispensed with by inserting a shorting plug, reaction being obtained by adjusting the neutralising condenser.

Coil Holder

The coil holder is made as shown in Fig. 3. An ordinary coil holder is obtained and the bottom corners rounded off to clear the shelf. Fixed to this by means of two 4 B.A. countersink screws is a brass bracket made from $\frac{1}{16}$-in. brass

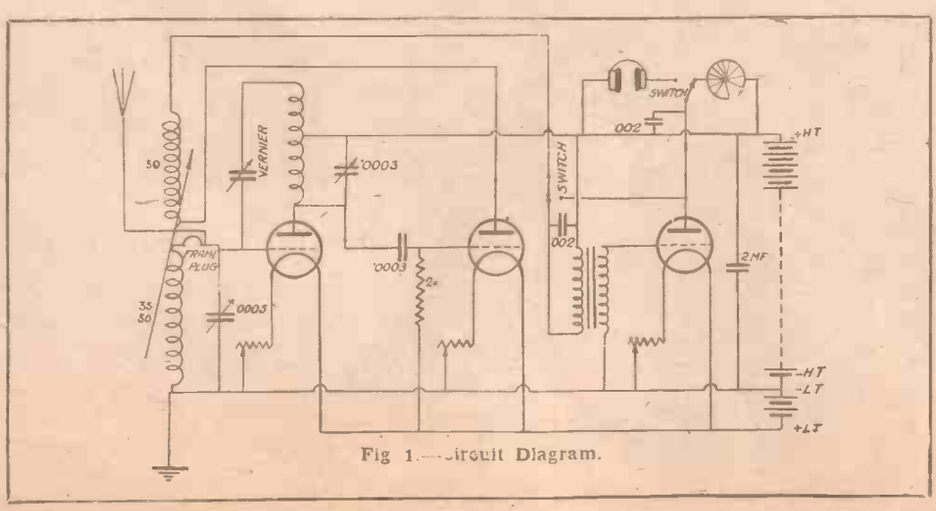
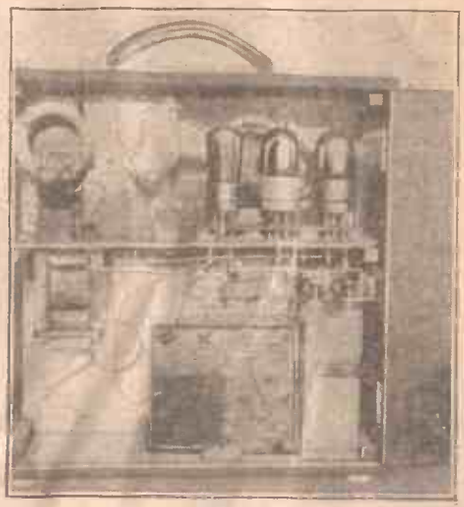


Fig 1.—Circuit Diagram.

eady for Use.

Many portable sets have been described, but this one is exceptional, inasmuch as a loud-speaker and all accessories are included in the receiver.



The Back of the Set Open.

plate bent as shown. A hole is drilled in this to take a short piece of rod and is held by two nuts. This rod passes through a bush in the panel and is attached to a knob and pointer; a spring washer should be fitted so that the weight of the coil does not make it turn.

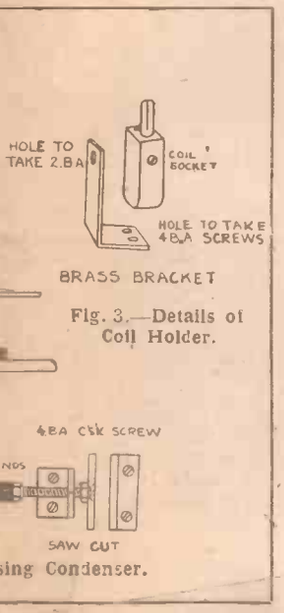


Fig. 3.—Details of Coil Holder.

sing Condenser.

The neutralising condenser (see Fig. 4) may easily be constructed from the drawing; the reason that the long control handle is fitted is in order to avoid hand-capacity effects.

Frame Aerial

The frame aerial has nine turns of No. 22 wire wound in the cover of the case, the turns passing under the heads of screws spaced ⅛ in. apart, a generous coating of shellac being given at the points of contact. The ends of the frame are attached to coil plugs which fit into a socket on the panel. These may be shorted when desired.

A separate filament control is provided for each valve. Non-spilling accumulators are used, and are held in position by small brass brackets clamped under the terminals (see Fig. 5) and screwed to the side of the case. A 66-volt H.T. battery is used, and is held in position by means of small blocks of rubber screwed to the bottom board.

The valve holder is shown in Fig. 6; it consists of a strip of ebonite ⅛ in. by 1 in. by 6 in. fitted with flush-fitting valve sockets and mounted on four pieces of very soft rubber.

Various kinds of rubber were tried. The usual sponge rubber did not have sufficient body, and the crêpe rubber was too hard. Eventually the writer obtained a pair of rubber-heel pads as worn inside the shoe. This rubber was cut into small pieces ¼ in. by 1 in. by ½ in. and fixed to the ebonite strips with rubber solution. Small lengths of rubber flex were then soldered to the valve sockets and the whole stuck to the ebonite shelf by the same means; the other ends of the flex were soldered to 4 B.A. screws previously fixed to the shelf.

Loud-speaker

The loud-speaker is of the pleated diaphragm type; it is mounted on a three-ply panel and clamped with a brass ring; a ring cut from three-ply wood would be equally suitable. A Brown A-type receiver is used.

The inside diameter of the diaphragm is only 6¾ in. and at first it was thought that a certain amount of volume would be lost by so small a diaphragm; actually, however, it was found that the volume was greater than with a large diaphragm.

For so small a diaphragm it was found that ⅜-in. pleats were better than ½ in. and that a thin paper was the best. Other details may be obtained from the drawing (Fig. 7).

Switches

Switches are provided to cut out the last valve and also to change over from phones to loud-speaker; there are besides two terminals which the writer included so that a crystal receiver may be attached to the input of the last valve.

When the set is being worked on the frame aerial only it is very sensitive to hand-capacity effects; on this account brass shields were fixed behind the condenser dials. Care should be taken that the moving vanes are joined to the earth potential side of each coil.

With regard to the valves used in a set of this description, one's choice is limited to those of low consumption, for preference the .06 type.

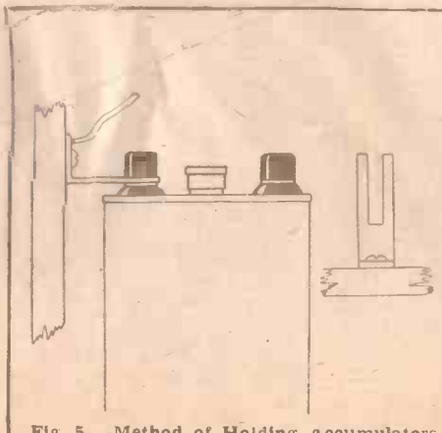


Fig. 5.—Method of Holding Accumulators.

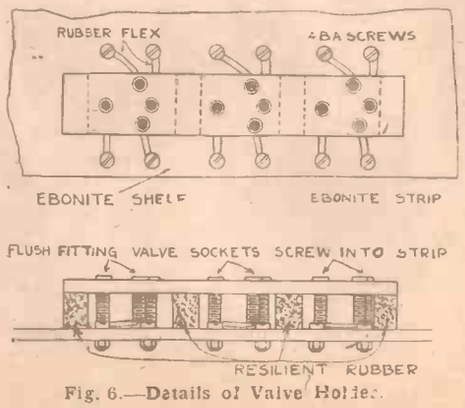


Fig. 6.—Details of Valve Holder.

The Panel

The top panel is of ebonite and measures 14 in. by 7 in. by $\frac{3}{16}$ in. The shelf is of the same material and size, but a strip 1 in. wide is cut off its width, part of which is used for the valve holders. The bottom panel is of $\frac{3}{8}$-in. three-ply wood and measures 8 in. by 14 in.

No. 16 tinned wire. The shelf and top panel should first be fixed together and connections soldered where possible; all the panels are then fitted into the case and the connections completed. Most of the valve leads may be taken to the 4 B.A. studs on the under side of the shelf, keeping the top free.

sions shown in Fig. 7. Coat it well with Seccotine and place it in the centre of the diaphragm, which should now be kept flat with small weights until properly dry. When fixed clamp the diaphragm between the ring and panel. The arms may be made as shown.

The connecting wire is made from

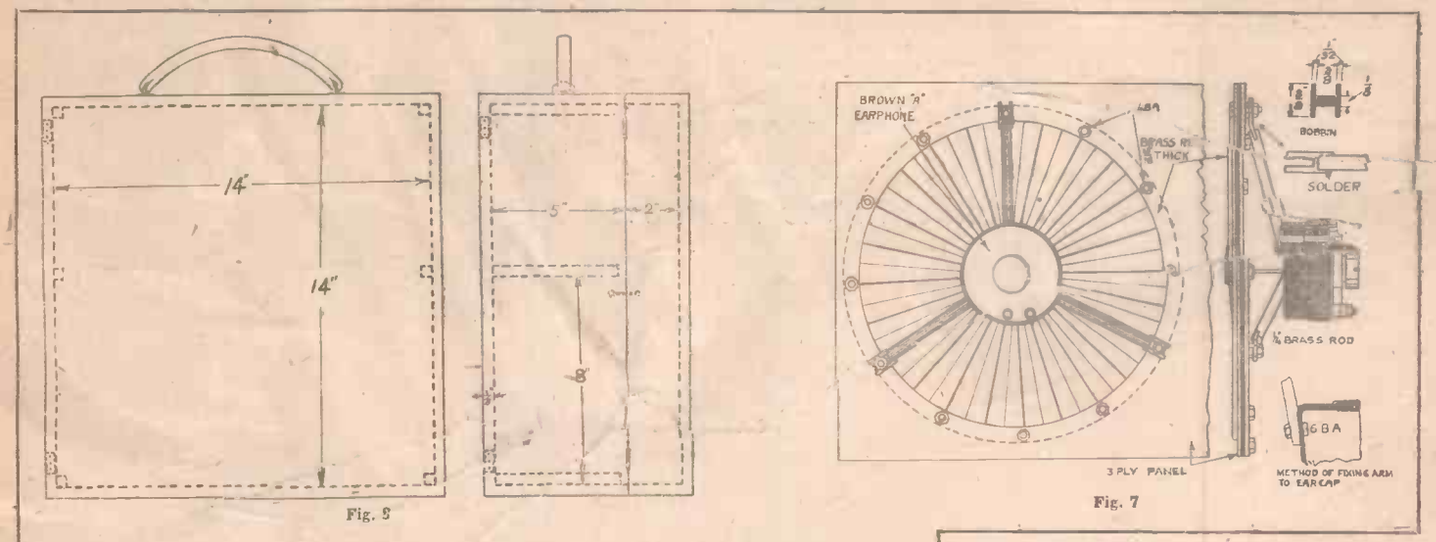


Fig. 8 Fig. 7

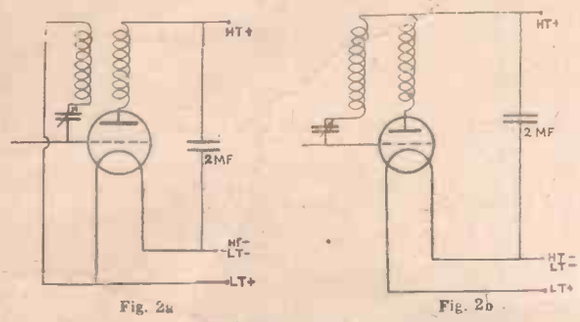


Fig. 2a Fig. 2b

Fig. 8.—Details of Case.

Fig. 7.—Front and Side Views of Loud-speaker.

Figs. 2a and 2b.—Two Circuits showing Neutralising Arrangements.

On the ebonite panel are mounted the aerial-tuning and anode-tuning condensers, the moving coil, the aerial and earth terminals, L.F. switch, input terminals, neutrodyne control, and frame aerial sockets. This panel is secured by brass brackets to the ebonite shelf, to which are fitted (on the top) the valve holders, grid condenser, fixed-coil (reaction) holder, the neutrodyne condenser, anode-coil-holder and a clix plug; on the under side are the transformer, grid leak and Mansbridge 1-microfarad condenser.

The three-ply panel has a 6¾-in. round hole (to take the loud-speaker), a brass ring held by 12 B.A. screws, three rheostats, loud-speaker switch and telephone terminals. In the cover of the case (Fig. 8) are carried the frame aerial and empty wire bobbin, on which is wound a length of rubber flex for a temporary aerial (this bobbin is mounted on a short piece of dowelling let into the side), three extra coils for the longer wavelengths (these also are mounted on small pieces of dowelling which fit into the coil sockets), and a holder for a single earpiece.

Rubber studs are fixed to the bottom of the case. Wiring is carried out with

A short length of rubber flex is taken from the two tags on the Mansbridge condenser. There are no L.T. leads, the brass holding brackets act as connectors; these together with the rubber blocks should be fixed in position before the panels.

Making the Loud-speaker

The construction of the loud-speaker is by no means as difficult as it may seem. First cut out the panel and clamping ring and drill and countersink for 4 B.A. Next cut a strip of paper half the width of the diaphragm and 25 in. long, just over 3½ times the diameter. Square one end and mark off every ⅜ in. on each edge. Rule every alternate division on one side with the blunt point of a hard pencil or the back of a knife, and then turn the paper over and rule the other divisions. Join the ends with Seccotine, and when dry place the cylinder upright on a polished surface and push down at the top. The bottom will slide outwards, forming a circular diaphragm. See that the outer edge is stretched tight; if not take out a few pleats.

Now make a small bobbin to the dimen-

No. 18 copper wire stretched until it breaks. Fix this to the reed with a touch of Chatterton's compound. The earcap is centered over the bobbin by adjusting the slotted arms.

All that then remains to be done is to adjust the reed and tune-in the station required.

A. R. TURPIN.

BROADCASTING IN HOLLAND

THE new station at Hilversum (H D O) is on the way to establish a regular broadcasting service. Erected by the Nederlandsche Seintoestellen Fabriek, experiments had been carried on for quite a considerable period, and it is now due to the help offered by the Phillips's Dutch valve works that regular programmes will be given. The wavelength of 1,050 metres has been retained, and although the station is only of about the same power as those established by the B.B.C. in this country, it is possible to obtain excellent reception on an ordinary detector valve set with reaction. First-class Dutch artistes have been engaged for the musical programmes in course of preparation, and at least once weekly performances by the famous Willem Mengelberg orchestra, of Amsterdam, will be either transmitted direct or relayed.

It is the intention of the organisers to make a practice of relaying public speeches of international interest, as well as grand opera from The Hague and Amsterdam.

Readers are, no doubt, aware that a proper broadcasting service does not yet exist in Holland, but if it does come about it will be due to the pioneer work done by the Hilversum station.

J. G. A.

AROUND THE SHOWROOMS

Solderless Wiring

LARGE numbers of otherwise enthusiastic people are discouraged from making their own sets by the large amount of soldering that seems to be inevitable.

This difficulty has now been removed, however, for a system of solderless wiring has just been put on the market.

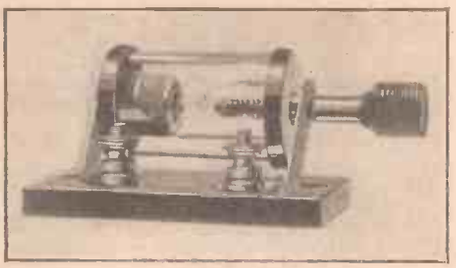
Konnectus, as the system is called, is the invention of Mr. J. W. Miller, of Miller's Radio Improvements, 68, Farringdon Street, E.C.4, who, my readers will remember, recently described in AMATEUR WIRELESS a method of using any number of phones with one crystal set.

The connections are made with finely coiled wire springs, of different sizes, which tightly grip the wires over which they are placed. Pulling the wires has the effect of tightening the coils, which thus grip all the more firmly.

It will be understood that each connector consists of two coils, which may be of different sizes to connect together two different sized wires. I hope that the system will be extended.

G.E.C. Detector

EXPERIENCE has shown that the sensitivity of a crystal detector is largely dependent on the adjustment of the contact point, and the design of the new Gecophone micrometer crystal detector is such that



G.E.C. Crystal Detector.

the finest possible adjustment of the cat-whisker can be obtained.

This is achieved by means of a thread of fine pitch controlled by a spring.

Two movements of the detector arm are thereby obtained, a free sliding movement for rapid searching of the crystal face, and a fine adjustment by rotating the ebonite knob.

Flush Valve Sockets

TO come back to the soldering bugbear again, I note that valve sockets are being made that comprise terminals with screws at the under-panel ends.

This arrangement also does away with fiddling nuts.

Screwdriver slots are provided across the tops of these sockets so that they can be easily screwed into a panel made to cut their own threads.

These sockets are made by Hewett and Co., of 315 and 317, High Road, Chiswick, W.4.

Vernier Rheostat

FINE filament control plays an important part in getting the best results from a set, a point that many of us are apt to overlook.

In this connection I was particularly interested in a new form of rheostat with a vernier adjustment introduced by the Economic Electric Co., of Fitzroy Square, W.1.

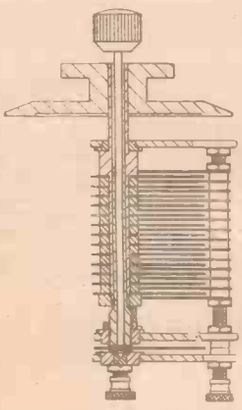
The knob is turned in the ordinary way to make a coarse adjustment and then moved back slightly for fine control. The resistance is of the ordinary circular wire type.

VANGUARD.

PROGRESS AND INVENTION

Variable Condensers

VARIABLE condensers of the moving-vane type are often fitted with vernier slow-motion devices in order to obtain the small changes of capacity necessary when accurately tuning-in a station. Such



Variable Condenser (226,668/23).

devices, however, have the disadvantage that it is difficult to obtain a constant ratio of reduction, and, especially in friction-type verniers, one is never quite sure a certain number of turns will effect the desired change of wavelength.

To overcome this defect variable condensers are sometimes fitted with a vernier device in which one of the moving plates is separate from the rest and is independently movable, so that when the course adjustment of capacity has been made in the usual way the vernier vane can then be adjusted for the best results.

Patent No. 226,668/23 (Harry Owen Wallis, Newdigate Street, Nottingham) describes an improvement on this type of variable condenser. The diagram illustrates the principle involved.

It will be seen that the vernier plate is connected to an axle which is mounted inside a hollow shaft bearing the main condenser vanes.

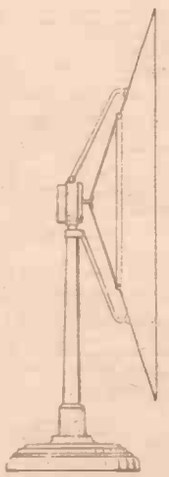
A separate knob is provided, concentric with the main knob, for fine tuning.

Hornless Loud-speaker

IN Patent No. 222,843/24 (Gustave Perron, Avenue Taillade, Paris) is described a loud-speaker having a frusto-conical-shaped tympanum attached to the reed or diaphragm of the loud-speaker, as is shown in the diagram.

This large conical diaphragm may be of any material, but it is probable that some non-resilient material, such as wood or papier-mâché, would give the best results. Metal would tend to produce a ringing sound, which it is the object of the invention to avoid.

The trumpet is supported at its edges by



Loud-speaker (222,843/24).

either three or four arms, which are fastened at their other extremities to the loud-speaker phone. Various methods of attaching the trumpet to the phone diaphragm are described at length in the specification.

RADIOGRAMS

THE world is getting too small for the British wireless amateur. Only two countries remain—South Africa and India—with which he has not exchanged wireless chats.

Wireless valves can now be used to melt steel, according to Dr. C. H. Desch, who has been experimenting with alternating current of extremely high frequency.

Printed and written words have been turned into music, transmitted through the ether by wireless and translated back into writing by means of instruments invented by Dr. Fournier d'Albe.

A certain hornless loud-speaker is doing good work in Glasgow after having been through fire and water. It was on a ship when the boilers blew up, and the ebonite was burned off the instrument's terminals, leaving the bare metal. For a period of several months the loud-speaker lay in sixteen fathoms of water, but was eventually recovered by a diver, and is now the equal of new following upon a thorough cleaning.

It is reported that the Cie Francaise de Radiophone is requesting permission to erect a powerful broadcasting station at Marseilles in the near future.

It is proposed to broadcast the proceedings of the Norwegian Parliament.

A "Musical Tour Round the World" will be given on February 9.

The S.B. programme to be given on February 10 will be provided mainly by the 2 L O Military Band, conducted by Mr. Dan Godfrey.

"A Pageant of Speech and Music" will be given on February 11.

A symphony concert will be relayed from Covent Garden on February 12.

The popular programme to be given on February 14 includes songs by Bryn Gwyn and entertainment by Foden Williams.

It is announced that the first public demonstration of a complete system for the transmission of light, heat and power by wireless will be given at the second Radio World's Fair in New York next September.

At a hospital at Strasburg where an examination for medical degrees was being held a concealed wireless set has been discovered, which, it is suspected, was installed in order to give fraudulent help to one of the candidates.

In New South Wales six broadcasting stations are to be established by firms interested in the sale of wireless sets.

A general reduction by 10 to 15 per cent. in the price of valves took place on February 2. It is expected that this reduction will induce people to buy more English makes instead of Dutch.

Wireless clubs in the south-west of France have decided to unite in a confederation for the purpose of protecting the rights of the amateur.

An association has recently been formed in Australia, under the name of the "Institution of Radio Engineers of Australia," to protect and advance the interests of the wireless profession, and to promote experiment and research in the science of wireless.

Radio-Belgique has been giving an original course of instruction in Spanish history recently.

The military band programme to be broadcast on February 5 will include songs by Frederic Lake and comedy duets by Marcia Boura and Lena Copping.

The programme to be broadcast on February 6 includes songs by Enid Cruickshank and orchestral items by the Wireless Symphony Orchestra.

"The Georgians" concert party will provide the programme to be broadcast on February 7.

About 2,700 licences for listeners have been issued in the Free State since licensing began last spring.

A powerful receiving set, presented to the Sick Children's Hospital by the Glas-

(*Continued on page 234*)

RADIOGRAMS (*continued from page 232*)

gow Radio Circle, is giving entertainment to 180 patients in six wards by means of a loud-speaker. The Circle expects to be in a position to give a similar set to another institution shortly.

A Glasgow amateur has heard N P L (San Diego, California), comfortably readable on 0-v-2, while that station was working to N B A on a very short wavelength.

Prior to the Glasgow University students' carnival on behalf of the city's hospital, some of the undergraduates took charge of the local broadcasting station in order to press home their appeal and at the same time to demonstrate their idea as to how a station should be run. Their programme was a great success, and the "bag" amounted to over £7,000.

While working on wavelengths below 50 metres in Glasgow, amateurs have been astonished to find that they can frequently dispense with both earth and aerial connections without interfering to any great extent with the efficiency of their sets.

An interesting transmission for British amateurs to attempt to pick up is that of Mr. E. T. Flewelling from his station, 9 X B G, at Chicago. Musical broadcasts are given each evening from 6 to 6.45 (American central standard time) on a wavelength of 64 metres.

Y Z, a French station in the vicinity of Paris, is transmitting each day except Sundays on 50 metres at 2.30, 4.30, 6.30 and 8.30 p.m. Transmissions over long periods, for the purpose of assisting the study of fading effects, are also made on Tuesdays, Thursdays and Saturdays from 4.30 p.m. until midnight, and on Wednesdays, Fridays and Sundays from 5.30 till 7.30 p.m.

Remarkably good business is being done just now by Scottish traders. The number of customers is said to be greater now than even at the Christmas gift season. All kinds of valve sets and parts are in much demand, with a marked partiality for good-quality material.

The well-known government broadcasting station of the Postes, Télégraphes et Telephones (P T T), of Paris, recently celebrated its second anniversary as a broadcasting station with a special programme which included many of the famous singers of the French capital.

The Radio World's Fair, to be held at Chicago this year, will be opened on September 14 in the Artillery Armoury, New York, the largest building of its kind in America. The exhibition will occupy 180,000 sq. ft. of floor space, and 325 wireless manufacturers will be represented. Fourteen different foreign countries will have exhibits of an official variety.

Geneva is to have an International Exposition of wireless in 1925.

In Ulster only one set in five is licensed, and the officials are busy hunting out the unlicensed listeners.

The enterprise of a barber in Atlanta, Georgia, in fitting telephones to his chairs, points the way to a new use of wireless and a defence against the too loquacious barber.

The Anglo-Franco-American Radio Club, which has so far held several unofficial soirées at their beautiful club house at 30, rue Vineuse, opened on January 17 with a dance and festival.

Russian wireless has taken big strides in the past year. Many large stations under the control of the Union of Soviet Socialist Republics now broadcast regularly from Moscow, from Leningrad (Petrograd), and from Nijni-Novgorod.

M. J. L. Menars, 8 F J, has in twelve days' work effected bilateral communication with eighteen French stations, two Belgian, eight English, three Italian, two Swiss, one Swedish, one station in Mesopotamia, one Dutch and three American.

Louden Valves

Filament Volts 4.8-5
Filament Amps. 0.4
Anode Volts 40-80

"Like the sweet sound that breathes upon a bank of violets."
TWELFTH NIGHT.

By many the 'cello is regarded as possessing the most beautiful tones of all instruments. From the sonorous bass notes of the C string to the soaring melodies of the D and A we cover a range of notes which, both in compass and in quality, resemble most closely those of the human voice.

Some of the most beautiful of our programmes have been those in which the 'cello has figured either as a solo instrument or in concerted works.

To enjoy the 'cello by wireless, however, and to appreciate to the full the subtle inflexions of the artist's playing, we need a good receiving set, a good loud-speaker, and FIRST-CLASS VALVES.

The Valves which your set requires are those which will give you a first-class concert from your own Broadcasting Station rather than those whose chief claim is that they will receive concerts over stupendous distances.

That is why we recommend you to equip your set with Louden Valves—their supremacy in the matter of Silver Clear reception is literally unchallenged, and within a few months of their introduction they are being asked for at the rate of many thousands per week!

The beautiful pure notes of the Louden Valve are due to special features found in no other valve; be sure, therefore, to ask for Silver Clear Louden Valves by name.

The Plain Louden for Detecting and Low-Frequency Amplifying.

The Blue Louden for H.F. Amplification.

All Loudens are Silver Clear and free from mush. Their current consumption is very low and their life long.

Louden VALVES

PRICE 10/-

Louden Valves - Silver Clear

Advt. of the Fellows Magneto Co., Ltd., Park Royal, London, N.W.10

E.P.S.9.

NOTE.—*In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.*

GREAT BRITAIN

The times given are according to Greenwich Mean Time.

London (2LO), 365 m. 1-2 p.m., con.; 3.15-3.45 p.m., lec.; 4-5 p.m., con.; 5.30-6.15 p.m., children; 6.40 p.m. talk; 7-7.30 p.m., time sig., news, talk; 7.30-9.30 p.m., music; 9.30-10.0 p.m., time sig., news, talk; 10.0-10.30 p.m., music. Mon. and Wed. the Savoy Bands are relayed until 11.0 p.m., and on Sat. until midnight. Sat. only, 4-5.30 p.m., con.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 435 m. **Birmingham** (5IT), 475 m. **Bournemouth** (6BM), 385 m. **Cardiff** (5WA), 351 m. **Glasgow** (5SC), 420 m. **Manchester** (2ZY), 375 m. **Newcastle** (5NO), 400 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 331 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 346 m. **Liverpool** (6LV), 315 m. **Nottingham** (5NG), 322 m. **Plymouth** (5PY), 335 m. **Sheffield** (6FL), 301 m. **Stoke-on-Trent** (6ST), 306 m. **Swansea** (5SX), 481 m.

CONTINENT

The times are according to the Continental system; for example, 16.30 *is* 4.30 *p.m., and* 08.00 *is* 8 *a.m.* (*G.M.T.*).

AUSTRIA.

Vienna (Ravag), 530 m. (1 kw.). 08.00, markets; 10.00, con.; 12.05, time sig.; 12.20, weather; 14.30, Stock Ex.; 15.00, news, con.; 15.10, children (Wed.); 17.10, lec. (Tues., Fri., Sat.), children (Tues.); 17.30, lec. (Wed.); 18.30, news, weather; 19.00, time sig., con., news; 21.00, dance (Wed., Sat.).

Graz (relay), 700 m. Testing.

BELGIUM.

Brussels (SBR), 265 m. (1½ kw.). 17.00, orch., children (Wed. and Thurs.); dance (Tues. and Sat.); 18.00, news; 20.15, lec., con., news (opera, Mon. and Wed.).

Haeren (BAV), 1,100 m. 13.00, 14.00, 16.50, 18.50, weather.

CZECHO-SLOVAKIA.

Kbely (OKP), 1,160 m. (1 kw.). Weekdays: 09.00, 10.30, 12.30, 16.00 and 17.00, con. (Wed. and Sat.); 18.30, lec., news, weather, con. (time sig., 19.00), daily; 10.00, con. (Sun.).

Komarov (OKB), 1,800 m. (1 kw.). Week-days: 13.00, Stock Ex., weather, news; 17.30, con. (Thurs.); 09.00, con. (Sun.).

DENMARK.

Copenhagen (Kjobenhavns Radiofonistation), 470 m. 19.00, con. (Sun., Wed., Thurs.); also tests on 750/800 m. 20.00 almost daily.

Lyngby (OXE), 2,400 m. Week-days: 18.20, news and Stock Ex.; 20.00 and 21.00, news, weather and time sig.

Ryvang, 1,025 m. 18.30, Eng. lesson (Wed.); 19.00, con. (Tues. and Fri.).

FRANCE.

Eiffel Tower, 2,600 m. (6 kw.). 06.40, weather (exc. Sun.); 11.00, markets (exc. Sun. and Mon.); 11.15, time sig., weather; 14.45, 15.35, 16.30,* Stock Ex. (exc. Sun and Mon.); 18.00, con. (not daily); 18.45, Paris fashions (in English)—temp—(Wed. and Sat.); 19.00, weather; 20.30, con. relayed from PTT (Fri.); 22.10, weather (exc. Sun.).

* On 1st and 15th of each month at 16.45.

Radio-Paris (SFR), 1,780 m. (2 kw.). Sundays: 12.45, orch.; 13.45, news; 16.45, con.; 20.30, news, &c.; 21.00, dance music. Week-days: 12.30, orch., Stock Ex., news; 16.30, markets, Stock Ex., con.; 17.45, Stock Ex., news, women; 20.30, lec., news, con.; 21.00, dance (Thurs.). *Le Matin*, Paris, provides a special con. every 2nd and 4th Saturday in the month at 21.00 or 22.00 G.M.T.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (400 w.). 14.00, lec. relayed from Sorbonne University (Thurs.); 15.00, outside relay (Sat., irr.); 15.45 and 17.00, lec. relayed from Sorbonne (Wed.); 16.00, outside relay (irr.); 20.00, Eng. talk (Tues.); 20.30, lec. or con., almost daily; con. relayed by F. L. (Fri.); 20.45, lec. (Sun.), organ recital 3rd Sun. each month; 21.30, con. (Sun.).

"Le Petit Parisien," 345 m. (500 w.). 21.30, con. (Sun., Tues., Thurs.), dance (Sat.).

Lyons-la-Doua, 550 m., 10.30, gramophone con.; news, etc. (irr.).

Radio-Lyon, 287 m. (2 kw.). 12.00, 17.15, 20.30, news; con. (irr.).

Toulouse Aerodrome (MKD), 1,525 m. 09.42, 19.42, weather.

Station du Pic du Midi, 350 m. (300 w.). Testing.

GERMANY.

Berlin (2), 503 m. (1½ kw.). 08.00, sacred con. (Sun.); 09.00, markets, news, weather; 10.00, factory con. and tests; 10.30, educat. hour (Sun.); 11.15, Stock Ex.; 12.00, time sig., news, weather; 13.15, Stock Ex.; 14.00, lec. (Sun.), markets; 14.30, children (Sun., Wed.); 15.00, Esperanto (Sat.); 15.30, orch., French (Tues.); 17.30, lec., women; 18.00, French (Mon.), lec. (Tues.); 18.30, lec., Engl. (Thurs.), theatre news (Tues.); 19.30,* con., weather, news, time sig.; 21.30, chess (Mon.), dance until 23.00 (Thurs., Sat., Sun.). * If opera relayed, at 18.30.

Berlin (Telefunken Co.), 750 m. (1 kw.). 10.30, 19.00, con., tests (irr.).

Eberswalde, 280 m. 22.15, con. (Mon.). 3,150 m.: Telegraphen Union, 06.45-18.45, news, con. (Fri., irr.).

Königswusterhausen (LP), 2,450 m. (5 kw.). Wolff's Buro. Press Service: 06.00, 20.00. 2,800 m. (5 kw.): 10.30, con. (Sun.), Esperanto lec. 4,000 m. (10 kw.): Express News Service, 06.00-20.00 (daily); lec. (Tues. and Fri., time irr.).

Bremen, 330 m. (1 kw.). Relay from Hamburg.

Breslau, 418 m. (1½ kw.). 10.15, Stock Ex., weather; 11.00, factory con. (weekdays), sacred con. (Sun.); 11.55 (Sun.), time sig., weather, Stock Ex.; 14.00, news (weekdays); 15.00, children (Sun.); 16.00, orch., children (Fri.); 16.45, con. (Sat.); 17.00, shorthand (Sat.), Mah Jongg (Wed.); 18.00, Esperanto (Mon.), Engl. (Thurs.), lec. (other days); 19.00, con., weather, time sig., news; 20.30, dance (Sun.); 21.15 (Mon.).

Cassel, 292 m. (1½ kw.). Relay from Frankfort.

Dresden, 280 m. (1½ kw.). Relay from Leipzig.

Frankfort-on-Main, 470 m. (1½ kw.). 07.30, sacred con. (Sun.); 10.10, Stock Ex.; 10.55, time sig., news; 15.00, children (Sun.), Stock Ex. (weekdays); 15.30, con., women; 16.00, con. (Sun.); 17.00, markets, lec., children (Wed.); 18.00, lec. (daily), shorthand (Wed.), Esperanto (Fri.); 18.30, educat. hour; 19.00, lec., Engl. (Mon.); 19.30, con. (daily), jazz band (Fri.); 20.30, time sig., weather, news; 21.00, dance or late con. (not daily).

Hamburg, 395 m. (1½ kw.). Sunday: 07.55, time sig., weather, news, lec., women; 10.00, sacred con., chess; 12.00, con., lec.; 16.00, children; 17.00, con.; 18.00, Engl. conv.; 19.00, sport, weather, news, con. or opera; 21.00 onwards, as weekdays. Weekdays: 06.25, time sig., news; 07.30, theatre news; 11.55, time sig.; 12.20, Engl. (Wed.); 14.00, political news, markets; 15.00, women; 15.30, lec., Esperanto;

(*Continued on page* 238)

"BROADCAST TELEPHONY" (*cont. from page 236*)

16.05, orch., 17.00, con., lec.; 18.25, lec., Engl. conv. (Tues. and Fri.), Spanish (Mon. and Thur.); 19.00, weather, con. or opera; 21.00, weather, markets, news; 21.50, news (in English), dance (not daily).

Hanover, 296 m. (1½ kw.). Relay from Hamburg.

Königsberg, 463 m. (1½ kw.). 08.00, sacred con. (Sun.); 10.15, markets; 11.55, time sig., weather; 13.15 and 15.00, markets; 15.30, children (Tues., Wed., Sat.), orch.; 18.30, lec., Esperanto (Thurs., Sat.); 19.00, con. or opera; 20.00, orch., lec., weather, news, dance (Thurs., Sun.).

Leipzig, 454 m. (1¼ kw.). 07.30, sacred con. (Sun.); 10.00, educat. hour (Sun.); 11.00, markets, orch., time sig.; 15.00, markets; 15.30, orch., children (Wed.); 16.30, lec. (Tues.); 17.30, lec. (Tues.), experimenters (Wed. and Sat.); 18.00, lec.; 19.00, lec. (irr.); 19.15, con. or opera, weather, news; 21.00, con. (not daily).

Münich, 485 m. (1½ kw.). 10.30, lec., con.; 13.00, news, weather, time sig.; snow forecast; 14.00, con., lec. (Sun.); 15.30, orch. (16.00 Sun.), children (Wed.); 17.00, agric. talk (Mon.), con.; 18.00, lec., Engl. (Mon. and Fri.), Italian (Tues.), Russian (Sat.), Esperanto (Thurs.); 19.30, con.; 20.30, news, weather, time sig.; 21.00, late con. (Sun.), lec. (Tues.), dance (Sat.).

Munster, 410 m. (1½ kw.). 11.00, sacred con., news (Sun.); 11.30, news (other days); 11.55, time sig.; 14.30, markets; 15.30, children (Sun.), lec. (weekdays); 18.40, weather, lec., time sig; 19.20, women, con. or opera, news, dance (Sat.); 21.00, English, Spanish or Esperanto, news, dance (Sat.).

Nuremberg, 340 m. Relay from Munich.

Stuttgart, 443 m. (1½ kw). 06.30, time sig., weather (weekdays); 10.30, con. (Sun.); 15.00, time sig., con., news (Sun); children (Sat.); 16.45, children (Wed.); 18.30, lec. (weekdays); 19.00, con. (daily); 20.15, time sig.; 22.00, weather, news, dance (Sun.).

HOLLAND.

Amsterdam (PCFF), 2,000 m. Daily: 07.55-16.10 (exc. Mon. and Sat., when 10.10-11.10), news, Stock Ex., time sig., 09.55 and 16.10. (PX9), 1,050 m.: con., 20.40, organ recital (Mon.).

Hilversum (NSF), 1,050 m. (1½ kw.). 18.55, children (Mon.); 20.40, lec. and con. (Fri.); 19.40, con. (Sun), relay of Mendelberg orch. (Thurs.).

Vossegat (Bé), 1,050 m. 12.30 and 19.40, weather.

Soesterberg, 1,050 m. 19.26, weather.

Bloemendaal, about 340 m. 10.40 and 16.40, sacred service (Sun.).

HUNGARY.

Buda-Pesth (MT1), 950 m. Half-hourly from 06.45, news, Stock Ex.; 10.00, con.; 11.30 news (daily).

ITALY.

Rome (1RO), 425 m. (2 kw.). 16.00, orch.; 19.35, news, con.; 20.15, lec., con.; 21.00, dance (irr.).

(Radioaraldo), 624 m. (500 w.). 10.30, news; 11.00, time sig., con.; 14.20, Stock Ex.; 19.00, con.

Centocelle (ICD), 1,800 m. (6 kw.). 15.00 and 19.30, news, con.

NORWAY.

Christiania, 440-500 m. (500 w). Testing, daily, about 19.30.

JUGO-SLAVIA.

Belgrade, 1,650 m. (2 kw.). 17.30, con., news, weather (Tues., Thurs., Sat.), weather, news only (Mon., Wed., Fri.).

PORTUGAL.

Lisbon (Aero-Lisboa), 375-410 m. 20.30, tests, music, speech (irr.).

Monsanto (CTV), 2,450 m. (15 kw.). Tests, music (irr.); 13.00 and 23.00, weather.

RUSSIA.

Moscow, 3,200 m. 13.30, speech or lec. (Esperanto) on last day of each month.

SPAIN.

Madrid (EAJ2), Radio-España, 335 m. 18.00, con.

Madrid (Radio-Iberica), 392 m. 21.00, weather, Stock Ex., time sig., con., news Sunday: 16.30, con.

Barcelona (EAJ1), 325 m. 17.00 and 21.00, con.

Seville (EAJ5), 350 m. 18.30, lec., con., news.

SWEDEN.

Stockholm (SASA), 430 m. (560 w.). Sundays: 09.55, sacred service; 16.00, children; 17.00, sacred service; 19.00, con.; 20.30, news, weather. Weekdays: 11.30, weather, Stock Ex., time sig. (11.55); 18.00, lec. (irr.); 19.00, con., lec., news, weather.

Gothenburg, 290 m. (500 w.), also 700 m. 10.00, fishery reports (700 m.); 11.55, time sig.; 19.00,* programme s.b. from Stockholm.

Malmoe, 270 m. 11.00, weather; 19.00,* programme s.b. from Stockholm.

Boden, 2,500 m. 18.00, con. (Tues., Fri., Sun.)—temp.

* Local programmes are also broadcast at times.

Sundsvall, 680 m. (500 w.). To open about March.

SWITZERLAND.

Geneva (HB1), 1,100 m. (500 w.). 13.15, lec. No Sun. transmissions.

Lausanne (HB2), 780 m. (500 w.). 07.05, weather; 12.30, weather, markets, time sig., news; 16.00, children (Wed.); 17.55, weather, news; 20.15, con. (exc. Wed.), dance (Thurs. and Sat.).

Zurich (Höngg), 650 m. (W.L. not definitely fixed) (500 w.). 11.00, weather; 11.55, time sig., weather, news, Stock Ex.; 15.00, con.; 17.15, children (Mon., Wed., Fri.); 18.00, weather, news; 19.15, lec., con., dance (Fri.); 21.00, news. Sundays: 15.00 and 19.15, con., news, weather.

"NOTTINGHAM RELAY STATION"—(*continued from page 215*)

Mr. Liveing (Uncle Ted) also started the 5 N G Radio Circle, which to date numbers over 4,000! It would be interesting to learn how these figures compare with those of other stations—relay as well as main. In this work he now has the valuable help of his assistant director (Mr. L. Bagshaw), familiarly known by the children as Uncle Laurie or the "wicked" uncle; Mrs. Leslie Barlow, who organised the Women's Half-hour (Auntie Ruby); Miss Ida Sargent (Auntie Ida), the station nightingale; Mrs. Hodgkinson (Auntie Mabel); and Mr. C. St. R. Wyche (Uncle Dick).

While eulogising the work performed since the inception of 5 N G by those in charge of the programme side, we must not forget the unceasing labours of Mr. Arthur Fielder, the engineer-in-charge, with his staff, comprising Messrs. Cook, Burton and Burt. Both at the transmitting station, some two miles away from the studio, and in the control room they have worked wonders, and it is very few occasions on which listeners to Nottingham relay transmissions have had to make any complaint on the score of weak or defective signals.

Like the station director, Mr. Fielder, at the head of his department, has been on the *qui vive* for openings giving him the opportunity for improving the station technically, and his alertness has been the means of the institution, for the first time in British broadcasting, of the "second dot" system of indicating that though the station is not actually transmitting, everything is O.K. for the listener; in other words, the second dot is heard during intervals either in the local or London programme. The success of this original idea has been unqualified. The dot is electrically operated from the main clock in the station.

Experiments are now in progress for deciding on the best characteristic signal to indicate the closing down of the local station on simultaneous broadcast nights. The sound of Robin Hood's horn has been suggested—in fact tried—but others are to be tested before a definite decision is reached.

The studio and offices at Bridlesmith Gate occupy the one-time home of Nottingham's only wireless school, which turned out such a large number of skilled operators during the war. The offices and waiting-rooms take up the first and third floors, while the studio and control room are on the intermediate floor. The former is heavily draped in a curtain scheme of slate grey, orange and black. The microphone is on the usual carriage, and the studio is equipped with all the necessary accessories.

The control room—the home of the wireless wizard—is the last word in apparatus. Direct lines to London, the transmitting station, also the sources of the local afternoon orchestral music are arranged on the plug-and-jack system. The amplifier and check receiver are also in the control room, together with the battery-charging equipment.

The whole of the offices are wired from the check receiver, so that the transmissions may be heard at any time from any part of the building. In the artistes' waiting-room is a loud-speaker, so that the approaching time of the next turn may easily be gauged.

The transmitting station is at New Basford, a suburb of Nottingham, some two miles distant from the studio, and this is connected with the latter by means of special land lines. The signals are radiated from a sausage aerial of the inverted L type suspended from two tall chimney stacks. In the transmitting station are the control valve, the modulator valves, and the oscillator, through which all the signals from the control room pass on their way to the aerial. F. R. S.

Small boats that are not compelled by Board of Trade regulations to carry wireless plant frequently have a receiving set installed aboard, and one case has come to the notice of the B.B.C. in which a two-valve set rigged up for the skipper's musical entertainment saved the vessel and her crew during a gale.

Every one is every other's Twin

Until recently the purchase of H.F. Transformers was something of a gamble. When buying these instruments one had to trust to luck or to the courtesy of one's dealer to obtain two or more which matched and could be used together successfully.

To-day the experimenter can go into any wireless store and buy at random two or a hundred Bowyer-Lowe H.F. Transformers of any given range, and every one will match every other perfectly.

Bowyer-Lowe Transformers actually cost less than other makes—they are only seven shillings each ; yet every one is built to such a high standard of accuracy that each can be guaranteed to give precisely similar performance to every other in its range.

All ranges from 150 to 3,000 metres and up can be obtained ; also a special Neutrodyne Unit covering 300 to 600 metres.

Successful H.F. amplification is ensured when you buy Bowyer-Lowe H.F. Transformers.

Bowyer-Lowe Matched H.F. TRANSFORMERS

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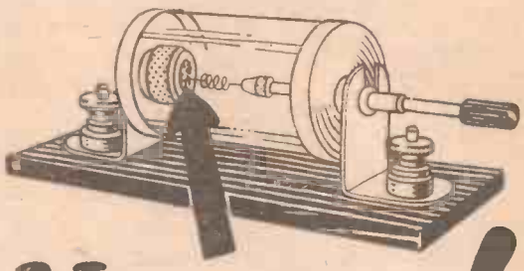
for distance



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"A. C.," Bakewell, receives Manchester on a Neutron plain Crystal Circuit.

Birmingham from London — 125 miles
"L. V. C.," of Chiswick, receives Birmingham regularly on a Neutron without amplifiers.

Chelmsford from York — 160 miles
"E. C. D.," York, receives the high-power station on a single slider set, with Neutron.

Brussels from Chiswick — 200 miles
"L. V. C.," of Chiswick, receives Brussels on a Neutron, without amplifiers.

Madrid from Chippenham — 800 miles
"R. A. H.," Chippenham, regularly receives Madrid on a plain Crystal circuit, with Neutron.

And with 2 stages of L.F. only, W B Z from Chippenham — 3,000 miles
"R. A. H.," of Chippenham, also reports reception of W B Z (Springfield, Mass.) on a Crystal set using Neutron, with 2 low-frequency valves acting as note magnifiers only.

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144, Theobald's Road, London, W.C.1.
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E.W.B

America Without an Aerial

SIR,—Happening to hear several weak stations whilst I was listening at 7.30 p.m. G.M.T. I accidentally disconnected the aerial from the receiving set (two-valve, detector and note magnifier) and was surprised immediately to hear, very clear and easily readable, WGH, the station at Tuckerton, U.S.A.

As I never use an earth connection on my receiving set, and the aerial was thus disconnected, surely this is a record?—2AYF (Southsea).

About Condensers

SIR,—With regard to the paragraph "About Condensers," by THERMION, under "On Your Wavelength," in No. 137, it would be interesting to know if any amateur transmitters have tried concentric high-tension three-core cable for condensers; if so, with what success. This cable should certainly stand up to the voltages mentioned.—R. S. (Swansea).

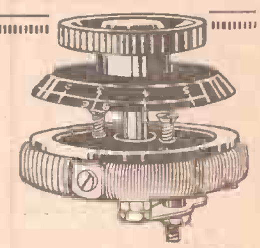
Interference from Northolt

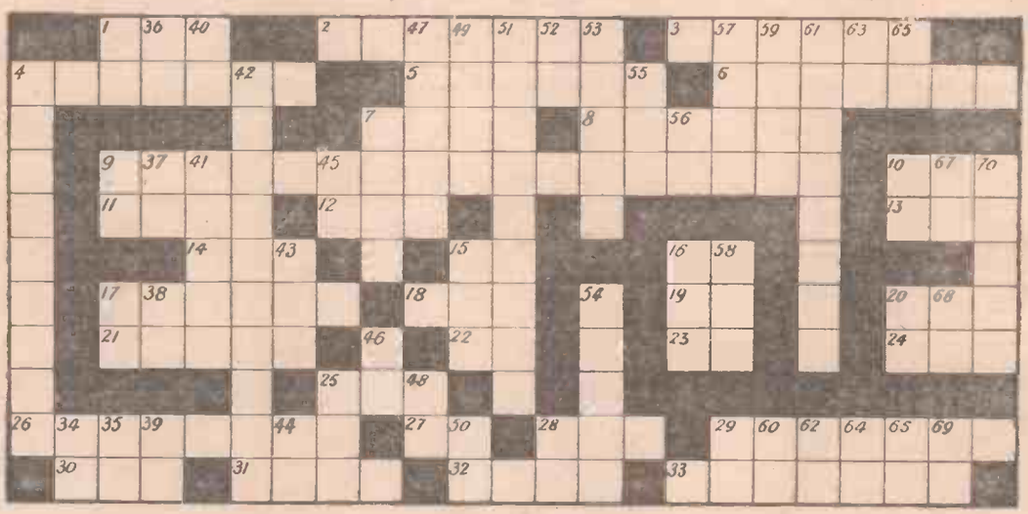
SIR,—One sees that Northolt is being blamed for a considerable amount of interference with broadcasting, and in this connection the following may be of interest:

Some months ago, and over a considerable period, at about 10.30 on Sunday morning, Northolt used to send out waves of about fifteen seconds' duration. As is generally known, Northolt is an arc station, and the transmission to which I refer consisted, therefore, of fifteen seconds on one note—that is, the marking wave—and about the same interval on another note—the spacing wave. I do not remember the exact durations, as it is some time since I experimented with this transmission.

This transmission was presumably done

(Continued on page 244)





The "words" in this puzzle include several generally accepted abbreviations or initials similar to the following:—

"R.H.A."—Royal Horse Artillery.

The "Clues" are not put forward as exact definitions but as affording an indication to the required word.

HORIZONTALS

1 Seven Hundred
2 A rare fruit tree.
3 Hard workers
4 A mineral found in Norway
5 Hero of a Roman epic
6 Your interest is
7 Useful for slotmeters
8 Probably dumped
9 A quality lacking in celluloid
10 A scriptural beast of burden
11 A great poem
12 Useful at Bridge
13 Goes with a dash
14 Demonstrative adjective
15 A royal title
16 Thus
17 Dismal
18 A woman's secret
19 Another scriptural beast
20 Yours or mine
21 Dig again

HORIZONTALS—continued

22 Indefinite article
23 Prefix signifying facility
24 A smaller scriptural beast
25 Upper crust
26 Comfortless
27 The song of the lost sheep
28 An emollient
29 Crippling
30 Demonstrative adjective
31 A monkey's tail
32 Found in cheese
33 A crime of violence

VERTICALS

4 Surpass
34 Electro-Technics
1 A note of a-scale (musical)
9 That's it
17 The family friend
35 Abbreviated bobs
36 Keeper of the Rolls

VERTICALS—continued

37 Not hall-marked silver
38 A British Regiment
39 Anglo-Saxon
40 101
41 Often quoted
42 Having feet made to specification
43 A physical unit
44 Often before day
45 Unmarried artist
25 Little Nigger Boys
7 A darling
46 End of the fight
47 A type of pie
48 Lead
49 To put in possession
15 The Heavies
50 A light metal
51 Beginning
52 A respected profession
28 Preposition
53 A gold coin

VERTICALS—continued

54 The nest of a bird of prey
55 A clerical area
56 England's glory
16 Worth listening for
57 Half a rubber
58 Bottled bullock
29 One better than a bachelor
59 Long ages
60 In or near
61 Has no meaning
62 Perfection
63 and 64 Thou and I
65 Steamer
10 Date indication
20 Quite right
66 A negative prefix
67 Postal address sign
68 West Indies
69 Over there
70 Grand at horse shows

CORRESPONDENCE (*continued from page 242*)

for test purposes, lasting for about ten minutes, and it occurred to me that, as that transmission was so very distinctive and there was so little doing in the ether on Sundays, it afforded a very good opportunity for tracking down harmonics.

The transmission was not on the wavelength normally used by Northolt, but was on about 6,000 metres. Taking first the upper harmonics, it was clearly audible at 12,000, 18,000 and 24,000, which is as high as I could get with my coils. Working downwards, I tracked, without a single break, every simple fraction down to 333.

Unfortunately I was unable to make any tests below 333, as I found on the two following Sundays that he had stopped these transmissions. However, I proved conclusively that his harmonics were audible over almost the whole of the broadcasting wavelength.—E. W. W. (Coventry).

Radio-Paris often retransmits 5 X X late in the evening.

2 LO's NEW TRANSMITTER

AT last it has been officially announced that 2 L O's transmitting gear is to be moved to a new site in the West End.

The change, which has been the subject of numerous rumours for a good many months, is necessitated by the otherwise unavoidable interference of the London broadcasting station with the Air Ministry's apparatus in Kingsway.

Power Doubled

More important than the actual moving, perhaps, is the fact that, as soon as the change has been made, 2 L O's power will be increased from 1½ to 3 kilowatts. This means that the range of crystal sets will probably be substantially increased, although not actually doubled.

For a long time now the B.B.C. have been looking for alternative sites for the London transmitter, but they were hard to find.

A new site, which it is thought will be quite satisfactory, has now been decided upon, however, and this is in the West End, about a mile to the north-west of Marconi House.

The studios will still remain at 2, Savoy Hill. They will be connected to the transmitter by a special land line.

It has not yet been decided whether the increase in power will be permanent; it will be made at first to ensure that reception in south London does not suffer.

Such things as interference with other stations and the range covered will have to be taken into account.

There is every reason to suppose, however, that the new transmitter will be more effective than the old one.

No definite date has been announced (up to the time of going to press) for these changes, but it is hoped that they will be made at about the middle of the month.

"Connecting Your Transformers."—In this article, which appeared on page 134 of No. 138, there is an error in the diagram Fig. 2. The anode, of course, should be connected to OP and the positive high-tension to IP. The text should read to correspond.

CHIEF EVENTS OF THE WEEK

SUNDAY, February 8.

Birmingham	9.0	Chamber Music Programme.
Bournemouth	3.0	Band of 1st Batt. The Argyle and Sutherland Highlanders.
Cardiff	9.0	Czecho-Slovakian Programme.
Manchester	8.45	Chamber Music Concert.

MONDAY

London and 5 X X	7.30	"Round the World in Music."
Birmingham	7.30	A Triple Bill by the Station Players
Bournemouth	7.30	Comic Opera, *Les Cloches de Corneville.*
Newcastle	7.30	"By the Shores of the Mediterranean."
Glasgow	7.30	A Night with Charles Dickens.

TUESDAY

5 X X	7.30	Ballad Concert.
London	7.30	Military Band Programme S.B. to all Stations.
Glasgow	9.0	The Scottish Orchestra.
Liverpool	7.30	Philharmonic Society's Concert.

WEDNESDAY

London and 5 X X	7.30	*The Seven Ages of Man.* A Pageant in Speech and Music.
Birmingham	7.30	English Music, Old and New.
Bournemouth	7.30	Winter Gardens Night.
Newcastle	7.30	Music of the Dominions.
Aberdeen	7.30	With the Composers Elgar and Brahms.
Belfast	7.30	Symphony Programme.

THURSDAY

ALL STATIONS	8.0	Third International Symphony Concert, relayed from the Royal Opera House, Covent Garden.

FRIDAY.

Bournemouth	7.30	Song Cycle and Light Music.
Cardiff	8.0	5 W A's Second Birthday
Aberdeen	7.30	Music and Drama.
Glasgow	7.30	Scots Night.

SATURDAY

Cardiff and 5 X X	7.30	Light Symphony Concert.
Manchester	7.30	Organ Recital by Dr. Kendrick Pyne.
Belfast	7.30	"Novelty Night."

CLUB DOINGS

Dorking and District Radio Society

Hon. Sec.—MR. A. J. CHILD, High Street P.O., Dorking.

AT the last meeting Mr. W. Gravett gave an interesting lecture on "Transmitting." His self-constructed transmitting apparatus was exhibited and explained

Hackney and District Radio Society

Hon. Sec.—MR. G. E. SANDY, 114, Parnell Road, E.9.

AT a meeting held on January 12 Mr. Toye gave a lecture and demonstration on his five-valve receiver.

Ilford and District Radio Society

Hon. Sec.—MR. F. W. GEDGE, 157, High Road, Ilford.

A FORMAL meeting was held on January 20, when Mr. D. S. Richards, of Messrs. Venner Time Switches, lectured on "Time Switches and Their Uses." He brought with him a very fine selection of switches.

The closing date for the competition has been fixed as March 3.

Barnsley and District Wireless Association

Hon. Sec.—MR. W. PEACOCK, 28, Park Grove, Barnsley.

AN interesting lecture was given on January 21 by Mr. W. D. Milner, B.Sc., when he spoke on the subject of wireless valves.

"**Electric Bell Troubles**" is the title of an article appearing in the current issue of "The Amateur Mechanic" (3d.), and shows how these inconveniences can be put right. Other articles and features appearing in the same number are: "Building a Poultry House and Run," "How to Fix Picture Rails," "Motor-cycle Practicalities," "Adding Another Valve to a Wireless Set," "How to Make a Ball-type Variometer," "Support for Carrying Indoor Wires," "Designs for Model Steam Traction Engines," "Hiding the Venetian-blind Cords," "Flower-holders in Plaster," "A Mantel Fitment," "An Easily-rotated Baking-dish."

ANNOUNCEMENTS

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General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets.

Contributions are always welcome, will be promptly considered, and if used will be paid for.

Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed.

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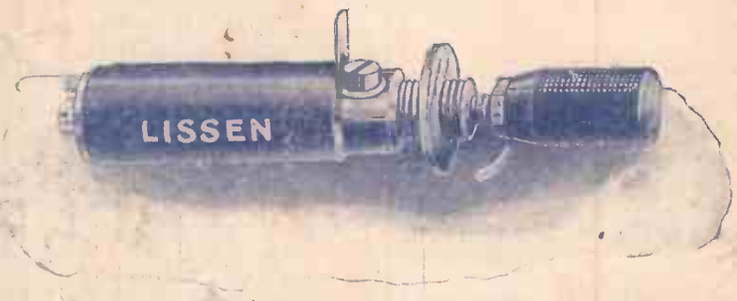

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MAKING A LOW-LOSS CRYSTAL SET

Amateur Wireless And Electrics

Vol. VI. No. 141. SATURDAY, FEBRUARY 14, 1925 Price 3d

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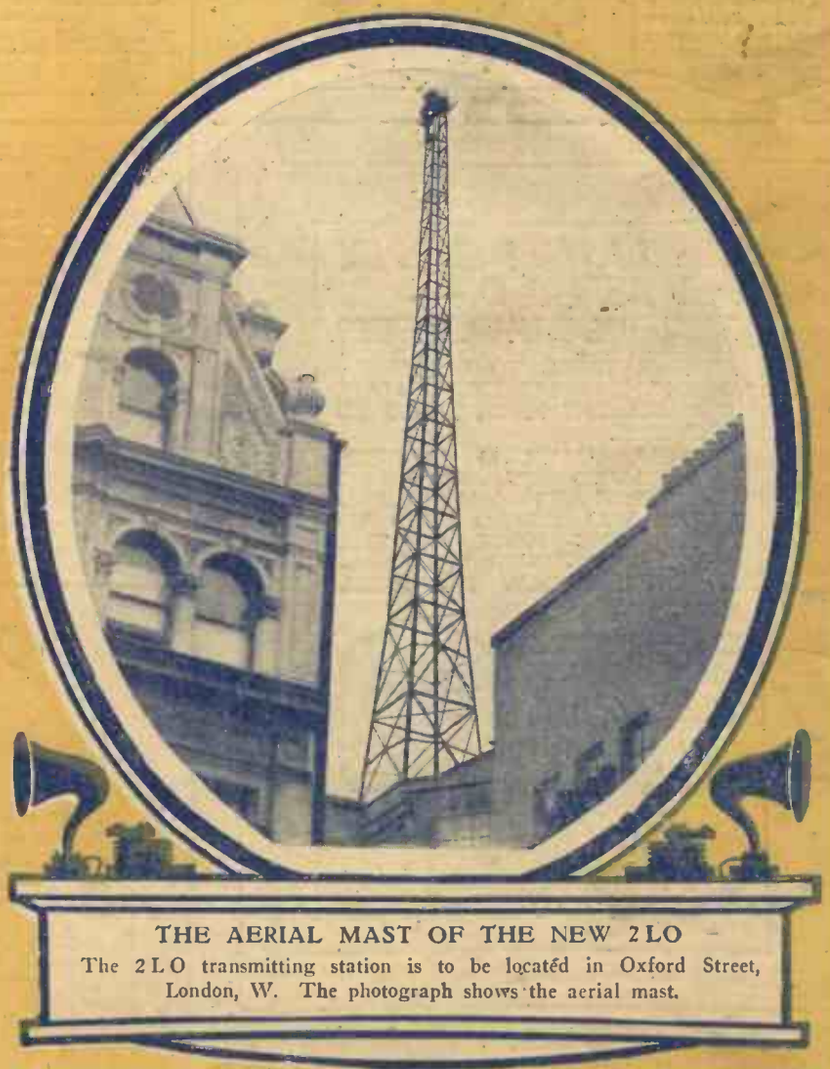

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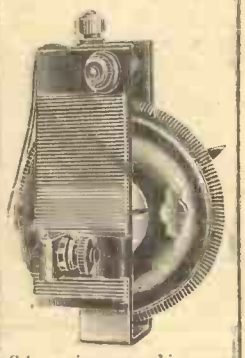

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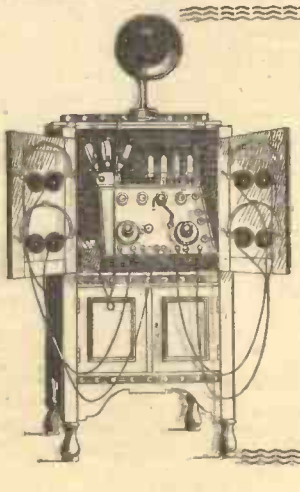

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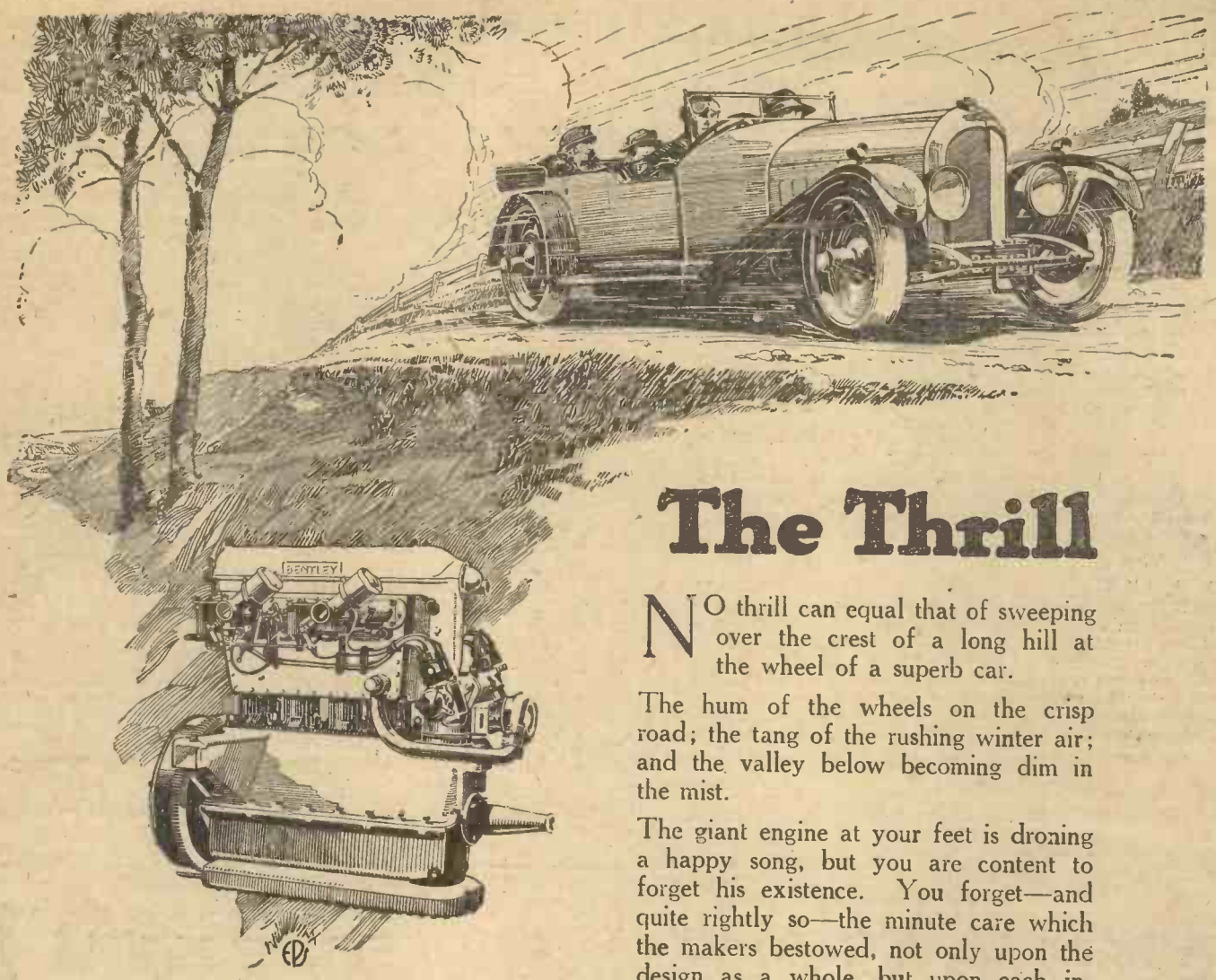

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Amateur Wireless and Electrics

Vol. VI. No. 141 February 14, 1925

THE MYSTERIOUS CRYSTAL

THE humble crystal presents some remarkable problems, not only for the wireless amateur but for the chemist and the physicist also. The familiar combination of a fragment of galena with a wire catwhisker is still an unplumbed depth of mystery; the amateur knows that it is capable of rectifying alternating currents, but by what property or quality it accomplishes this work even our foremost scientists cannot accurately determine for us. Perhaps the best explanation yet put forth of the rectifying properties of crystals is the thermo-electric theory which regards the crystal-wire combination as a thermo-couple.

The Thermo-electric Theory

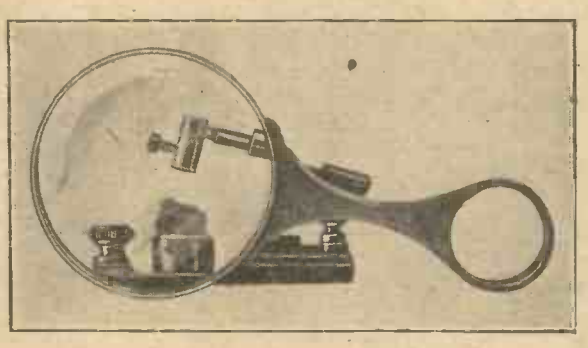
This theory depends on the fact that one or both substances (in the case of two crystal detectors) has a large and dissimilar temperature variation of resistance. Thus, when an alternating current—such as the radio-frequency current received by the aerial—is applied, two distinct actions occur: when the current is flowing in one direction the temperature of the junction between crystal and catwhisker will rise, resulting in a reduction of the resistance and the passage of a large current. It is known that as the temperature increases, the resistance decreases, so that any increase of current will increase the heat production and the conductivity of the junction.

During the second half of the cycle, when the voltage is reversed, the conditions are altered. The junction temperature, owing to what is technically known as the Peltier effect, will then be cooling instead of heating, and this cooling is in direct ratio to the energy supplied—the greater the current the greater the cooling. The resistance now, instead of being reduced, is materially increased, with the result that the currents flow freely in one direction but only weakly in the other.

Other Theories

Various other theories have been offered, many of them too technical and involved to be of interest to readers of a journal whose prime appeal is to the amateur, but the one explained above appears to be the most plausible and to have gained the largest number of adherents. In this respect, then, it suffices to remark that the true significance of the crystal as a rectifier has not yet been accurately determined.

The behaviour of crystals under heat opens up another interesting field for investigation. Most amateurs are aware of the fact that by slightly warming the crystal better results are often obtained, yet this phenomenon is in direct contrast to the directions generally printed on the container, which claim that the sensitivity of the crystal is materially impaired, or even dispelled, by the application of any heat.



The Crystal and Heat

Recent investigations have proved that many minerals, especially those belonging to the pyrites group, undergo a physical change when heated. Those readers who still remember their school chemistry will be aware of the difference of molecular structure exhibited by yellow and red phosphorus, an outstanding example of physical change brought about by the application of heat. Here we have two substances entirely dissimilar in appearance and behaviour, yet identical in their chemical composition.

Similarly the galena crystal, which is a natural form of lead sulphide, as used in crystal detectors, has marked rectifying properties, while its constituents, if prepared in the laboratory, exhibit no similar characteristics. Many scientists believe this to be due to the peculiar crystalline structure of the native mineral—a structure which it is difficult to imitate in the synthetic forms which are now generally included in the "ites" class. Artificial forms of galena are obtainable which possess remarkable rectifying qualities, but in the writer's experience a good specimen of the real mineral excels them all.

It is this minutely crystalline structure—a crystal within a crystal, so to speak—which suffers derangement by the application of heat. Even then, by applying the heat gradually and allowing the crystal to cool slowly, this arrangement of the crystal is *apparently* unaffected, since its sensitivity remains unimpaired; indeed, I have found it possible occasionally to rejuvenate an old crystal by this method. I say "apparently" advisedly because it is possible that the crystal may undergo a structural alteration with an ultimate return to the old arrangement at the end of the slow cooling process.

Effect of Light

Another crystal phenomenon consists in the fact that strong light, especially sunlight, alters the behaviour of crystal detectors whenever the light is focused on the surface of the crystal during the reception of signals, a phenomenon which has already been discussed in these pages. Under some conditions the electrical conductivity of a crystal is altered whenever a strong light falls upon it, and further investigations into this peculiarity have brought to light another mystery for crystal theorists to puzzle over.

In the American *Physical Review* for November, 1923, and under the rather overwhelming title of "Spectro-photo-electrical Effects in Argentite," is described a record of experimental work with crystals of the mineral argentite, which is an ore of silver analogous to galena in that both are metallic sulphides having many common characteristics. Just as the galena was affected by light, so, it was found, was argentite affected.

But something entirely new and unexpected was discovered. This was the production, inside the illuminated crystal, of an actual electromotive force. In some manner the crystal, or some constituent of it, acted to convert a part of the energy of the light into electricity,

(*Continued at bottom of next page*)

USING A SOFT VALVE IN A REFLEX SET

MANY users of reflex circuits fail to get good results because they employ valves which are far too soft for the purpose. Apart from the fact that such valves never give good amplification, it is exceedingly easy to arrive at a situation in which the valve is rectifying, at one of the bends in its characteristic curve, while the crystal becomes simply a "passenger."

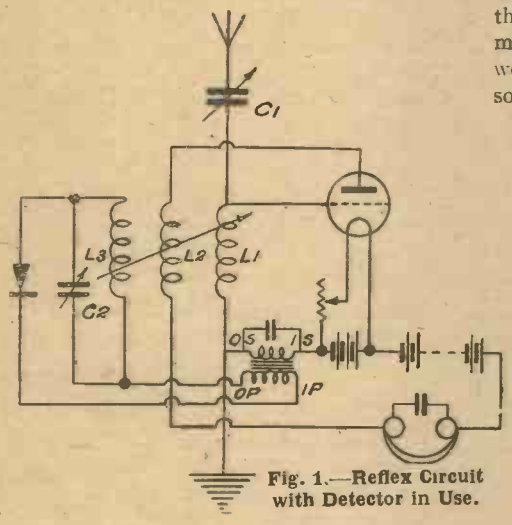


Fig. 1.—Reflex Circuit with Detector in Use.

The existence of this state of things is readily detected by simply raising the catwhisker, when signals should become very much fainter or disappear entirely. If they retain or, as they often will, increase their strength, the valve is rectifying and steps should be taken (by means of grid bias, etc.) to alter its operating position on to the straight portion of the characteristic. If a soft valve is being employed this will not improbably spoil the reception altogether. The accepted remedy, of course, is to substitute a harder valve.

When Your Valve Burns Out

But if, as recently happened to the writer, your only hard valve has suddenly become *hors de combat* owing to excessively "close coupling" between the H.T. battery and the filament, and you have only an old stager whose blackened bulb betrays the softening due to age, excellent results can be obtained by frankly cutting out the crystal and using the set as a single-valve detector.

Fig. 1 shows one of the best and most commonly employed of the reflex circuits. Sometimes the primary instead of the secondary of the H.F. transformer (either tight- or loose-coupled) is tuned and it seems to make little difference which arrangement is adopted. In the writer's set it is the secondary which is tuned and the transformer is loose-coupled, the three coils—aerial, aperiodic anode and tuned secondary—being all intercoupled in a three-coil holder.

Valve Rectification

If now a soft valve is put into the Fig. 1 circuit and the catwhisker lifted, we have the effective circuit shown in Fig. 2. It might be thought that the secondary, L_3 C_2, would be out of action, but this is not so. The coupling of the coils still enables it to tune the anode as before and the whole tuning of the circuit is unchanged. In order to get good results, however, the valve must be adjusted to work on the proper part of the characteristic curve.

Adjusting the Valve

This may be brought about by varying the H.T. voltage, the effect of which is to move the characteristic curve bodily across the grid-volts base-line (see Fig. 3). Signals may sometimes be improved by shifting shifting the connection to I.S. of the L.F. transformer to the filament side of the rheostat, as shown by the dotted line in Fig. 2, or even to L.T. +. This puts positive bias on the grid.

Double Rectifying Effect

Do not short-circuit or remove the L.F. transformer, as the secondary coil, with the condenser across it, acts in some measure like a grid leak and, even though your object is to work at the upper bend in the characteristic, this gives an increased rectifying effect.

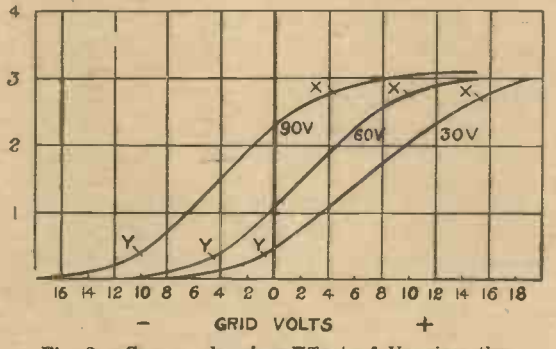


Fig. 3.—Curves showing Effect of Varying the H.T. Voltage.

This circuit, though primarily evolved as a makeshift to enable a soft detecting valve to be used in a reflex set, is in itself a very good single-valve regenerative arrangement. In the writer's experience the method of tuning the anode by the separate secondary circuit gives finer control than the ordinary tuned-anode, and the inclusion of the L.F. transformer (which is not, of course, a new device) is very satisfactory. H. W. S.

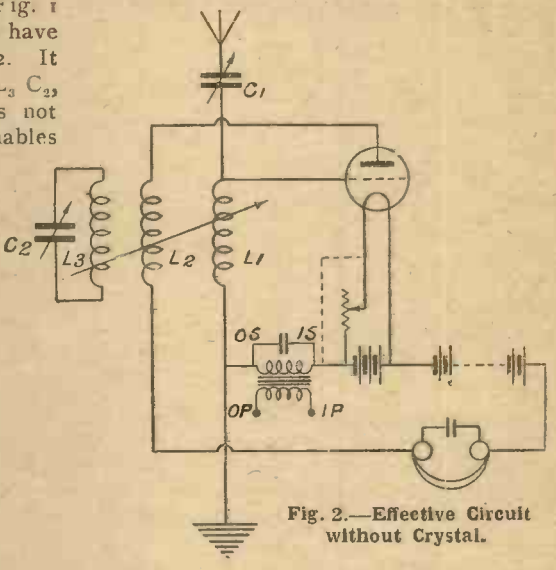


Fig. 2.—Effective Circuit without Crystal.

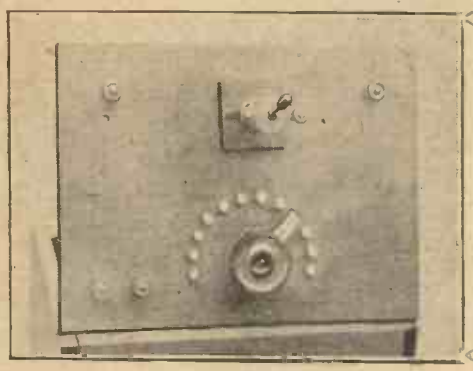
"THE MYSTERIOUS CRYSTAL" (*continued from preceding page*)

just as a dynamo converts mechanical power into electricity. It was even possible to measure the amount of this energy, a light of 600 candle-power at a distance of one metre from the crystal producing an electro-motive power of as much as .013 volt.

It is improbable, of course, that an effect so small as this (in volts) can ever be employed for the useful conversion of light energy into electrical energy. The real significance of the discovery does not rest upon that factor. The promise of importance lies in the chance of a better insight into what electrical processes really take place inside the crystal.

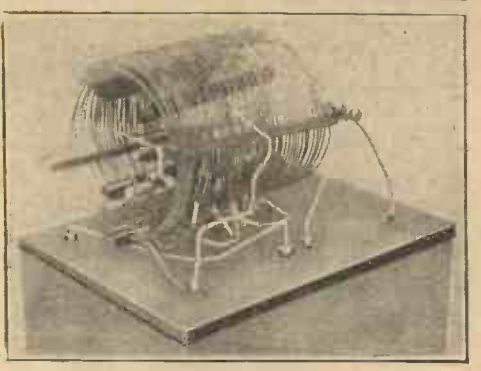
There is very little doubt that all these electrical and photo-electrical phenomena are related to the properties of the electrons in the crystal; that if we could know more about these properties we should be enlightened on many other points—the light-detecting property of selenium, the emission of electrons when light falls upon a metallic surface, the pressure effects which are responsible for the "talking crystals" and last, but not least, the familiar but mysterious behaviour of the crystal as a wireless detector.

Indeed, when one considers all, there is probably no other field of research in the whole of physics which offers a greater promise of important discoveries, both in theory and in commercial practice, than does the study of the crystal. A. J. B.



Front of Panel.

MAKING A LOW-LOSS CRYSTAL SET



Back of Panel.

THE following is a description of a low-loss crystal set with a bare-wire loose-coupled tuning inductance. Since the construction of the coils presents the greatest difficulty, the writer will describe in detail the method employed (see Figs. 1 and 2), which is very simple and straightforward. Fig. 1 shows a half section of a cardboard former tube (view of tube cut in halves lengthways). Assuming we are winding the outer coil first (4 in. in diameter), take a piece of $\frac{3}{16}$-in. ebonite and cut four strips $\frac{1}{2}$ in. wide and 6 in. long. Trim these up so that they are exactly the same shape, and clamp all four strips together in the vice so that they appear as a solid piece of ebonite $\frac{3}{4}$ in. by $\frac{1}{2}$ in. by 6 in. (see Fig. 3).

Coil Formers

Using a square as shown in Fig. 3, mark off forty divisions pitched $\frac{1}{8}$ in. apart. On each of the two outer faces of the strips scribe a line $\frac{3}{16}$ in. from the top throughout their length. This is to guide the depth of the saw in cutting the teeth. The first tooth may be about $\frac{3}{8}$ in. from the end.

Having cut the forty teeth to the depth of $\frac{3}{16}$ in. to the lines, and whilst still in the vice, pieces are cut out of each end of the strips as shown at A and C (Fig. 1). The strips now present the appearance of C (Fig. 1). Before removing the strips from the vice, mark each at one end so that they will be in line when fitted.

The next thing to prepare is the cardboard former. This may be as shown, 8 in. long and 4 in. in diameter (Fig. 1). Cut four slots 5 in. long by $\frac{3}{16}$ in. wide 1 in. from one end of the former and equidistant around its circumference. This may be done on the domestic rolling-pin with a sharp knife. The four strips of ebonite may now be fitted into these slots as shown in Fig. 1, taking care to keep the marked ends of the strips at one end. Pack the inside of the former with rolls of paper to keep the strips pressed home, and the coil is ready for winding. Anneal the wire by heating to redness and cooling in water, and then stretch it from a post to take any kinks out by running emery-cloth between two pieces of wood along the wire. This serves two purposes: it straightens the wire and cleans off the oxide formed by annealing.

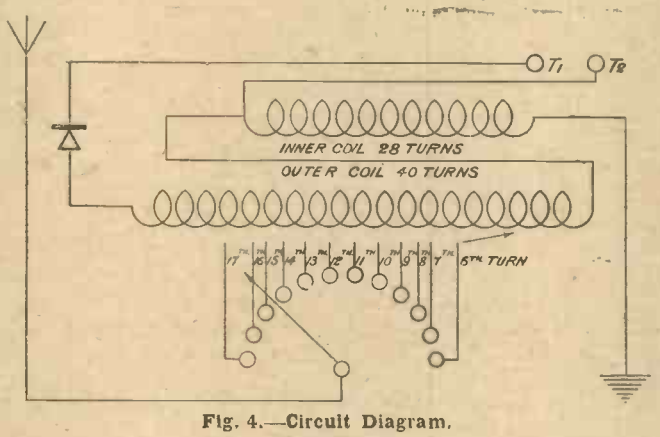


Fig. 4.—Circuit Diagram.

The coil can then be wound on the former, taking the turns between the ebonite teeth in the ordinary way. It should, of course, be fastened at the beginning and the end through holes in the former. After this is done a little shellac should be carefully dropped between each tooth, taking care that none drops on the cardboard former. The coil should then be allowed to stand for a few hours to allow the shellac to set. All that remains to be done now is to cut down through the former to each end of the four slots—that is, from the ends of the tube. The four pieces of former can then be gently broken away from the ebonite strips, leaving the finished coil. This method obviates the tedious drilling and threading of wire. The inner coil is wound in exactly the same manner.

Circuit

The wiring diagram is shown by Fig. 4 and is self-explanatory. The outer coil is tapped at single turns from the sixth turn from the end indicated by the arrow at twelve points. It will be noticed in the photograph that there is a direct lead from the aerial terminal to the fifteenth turn. This is the writer's setting for Liverpool and need not be followed. The inner coil is set midway in the outer. For wavelengths longer than Liverpool another ten turns to both coils may be added.

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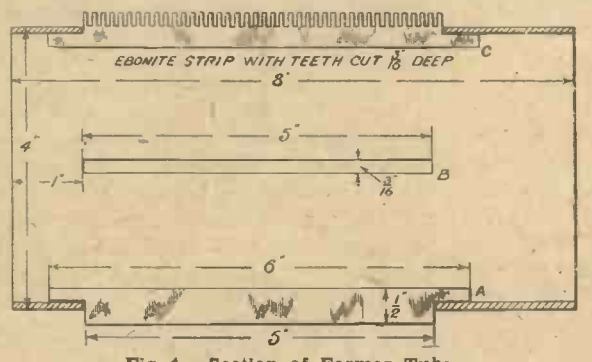


Fig. 1.—Section of Former Tube.

Fig. 2.—Cross Section of Former

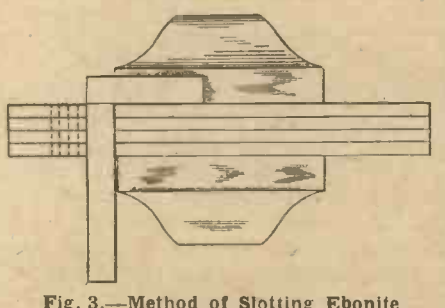


Fig. 3.—Method of Slotting Ebonite Formers.

BOSPHOR PRONZ ON "SOME" APPARATUS

The Longcord Headphones

THERE has been sent to me for examination a pair of "Longcord" headphones. As their name implies, the feature of these phones is the long cord or cords which is or which are supplied with every pair. For the greater part of its length the cord of the Longcord headphones is a single cord. At the end of the cord away from the earflaps there are two distinct cords, each of which ends in a metal tag. These tags are of satisfactory shape and design for adult use, but should they find their way into the hands of children they would doubtless be considered too pointed.

At the other end of the cord, about a foot from the end, the Longcord cord divides again into two separate cords, each of which goes to an earpiece, thus making dual aural reception possible with these phones. On turning one of these earpieces over, it is at once noticeable that the cords again break up into two distinct cords. Thus the cord of the Longcord headphones is a single cord, a double cord or a quadruple cord according to the part of the cord you have under observation.

From earpiece to metal tag the cord of the Longcord headphones measures 12 ft. 2.943 in. This excessive length can be easily reduced by the simple expedient of winding the cord into a coil of the slab-dab type, but the great feature of the Longcord headphones is that they make remote control possible. I find it an easy matter with these phones to tune in a crystal set placed directly under my aerial lead-in while seated in an armchair near the fire. Certainly it was a cold night when I carried out this test, and my assistant had every reason to complain of being made to stand by the window so long.

Since the bands of the Longcord headphones are covered with black morocco, I gather that these earphones are of Spanish origin. The earpieces fit fairly comfortably, but why cannot manufacturers of headphones make their earpieces of ample size? The pair sent me for test fitted over my own ears quite easily, but they were just half the size necessary to cover the ears of my assistant. Manufacturers should make their earpieces big enough for the biggest ears and not just big enough for the average ear. I shall be happy to send the dimensions of my assistant's ears to any manufacturer who is interested.

The Longcord phones are decidedly sensitive. Unfortunately in the pair supplied for examination the left earpiece was defective owing to the fact that the sensitive side of the diaphragm had been carelessly placed inwards instead of outwards. When the necessary change was made, the left phone was slightly better than the right phone. It is worth noting here that the sensitive side of the diaphragm can always be found by biting the diaphragm with the teeth. The sensitive side sticks to the teeth, the other side does not. This simple test, however, should not be made use of by anyone who has metal fillings in the front teeth. Such fillings have been known to take away the magnetism of a headphone diaphragm.

A New Leak

Messrs. Tiffy Taffy, of Knarvon, have sent me a presentation sample (other manufacturers, please copy) of their latest wireless accessory, the Daffodil leak. This ingenious little instrument is a vegetable product about 9 in. long consisting of a tuning knob in which are placed several dead end effects. Is is interesting to note that one-hole fixing is used in the development of these useful little gadgets. The appearance of the Daffodil leak is certainly a pleasing one, and its finish is of a consistently high odour.

For the reception of distant broadcasting stations the Daffodil leak is to be recommended strongly. It is particularly efficient in picking up Brussels, the new American station POT 8 O and the French station Ka Barge.

The Leopard Crystal Detector

A long-distance wireless correspondent, who must remain nameless since he has not yet renewed his licence, has sent me a beautifully designed and constructed crystal detector. The first thing I noticed about this crystal detector was the glass barrel which holds the crystal. Since this barrel is made of the clearest glass, it is possible to keep the crystal under constant supervision and to make sure it is carrying out its rectifying duties properly. In addition to this, the glass barrel protects the crystal from dirt and dust and the greasy fingers of meddlesome wireless visitors. My long-distance friend, in the letter he sent with the crystal detector, expresses himself very strongly upon the subject of glass barrels. He is of the opinion that the world would be a better place if all barrels for crystals and other purposes were of glass so that one could always see what was in them.

As well as holding the crystal, the glass barrel supports the catwhisker controlling mechanism. This ingenious mechanism consists of a handle at the inner end of which is the catwhisker, this being inside the barrel as usual alongside the crystal. The other end of the catwhisker handle is outside the glass barrel, and it is this end of the handle which calls for special comment. Instead of being straight, as is so necessary for straight crystal circuits, this handle is shaped like the starting handle of a motor-car. The main portion of the handle—that is, the portion which has the catwhisker at the inner end—passes through a small musical box mounted in the end of the glass barrel and secured there by a couple of brass nuts. So ingeniously is the handle arranged that a mere turning of the handle in one direction causes the musical box to function, thus facilitating tuning to an unheard of extent.

It is, however, the crystal which gives the name to the Leopard crystal detector. This crystal is unique in that the sensitive spots show up as tiny but visible yellow patches, the rest of the crystal being of the usual nondescript colour. When examined carefully under a microscope having two stages of low-frequency amplification, it is seen that the sensitive streaks of the Leopard crystal go right through the whole crystal in much the same way as the inscriptive letters go through a bar of seaside rock. After testing the crystal so kindly sent me, I have no hesitation in saying that the Leopard crystal knocks spots off any other type of crystal it has been my privilege to receive and to receive with.

"MAKING A LOW-LOSS CRYSTAL SET" (*continued from preceding page*)

Fig. 5 shows the layout of the panel. The set fits into a box just deep enough to allow the coil to rest on the bottom.

In comparison with a variometer set (using one of the expensive spherical variometers of a well-known make), the bare-wire set gave far greater volume. Compared with another variometer set (using a large-diameter variometer wound with No. 15 wire), the bare-wire set was about equal in volume, but speech and music were far sharper. Again, compared with a tapped inductance set wound with No. 24 wire, the bare-wire set gave far greater volume. W. G.

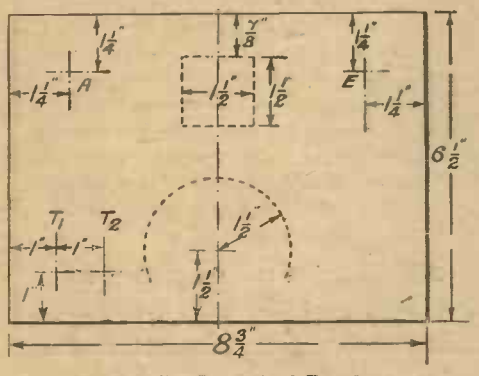


Fig. 5.—Layout of Panel.

ADAPTING A PHONE FOR LOUD-SPEAKER

Parts of Reed-type Receiver.

THE receiver to be described was made for a pleated-paper loud-speaker, although it can be successfully used as a relay for the "Crystal" loud-speaker. The components required are: An ordinary single earphone; an ebonite knob; a piece of sheet brass, about 8 in. by 2½ in. by $\frac{1}{64}$ in. thick; an ebonite sheet, 4 in. by 2½ in. by $\frac{3}{16}$ in. thick; a quantity of 6 B.A. nuts and screws; and a length of 6 B.A. threaded rod.

Before going into the actual details of the receiver it will be useful to explain the construction of an ordinary earphone. The one represented in Fig. 1 is a typical ex-Government receiver (2,000 ohms) that lends itself admirably for the purpose. It consists of a horse-shoe permanent magnet held in position by a short clip C screwed to the permanent magnets. To make the reed receiver, the polepieces are unscrewed and the bends opened out so as to give them the shape shown in Fig. 2. It will be necessary to change the position of the bobbins to allow the soft-iron cores to project well beyond them. This can be accomplished by pressing the bobbins down gently with a piece of wood. The permanent magnets with the polepieces are next fixed on an ebonite piece G of the shape shown in Fig. 2, the screws passing through the ebonite piece, permanent magnets and the tapped holes in the soft-iron pieces. The portions of the soft-iron pieces projecting beyond the magnets are filed off, also the ends of the polepieces facing the reed are carefully filed to present a flat surface.

The ebonite piece G, Fig. 2, is drilled in the centre, tapped 2 B.A., and a short length of 2 B.A. rod screwed into it and tightened by a nut. This part of the receiver is completed by a screw D screwed in the ebonite piece G, which passes through the hole in the magnets and projects about ¼ in. beyond the ebonite. This screw serves to keep the magnets in position and prevents them from moving as the knob is turned for adjustment. If the magnets are not provided with a hole for this screw the alternative plan is to screw it flush with the ebonite before mounting the magnets on the ebonite piece.

A circular piece of ebonite F, Figs. 2 and 3, 2¼ in. in diameter and $\frac{3}{16}$ in. thick, is cut and carefully drilled in the centre to allow the 2 B.A. rod to pass through, also a second hole is drilled for the screw D (Fig. 3) so that the screw can move freely as the adjustment is made with the knob. On this circular piece is fixed the first ebonite piece G, on which are mounted the magnets, with a spring S and a spring

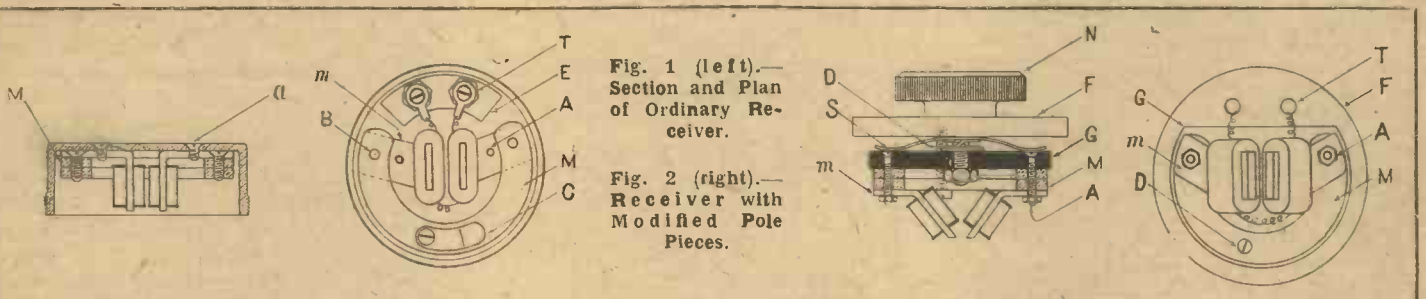
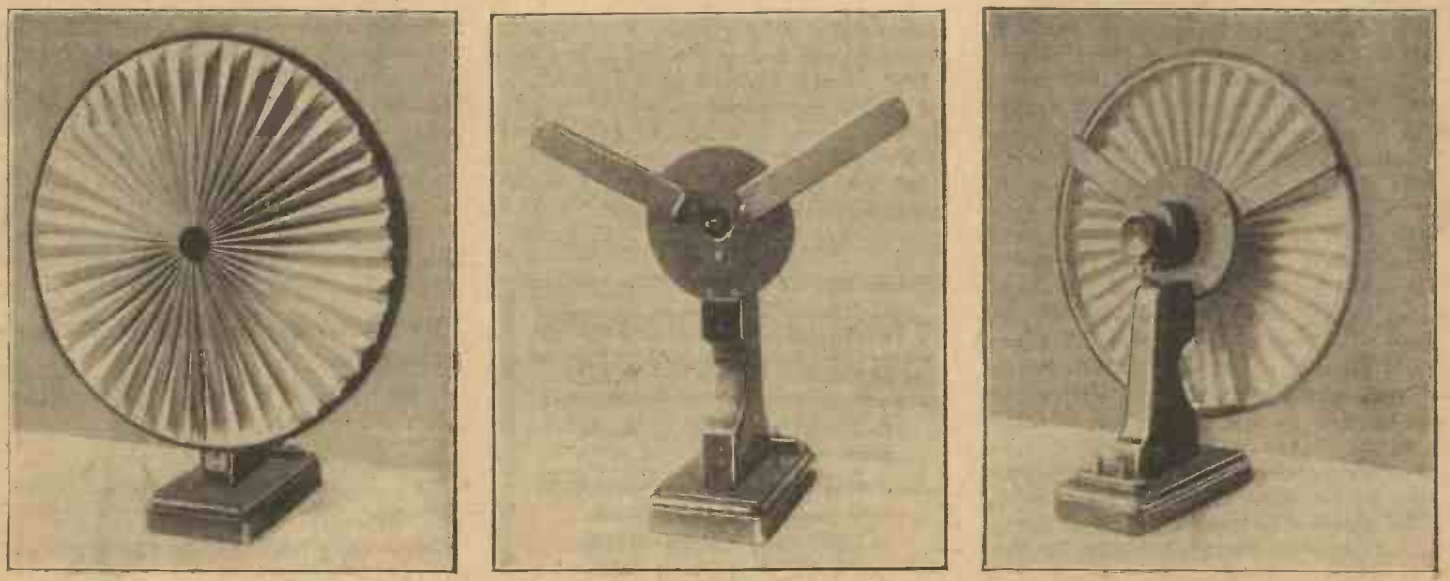


Fig. 1 (left).—Section and Plan of Ordinary Receiver.

Fig. 2 (right).—Receiver with Modified Pole Pieces.

M, at the ends of which are fixed the soft-iron polepieces *m* by the screws B. The whole arrangement is fixed into the aluminium case by the screws *a*, screwed in the tapped holes A in the polepieces *m*. The ends of the windings are soldered to two terminals T, which are screwed in an ebonite piece E. The phone leads, whose ends are connected to the terminals, are



Three Photographs showing the Attachment of Reed-type Phone to Pleated diaphragm Loud-speaker

washer in between them as shown in Figs. 2 and 3. The spring S consists of a strip of hard brass ½ in. wide and 2 in. long with a hole in the centre. If the knob N be now turned the magnets will move backwards and forwards, depending on the direction of rotation of the knob. The ends of the magnet windings are soldered to the terminals T screwed on the ebonite piece F.

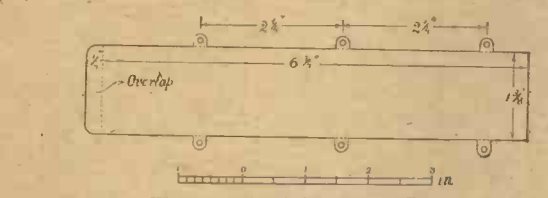


Fig. 4.—Metal for Outer Cover.

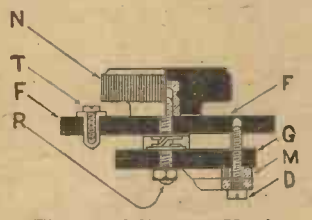
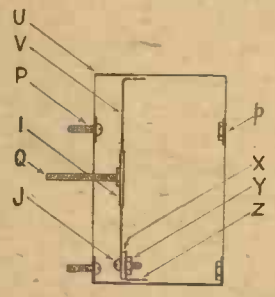
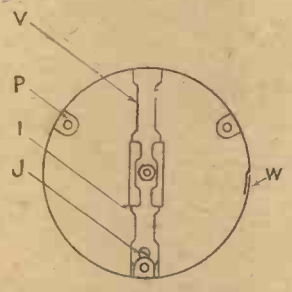


Fig. 3.—Adjusting Knob.





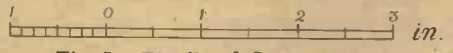


Fig. 5.—Details of Case.

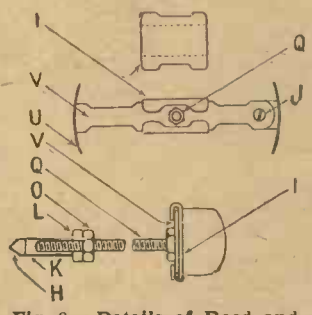


Fig. 6.—Details of Reed and Adjusting Device.

The outer cover can be made out of a strip of brass sheet cut according to the dimensions given in Fig. 4, which is rolled round and the joint W (Fig. 5) soldered. For fixing this to the receiver and the magnets, nuts are soldered on the inside of the three projections of one side, while small 6 B.A. screws P are soldered on the opposite three projections (see Fig. 5).

The Reed

The vibrating reed V (Figs. 5 and 6) is cut out of a piece of hard brass sheet, one end of which is bent at right angles and soldered to the inside of the cover U. The free end is screwed to the L-shaped piece Z and also soldered to the inside of the brass cylinder, with a rubber washer X in between. The difficulty of tapping the piece Z can be avoided by soldering a nut Y on its inside as shown in Fig. 5. The vibrating reed being of brass cannot be actuated by the magnets, and a piece of soft iron I (a diaphragm of the phone will serve for the purpose) of the shape shown in Fig. 6 is cut and fixed on the inside of the reed by turning its edges over. Finally, a length of 6 B.A. rod is soldered in the middle of the reed along with a nut to strengthen the soldered joint.

Further constructional details are provided by the photographs and diagrams.

The receiver described was made for a pleated-paper loud-speaker (12 in. in diameter), the construction of which has already been dealt with in the previous issues of AMATEUR WIRELESS. Photographs of the loud-speaker are given to show the method of mounting the diaphragm and the receiver. The base of the loud-speaker, as will be seen from the photographs, consists of an ordinary wooden block 3 in. by 6 in., used in electrical installations, and the vertical wooden piece, which is 1⅛ in. thick, is drilled along its length. Through this hole pass the wires which connect the terminals on the board with the receiver.

Tension on Diaphragm

It was noticed that the tension on the paper diaphragm has a considerable effect on the tone and the quality of the music. This necessitated the use of an arrangement for altering the length of the rod pressing against the diaphragm. The arrangement consists of a small piece of brass tube K (Fig. 6) soldered to a nut L on one end, and the other end completely closed by soldering a short length of brass rod H pointed at the end. This tube is screwed on the end of the rod Q and can be kept in any position by a lock-nut O, thus regulating the length of the rod Q.

In conclusion, it might be added that this loud-speaker, though not quite as loud as the horn-type, gives a faithful reproduction free from all distortion.

M. J. C.

A WANDERER RETURNS

I HAVE just resumed my interest in wireless after the lapse of over a year. My set, together with the inevitable assortment of spare coils, condensers, etc., had been reposing in a damp cellar, whence a fresh wave of enthusiasm has rescued them in a pitiable state of mouldiness and neglect. My accumulator, which is used for various other purposes, had not, fortunately, shared the general neglect, and having purchased a new set of H.T. batteries, I reassembled, in all their damp and mouldiness, the various components of my set. It was amazingly heartening to get an instantaneous response—not from Radio-Paris, for which I was trying, but from Chelmsford, a station that has come into being since my desertion from the science.

Then I slipped gently from all my old friends and, this journal beside me, sought for new stations.

I was at once made forcibly to realise the almost incredible advance that has been made in transmission, and, after the inspection and comparison of various receiving sets, I have been forced to the conclusion that transmission has made far greater strides than reception. Wireless enthusiasts, except those living under the shadow of a broadcasting station and using crystal sets, are still harassed by the bugbear of unreliable and unstable H.T. batteries. Valves, even the best and most expensive of them, are still fragile things. However, I derived enormous comfort from the fact that my own set, which employs a crystal detector and a reflex circuit, had treated the dampest of years in the dampest of places with the utmost contempt, and functioned as admirably as ever; nor do I find it in the least inferior to that of my neighbour, although his is a beautiful instrument of renowned make and almost irritating newness.

From all this I infer that, in general, our receiving sets have improved not of their or our volition, but almost inevitably by the astonishing progress that has been made in transmission. WALTER MEADE.

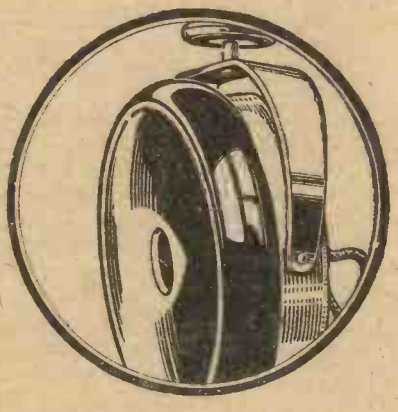
One rheostat may be used on a two-valve amplifier.

A long aerial is desirable, but good results are sometimes obtained on a short one.

Don't forget to clean off the flux after soldering.

If you use a loud-speaker that needs an accumulator, be sure and shut the current off when you have finished listening-in.

All Brandes products carry our official money-back guarantee, enabling you to return them within 10 days if dissatisfied. This really means a free trial.



The ebonite cap of the earpiece is screwed on by special apparatus to a marked degree of tightness. It is almost impossible to unscrew it without a wrench. This means more accurate clearance distance between the diaphragm and the faces of the pole pieces and guards against distortion. But what is more important, it defeats any casual attempt to unscrew the caps, which, once done, destroys the *Matched Tone* adjustment.

British Manufacture (B.B.C. stamped.)

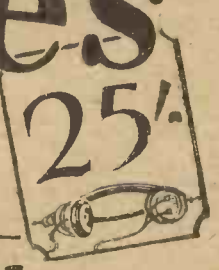
When we assemble the *Matched Tone* Headphones we select, by means of special apparatus, two earpieces whose electrical properties closely agree. One by one the earpieces are tested by vibrating the diaphragm of a fixed telephone receiver with an oscillating current. The vibration is transmitted by a closed column of air to the diaphragm of the one on test, which is adjusted immediately beneath the permanently fixed example. It then vibrates in sympathy, thus causing a current to flow through the bobbins. The volume of the current is indicated on the dial of the testing apparatus, and any two 'phones which closely agree are matched and are assembled in one headphone—hence *Matched Tone*. This means greater purity, strength and sensitivity. Obviously, the joint energies of both earpieces in perfect unison means redoubled effectiveness in all these three qualities.

Ask your Dealer for Brandes.

The *Table Talker* is another Brandes quality product at moderate price. Its full round tones are wonderfully clear and pleasing. The horn is matched to the unit so that the air resistance produced will exactly balance the mechanical power of the diaphragm. This means beautiful sound-balance. Gracefully simple of line, it is finished a shade of neutral brown. **42/-**

Brandes

The Name to know in Radio

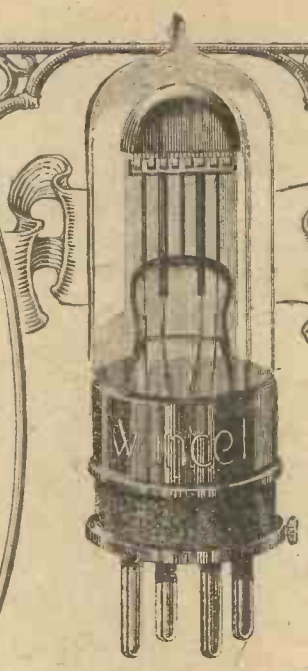


Superior Matched Tone Headphones

TRADE MARK

Cossor
Bright Emitter

Edouard Branly



Wuncell
Dull Emitter

Iron filings put to a new use!

JUST over thirty years ago that grand old man of Science, Edward Branly, invented one of the first detectors ever used for wireless. In those days, of course, wireless was little more than an inventor's dream, the very greatest distance that signals had ever been transmitted without the aid of wires was only a few yards. With Branly's iron filings detector—afterwards called the coherer—a new era dawned.

A few years later, as we all know, signals were successfully transmitted—to the wonderment of the whole world—from Cornwall to Newfoundland—and received on the coherer. Surely one of the most remarkable uses for iron filings ever discovered.

It is a big step forward from Branly's coherer to Dr. Lee Forest's three electrode valve—and from the first valve to the latest Cossor Wuncell Dull Emitter is also another big step forward. Instead of a valve having a filament consumption of nearly ¾ of an amp. and operation at 4 volts there is now available in the Wuncell a valve that functions at its best when its filament glow is almost invisible.

So small is its filament consumption, in fact, that a very small portable 2-volt accumulator will run the average 2-valve set more than a fortnight without re-charging. And the cost of a re-charge is only a few coppers.

But low operating cost is only one of the many exclusive Wuncell advantages. In volume, sensitiveness, long life, freedom from microphonic noises it is fully the equal of Cossor Bright Emitter Valves. No greater tribute than this could be paid. Before you select your Dull Emitter Valves, get one of our large illustrated Folders describing the Wuncell from your Dealer free of charge, or send us a postcard for one.

All Cossor Valves reduced in Price.

Cossor Valves

Advertisement of A. C. Cossor Ltd., Highbury Grove, N.5.

Gilbert Ad. 2217

On Your Wavelength!

Why Bother with H.T. Batteries

I'M not going to describe in these columns a new circuit for the elimination of H.T. batteries. There are more ways of killing a cat than by drowning it, and similarly there are more ways of enticing electrons on to the plate of the valve than by buying expensive and troublesome dry batteries for the plate current supply. I suppose that for every reader who lives in a house without an electrical supply installation there are two or three who have such a service, and it is up to them to see that they avail themselves of the supply for their valve H.T. It's quite a simple matter to rig up the gear, and the first cost is only slightly in excess of the cost of a 60-volt unit. The Neon tube method, of which I speak, with its two attendant chokes and fixed condensers is also interesting from the experimenter's point of view, for the flashes of the tube when in operation on a multi-valve set perform amusing antics, as, for instance, when C.W. signals are being received they can literally be sight read by the flashes! If the amateur has any qualms about meddling with the mains, I think that he will find that his local electrical contractor will fit him up with the required gear at a very moderate sum.

Every Amateur a Transmitter

If anything adds to one's interest in wireless it is the fact that one understands what is taking place at the transmitting end. In order to fully understand transmission every serious amateur should be the proud possessor of a transmitting licence, and there is no reason why he should not have one. Of course I'm not referring to the full open aerial licence which is used by the "pukkah" trans-oceanic enthusiast, but to the dummy or artificial aerial licence which carries with it a call sign and the Postmaster-General's authority to carry out laboratory experiments on transmitting gear. One feature of the licence which is particularly attractive is the fact that it costs nothing to obtain and is about the only thing in wireless which can be obtained free of charge. As regards limitations, your set must not radiate beyond your own premises and you must not call another station, but nevertheless it is a transmitting licence and your knowledge of things pertaining to wireless will be considerably enhanced.

Possibilities

Think of your own self-satisfaction when Brown, Smith, Green or any other of the "pukkah" transmitting fraternity are discoursing on the merits of oscillators and modulators with a superior air, and you are able to follow their remarks intelligently and possibly trip them up if you feel so inclined. This perhaps sounds rather too optimistic, but transmission on a dummy aerial so nearly approaches to the real thing and under such convenient conditions that one can often learn far more with such an aerial than can many of the 10-watters who so regularly disturb the ether with their heart-breaking attempts at a little private broadcasting.

An Incentive to Learn

Another possibility is that when once you own such a licence it is an incentive to learn more and more about the science, and even that dry-as-dust requirement of the Postmaster-General's "inquisition form"—umpteen words of morse code per minute—can be tackled with a good heart. This all means that after a few months of dummy-aerial transmission you may easily qualify for the full licence if you wish to, and who knows but what you will in due course become one of the élite who has "been across" the Herring Pond.

Having said this much I expect that I shall now get into trouble with some of the "hams" of whom I have spoken with such gross irreverence. Possibly they do not now recollect the time when they first dabbled with an R transmitter valve and a doubtful 100-volt dry H.T. or, worse still, a 4-volt accumulator and a couple of brass bedstead knobs to form a spark gap. Of course they have their own aspect of "every amateur a transmitter" to consider, and they are none too keen on the ether being any more crowded than it already is. I appreciate their outlook, but a little fresh blood will do no harm. There is still plenty of room for research.

The Transmitting Movement

Furthermore, the transmitting movement requires strengthening; for every ten thousand broadcast listeners there is only one amateur transmitter, and until the strength of the amateur experimenter is felt in official quarters his lot is not likely to be an easy one. It is true that his fine work has caused those who would rather have treated him as a boy with a none too serious hobby to "sit up and take notice," but this of itself is not likely to induce the powers that be to deal leniently with the experimenter in any contemplated alteration to existing rules and regulations.

It is ridiculous, but a fact, that many scientifically qualified men have been debarred from experimenting on an open aerial solely because the P.M.G. was not satisfied that they had any useful experiments in view, or that their morse qualifications were in keeping with the official idea of a wireless telegraphy operator. At the other extreme is the spectacle of unqualified minors who, by reason of being in the position to do morse working and enumerate a sufficiently impressive programme, have managed to obtain a full licence.

Obtaining a full transmitting licence has become dependent on the applicant's ability to "tell the tale," coupled with his nimbleness of finger, for it must be admitted that most great inventions have been the result of accident. To think that an applicant can sit down and deliberately write that which he hopes to discover is asking a little too much, and before this state of affairs can be remedied the strength of the amateur must increase so that "pulling weight" might be felt in any future legislation affecting his interests.

Cheaper Valves

Writing in the New Year Number of AMATEUR WIRELESS I predicted that during the year we should see very substantial reductions in the prices of valves. Within the past few days announcements have appeared that prices have been lowered all round, and I am very glad to see that makers have taken this step. The valve is, of course, a much more difficult piece of apparatus to make than the electric-light bulb, but I think that on the whole valves have been too dear, and I am hoping that we shall see another substantial reduction before the year is out. When you come to think of it, those turned out by the French and the Dutch are not too bad—for rectification purposes there is nothing to beat a Dutchman—and their prices are very low. In the case of French valves, the smallness of their price is due probably to some extent to the fact that the franc stands now at only a fraction of its pre-war value; this argument cannot be urged in the case of Dutch valves, for the rate of exchange between Holland and this country has long been slightly against us.

One reason why I welcome the reduction in valve prices is that it brings the super-heterodyne set more within the range of the average wireless enthusiast. Bright-emitters can hardly be used owing to the enormous amount of current consumed by their filaments—ten standard bright-emitters would take about 7 amperes. With valves of the "06" type we can bring the total current used down to .6 ampere, whilst 3 amperes will supply the needs of ten dull-emitters of the 2-volt type.

From Across the Herring Pond

Conditions for the reception of American stations have been much better of late.

On Your Wavelength! (continued)

This is put down in some quarters to improvements made at Northolt, but whether Northolt has anything to do with it or not I am not prepared to say. The other night, having adjusted my set to Bournemouth, I switched off at closing-down time and switched on again just before going to bed. There was WGY, as large as life, and WBZ was coming in so well that it was possible to find him with the set so far from the oscillating point that no trace of his carrier wave was to be heard as the condenser knobs were moved. In neither case was signal strength so great as I have known it on especially good nights, but there was almost a complete absence of atmospheric interference and items from programmes could be heard to perfection. Friends living in and around London tell me that they can generally get both of these stations just now whenever they try for them.

More About the Eclipse

It has been quite definitely established that KDKA's short-wave transmission during the eclipse was picked up in England by at least two listeners. Capt. West, of the B.B.C., whose Transatlantic work is well known to all "fans'" was one of the two successful, though even he, apparently, found considerable difficulty in solving the carrier of this station. It is a curious question why, during the daytime, WGY on her normal wave-band should have been so much more easy to receive than KDKA on the short wave, the more especially when we consider the accepted theory that short-wave transmissions travel farther with given input than the longer waves do. But this is quite in keeping with recent experience, which has shown WGY and WBZ at much better volume than the short-wave station even during the normal broadcast hours.

It really does seem as though wireless has made up its mind to confound every theory immediately it is really established, for ever since we came to the conclusion that short-wave work gave better results over distance the reverse has been the case in fact.

A German station is to attempt the re-broadcast of KDKA. Whether the experiment will be a success cannot so far be gauged. Personally I am inclined to think that listeners in England will get better reception direct than via the intermediate transmitter at Stuttgart. Another Canadian station is trying to get over to England. Truly Transatlantic wireless is booming. This station, which is working on 313 metres, should be heard here, I think, unless, as sometimes does happen, a backwash harmonic of Northolt blots it out. However, 313 metres stands a much better chance of getting over than the wavelength used by the Montreal station during the special tests conducted from there.

Whether this latter station has ever really been heard in England is a moot point, though I believe reports of its reception have come in at various times. Possibly when there is no intereference from Northolt—which, by the way, has been the case more often lately than the average listener is used to—the Montreal station would be heard, though personally I have never been fortunate enough to strike during my testing a time when this fortunate state of affairs existed.

To Super or Not to Super

I will deal with a question that I have been asked recently by dozens of wireless friends: Is the super-heterodyne really a good thing? I need hardly say that the answer to this question is the one which must be returned to the majority of wireless posers—yes and no. Let us deal with the "Yes" part first of all. If well built and properly handled the super-heterodyne will give you a degree of selectivity which is absolutely unobtainable with any other kind of set. That is a very strong point in its favour, especially if you live in a place where interference is particularly bad.

Next the range of the super-heterodyne is limited only by the amount of atmospheric interference that is encountered. This means that you can pick up practically any signal that is going so long as its strength is great enough to enable it to be heard above the crackles and fizzes. But it must not be forgotten that if the range of the super-heterodyne is practically unlimited so far as signals are concerned, the same is equally true of atmospherics. Thus, except when conditions are phenomenally good, it cannot be operated in conjunction with the outdoor aerial. Another point in favour of the super is the fewness of its controls. A nine- or ten-valve set can be built upon whose panels appear only two condenser knobs, one for the aerial and one for the oscillator valve.

On the "No" side we have two very strong drawbacks. The first is that owing to its sensitiveness and to the fact that it brings in atmospherics which would be inaudible in the ordinary way the set is apt to be very noisy. I have never yet known anything like a background of silence with a super. The second is that unless it is very carefully handled it is liable to cause a good deal of interference.

The Power of the Plebiscite

"Vox populi vox aetherii" should really be the motto of the B.B.C., or, in other words, "Give the public what it asks for." Anyhow, Manchester is going to adopt this solution, for so many requests for favourite pieces have been received that one evening is going to be devoted entirely to the listeners' own choice of works, commencing to-night, and as the programme includes "by request" such works as the Finale from Mendelssohn's Italian Symphony, as well as the Overture to Balfe's *Bohemian Girl*, it looks as if the public knows its own business.

On the more serious side, 2ZY starts to-morrow with that long-promised organ recital at the town hall by Dr. Kendrick Pyne. He is giving the programme postponed from December, and I note that it includes Widor's Organ Symphony in F minor. The outstanding feature of this is a Toccata, which when heard with the orchestra as well as organ gives the impression of mighty wheels going round; one could almost liken it to a musical version of a pyrotechnic display.

The English Element

Some of the best of the programmes recently, I am glad to note, have had a thoroughly native element, despite the symphony concert at the Opera House last night, when Bruno Walter was the conductor and Wilhelm Rode was announced as vocalist. Personally I fail to see why we should revel in German art while we have the Halle Orchestra conductor, Mr. Hamilton Harty, Goossens, Landon Ronald, Dr. Adrian Boult and others.

THERMION.

WINDING HEXAGONAL COILS

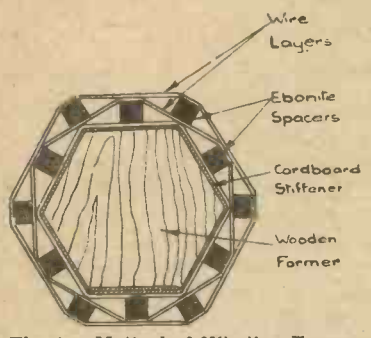


Fig. 1.—Method of Winding Former.

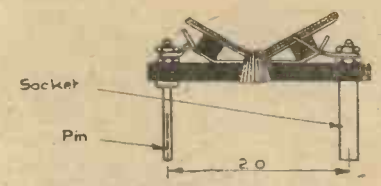


Fig. 2.—Method of Mounting Coil.

THE coil about to be described may be said to have some advantages over the duolateral coil. It is simpler to make, no elaborate former is necessary, and as no shellac or wax is used its self-capacity is a minimum.

A simple former is required. This consists of a hexagonal block 1 in. thick with 1 in. sides. This can be made from wood.

A strip of thin cardboard preferably of a fine hard texture ¾ in. wide and about 7½ in. in length is bent round the former. It is overlapped the length of one side and Seccotined, with the end of the wire to be used between the overlap.

A layer of the wire is wound tightly on the cardboard. Six ebonite spacers are now required. These should each be ¾ in. long by ¼ in. square; they are held on the centre of the coil's sides by a rubber band. Another layer is now wound on over the spacers. After a sufficient number of turns to hold the spacers have been wound on, the rubber band can be removed. This process is continued until the required number of turns has been reached.

The following table shows the gauge of wire required for different wavelengths and the number of turns per layer.

No. of Turns	*S.W.G.*	*Turns per Layer*
12	18	6*
18	18	6*
25	18	6*
30	18	10
35	22	18
40	22	18
50	22	18
60	22	18
75	26	25
100	26	25

* Turns air-spaced.

The wire in all cases should be double-cotton-covered.

Care should be taken to see that the layers are all wound in the same direction.

When the finished coil is slipped from the former it will be found to be very rigid if care has been taken to wind the wire on tightly.

A slight modification must be made for coils for the higher frequencies. Six equally-spaced grooves are filed on the corners of the cardboard stiffener and on one side of the spacers. The wire when wound into these grooves will have an air space of about one diameter between the turns.

Note should be made of the fact that when more than four layers are required the third and subsequent sets of spacers should be made with slightly increasing thicknesses.

The coils can be conveniently mounted on the standard plug and socket.

If the self-capacity is to be at a minimum, special mountings should be made.

The mountings can be made quite easily from a piece of ebonite 2½ in. long by ¾ in. wide. An ordinary valve pin and socket tapped into the ebonite are used. The coil can be bound to the mounting by thread or empire tape, or attached by a strip of fibre passed over the coil and fixed to the pin and socket by nuts.

If the coil is of such a size that it fouls the pin and socket, a packing block of ¼-in. ebonite 1½ in. long by ¾ in. wide should be inserted between the coil and the mounting.

B. H.

WIRELESS FOR SHIPS' LIFEBOATS

TWO of the motor-driven lifeboats of the R.M.S. *Orbita*, which have been built by Messrs. Harland and Wolff, Ltd., of Liverpool, have been equipped with the latest type of Marconi wireless apparatus.

The photograph shows one of these lifeboats on her trials at Liverpool.

The installation comprises a transmitter and a receiver which embodies a direction finder. The transmitting range is, under normal conditions, at least sixty nautical miles when the receiving station is using a crystal detector; very much greater ranges can be obtained when a valve receiver is employed.

The transmitter, which is of the quenched spark type, is supplied with power by a generator driven by a petrol engine, which can be run continuously for nine hours.

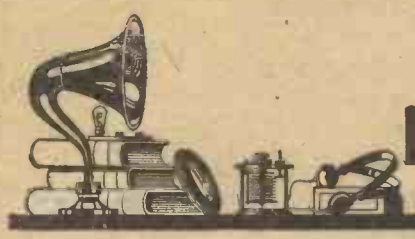
The receiver, with which dull-emitter valves are used, can be employed for "all-round" reception or, by a simple adjustment, for direction finding. For the latter important service the small rectangular frame aerial mounted near the bow of the boat is used in conjunction with the main aerial.

Marconi Installation on a Ship's Lifeboat.

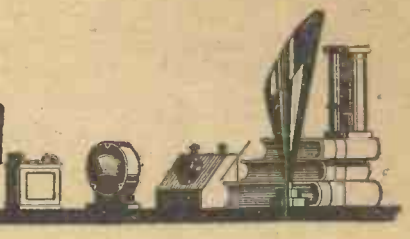
Station C N R, Moncton, Canada, transmitted a special programme for the benefit of British listeners on February 3.

On three recent occasions the broadcasting from 2 L O has been heard in British North Borneo, about 10,000 miles away.

An additional direct-wireless telegraph service to New York has been opened by the Marconi Wireless Co., and messages can now be sent at the rate of 200 words a minute.



OUR INFORMATION BUREAU

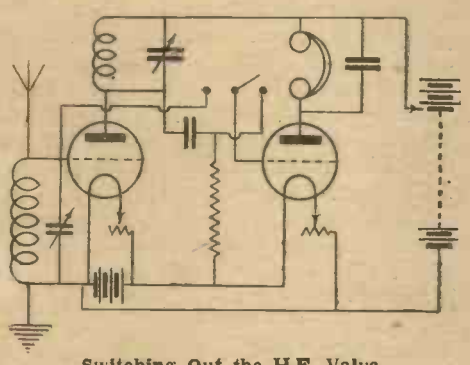


RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, lay-outs, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 288).

Switching in H.F. Circuits

Q.—What is the simplest method of switching out the high-frequency stage in a set employing 1 H.F. and detector?—H. S. (S.W.17).

A.—We do not recommend switching in high-frequency amplifiers, but where it is



Switching Out the H.F. Valve.

essential to dispense with the high-frequency amplifier the connections shown in the accompanying diagram may be employed.—U.

Wireless Waves

Q.—How fast does a wireless wave travel?—L. C. (E.9).

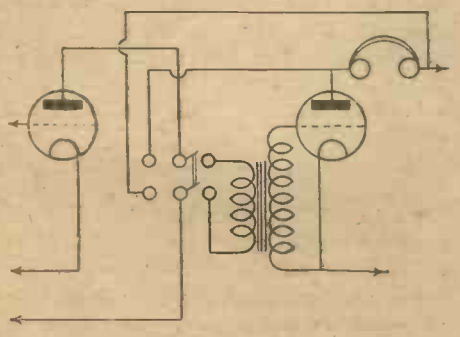
A.—186,000 miles a second. This speed never varies, and is identical with that of light and radiant heat.—U.

Switching Out the L.F. Stage

Q.—Please give a circuit diagram showing a method of switching out the last valve on a 3-valve set (H.F., D. and L.F.), using a double-pole double-throw switch.—A. W. (Rye).

A.—The connections are shown for a switch to cut out the low-frequency amplifier.

A double-pole double-throw switch is



L.F. Switching.

employed for switching, and there is no need to employ a special anti-capacity switch for the purpose.

When placed to the left the L.F. valve is cut out, and when placed to the right the amplifier is introduced.—U.

Weather and Wireless

Q.—Does weather affect wireless?—D. G. (Wimbledon).

A.—Not very much. Thundery weather may cause atmospherics, but fog, rain, frost or snow make no particular difference to wireless signalling.

Aerial insulators are apt to leak in damp weather and loss of signal strength is often noticed during wet periods for this reason.—U.

Capacity Effects

Q.—How can one avoid hand-capacity effect?—S. D. (Reading).

A.—We suggest you fit an extension handle to the tuning condenser. You will find that adjustments of filament current and anode potential are necessary before good results are obtainable.—U.

The Lightning Arrester

Q.—What is a lightning arrester?—H. O. Manchester.

A.—As applied to wireless, a lightning arrester is essentially a minute gap between the foot of the down-lead and the earth-lead.

The theory is that high-tension currents, such as those due to lightning discharges, or even the "return currents" from earth due to a near-by cloud inducing a charge in an aerial, will jump across the small gap rather than traverse the highly inductive winding of the receiving set which is connected to opposite sides of the gap.

The received currents, on the other hand, are too feeble to jump the gap and must of necessity traverse the receiving apparatus.—U.

Aerial Gauge and Signal Strength

Q.—Does the gauge of wire used for an aerial affect the strength of signals received?—A. F. (Birmingham).

A.—There is absolutely nothing to be gained by using wire thicker than No. 22 S.W.G., 0.028 in. in diameter. With a crystal set as the receiver no appreciable difference in signal strength will be noticed when No. 37 S.W.G. wire or silicon bronze aerial wire is used. Mechanical strength of the wire will, however, have to be remembered when erecting serials.—K

Two Leads from One Aerial

Q.—Will the efficiency of an aerial be reduced if a lead-in is taken from each end?—T. C. (London).

A.—No attempt should be made to attach two receivers to the same aerial. The aerial may, however, be broken in the centre if desired, and a "lead-in" taken from each end.—U.

Impedance

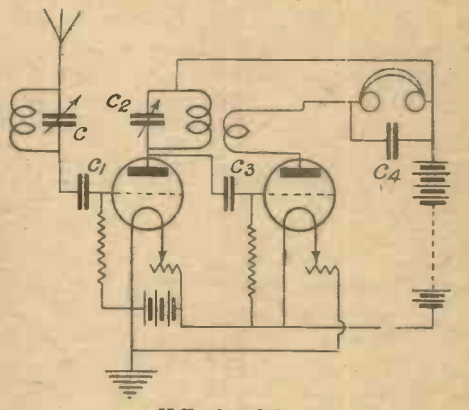
Q.—What exactly is meant by impedance?—W. P. (Barnet).

A.—The property which a wire possesses of offering apparent obstruction to the passage of an alternating current. Simply explained it may be stated thus: Inductance offers obstruction to the passage of a direct current, but is almost immediately overcome, and then the current flows.

With alternating current, changing direction at high speed, the obstruction is not overcome before the current changes its direction, and is again obstructed, the result being that it never gets through.—U.

Short Wave Sets

Q.—Please give a circuit, employing 1 H.F. and detector suitable for long-distance work on short wavelengths (in the range of 100 to 200 metres). Please give values of condensers.—H. M. (Hereford).

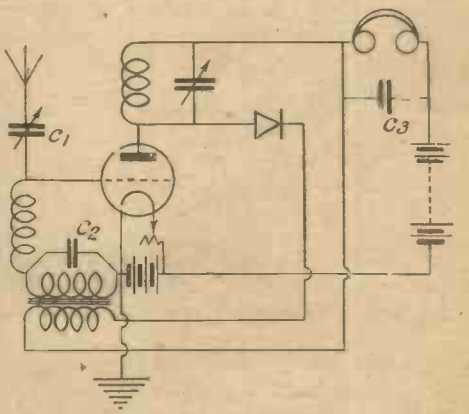


H.F. Amplifier.

A.—High-frequency amplification on these short wavelengths is exceedingly difficult, but the circuit shown in the accompanying figure may be used with every chance of success. C is the ordinary A.T.C. having a value of .0003 microfarad. C_1 and C_3 are grid condensers, value .0003 microfarad. C_2 the anode T.C. may have a value of .0002 microfarad. C_4 is the highly desirable phone condenser that enables high-frequency pulsations in the plate circuit to pass direct to earth. A suitable value is .001 microfarad.—U.

A Single Valve Dual Circuit

Q.—What are the connections for a single-valve dual set, employing a crystal detector and a low-frequency amplifier?—I. S. (Hammersmith.



One-valve Reflex Circuit.

A.—The necessary connections for a single valve reflex receiver are shown in the accompanying figure. The condenser C_2 should have a value of about .0003 microfarad and is for the purpose of by-passing the aerial current direct to earth.—U.

THE TRUTH ABOUT AMPLIFICATION

ALTHOUGH to-day the general public is much more well informed on wireless matters than it was a couple of years ago, a great deal of uncertainty seems to exist in the minds of amateur constructors as to exactly how much actual amplification can reasonably be expected from a given combination of valves.

Vague Ideas

It is safe to say that until comparatively recently even experts had very vague ideas on this subject. Only the other day the writer picked up a book written a few years ago by a now famous author, who, referring to a set comprising two stages of high-frequency amplification, a valve detector and two low-frequency stages, assumed that as each valve could be expected to increase signal strength at least five times, a total amplification of 5^5, or 3,125 times, would be given by the set. And the H.F. valves were coupled by aperiodic transformers!

Although nowadays few people are optimistic enough to expect such enormous amplification from any "straight" circuit, still most amateur constructors seem to have a very hazy idea as to what amount of amplification really is obtainable, and it is the purpose of this article to attempt to clear away some of this vague uncertainty on a very vital subject.

Most of those who have had experience with multi-valve sets will have found that much louder signals can be obtained by using low-frequency amplification than by using the same number of stages before the rectifier. It is now generally agreed that high-frequency amplification, by present-day methods, is of no use at all on short wavelengths (below about 200 metres), while several authorities have expressed a doubt as to whether it is of any real use even on the broadcast band, and one or two have even gone a step further and stated definitely that it is not.

Exaggerated Statements

These latter, in the writer's opinion, have gone too far, and their conclusions do not agree with his own experience. It can be confidently stated that on the broadcast wavelengths, using one stage of H.F. amplification before the rectifier, in a set very carefully designed to reduce capacity losses to a minimum, a voltage amplification of twice is possible, but is seldom obtained by the home constructor. The amplification given by a second H.F. stage may be as high as 1.5, but not more, while it is practically impossible to obtain any useful amplification at all from a third H.F. stage.

In view of its low efficiency, H.F. amplification may be considered to be of doubtful utility on the broadcast wavelengths (except in certain special cases) and not worth the extra tuning complications, the L.T. and H.T. consumed, and the cost of the extra valves. However, it should be pointed out in this connection that, owing to the peculiar shape of the rectification curve, the efficiency of the detector increases with an increase in the amplitude of the H.F. oscillations applied to it, and thus the slight increase of signal strength due to the use of one or two high-frequency stages may be of more use than is at first sight apparent.

L.F. Amplification

Coming now to the question of low-frequency amplification, we find that the operating conditions are vastly different from those obtaining on the other side of the rectifier. We are now able to make use of step-up transformers to increase the voltages applied to the grids of the valves (which was not practicable when dealing with H.F. currents owing to the necessity of tuning both the plate and grid circuits to approximately the same wavelength as the incoming signals); also the existence of capacity between leads and components is of much less importance when dealing with low-frequency currents.

The amount of "step-up" that can be obtained by the use of transformers is, however, strictly limited, as in order to obtain good reproduction it is necessary to make the impedance of each transformer winding approximately equal to the impedance of the rest of the circuit in

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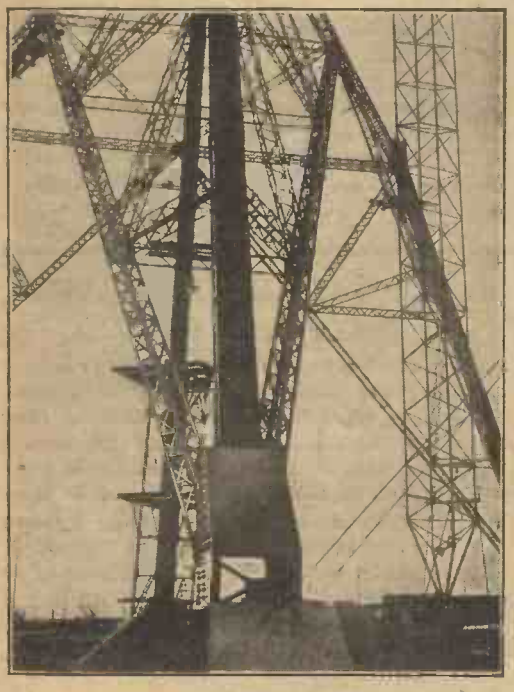
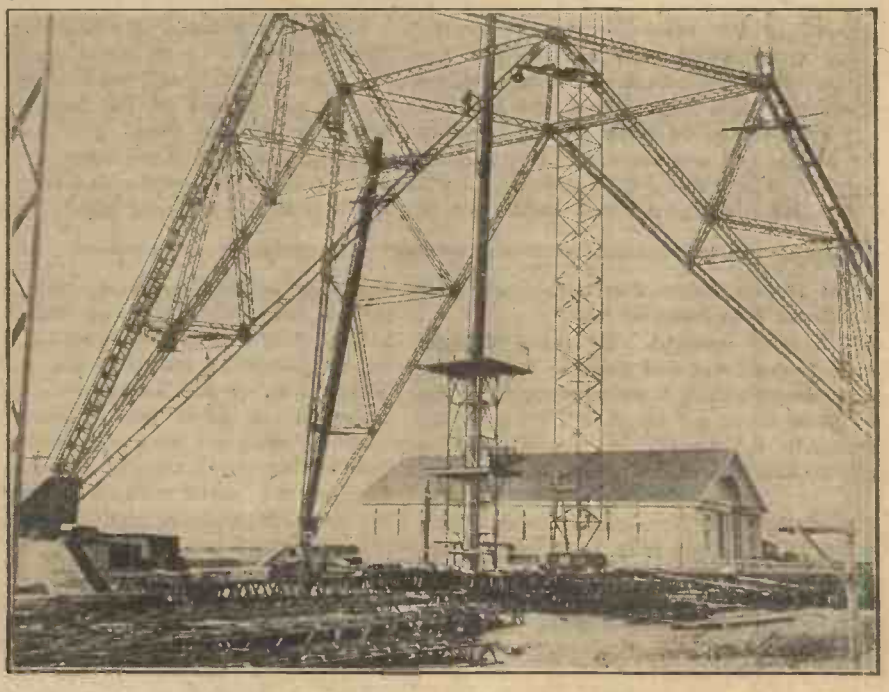




BUILDING THE LARGEST WIRELESS STATION IN THE WORLD

At Königswusterhausen, Germany, the largest wireless station in the world is now being erected. The photographs show the base of the great tower, which is to be 225 metres high, in course of erection and one of the transmitting houses.

AN EXTENSIBLE UNIT SET.—VI

THE REACTION UNIT

THE constructor, if he is a comparative beginner, will by now have gained enough practical experience in working the set to enable him to employ reaction. Properly-used reaction can considerably increase the sensitiveness, which is the distance-range of a receiver. Abused, it will cause interference with the reception of broadcast by sets in the neighbourhood.

The parts for the reaction unit are shown in Fig. 28a (p. 225). They are: Two 9-in. lengths of rubber-covered flex; one condenser extension handle; one coil holder; one coil-holder plug; 1½-in. 4 B.A. screwed rod.

Fig 39.—View of Set showing Connections on Panel.

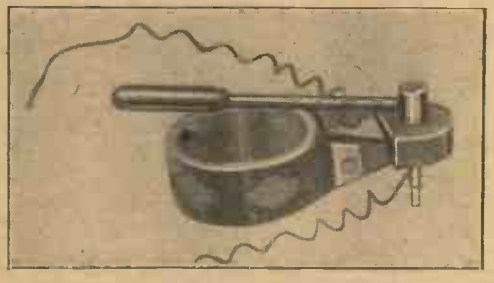


Fig 37.—Reactance Unit Complete.

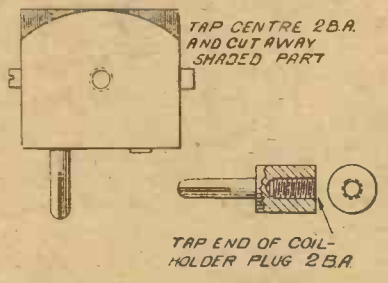


Fig. 36.—Details of Reaction Coil Mount.

Fig. 38.—Top View of Set showing Reactance Unit.

Fig. 36 shows each part with the necessary machining and drilling indicated. To assemble the unit the screwed rod is secured in the extension handle by the fixing screw which is incorporated in the latter. It is important to ascertain when purchasing this handle that the junction has a set-screw, as some are tapped only for 2 B.A. rod and are secured by a binding nut, which will not be suitable in this case. Next screw the coil holder on to the rod until it binds rigidly against the extension handle collar; finally screw the coil-holder plug on tightly. In Fig. 37 this is made clear and the unit is shown completed.

There now remains only to drill a 2 B.A. clearance hole between the plug and socket of the aerial-tuning coil holder and another in the coil holder of the high-frequency unit. By inserting the plug of the reaction unit into either of these holes and attaching the flex leads to the two terminals at the top of the detector panel (discarding the bar which has hitherto joined these terminals) reaction may be applied to the aerial circuit or, particularly for broadcast, to the H.F. circuit. The adjustment of the reaction coil with relation to the other is quite smooth, and to change the reaction from one circuit to the other is only a matter of a moment. To test the unit it should be tried on each coil, and should it in either case produce no increase in signal strength as one coil is made to approach the other the leads of the fixed coil must be reversed. If reaction phenomena is absent in both cases, reversing the reaction coil leads will put matters right.

Fig. 38 is a photograph of the top of the set with reaction applied to the tuning coil of the aerial circuit. The socket in the H.F. coil can be seen.

Fig. 39 is a photograph of the complete set as so far described and including the reaction unit. The next unit which will be described is a simple and effective "wave trap."

DAVID GREY.

(*To be continued*)

"THE TRUTH ABOUT AMPLIFICATION" (*continued from preceding page*)

which it is inserted. By using a high-ratio transformer and suitable valves it is possible to obtain a voltage amplification of 30 or more per stage without affecting seriously the quality of reproduction; a more usual figure, however, is 15.

Resistance-capacity Amplification

So far we have only considered transformer-coupled L.F. amplifiers. When we make use of resistances and condensers or chokes and condensers between the valves we are, as when dealing with H.F. currents, unable to obtain any step-up in voltage between one valve and the next. However, as losses due to capacity and other causes are much less serious here than on the high-frequency side, we can obtain an actual voltage amplification more nearly approximating to the theoretical amplification factor of the valve. A common figure for the latter is 10 or 12, although at least one modern valve, specially designed for use in these circuits, has a theoretical amplification factor as high as 20! Thus with choke-capacity or resistance-capacity coupled L.F. amplifiers, using general-purpose valves, an actual voltage amplification of 8 to 10 times per stage may be expected.

J. F. JOHNSTON.

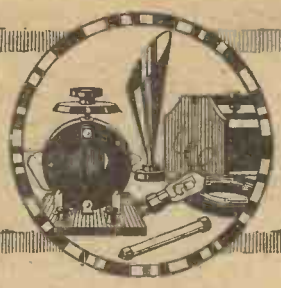
The French Government is seriously considering a proposal to convert the Bordeaux, Lyons and Tours high-power stations for the purposes of wireless telephonic transmissions.

BROADCASTING AND DEEP-SEA FISHING

IN Sweden reports are regularly broadcast by the Gothenburg (S A S B) wireless station on 700 metres, as well as from other coast transmitters, for the benefit of the smacks at sea. Information is given relative to the positions at which large shoals of fish have been located. Weather forecasts are also broadcast at regular intervals in order that the trawlers may be duly warned of approaching storms and movements of icebergs.

J. G. A.

Unable to applaud wireless items they enjoy, American listeners-in send printed cards which carry their views at postcard rate.



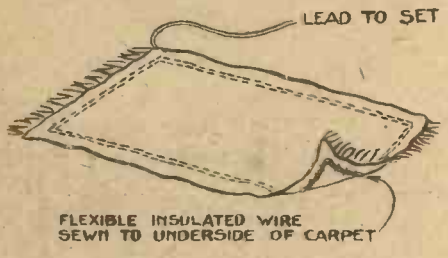
PRACTICAL ODDS AND ENDS

A Novel Indoor Aerial

THE illustration shows a convenient method of constructing an unobtrusive indoor aerial for use in the top rooms of a house situated near a broadcasting station.

The receiving set used should preferably contain at least one stage of H.F. amplification, particularly if the carpet to which the aerial wire is sewn is small.

An earth lead to some near-by water-



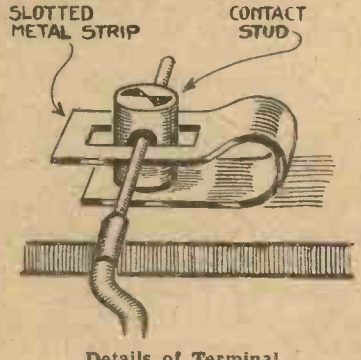
Wires Sown under Carpet.

pipe must, of course, be employed in conjunction with the "carpet" aerial.

R. N. W.

A Spring Terminal

THE following may be used in any position or for any purpose when quick detachability is required. The materials required are few, being single contact stud, nut and washer, and a short piece of springy sheet brass. Ordinary soft sheet may be brought to this condition by



Details of Terminal.

judicious hammering along its length. The sketch should be self-explanatory.

C. W.

Lead-in Wires

SERIOUS losses of aerial energy are liable to occur at the point where the leads of a multi-wire aerial meet owing to imperfect contact between the wires.

A good way of connecting them is to take a short length of annealed copper tube, hammer one end flat, and solder the aerial into the other end. The flat end can be drilled and held under a terminal on the end of the lead-in tube. K.

Soldering Aluminium

THERE are occasions when the constructor is up against the problem of soldering aluminium.

The job is not difficult when set about in the correct way and using one of the many specially prepared solders for that metal. The procedure is slightly different to that of soldering brass or copper in that no flux is used. Use a perfectly clean iron, and heat a little above the usual temperature. Make a little brush from a few pieces of thin brass wire.

After cleaning the parts, melt off the stick a "blob" of solder on to the place to be tinned with the iron. (Do not attempt to pick up the solder with the iron in the usual way.) Keep the iron on the outer edge of the blob and with the wire brush scratch the metal underneath *through* the blob of molten solder. This will break up the filter of oxide which will have formed between the solder and the metal and preventing them from uniting. "Humouring" the solder with the iron at the same time will result in the solder adhering and a job being made.

A fine nickel bit makes things easier, but with care and a little patience success can be obtained with a copper bit if the hints above are followed. C. W.

Indoor Earths

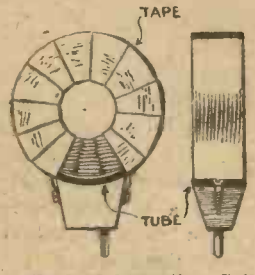
FREQUENTLY amateurs who are unable to erect outdoor aerials find it equally difficult to get a satisfactory earth connection.

Perhaps the simplest thing to use is an iron bedstead as a counterpoise earth. A large piece of copper or iron netting placed under the floor covering can also be used. U.

Honeycomb Coil Mounting

HONEYCOMB coils, unless rendered less efficient by impregnation with shellac, are liable to be crushed with constant use if the coil plugs fit at all tightly.

A novel method of mounting which will stand up to any ordinary wear and tear is shown in the diagram. A length of $\frac{3}{16}$-in. ebonite tube is required of 3 in. or $3\frac{1}{2}$ in. diameter. This is cut into rings of the thickness of the coils to be mounted. The rings are secured to the coil mounts by a screw, as shown in section. The coils can be held in position by binding with empire cloth or insulating tape. By varying the number of pins counted in winding, the gauge of wire and thickness of coils, an efficient set can be made all approxmating to the same diameter. A hole only slightly less than the diameter of the fixing screw must be drilled in the ebonite mount before assembling is attempted.

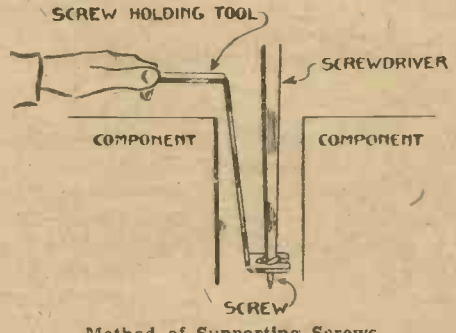


Method of Mounting Coil.

When cotton-covered wire is used it is advisable to bind with empire cloth first unless the coil is lightly impregnated with wax or shellac. When wax is used any surplus should be removed by rotating the coil about 9 in. above a gas-ring before removing the pins. S. E. N.

Screws in Awkward Places

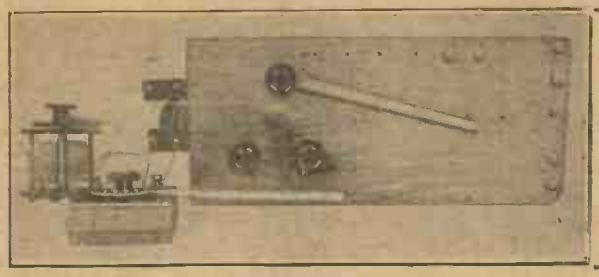
HOLDING a screw in an inaccessible position while the screwdriver is manipulated often proves somewhat of a problem. By constructing a simple tool



Method of Supporting Screws.

from a piece of strip brass or steel as shown in the illustration the screw may be held quite easily while the first few threads are engaged.

In making the holder it should be noted that a slot is cut in one end of a width great enough to pass the shank of the screw but not the head. In some cases a strip of cardboard or thick paper will serve the same purpose. N. W.



Front of Panel.

A RECEIVER FOR SH

CONSTRUCTIONAL NOTES ON A SIMP

NOW that so much transmission takes place on 50 to 120 metres, many amateurs wish they had a receiver which would work efficiently on that range. It is true that certain precautions must be taken when working on so low a wavelength, but, providing no grossly careless mistakes are made, there should be no real difficulty for anyone who has had some experience of valve sets in general.

The writer wished to build a receiver which would bring in American amateur and short-wave broadcasting stations as regularly and reliably as possible. The use of high-frequency amplification is not to be recommended to anyone who wishes to build a short-wave receiver with the minimum trouble and expense. It was decided, therefore, that for general purposes a detector and single L.F. amplifier should be used.

On nights when conditions are good it is possible to use a further stage of note magnification, but as a rule atmospherics are sufficiently bad to render the use of another amplifier objectionable.

The Detector Circuit

There being no radio-frequency amplification, it is obvious that the detector valve must work at its utmost efficiency. It is in the detector circuits that special precaution must be taken. Wiring up with No. 26 S.W.G. wire in systoflex may be all right in a note magnifier, but it is not suitable for very high-frequency circuits; the spacing of the wiring must be kept reasonably large.

The tuning coil requires careful designing. It is possible to receive signals with coils wound in the ordinary way on cardboard formers or in honeycomb form, but the results are very disappointing. The coil must be rigid and have a very low self-capacity and H.F. resistance.

Then there is the question of reaction. It will be found difficult to make the circuit oscillate nicely with the use of the ordinary feed-back coil. If it is at all periodic, fairly tight coupling will be required, and the change in wavelength of the circuit will be very large for small changes in coupling, making it difficult to tune in weak telephony. If a tuned-reaction coil is used the set will be found to burst into oscillation suddenly, and smooth control will be very difficult to obtain. A single-coil circuit was therefore tried. The finished receiver uses the Hartley circuit, such as is common in transmitters.

It will be seen from the circuit diagram that the plate is joined through a small condenser to one end of the coil and the grid condenser to the other. A lead is taken from the centre of the coil to the filament. The small variable condenser in the plate lead controls the oscillation of the valve, giving a fine adjustment of reaction with very little wavelength change for corresponding changes in reaction. The tuning condenser is put across the whole coil. It was originally intended to use an entirely aperiodic aerial coil, but after a certain amount of experiment it was discovered that a semi-tuned aerial circuit increased the signal strength in some cases by 100 per cent.

It will generally be found impossible to tune the aerial circuit exactly with the secondary because the detector valve stops oscillating unless a very high plate potential is applied. This is exceedingly bad practice, as the set virtually becomes a low-power transmitter and will cause interference for a considerable distance around. But it will be found that quite a large increase in signal strength will be gained by tuning the aerial circuit somewhere near that of the received signal.

The set was built with a view to reliability and efficiency, and hence little has been done to make it look attractive, as will be seen from the two photographs which give a general view of the receiver.

The front panel is of mahogany which had been used previously for other apparatus. If desired, an ebonite panel may of course be used.

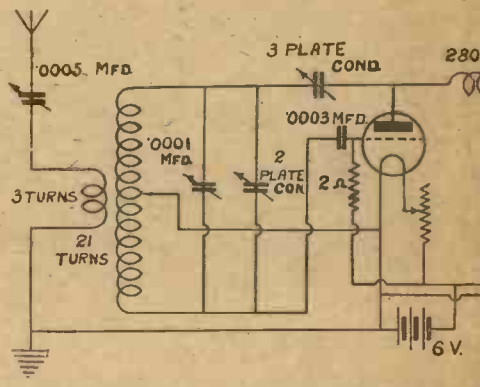
The panel is roughly 20 in. by 8 in. by ⅜ in., and is screwed to the edge of the baseboard, which is of varnished teak size 12 in. by 14 in. by ⅜ in.

Inductance Coils

The coils next merit attention. In the first place all insulation on the wire is dispensed with and bare tinned-copper wire is used. The gauge is also important. If this is too small the resistance will be too large. It must be remembered that at very high frequencies only the outside surface of the wire carries the current. The wire must therefore be of large cross-section. If, on the other hand, the wire is made very large, very wide spacing would be necessary to reduce the capacity of the coil. It has been found, after a lot of experiment, that No. 16 round tinned copper wire is the best for the purpose.

View of Receive

The next item which claims attention is the former. If any solid support is used



it will increase the capacity of the coil. An ultra efficient coil would be self-supporting. This has the disadvantage of being very sensitive to vibration, etc. Four thin strips of dry wood were used to support the turns. Here again ebonite could be used, but it would increase the capacity of the coil, the specific inductive capacity of ebonite being considerably larger than that of wood. Twenty-one holes, $\frac{3}{16}$

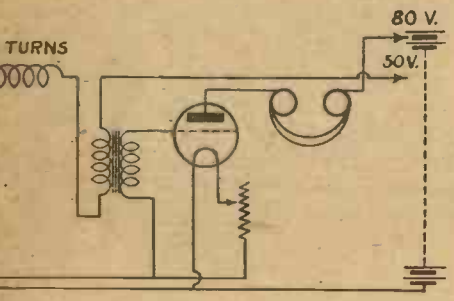
Back of

ORT WAVELENGTHS

LE SET FOR AMERICAN BROADCAST

r from above.

in. apart, are drilled in each strip, which are of cedar wood (cigar-box) about 5 in. long by ½ in. wide by ⅛ in. thick. The wire is then straightened by putting one end in the vice and twisting the other end round a tool handle and pulling hard. When the wire is quite straight, take a stout cardboard or wooden former, about 3 in. in diameter and about 6 in long, and attach one



Circuit Diagram.

end of the wire to it. Now wind on some twenty-four turns as tightly as possible and cut off the surplus wire. On releasing the wire the coil will spring out to a diameter of about 4 in. About half the first turn is now cut off and the four pieces of wood threaded on one after the other.

Panel.

When the wire has been put through the first hole it is threaded through the next until all the 21 turns are through.

A piece of wire is now soldered to the *middle* of the *middle* turn. This is important if the set is to work properly. A length of the same wire is then wound to form the aerial coil, which has three turns. The construction will be obvious from the third photograph. The size of this coil is made so that it just fits into the larger coil.

Condensers

The condenser which is connected in series with the aerial is of .0005 microfarad capacity and need not necessarily have an anti-capacity handle. This condenser can be seen in the photograph on the left. The other condenser in the box is of .0001 microfarad fitted with a long (10 in.) extension handle. It will be seen that this condenser is connected to a pair of terminals on a strip of ebonite on the left of the panel. These terminals are wired across the whole of the coil. The pair of terminals above are wired in parallel and are for the use of a two-plate vernier condenser.

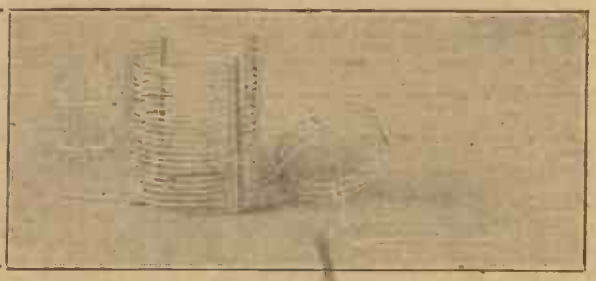
The anode stopping condenser has two moving plates and one fixed plate between them. It is mounted on the panel, and the extension handle can be seen in the photograph.

The valve holder used for the detector valve is also an important point. An ordinary A-type valve holder has far too large a capacity for use on short wavelengths.

Four extra short valve sockets are screwed on to a piece of ⅛ in. ebonite. A small hole is drilled lengthwise in the shank of the socket and the wire soldered in. As much metal as possible is filed away from between the legs to still further reduce the capacity.

A hole is drilled in each corner of the ebonite and four screws hold it down, sufficient condenser spacing washers being placed between the wood and the ebonite to prevent the wires touching the baseboard.

The grid condenser is of good quality with a capacity of .0003 microfarad. A grid leak is connected between grid and negative L.T. Clips are dispensed with, and the wires are soldered directly on to the brass ends of the leak to ensure reliable connection. A leak of 2 megohms is satisfactory, but it must be of good quality



The Inductance Coil.

or silent working will be absolutely impossible.

On referring to the circuit diagram it will be seen that an H.F. choke coil is connected in series with the primary of the L.F. transformer. This is essential in order that the H.F. oscillations may not by-pass through the H.T. circuit. The self-capacity of these coils must be low. In this case two are put in series. One has 160 and the other 120 turns. They are mounted on blocks of ebonite and well spaced.

The L.F. transformer can be of any good make. The whole L.F. amplifier is built on ordinary lines and contains no special features. It will be noticed that separate terminals are provided for positive H.T. for detector and amplifier.

Two Cossor P1 valves are used ordinarily and have given every satisfaction. About 50 volts are ample for the detector, while 80 volts may be used on the amplifier. The bottom end of the secondary of the transformer should be connected to the negative L.T. terminal, thus providing a potential difference across the filament rheostat for a slight grid bias.

Results

It will be seen from the diagram that the centre tapping of the coil is also joined to earth. This is not essential, but by being so any hand-capacity troubles are avoided when adjusting the filament current.

No condenser is necessary across the transformer or H.T. as there should be no H.F. current passing in this circuit.

The set has been in use for some little time on a temporary aerial consisting of 60 ft. of ordinary 7/22's bare wire with a 10-ft. lead-in. The aerial is about 25 ft. high at the lead-in end and 12 ft. high at the free end. The aerial is far from efficient, but K D K A can be heard any night at 11.20 p.m. and by midnight it is sufficiently strong to work a small loud-speaker directly off the set.

An improvement will probably be found in the use of a counterpoise. This should consist of four or five wires spaced about 2 ft. or 2 ft. 6 in. apart and fixed about 6 ft. above the ground parallel to the aerial. They should be perfectly insulated and as much care taken over them as the aerial itself.

H. A. C.

THE NEW 2LO TRANSMITTER

A PREVIOUS announcement of 2LO's forthcoming move from its present position at Marconi House has already been made, and details of the new transmitter are now available.

Two aerial masts of the lattice-steel type are being erected on the roof of a West End store, and will be about 125 ft. high. The building itself is about 100 ft. high, so it will be seen that an effective height of 225 ft. will be obtained.

The aerial itself is of the inverted L-cage type, only some 70 ft. long. The lead-in is, however, 220 ft. long. The aerial consists of two "sausages," spaced by a 15-ft. spreader, each "sausage" having five wires on 3-ft. 6-in. diameter hoops.

The transmitter will be housed in a hut which is being constructed on the roof of the building directly in line with the masts. This hut will contain the actual wireless transmitter. A second hut near the base of one of the masts contains the alternators and dynamos.

The input power of the transmitter will be 3 kilowatts to the anodes of the oscillators—that is, twice the power at present employed at London and other main stations. The set has been specially built, and it is in effect equivalent to two main station transmitters run in parallel.

The fact that the power of the London station is being doubled will, of course, *not* mean that its range will be doubled. It will, as a matter of fact, be increased by less than one and a half times, and its effective crystal range will probably be in the neighbourhood of 25 miles, assuming that it is at present 17 to 18 miles.

REDUCTION IN THE PRICE OF VALVES

The following are the ireductions in the prices of wireless valves which came into operation on Monday, February 2, 1925.

Name	*Type*	*Present Prices*	*Reduced Prices*
B.T.H.	R.	12/6	11/-
Cossor	P.1. & P.2.	12/6	11/-
Ediswan	A.R. & R.	12/6	11/-
Marconi Osram	R. R.5V.	12/6	11/-
Mullard	Ora. R. H.F. & L.F.	12/6	11/-
,,	Ora B.	13/-	11/6
B.T.H.	B.3.	21/-	18/-
Cossor	"Wuncell" W.1. & 2.	21/-	18/-
,, ,,	W.R.1. & 2.	23/6	20/-
Ediswan	A.R.D.E.	21/-	18/-
Marconi Osram	D.E.R.	21/-	18/-
Mullard	L.F. Ora D.3. L.F. D.3. H.F.	21/-	18/-
B.T.H.	B.5.	25/-	21/-
Cossor	"Wuncell" W.3.	25/-	22/6
,,	,, W.R.3.	27/6	25/-
Ediswan	A.R.06	25/-	21/-
Marconi Osram	D.E.3.	25/-	21/-
,, ,,	D.E.6.	25/-	22/6
Mullard	D.F. Ora. D.06 L.F. & H.F. Weco.	25/-	21/-
Western Electric	Wecovalve	25/-	21/-
B.T.H.	B.4. B.6.	35/-	30/-
Ediswan	P.V.5.D.E.	35/-	30/-
Marconi Osram	D.E.4.	30/-	26/-
,,	,, D.E.5. D.E.5.B.	35/-	30/-
Mullard	D.F.A.2. D.F.A.O.	30/-	26/-
,,	D.F.A.1. D.F.A.4.	35/-	30/-
B.T.H.	B.7.	37/6	32/-
Marconi Osram	L.S.5.	55/-	50/-
Mullard	D.F.A.3.	37/6	32/-

St. David's Day this year will be the occasion of an interesting innovation. The B.B.C. have now decided to broadcast the service which will be held at the King's Cross Tabernacle, London, on the evening of March 1 (St. David's Day).

The broadcasting of the Nottingham Council debates is the subject of a report by the General Purposes Committee which will be considered at the meeting of the Council to be held shortly.

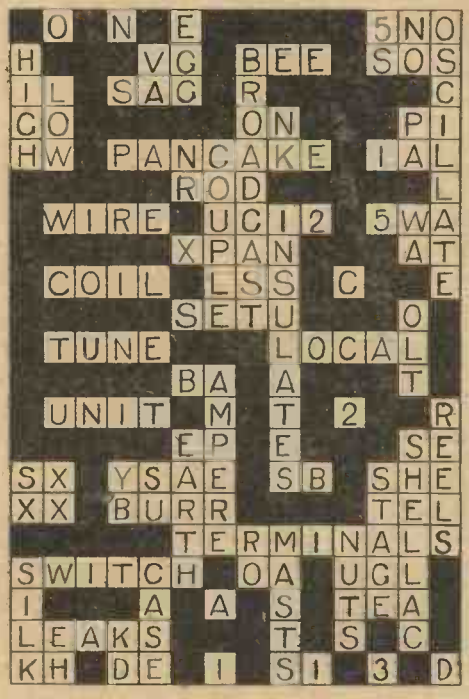
Radio-Paris has attempted successfully the relaying of programmes broadcast from 5XX at Chelmsford, England. These relayed concerts are of great interest to French amateurs who have not been able to pick up England directly.

Great success has attended the efforts of M. Robert Goldschmidt to establish wireless communication with the Belgian colony in the Congo.

Recent broadcasting from KDKA has been clearly heard at Sydney (about 8,000 miles away).

THE SOLUTION OF THE "A.W." CROSS-WORD CIRCUIT

(The puzzle was published in our last issue.)



RADIO PARIS AND 5XX

THE following is a copy of a letter which we have received from Capt. Eckersley, chief engineer of the B.B.C., on the subject of a paragraph which appeared in "On Your Wavelength" in No. 136.

SIR,—In a recent issue of AMATEUR WIRELESS the remark was made: "The man in the Wireless Street has never succeeded in bringing in Radio-Paris while 5XX is working. Now we know where we fail—the B.B.C. cannot do it either." A remark was made in the *Radio Times* to say that with a really selective set it was possible to tune out Chelmsford in London and get Paris. In another issue of the *Radio Times* the great difficulty of eliminating the one in favour of the other was commented upon. The two statements do not contradict one another. There is a great deal between the man in the Wireless Street and the expert operating a really selective set.

Certain of our member firms market sets which we are sure will comply with the desired performance. I was present at a test in which 5XX was tuned out and Paris brought in. In this particular case a good aerial was used with reaction, a really satisfactorily arranged coupled circuit, and a well-designed tuned anode.

Possibly the above may tend to clear up any misconception, and illustrates the difference between a really selective set and the one used by the man in the Wireless Street. This is not meant to disparage the man in the Wireless Street, who for general purposes does not require a very selective arrangement.

May I take this opportunity of recommending your readers to experiment with good aerials and carefully-screened coupled circuits if they wish to listen to Paris while Chelmsford is working? The reason why we made the statement over the broadcast that the *Daily Express* concert would be heard better in England, owing to the interference from 5XX, was that we knew that the majority of listeners do not happen to possess very selective apparatus.

The Argentine Republic, with a number of receiving stations estimated at nearly 200,000, is making fast progress in wireless.

The Postes, Telegraphes et Telephones department in France has announced that wireless messages may be transmitted between France and Russia at the same rates as were usual before the war.

The earth connection arranged for the new station at Daventry is an elaborate one. The station will have an earth system of wires measuring 200 ft. across.

AROUND THE SHOWROOMS

Cheaper Valves—

EVERYBODY is glad of the reduction in valve prices, which, although not great, is certainly very welcome to amateurs—especially to those multi-valve enthusiasts who are unlucky in the matter of burn-outs.

As the market for valves becomes steadier and as manufacturers learn more about mass production methods, we may expect the prices of valves to be still further reduced.

That manufacturers are seriously applying their energies to the production of better valves is proved by Cossors. In future all Cossor valves are to be fitted with a special anti-capacity base. This is of particular interest in these days of short-wave work.

—and More Valves

THOSE who are interested in wireless development can carry out for themselves some experiments with some of the earliest valves—I refer to the Marconi-Round valves—at small cost.

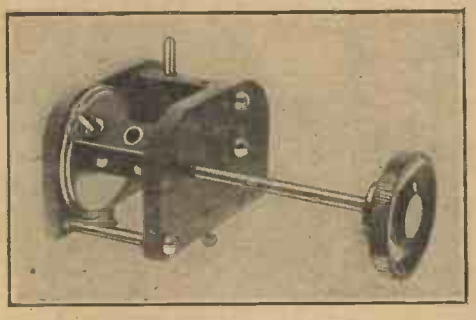
These valves, I notice, are being offered at 3s. each by T. W. Thompson and Co., of 39-43 London Street, Greenwich, S.E.10.

Direction-finding stations erected in France early during the war had to make use of Round valves. To get the best results the "pip" at the top, which contains a piece of asbestos, has to be heated, and I have heard many glowing tales of D.F. huts having floors with a carpet of matchsticks over an inch thick!

Geared Coil Holder

THE necessity for using a coil holder capable of fine adjustments was brought home to me last week when I was using a reflex set that incorporated reaction in the ordinary way.

During the testing-out stage reaction was very difficult to control, oscillation being very sudden and fierce with the coil holder I was using. For fine adjustments it is essential to use a geared holder, such as the Lotus shown by the photograph.



Lotus Coil Holder.

Behind the metal disc on the left is a system of gear wheels that gives an 8-1 reduction.

This means that eight revolutions of the control knob are necessary to move the coil through one revolution. Of course in practice it does not go right round.

Another important point about this coil holder is that, no matter in what position it is fitted, the moving coil cannot fall.

The makers of Lotus coil holders are Garnett, Whiteley and Co., Ltd., of Broadgreen Road, Liverpool.

Dual Filament Resistance

NOWADAYS almost every valve user wants to be able to change over directly from bright-emitters to dull-emitters, that is, without having to connect extra resistance in circuit.

Most resistances that are suitable for use with either type of valve are of the carbon variety. I see, however, that L. McMichael, Ltd., of 179, Strand, W.C.2, are making a dual rheostat that has a wire resistance element.

The wire is wound on a circular former in the ordinary way, one-half being for bright-emitters and the other half for dull-emitters. The dial is engraved red on the bright-emitter segment and white on the dull-emitter segment.

Loading-coil Socket

WHERE a loading coil is provided for in a set it is necessary to short-circuit the socket when the coil is not in use.

To save this trouble a neat little socket has been made that automatically completes the circuit when there is no coil.

The switching is done by the plug, which springs up when not held down by a coil. This device is well made and can be fixed to any panel of ¼ in. in thickness.

Will Day, Ltd., of 19, Lisle Street, Leicester Square, W.C.2, are the manufacturers.

VANGUARD.

PROGRESS AND INVENTION

Plug Connectors

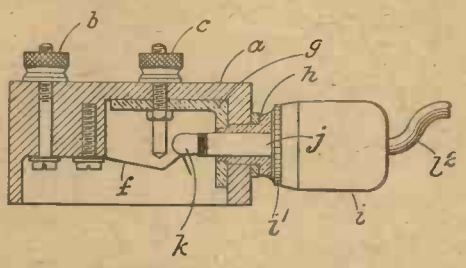
VARIOUS types of aerial-earthing plug have been constructed, but most of them are lacking in compactness and neatness. Many of these, also, are not of the anti-capacity type, and since the contacts form the two plates of a condenser by-passing the aerial currents, efficiency is often low.

Quite a neat type of plug connector and earthing switch is described in Patent No. 225,276/23 (F. W. Pleasance, Glengall Road, Peckham, London).

It will be seen from the diagram that although good contact is made when the plug is withdrawn, the contacts themselves present only a small area one to another, and the self-capacity of such a switch is therefore small.

The plug itself may be insulated, or may be connected either to the aerial or earth terminal of the set.

This type of plug should also prove useful for switching in high-frequency circuits where a good-contact low-capacity switch is necessary.



Plug Connector (225,276/23).

If necessary, two fixed contacts could be employed on either side of the spring, and the plug would then be insulated from the circuit.

Portable Loud-speakers

NOW that spring is coming and many amateurs will be taking their sets out into the open, portable sets and loud-speakers will be greatly in demand.

The average loud-speaker is awkward to use in the open air, for the horn is usually fixed in one position relative to the base, and it is impossible to direct the sound where it is needed.

Patent No. 226,585/23 (Edward Alfred Graham, St. Andrew's Works, Crofton Park, Brockley) describes a method of rendering the loud-speaker more suitable for outdoor use.

According to this invention, the horn is pivoted at the base so that it may be turned in the direction in which maximum volume is desired. If necessary it may even be tilted in a vertical position, and this position will probably be found very effective under certain conditions.

EXPERIMENTAL TRANSMISSION.—IX

STILL MORE CIRCUITS DISCUSSED

ANOTHER excellent arrangement is also shown in Fig. 33, which may be adapted to any circuit where a combination of earth and counterpoise systems is to be employed.

The direct earth is tapped to the exact centre of the inductance, and aerial and counterpoise tappings are then moved simultaneously until *aerial* and *counterpoise* (not counterpoise and *earth*) are in tune, when maximum results will be obtained. Either of the two previous systems mentioned for combined earth and counterpoise may, of course, be used instead, and this is certainly worthy of consideration.

Fig. 34 illustrates a scheme whereby the radio choke in the plate circuit may be omitted and a high-tension + tapping be taken on to the tuner.

In Fig. 35 a high-tension negative tapping is taken to the tuner, but the feature worthy of note is the method of tuning the counterpoise by means of a separate inductance coil with tappings. The operation of bringing earth and counterpoise in tune may thus be simplified, as the position of the tappings to counterpoise will have no effect on oscillation.

Fig. 36 is essentially the same as the preceding one, but it will be noticed that an extra tapping, in series with a blocking condenser C, has been included on the tuning inductance. Control of oscillation and wavelength will by this means be slightly simplified, and no matter what may occur in theory, it is a practical dodge well worth trying. The capacity of this condenser is not critical, something approximating .002 microfarad having been found suitable.

Fig. 36a illustrates a typical transmitting circuit, capacity coupled, such as is employed in many Dutch amateur stations.

Figs. 37 and 38 illustrate two methods by which the correct negative potential may be maintained on the grid, the use of extra cells shunted by a large-capacity condenser, and (Fig. 38) the use of a valve as a high-resistance leak.

The internal resistance of the valve is controlled by the emission of electrons, that is, by filament current; a receiving valve with about 4 volts on the filament would prove most satisfactory.

The choke Ch may often be omitted.

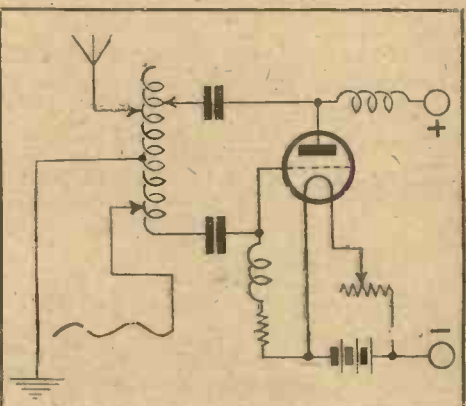


Fig. 33.—An Arrangement of Counterpoise

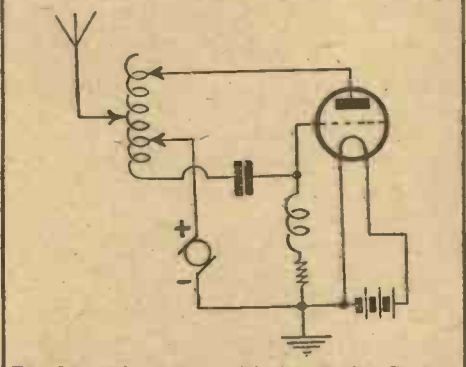


Fig. 34.—Dispensing with the Radio Choke.

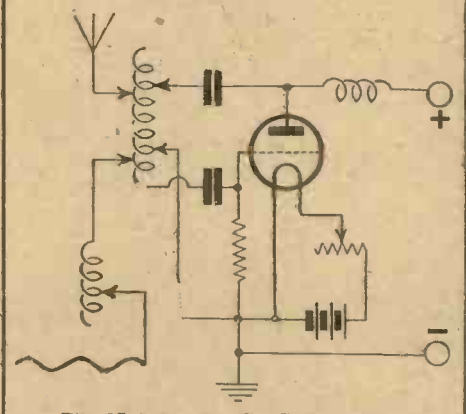


Fig. 35.—Tuning the Counterpoise.

The Master Oscillator System

Although the master oscillator system is rather difficult to work and as it requires an extra valve, it cannot give the same overall efficiency as a set of the normal type, yet it is really the key to most difficulties in short-wave transmission, and as such is considered worthy of a special note.

In the master oscillator system the power valve is excited from an oscillator which is capable of generating enough power to meet the losses in the grid circuit of the power valve.

The general principle is shown in Fig. 39. The grid of the power valve is connected to an oscillator tuned to the required frequency, and so the plate output wavelength is quite independent of the aerial tuning, which results in a perfectly constant wavelength however much the aerial may swing.

A very suitable circuit is shown in Fig. 40, but, of course, any one of the preceding oscillators described may be used as a driver, and the power-valve circuit may take different forms.

The plate-grid coupling is not in any way critical, and is not necessary in many cases, a fact conducive to easy wave changing.

A hard receiving valve may be used to control the power valve provided that powers not greater than 10 watts are dealt with, but it will be very hard pressed. Operations will be greatly simplified if a

(*Continued on page 274*)

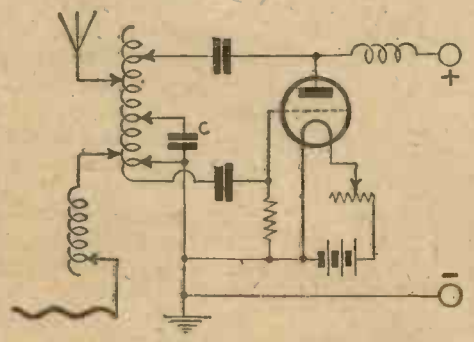


Fig. 36.—A Method of Fine Tuning.

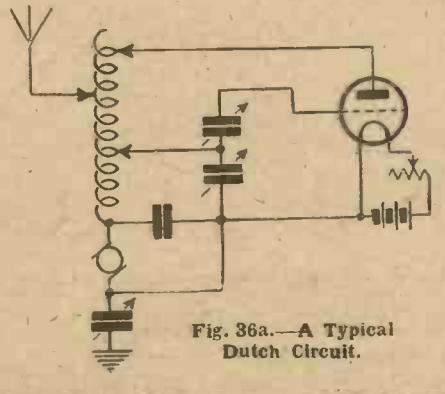


Fig. 36a.—A Typical Dutch Circuit.

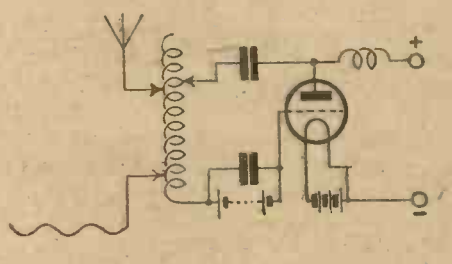


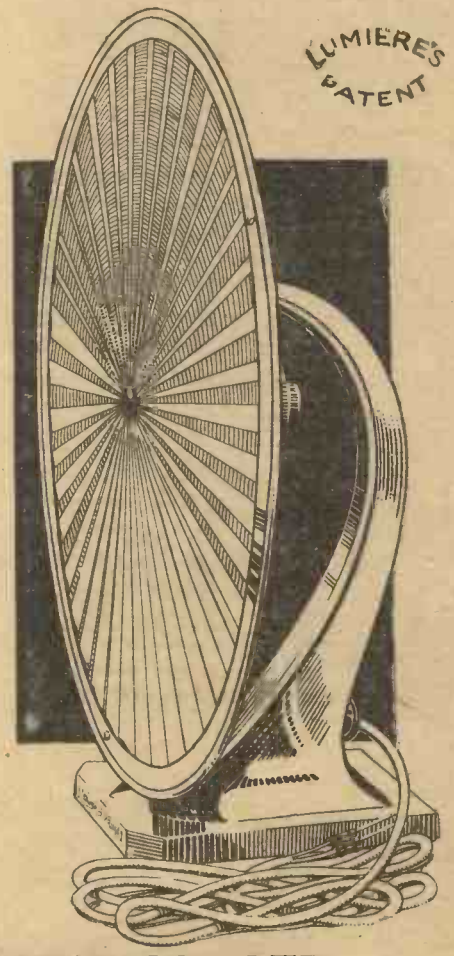
Fig. 37.—Obtaining Correct Grid Potential.

Now fades the glimmering landscape on the sight
And all the air a solemn stillness holds
GRAY'S ELEGY

NOW that the Sterling "Primax" Loud Speaker has taken its place as the true master of radio reproduction, how great the wonder and delight radio evenings hold! For the "Primax" is truly supreme. It reproduces music, song and speech with a purity and volume so perfect that the keenest critics of music praise its powers. The pleated diaphragm gives even distribution of sound. The simplicity and perfection of the electro-magnetic mechanism ensures the complete absence of any harshness. The "Primax" is an ornament to any room —a joy to all musicians.

Radio dealers will willingly demonstrate its distinctive qualities before purchase, and any test is cordially welcomed.

The Sterling "Primax" Hornless Loud Speaker has a pleated diaphragm mounted in a frame and supported on a graceful stand. The whole instrument is bronzed finish. It is connected to the receiver in exactly the same way as an ordinary loud speaker. Complete with 12 ft. of flexible cord. (2,000 ohms resistance.) PRICE **£7:15:0**



STERLING PRIMAX

Hornless Loud Speaker (Bronzed Finish)

At your Radio dealers

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Manufacturers of Telephones and Radio Apparatus, etc.

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Sole Manufacturers and Licensees of the "Primax" Loud Speaker

RADIOGRAMS

IT has been decided to broadcast a service from York Minster. In all probability it will either be the Easter Sunday service of the Military Sunday service on May 3.

Following similar tests in France, German scientists claim to have succeeded in producting ultra-short waves having a frequency of more than 300,000,000 per second, which corresponds with a wavelength of less than one metre.

A symphony concert will be relayed from the Covent Garden Opera House on February 12 at 8 p.m.

A miscellaneous programme to be broadcast on February 13 includes songs by Roderick Ackroyd and pianoforte solos by Chilton Griffin.

The broadcasting station at Rome has increased its daily service from two hours to three. Now the station gives a programme in the afternoon from 3 to 4 and at night from 8.30 to 10.30.

It has been decided to fit the seats in the Italian Senate with plugs for wireless sets.

The French station at Agen has made several trials at broadcasting on a wavelength of 340 metres, but their transmissions are constantly jammed by those of the German stations across the border.

Before the opening of the relay station at Hamburg there were only 400 people who listened-in, but only three months afterwards they numbered 50,000.

The Capetown station has broadcast a novel relay throughout the South African Union, giving a band performance from the Swedish cruiser *Fylgia,* which was at the time of the performance about 250 miles out at sea.

The "Roosters" concert party will broadcast a "mixed grill" on the evening of February 16.

The S.B. programme to be given on February 17 includes musical comedy excerpts given by the J. H. Squire Celeste Octet.

A new valve has been invented which requires 110 volts to operate it! Its great advantage is that it can be plugged direct to the house electric lighting supply, whether A.C. or D.C., and thus eliminates the accumulator entirely.

The Westinghouse station at Pittsburg, KDKA, has sent out a message which was clearly heard at Sydney, Melbourne, and at Rabaul, in the Bismarck Archipelag, north of New Guinea, a distance of over 9,000 miles.

The official wireless telephony tests between Australia and America have been quite successful, many musical items and speeches having been distinctly heard in different parts of Australia. The strength of signals from America was quite as powerful as from the Sydney broadcasting station.

"From the Mystic East" is the title of the programme to be given on February 18. Louis Hertel will provide humour appropriate to the scheme of the evening.

A programme of chamber music of great interest will be broadcast on February 19.

"Quips" will give another of his talks on "the World in Anecdote" at 8.30 p.m. on February 20.

A popular programme will be broadcast on February 21, which will include items by the Band of H.M. Scots Guards.

The wavelength of the Edinburgh station has now been definitely fixed at 465 metres.

A new installation, tried for the first time recently by the municipal broadcasting station WNFC, of New York, is expected to prove a valuable adjunct to the work of the police.

Experiments carried out by experts in wireless telephony go to show that the eclipse on Saturday, January 24, undoubtedly did have an effect on the reception of wireless signals.

A new broadcasting station is to be erected at Finkenwalde, near Stettin, with two towers each 130 ft. high.

Amateur wireless users in Bulawayo have heard Pittsburg, in the United States, more than 7,000 miles away, on two-valve sets.

The popular programme to be broadcast on February 14 includes songs by Bryn Gwyn and musical entertainment by Foden Williams.

A "Star Ballad" concert will be broadcast on February 15, in which all the artistes are of the highest standing in the London musical world. De Groot and the Piccadilly Orchestra will provide the evening programme.

A Swedish magazine, the *Radio-Bladet,* has organised a test between Swedish and American amateurs for the purpose of encouraging amateur transmissions in Sweden.

The café habit is rapidly being discarded in France as a result of the introduction of wireless. Frenchmen and their families now hear concerts by wireless from Paris, London and Brussels instead.

Using wireless apparatus, with the human body instead of an aerial, a German physiologist, Dr. Lilienstein, has succeeded in hearing the action of the muscles.

A wireless club has been organised at Poznan (Poland) for the purpose of popularising wireless in that country and developing the wireless industry.

A temporary agreement was reached between the British Broadcasting Company and representatives of the entertainment industry at their last meeting in London.

EXPERIMENTAL TRANSMISSION" (*continued from page 272*)

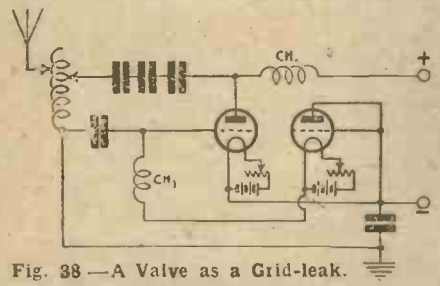


Fig. 38.—A Valve as a Grid-leak.

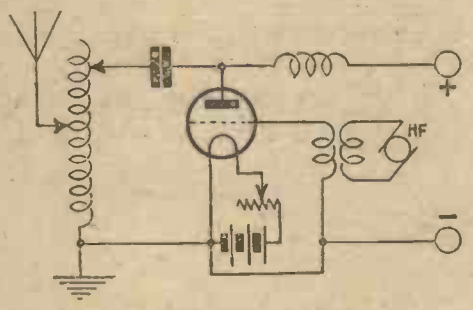


Fig. 37.—The Principle of the Master-oscillater.

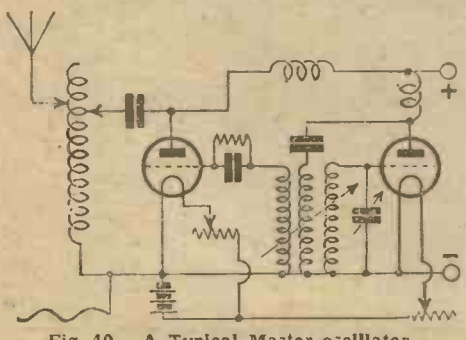
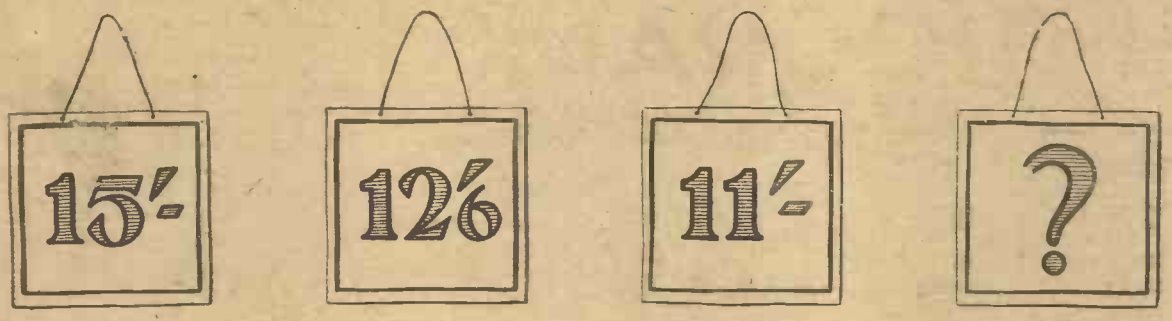


Fig. 40.—A Typical Master-oscillater.

small-power valve is employed. If a receiving valve is used it will probably not work efficiently on the high plate voltage supplied to the transmitter. To obviate this difficulty the radio choke may be wound with resistance wire or a separate plate supply may be employed.

KENNETH ULLYETT.

(To be continued)



Months ago we decided that a first-class bright filament valve could be manufactured to sell at 10/- and yet contain the very best materials and workmanship. We still find this true to-day. The price of the Silver Clear Louden remains at 10/-.

LOUDEN 10/- VALVES

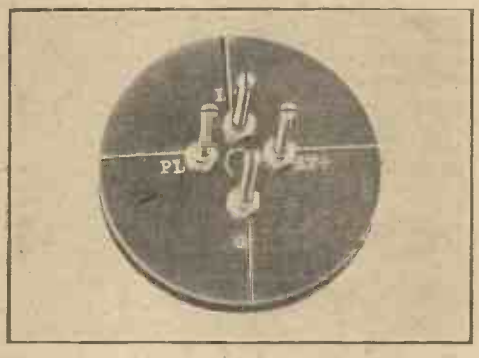
Louden Valves - Silver Clear

Advert. of the Fellows Magneto Co., Ltd., Park Royal, London, N.W.10.

E.P.S.44.

H.F. Couplings

SIR,—Specialising as we do on H.F. couplings and reaction units to work in conjunction with them, we were interested in the article on page 134 of No. 138. We would like your readers to know that the method suggested of marking the pins of transformers has been adopted by us for more than two years on all the apparatus of this class which we make. The photograph shows one of our transformers,



Radiax H.F. Transformer.

from which you will see that the pins are marked.

The same method is adopted in the case of our anode coils, which are made up in the same style; the top or L.T. pin is a dummy; the plate and grid pins are connected together so as to automatically make the plate-to-grid connection when the anode coil is plugged in, thus enabling transformer or tuned-anode coupling to be used in the same sockets. Anode reaction can be used on any of these instruments by means of our various reaction units.—RADIAX, LTD. (London, W.1).

"Seeing Music"

SIR,—From the remarks of "Thermion" in No. 139 under the heading "Seeing Music," in which he describes how the needle of a milliammeter fluctuates in unison with the music or speech received, it is obvious that his set must be yielding very distorted reception. As his remarks are likely to prove most misleading, may I be allowed to make the following correction.

If the needle of a milliammeter placed in the H.T. lead of an L.F. amplifier fluctuates, it is quite obvious that some or all the valves are being operated beyond their linear limits. A dip of 5 milliamps that "Thermion" mentions indicates appalling overloading of the valves and that they are partially rectifying the L.F. impulses.

In every amplifier attached to a B.B.C. station a milliammeter is permanently inserted in the H.T. lead, and it is one of the primary duties of the control engineer to see that the needle *never* fluctuates. I mention this as a practical proof of what is really an elementary theoretical consideration in efficient L.F. amplification.—C. E. W. (Parkstone).

"What Your Condensers Do"

SIR,—In reply to the letter of A. F. W. (Kingston) in No. 138, I should like to point out what appears to be an error. There are three well-defined classes of electrical movement constituting three different kinds of electric current, namely: (*a*) conduction currents formed by movements of electrons from one atom to another in a conductor or closed circuit when an E.M.F. is applied to that circuit; (*b*) displacement current obtained by impressing a fluctuating or oscillating E.M.F. across an insulator or dielectric (the current that flows is not an electron flow or complete transference of electrons from one atom to another, but is a combined movement of electrons in the neutral atoms themselves that causes a momentary movement of electrons known as a displacement current); the third (*c*) is known as a convection current—that is, a current due to the movement of electrons or negative and positive ions through the acid or electrolyte of a cell, across a spark gap or arc or between the filament and anode of a valve—in fact in all cases where an ionising action occurs. I do not agree that the statement referred to is inaccurate, as displacement current does momentarily flow and continues to flow whilst an E.M.F. of varying amplitude is applied and maintained.—L. A. C. (London).

Other Correspondence Summarised

G. B. (Swansea), E. K. (Edmonton) and A. H. P. (Shepherd's Bush), referring to the letter of W. B. S. (Dornoch, N.B.) in No. 139, state that the church service which he received at 1 a.m. on January 12 was transmitted by W G Y.

E. T. G. (Henley-on-Thames) states that his crystal reception has greatly improved since he installed a "Vertex" aerial.

H. S. (Longsight) would like to draw attention to the fair treatment he received when he returned a faulty Eureka transformer to the makers. Although it had been in use for several months, they immediately sent a new one.

REDUCED PRICE

25/-

Carriage Paid, ready for mounting.

Clearer Speech and Music

with the

M-L TWIN-COIL L.F. INTER VALVE TRANSFORMER

ONE amateur enthusiast writes: "Your transformers are definitely superior in quality of production of speech and music." Another says: "The greatly improved reception since fitting these transformers is indeed amazing."

These opinions, arriving daily, confirm our own tests. With the M-L transformer you get both speech and music clearer. There is a complete absence of distortion, greater amplification and a longer range.

Stoutly built and well finished, it is dust and damp proof. The coils are completely enclosed. Insulation has received special attention, and there is no danger of burning out. Primary to secondary ratio, 1—4.

To get the best from your set use an M-L transformer.

The M-L ANODE CONVERTER

A PERMANENT substitute for the high-tension battery. Ideal for power amplifier work. Worked from the ordinary 6-volt accumulator, the consumption is low — 1.15 amperes. Perfectly smooth reception. Continuous adjustment of H.T. voltage and not by steps.

Supplied in the following standard voltage ranges:

Type S 6-120 volts £11 5 0 } For two stage power amplification

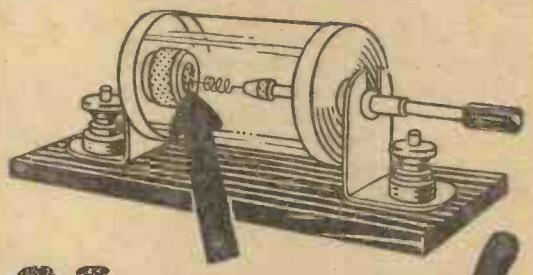
Type C 12-300 volts £13 10 0 } For two stage power amplification

Type D 12-500 volts £18 0 0 } For low power transmission work.

We invite applications from traders for terms. Write for details.

The M-L Magneto Synd., Ltd., Wireless Dept., Victoria Works, Coventry.

for distance



Neutron!

The *consistent* high sensitivity of Neutron Crystal is proved by the rapidly accumulating records of "long-distance" reception — and *you* can obtain the same results, with care in your choice and arrangement of apparatus; particularly in your choice of Crystal — at the same time the *most important* item and the *least expensive*. Be sure it is Neutron.

Manchester from Bakewell 38 miles

"A. C.," Bakewell, receives Manchester on a Neutron plain Crystal Circuit.

Birmingham from London 125 miles

"L. V. C.," of Chiswick, receives Birmingham regularly on a Neutron without amplifiers.

Chelmsford from York 160 miles

"E. C. D.," York, receives the high-power station on a single slider set, with Neutron.

Brussels from Chiswick 200 miles

"L. V. C.," of Chiswick, receives Brussels on a Neutron, without amplifiers.

Madrid from Chippenham 800 miles

"R. A. H.," Chippenham, regularly receives Madrid on a plain Crystal circuit, with Neutron.

And with 2 stages of L.F. only, W B Z from Chippenham 3,000 miles

"R. A. H.," of Chippenham, also reports reception of W B Z (Springfield, Mass.) on a Crystal set using Neutron, with 2 low-frequency valves acting as note magnifiers only.

NEUTRON TRADE MARK

Concert Tested & Guaranteed Radio Crystal

Stocked by the Best Radio Dealers. Packed in tin with silver catswhisker. Insist on Neutron in the Black and Yellow Tin— **1/6**

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144, Theobald's Road, London, W.C.1.

Phones: Museum 3795 & 6841.

TRADE NOTES AND CATALOGUES

WE are informed by Fuller's United Electric Works, Ltd., Woodland Works, Chadwell Heath, that they are in a position to supply standard-size ebonite panels ready for use in sealed envelopes.

Mr. Herbert G. White, who has been associated for the past fourteen years with Messrs. Gent and Co., Ltd., has relinquished his post as London manager with this firm to take up the appointment of chief engineer of the wireless department of Messrs. C. A. Vandervell and Co., Ltd., Acton, London, W.3.

From the British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2, we have received an illustrated leaflet of table-lamp loud-speakers.

Two large show-cards illustrating the "Dragonfly" loud-speaker have been sent us by Alfred Graham and Co., St. Andrew's Works, Crofton Park, S.E.4.

A catalogue of C.A.C. wireless sets and accessories has been sent us by the City Accumulator Co., 10, Rangoon Street, E.C.3.

A window card illustrating the R.I. low-frequency transformer has been received from Radio Instruments, Ltd., 12, Hyde Street, New Oxford Street, W.C.1.

From the Radi-Arc Electrical Co., Ltd., Bennett Street, Chiswick, W.4, we have received a sample of the Liberty safety wander plug, which will not allow sufficient current to pass to injure valves.

FALLON
SQUARE LAW CONDENSERS

Features include : **One hole fixing, tag connections, heavy aluminium top and bottom plates.** Metal to metal adjustable bearings, stout, well-cut aluminium vanes, Complete as illustration.

The New Fallon Square Law Condenser is absolutely the last word in perfect condenser construction.

Extremely handsome appearance, all parts being heavily plated ; .068 spacing (the closest possible). In the new model the overall length of the .001 condenser is only 4¾ in. as against 5¾ in. in the old model, and by a new idea in spacing washers, rigidity of construction, never before achieved in any make of condenser, has been obtained.

SQUARE LAW TYPE (As illustrated.)

	Price		Price
.001 ...	9/6	.00025 ...	6/9
.0005 ...	8/6	.0002 ...	6/-
.0003 ...	7/-	Vernier, 3 or 5,	4/6

STANDARD TYPE With Ordinary Vanes

	Price		Price
.001 ...	8/9	.00025...	6/-
0005 ...	7/-	.0002 ...	5/6
.0003 ...	6/6	Vernier, 3 or 5,	4/-

FALLON
FIXED CONDENSERS

— improve results in all Sets.

Made of the highest quality mica and copper foil ; each one tested and guaranteed. FALLON Fixed Condensers are right up to FALLON standard. Fitted with soldering tags and nuts for making clean connections.

British Reputation.— Your Condensers are not FALLON'S unless the name FALLON appears on same.

FALLON Fixed Condensers
Capacities up to .001, 1/3 each.
Capacities up to .004, 2/- each.

Fixed Condenser and Grid Leak COMBINED.
(As Illustrated.)
2 or 3 megohms, 2/6 each.

FALLON'S
The Premier VARIOMETER

Inside winding, suitable for broadcast reception on any P.M.G. Aerial, extraordinary close coupling ensuring large tuning range. Inductance, the highest possible—9.5 to 1. Metal feet can be adjusted to four different positions. As used in the Single Valve receiver for all wavelengths, described and illustrated in "Modern Wireless," July issue.

Postage 6d. PRICE **10/-**

All Post Orders, Correspondence and Applications for Trade Terms to :

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Music-Masters both!

80/-

THE "Revo" Loudspeaker is as near perfection in reproduction as a loudspeaker can be. We didn't put it on the market till we had explored every avenue of research, and now we have a loudspeaker that reproduces melody that's rich and pure, exquisite in its fidelity.

By the peculiar construction of the throat and bell, distortion is kept at zero point and "muffling" is entirely absent.

The diaphragm adjustment is most flexible in its control.

THE "REVO" SENIOR

Specification : 22 in. high ; Aluminium Trumpet 14 in. diam. ; Finished Black. Price, 80/-.

The "Revo" "Senior" Loudspeaker has two small brothers the Junior and Baby, worthy followers, finished black, price 48/- and 30/- each respectively.

At all dealers. If unable to obtain locally write direct :

The CABLE ACCESSORIES Co., Ltd., Tividale, Tipton, STAFFS.

We produced the "Revo" Lightweight Headphone to meet the demand for a light, comfortable and ultra-sensitive phone. No pressure, no hair-tearing, no discomfort, no projections. 21/-.

Guaranteed for 12 months.

"Revo" Regd.

The Name for Perfect Radio

BROADCAST TELEPHONY

NOTE.—*In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.*

GREAT BRITAIN

The times given are according to Greenwich Mean Time.

London (2LO), 365 m. 1-2 p.m., con.; 3.15-3.45 p.m., lec.; 4-5 p.m., con.; 5.30-6.15 p.m., children; 6.40 p.m. talk; 7-7.30 p.m., time sig., news, talk; 7.30-9.30 p.m., music; 9.30-10.0 p.m., time sig., news, talk; 10.0-10.30 p.m., music. Mon. and Wed. the Savoy Bands are relayed until 11.0 p.m., and on Sat. until midnight. Sat. only, 4-5.30 p.m., con.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 435 m. **Birmingham** (5IT), 475 m. **Bournemouth** (6BM), 385 m. **Cardiff** (5WA), 351 m. **Glasgow** (5SC), 420 m. **Manchester** (2ZY), 375 m. **Newcastle** (5NO), 400 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 331 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 346 m. **Liverpool** (6LV), 315 m. **Nottingham** (5NG), 322 m. **Plymouth** (5PY), 335 m. **Sheffield** (6FL), 301 m. **Stoke-on-Trent** (6ST), 306 m. **Swansea** (5SX), 481 m.

CONTINENT

The times are according to the Continental system; for example, 16.30 is 4.30 p.m., and 08.00 is 8 a.m. (G.M.T.).

AUSTRIA.

Vienna (Ravag), 530 m. (1 kw.). 08.00, markets; 10.00, con.; 12.05, time sig.; 12.20, weather; 14.30, Stock Ex.; 15.00, news, con.; 15.10, children (Wed.); 17.10, lec. (Tues., Fri., Sat.), children (Tues.); 17.30, lec. (Wed.); 18.30, news, weather; 19.00, time sig., con., news; 21.00, dance (Wed., Sat.).

Graz (relay), 700 m. Testing.

Innsbrück (relay station). Under construction.

BELGIUM.

Brussels (SBR), 265 m. (1½ kw.). 17.00, orch., children (Wed. and Thurs.); dance (Tues. and Sat.); 18.00, news; 20.15, lec., con., news (opera, Mon. and Wed.).

Haeren (BAV), 1,100 m. 13.00, 14.00, 16.50, 18.50, weather.

CZECHO-SLOVAKIA.

Kbely (OKP), 1,160 m. (1 kw.). Weekdays: 09.00, 10.30, 12.30, 16.00 and 17.00, con. (Wed. and Sat.); 18.30, lec., news, weather, con. (time sig., 19.00), daily; 10.00, con. (Sun.).

Komarov (OKB), 1,800 m. (1 kw.). Weekdays: 13.00, Stock Ex., weather, news; 17.30, con. (Thurs.); 09.00, con. (Sun.).

Strasnice (430 m.). Testing shortly.

DENMARK.

Copenhagen (Kjobenhavns Radiofonistation), 470 m. 19.00, con. (Sun., Wed., Thurs.); also tests on 750/800 m. 20.00 almost daily.

Lyngby (OXE), 2,400 m. Week-days: 18.20, news and Stock Ex.; 20.00 and 21.00, news, weather and time sig.

Ryvang, 1,025 m. 18.30, Eng. lesson (Wed.); 19.00, con. (Tues. and Fri.).

FRANCE.

Eiffel Tower, 2,600 m. (6 kw.). 06.40, weather (exc. Sun.); 11.00, markets (exc. Sun. and Mon.); 11.15, time sig., weather; 14.45, 15.35, 16.30,* Stock Ex. (exc. Sun and Mon.); 18.00, con. (not daily); 18.45, Paris fashions (in English)—temp—(Wed. and Sat.); 19.00, weather; 20.30, con. relayed from PTT (Fri.); 22.10, weather (exc. Sun.).

* On 1st and 15th of each month at 16.45.

Radio-Paris (SFR), 1,780 m. (2 kw.). Sundays: 12.45, orch.; 13.45, news; 16.45, con.;

(*Continued on page* 282)

"BROADCAST TELEPHONY" (*cont. from page 280*)

20.30, news, &c.; 21.00, dance music. Weekdays: 12.30, orch., Stock Ex., news; 16.30, markets, Stock Ex., con.; 17.45, Stock Ex., news, women; 20.30, lec., news, con.; 21.00, dance (Thurs.). Frequent relays of 5 X X after 22.00. *Le Matin*, Paris, provides a special con. every 2nd and 4th Saturday in the month at 21.00 or 22.00 G.M.T.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (400 w.). 14.00, lec. relayed from Sorbonne University (Thurs.); 15.00, outside relay (Sat., irr.); 15.45 and 17.00, lec. relayed from Sorbonne (Wed.); 16.00, outside relay (irr.); 20.00, Eng. talk (Tues.); 20.30, lec. or con., almost daily, con. relayed by F. L. (Fri.); 20.45, lec. (Sun.), organ recital 3rd Sun. each month; 21.30, con. (Sun.).

"Le Petit Parisien," 345 m. (500 w.). 21.30, con. (Sun., Tues., Thurs.), dance (Sat.).

Lyons-la-Doua, 550 m., 10.30, gramophone con.; news, etc. (irr.).

Radio-Lyon, 287 m. (2 kw.). 12.00, 17.15, 20.30, news; con. (irr.).

Toulouse Aerodrome (MKD), 1,525 m. 09.42, 19.42, weather.

Station du Pic du Midi, 350 m. (300 w.). Testing.

GERMANY.

Berlin (2), 503 m. (1½ kw.). 08.00, sacred con. (Sun.); 09.00, markets, news, weather; 10.00, factory con. and tests; 10.30, educat. hour (Sun.); 11.15, Stock Ex.; 12.00, time sig., news, weather; 13.15, Stock Ex.; 14.00, lec. (Sun.), markets; 14.30, children (Sun., Wed.); 15.00, Esperanto (Sat.); 15.30, orch., French (Tues.); 17.30, lec., women; 18.00, French (Mon.), lec. (Tues.); 18.30, lec., Engl. (Thurs.), theatre news (Tues.); 19.30,* con., weather, news, time sig.; 21.30, chess (Mon.), dance until 23.00 (Thurs., Sat., Sun.). * If opera relayed, at 18.30.

Berlin (Telefunken Co.), 290 m. Tests.

Eberswalde, 3,150 m.: Telegraphen Union, 06.45-18.45, news, con. (Fri., irr.).

Königswusterhausen (LP), 2,450 m. (5 kw.). Wolff's Buro. Press Service: 06.00, 20.00. 2,800 m. (5 kw.): 10.30, con. (Sun.). Esperanto lec. 4,000 m. (10 kw.): Express News Service, 06.00-20.00 (daily); lec. (Tues. and Fri., time irr.).

Bremen, 330 m. (1 kw.). Relay from Hamburg.

Breslau, 418 m. (1½ kw.). 10.15, Stock Ex., weather; 11.00, factory con. (weekdays), sacred con. (Sun.); 11.55 (Sun.), time sig., weather, Stock Ex.; 14.00, news (weekdays); 15.00, children (Sun.); 16.00, orch., children (Fri.); 16.45, con. (Sat.); 17.00, shorthand (Sat.), Mah Jongg (Wed.); 18.00, Esperanto (Mon.), Engl. (Thurs.), lec. (other days); 19.00, con., weather, time sig., news; 20.30, dance (Sun.); 21.15 (Mon.).

Cassel, 292 m. (1½ kw.). Relay from Frankfort.

Dresden, 280 m. (1½ kw.). Relay from Leipzig.

Frankfort-on-Main, 470 m. (1½ kw.). 07.30, sacred con. (Sun.); 10.10, Stock Ex.; 10.55, time sig., news; 15.00, children (Sun.), Stock Ex. (weekdays); 15.30, con., women; 16.00, con. (Sun.); 17.00, markets, lec., children (Wed.); 18.00, lec. (daily), shorthand (Wed.), Esperanto (Fri.); 18.30, educat. hour; 19.00, lec., Engl. (Mon.); 19.30, con. (daily), jazz band (Fri.); 20.30, time sig., weather, news; 21.00, dance or late con. (not daily).

Gleiwitz (relay station). Under construction.

Hamburg, 395 m. (1½ kw.). Sunday: 07.55, time sig., weather, news, lec., women; 10.00, sacred con., chess; 12.00, con., lec.; 16.00, children; 17.00, con.; 18.00, Engl. conv.; 19.00, sport, weather, news, con. or opera; 21.00 onwards, as weekdays. Weekdays: 06.25, time sig., news; 07.30, theatre news; 11.55, time sig.; 12.20, Engl. (Wed.); 14.00, political news, markets; 15.00, women; 15.30, lec., Esperanto; 16.05, orch., 17.00, con., lec.; 18.25, lec., Engl. conv. (Tues. and Fri.), Spanish (Mon. and Thur.); 19.00, weather, con. or opera; 21.00, weather, markets, news; 21.50, news (in English), dance (not daily).

Hanover, 296 m. (1½ kw.). Relay from Hamburg.

Königsberg, 463 m. (1½ kw.). 08.00, sacred con. (Sun.); 10.15, markets; 11.55, time sig., weather; 13.15 and 15.00, markets; 15.30, children (Tues., Wed., Sat.), orch.; 18.30, lec., Esperanto (Thurs., Sat.); 19.00, con. or opera; 20.00, orch., lec., weather, news, dance (Thurs., Sun.).

Leipzig, 454 m. (1¼ kw.). 07.30, sacred con. (Sun.); 10.00, educat. hour (Sun.); 11.00, markets, orch., time sig.; 15.00, markets; 15.30, orch., children (Wed.); 16.30, lec. (Tues.); 17.30, lec. (Tues.), experimenters (Wed. and Sat.); 18.00, lec.; 19.00, lec. (irr.); 19.15, con. or opera, weather, news; 21.00, con. (not daily). Will shortly be increased to 5 kw.

Münich, 485 m. (1½ kw.). 10.30, lec., con.; 13.00, news, weather, time sig., snow forecast; 14.00, con., lec. (Sun.); 15.30, orch. (16.00 Sun.), children (Wed.); 17.00, agric. talk (Mon.), con.; 18.00, lec., Engl. (Mon. and Fri.), Italian (Tues.), Russian (Sat.). Esperanto (Thurs.); 19.30, con.; 20.30, news, weather, time sig.; 21.00, late con. (Sun.), lec. (Tues.), dance (Sat.).

Munster, 410 m. (1½ kw.). 11.00, sacred con., news (Sun.); 11.30, news (other days); 11.55, time sig.; 14.30, markets; 15.30, children (Sun.), lec. (weekdays); 18.40, weather, lec., time sig.; 19.20, women, con. or opera, news, dance (Sat.); 21.00, English, Spanish or Esperanto, news, dance (Sat.).

Nuremberg, 340 m. Relay from Munich.

Stuttgart, 443 m. (1½ kw.). 06.30, time sig., weather (weekdays); 10.30, con. (Sun.); 15.00, time sig., con., news (Sun), children (Sat.); 16.45, children (Wed.); 18.30, lec. (weekdays); 19.00, con. (daily); 20.15, time sig.; 22.00, weather, news, dance (Sun.).

HOLLAND.

Amsterdam (PCFF), 2,000 m. Daily: 07.55-16.10 (exc. Mon. and Sat., when 10.10-11.10), news, Stock Ex., time sig., 09.55 and 16.10. (PX9), 1,050 m.: con., 20.40, con. or organ recital (Mon.).

Hilversum (HDO), 1,050 m. (1½ kw.). 17.40, children (Mon.); 19.40, lec. and con. (Wed. and Fri., irr.); 19.40, con. (Sun.), relay of Mendelberg orch. (Thurs.); con. (Sun.); 21.40, lec. (Sun.).

Vossegat (Bé), 1,050 m. 12.10 and 19.40, weather.

Soesterberg, 1,050 m. 19.26, weather.

Bloemendaal, about 200 m. 09.40 and 16.40, sacred service (Sun.).

HUNGARY.

Buda-Pesth (MT1), 950 m. Half-hourly from 06.45, news, Stock Ex.; 10.00, con.; 11.30 news (daily).

ITALY.

Rome (1RO), 425 m. (2 kw.). 16.00, orch. 19.35, news, con.; 20.15, lec., con.; 21.00 dance (irr.).

(Radioaraldo), 624 m. (500 w.). 10.30, news; 11.00, time sig., con.; 14.20, Stock Ex.; 19.00, con.

(*Concluded on page 284*)

"BROADCAST TELEPHONY" (*cont. from page 282*)

Centocelle (ICD), 1,800 m. (6 kw.). 15.00 and 19.30, news, con.

JUGO-SLAVIA.

Belgrade, 1,650 m. (2 kw.). 17.30, con., news, weather (Tues., Thurs., Sat.), weather, news only (Mon., Wed., Fri.).

NORWAY.

Christiania, 340 m. (500 w.). Testing, daily, about 19.30.

PORTUGAL.

Lisbon (Aero-Lisboa), 375-410 m. 20.30, tests, music, speech (irr.).

Monsanto (CTV), 2,450 m. (15 kw.). Tests, music (irr.); 13.00 and 23.00, weather.

RUSSIA.

Moscow, 1,500 m. (temp. W.L.). Weekdays: 14.00, markets; 16.30, news and/or con. Sundays: 13.45, lec.; 16.30, news; 17.15, con. Times are not strictly adhered to, as broadcasting programme is not yet fully organised.

SPAIN.

Madrid (Radio-Iberica), 392 m. 21.00, weather, Stock Ex., time sig., con., news; 22.00, *La Libertad* con. (Tue. and Fri.). Sunday: 16.30, con.

Barcelona (EAJ1), 325 m. 17.30 or 18.00, lec., Stock Ex. markets, con. or relay of opera; 20.30, news and con.

Seville (EAJ5), 350 m. 18.30, lec., con., news.

SWEDEN.

Stockholm (SASA), 430 m. (500 w.). Sundays: 09.55, sacred service; 16.00, children; 17.00, sacred service; 19.00, con.; 20.30, news, weather. Weekdays: 11.30, weather, Stock Ex., time sig. (11.55); 18.00, lec. (irr.); 19.00, con., lec., news, weather.

Gothenburg (SASB), 290 m. (500 w.). also 700 m. 10.00, fishery reports (700 m.); 11.55, time sig.; 19.00,* programme s.b. from Stockholm.

Malmoe (SASC), 270 m. 11.00, weather; 19.00,* programme s.b. from Stockholm.

Boden (SASE), 2,500 m. 18.00, con. (Tues., Fri., Sun.)—temp

* Local programmes are also broadcast at times.

Sundsvall (SASD), 680 m. (500 w.). To open about March.

Falun (SMZK). Tests. Occasional relay of 5XX.

SWITZERLAND.

Geneva (HB1), 1,100 m. (500 w.). 13.15, lec. No Sun. transmissions.

Lausanne (HB2), 780 m. (500 w.). 07.05, weather; 12.30, weather, markets, time sig., news; 16.00, children (Wed.); 17.55, weather, news; 20.15, con. (exc. Wed.), dance (Thurs. and Sat.).

Zurich (Höngg), 515 or 650 m. (W.L. not definitely fixed) (500 w.). 11.00, weather; 11.55, time sig., weather, news, Stock Ex.; 15.00, con.; 17.15, children (Mon., Wed., Fri.); 18.00, weather, news; 19.15, lec., con., dance (Fri.); 21.00, news. Sundays: 15.00 and 19.15, con., news, weather.

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S.P.D.T. Panel Switches	1/5
Bretwood Variable Grid Leak	3/-
Watmel Variable Grid Leak	2/6
Bretwood Anode Resistance	3/-
Watmel Anode Resistance	3/6
McMichaels 2 Meg Grid Leak	2/6
McMichaels 100,000 ohm Resistance	2/6
Tools, seven Twist Drills	2/6
Taps 0, 2, 4, 6 BA set	2/11
4 Taps and Wrench	3/6
Soldering Iron and Solder	2/9
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ELECTRICAL LOSSES REDUCED to a minimum. Full capacity as rated.

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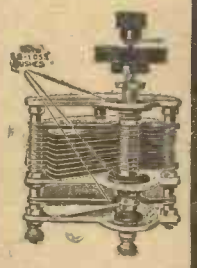

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Trade supplied Post 6d. set

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Equal units of .00025 or .0003. Complete with Knob and Dial. 9/- Post 6d.

JACKSON BROS.

SQUARE LAW.		STANDARD. Variable Condensers, with Knob and Dial.	
.001	9/6	.001	8/6
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.0005	8/-	.0003	5/9
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Post 4d. Set.

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.0001 to .0005 Fixed	1/3
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Adjustable diaphragm, detachable receivers, double leather-covered headsprings, long flexible cords, nickel plated parts. Very comfortable fitting to the head.

SEE TRADE MARK.

4000 ohms 13/3

Post 6d. pair.

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Variable Grid Leak	2/6
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T2, 25/-; T3, 16/6; Coils: 25, 4/10; 30, 35, 40, 4/10, 50, 5/-; 60, 5/4; 75, 5/4; 100, 6/9.

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3-way ,, ,,	12/6
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D.C.C. WIRE per ½ lb.

13 g.	9d.
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CHIEF EVENTS OF THE WEEK

SUNDAY, February 15.

London and 5 X X	3.0	Star Ballad Concert.
London and 5 X X	9.0	De Groot and Piccadilly Orchestra
Bournemouth	3.0	Russian Symphony Concert.
Manchester	3.0	Sonata Recital—Solos and Songs.
Newcastle and 5 X X	8.30	Byrd's Great Service by the Newcastle Bach Choir. Address by the Very Rev. the Dean of Durham.
Glasgow	9.0	Recital of 16th Century Church Music.
Liverpool	9.0	Operatic Evening by the British National Opera Company.

MONDAY

Bournemouth	8.0	Winter Gardens Night.
Newcastle	7.30	A Scene from *The School for Scandal*
Glasgow	7.30	Choral and Orchestral Evening.

TUESDAY

5 X X	7.30	Operatic Programme.
London	7.30	Musical Comedy Excerpts.
Belfast	8.0	Belfast Postmen's 13th Concert.

WEDNESDAY

London and 5 X X	7.30	From the Mystic East.
Birmingham	7.30	The Band of 2nd Batt. The East Yorkshire Regiment.
Cardiff	7.30	The Music of Edward German.
Manchester	7.30	Operatic.
Newcastle	7.30	Light Opera.
Newcastle	8.30	Violin and Pianoforte Recital.
Aberdeen	7.30	Choral and Orchestral Evening.
Belfast	7.30	Symphony Concert.
Nottingham	7.30	The Nottingham City Orchestra.

THURSDAY

London	7.35	Chamber Music Evening.
Bournemouth	7.35	Musical Appreciation
Manchester	7.35	Vocal and Instrumental Hour.
Glasgow	7.35	Spanish Scenes.

FRIDAY

London and 5 X X	8.25 (approx.)	Speeches at the Civil Service Dinner, relayed from the Connaught Rooms.
Birmingham	8.15	Speech by the Rt. Hon. The Earl of Birkenhead, K.C., relayed from the Chamber of Commerce Banquet.
Bournemouth	7.30	Musical Appreciation, Second Night
Cardiff	7.30	The Charm of Variety.
Manchester	7.30	Concert in Aid of the Lord Mayor's Unemployment Fund.
Newcastle	7.30	From the Cotton Fields.

SATURDAY

London	7.30	Band of H.M. Scots Guards.
Birmingham and 5 X X	7.30	A Nigger Minstrel Programme.
Manchester	7.30	Pantomime, *Cinderella*.
Aberdeen	7.55	Violin and Pianoforte Recital
Aberdeen	8.35	A One Act Farce, *The Cure*.

Inland Revenue Radio Society

Hon. Sec.—MR. J. O. CLAXTON, 570, Salisbury House, London Wall, E.C.2.

MEETINGS are held at 2, South Place, E.C.2, on first and third Fridays in each month during the winter months and the first Friday in each month during official summer time. Membership is open to permanent, temporary and retired members of the Inland Revenue Department.

The first regular meeting was held on Jan. 16, when Mr. Crewe gave a talk on the working and running of a wireless society. This was followed by a description of an efficient short-wave receiver. Mr. M. C. Butler also spoke on the subject of "The Use of Esperanto in International Radio Communication."

Coventry and District Co-operative Radio Society

Hon. Sec.—MR. A. CURTIS, West Orchard, Coventry.

THE meeting held on January 28 was devoted to practical work, when a loud-speaker of the pleated paper type made by a member was tested on the society's three-valve receiver and gave excellent results.

"**Practical Notes in Electric-light Wiring**" is the title of an illustrated article appearing in the current issue of "The Amateur Mechanic and Work" (3d.), and will be of use to all those who contemplate installing the necessary wires and apparatus for lighting up their own homes. Other articles and features appearing in the same number are: "Mending Broken Glass and China," "A Hall Stand for a Restricted Space," "Our Small Car Page," "Adding a Valve to a Wireless Set," "A Catwhisker Clutch," "Notes by the Way," "Practical Photography: Snow and Hoar-frost Landscapes," "Repairing a Broken Vice," "A Tobacco-pipe Cleaner," "Designs for Model Steam Traction Engines," "Motor Cycle Practicalities," "Fitting Shelves in Recesses," "Cycling Chat: Winter Equipment."

ANNOUNCEMENTS

"**Amateur Wireless and Electrics.**" Edited by Bernard E. Jones. Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. It will be sent post free to any part of the world—3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to the Proprietors, Cassell & Co., Ltd.

General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets.

Contributions are always welcome, will be promptly considered, and if used will be paid for.

Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed.

Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," La Belle Sauvage, London, E.C.4.

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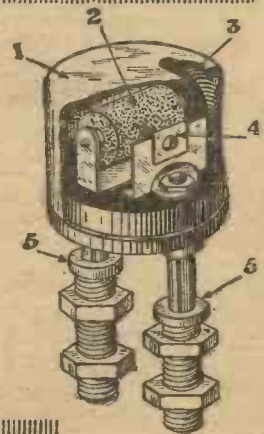

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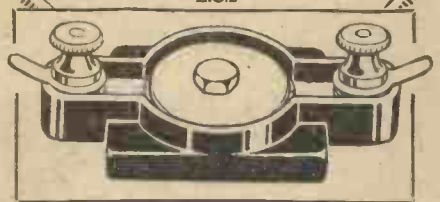

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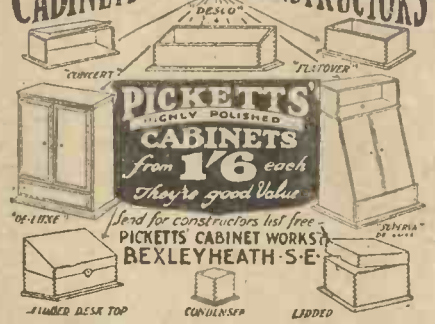

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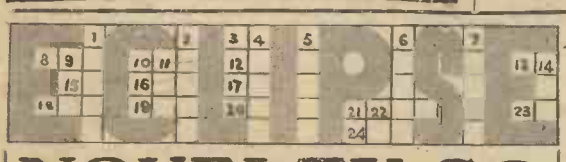

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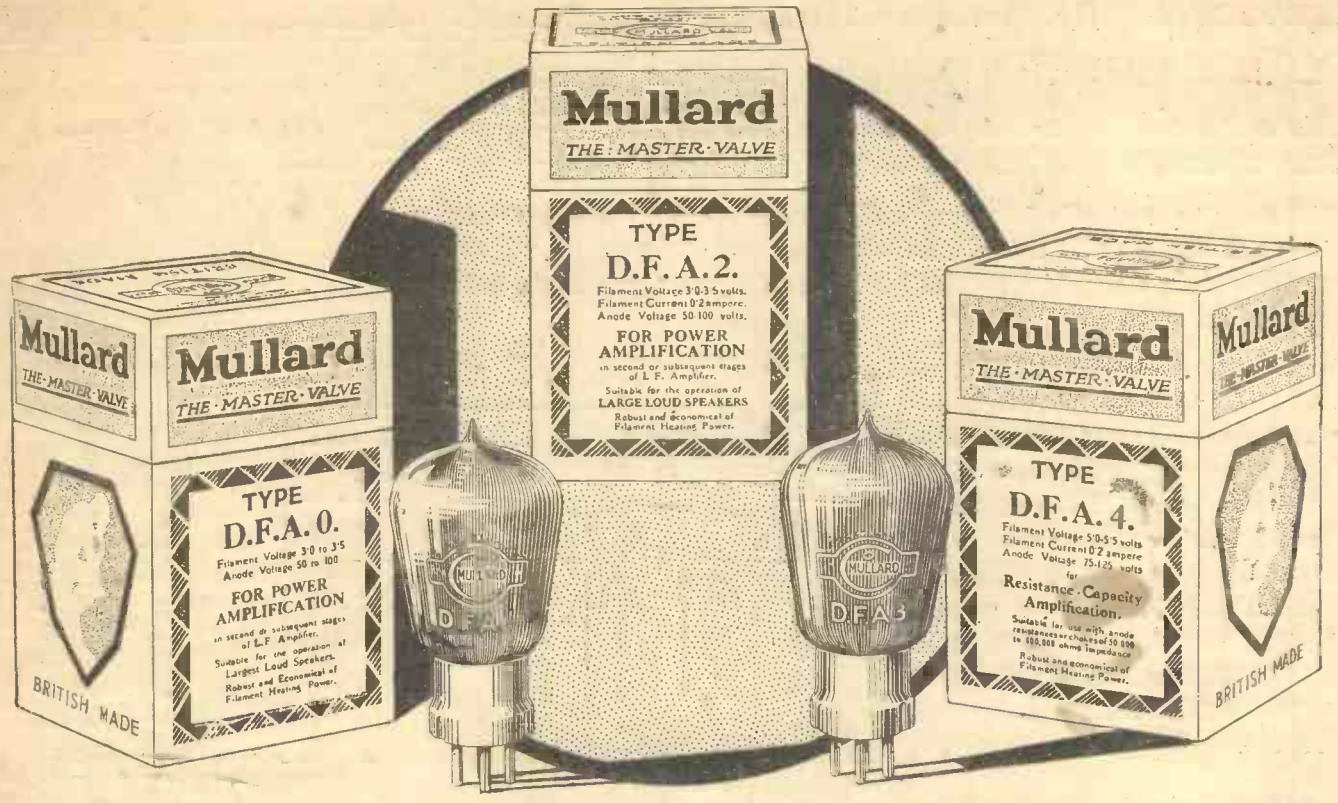

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No. of Coil.	Minimum Wave-length.	Maximum Wave-length.	Minimum Wave-length.	Maximum Wave-length.	PRICE.
25	185	350	100	325	4/10
30	235	440	130	425	4/10
35	285	530	160	490	4/10
40	360	675	200	635	4/10
50	480	850	250	800	5/–
60	500	950	295	900	5/4
75	600	1,300	360	1,100	5/4
100	820	1,700	500	1,550	6/9
150	965	2,300	700	2,150	7/7
200	1,885	3,200	925	3,000	8/5
250	2,300	3,800	1,100	3,600	8/9
300	2,500	4,600	1,400	4,300	9/2

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In the new LISSEN CRYSTAL SET a form of tuning has been introduced which permits of a No. 60 LISSENAGON (pronounced LISSEN-AGON) coil being used, and dispenses with the need of added capacity to tune it. A big signal voltage is built up. But, apart from its high inductance efficiency, too, there are other considerations which place this receiver far above all other crystal sets, NO MATTER WHAT THE PRICE.

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In conjunction with the principle of EDDY CURRENT TUNING employed in this new LISSEN CRYSTAL SET, LISSENAGON COILS ARE PECULIARLY EFFICIENT. No other coils give the same results.

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NOTE.—One LISSENAGON coil must be ordered with each set—the receiver will not be sold without a LISSENAGEN coil because the use of these coils ensures very high efficiency.

No paper — no cardboard — no loose contacts — no loose wires — connections are stamped-out strips — the whole receiver is an instrument throughout — robust — and THE MOST EFFICIENT CRYSTAL SET MADE — WITH THE MOST EFFICIENT INDUCTANCE.

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Amateur Wireless And Electrics

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PRINCIPAL CONTENTS

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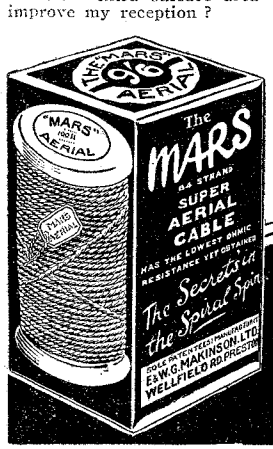

THE MARS AERIAL

Amateur Wireless and Electrics

Vol. VI. No. 142 February 21, 1925

ANALYSING THE CIRCUIT DIAGRAM

THE beginner who wishes to know how his set works usually has little difficulty in understanding the action of the single-valve circuit, where the valve works either as an amplifier (Fig. 1) or as a detector (Fig. 2). In either case a direct current from the H.T. battery passes through the valve from anode to cathode, the amplitude of this current at any instant depending upon the potential of the grid with respect to the other two electrodes between which it is situated.

In Fig. 1 the signals to be amplified are applied between grid and filament, causing the potential of the former to vary with respect to the latter so that variations of the anode current take place which correspond exactly to the original signals but are of greater amplitude.

In Fig. 2 the action is slightly more complicated. By the insertion of a leaky condenser one-half of the H.F. oscillations is made to affect the plate current to a much greater extent than the other half does, and owing to the effect of the used half-cycles being cumulative, the anode current is affected by each train of waves as a whole.

What really happens is that, owing to the unilateral conductivity of the valve, the signals are rectified between filament and grid, and as the accumulating negative charge on the grid side of the condenser can only escape slowly via the grid leak, the potential of the grid is materially reduced by each train of oscillations. The arrangement shown by Fig. 2 is really equal to a two-electrode valve followed by a three-electrode valve acting as a direct-coupled L.F. amplifier.

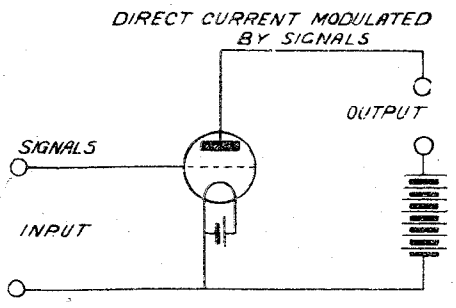

Fig. 1.—The Valve as an Amplifier.

When studying the action of the valve the filament current, of course, may be ignored, as this plays no part in the actual working of the valve beyond merely raising the temperature of the filament to a point at which it will emit sufficient electrons.

The "Straight" Circuit

The straight single-valve circuit is really so simple that its action can be readily understood by the veriest novice, but having reached this point the interested student naturally wishes to proceed further, but the next step, he finds, is a very big one. He finds himself confronted by a formidable array of three-, four- and five-valve circuits in which it is difficult to see how the principles which he has already mastered can apply. Instead of the two simple circuits with which he has been concerned, he now has to deal with an intricate maze of conductors, circuits and parts of circuits, not isolated so that he can study the action of each one separately, but interconnected and superimposed one upon the other until it seems hopeless to try to understand the actual working of the complicated whole.

To show how such a multi-valve circuit diagram can be resolved into its component circuits so that the action of each one can be studied separately is the purpose of this article. Perhaps the best way of explaining how the present-day complicated circuit can be analysed and its constituents separated is to reverse the process and follow the evolution of the intricate modern circuit from the mere collection of simple circuits which was its prototype.

Fig. 3 shows diagrammatically the connections of a three-valve receiver as actually used in the early days of the three-electrode valve. The valves act respectively as an H.F. amplifier, a detector and a note magnifier. As the various stages are entirely separated one from the other the student will have no difficulty in following the action of each. However, we will follow this out in detail. For greater clearness the nature of the current flowing in each circuit is indicated by an initial placed near that circuit. The meaning of these initials is as follows:

H, high-frequency currents; AH, amplified H.F. currents; R, rectified currents; L, low-frequency currents; AL, amplified L.F. currents; D, direct current.

Referring to Fig. 3, the H.F. currents in the aerial induce H.F. currents in the secondary circuit, which is the grid circuit of the first valve, and therefore an amplified reproduction of the original oscillations is superimposed upon the direct current flowing from the H.T. battery through the valve. Although the current in the primary of the H.F. transformer is really a fluctuating D.C. current, only the H.F. component, of course, produces any effect in the secondary of the transformer by which the amplified H.F. currents are applied to the grid and filament of the

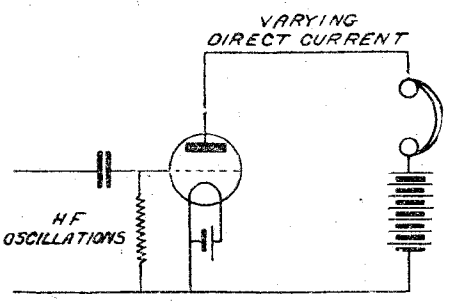

Fig. 2.—The Valve as a Detector.

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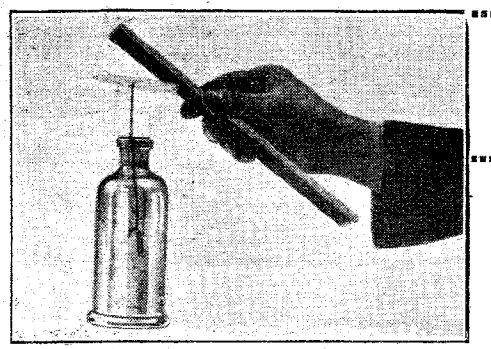


TEST YOUR EBONITE

CONSTRUCTORS of wireless sets often falsely economise by buying cheap ebonite.

Most amateurs have not the necessary apparatus to test for current leakage across an insulating surface, nor have they seen an experiment conducted which would visibly impress them that leakage does take place.

The following is an interesting experiment which can be carried out in a few minutes and will leave an indelible impression as to the relative insulating properties of materials.

Construct a simple form of the gold-leaf electroscope, as shown in the photograph. All that it consists of is a bottle, a piece of wire bent as shown (to the top of which is soldered a circular disc of metal) and a piece of gold leaf. The gold leaf is attached by means of a little gum to the bottom end of the wire.

Charge the electroscope by flicking the disc with a piece of dry fur or flannel. The leaves will diverge, the instrument being charged and ready for the test.

(Note.—The leaves will more readily diverge if the instrument is placed a few feet from the fire for a short time.)

Now take hold of, say, a piece of ebonite and touch the disc with it. If the surface is non-conducting the leaves will remain apart, but if leakage is taking place the static charges residing on the leaves will leak to earth through the body and the leaves will slowly collapse. In turn present other materials—three-ply wood, oak, etc.—to the electroscope and note the results; the rate of collapse of the leaves will indicate the quality of the insulation of the material.

The experiment will prove that most materials, ebonite excepted, used for panels leak electrically, and consequently the efficiency of sets built upon them will be greatly impaired.

Such an experiment is convincing, and amateurs will feel amply repaid having made another incursion into the realm of experiment.

C. L. R.

"ANALYSING THE CIRCUIT DIAGRAM" *(continued from preceding page)*

detector valve. Owing to the action of the grid condenser and leak a decrease of plate current is produced by each group of waves and so the current flowing in the plate circuit of the detector valve consists of a direct current modulated at speech frequencies. As before, only the fluctuating component induces a corresponding current in the secondary of the transformer, which causes the potential of the grid of the last valve to fluctuate and vary the direct current through the phones so that the telephone diaphragm produces audible signals.

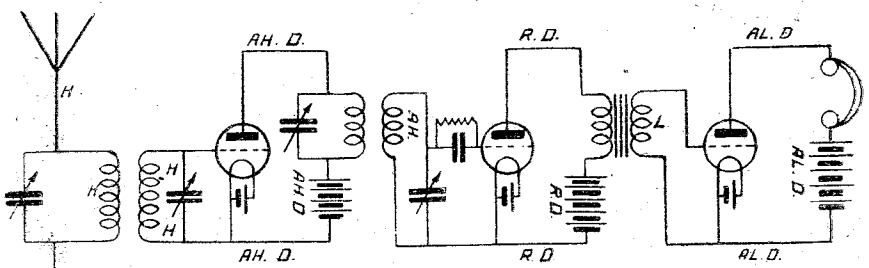


Fig. 3.—Early Arrangement of Valves in Cascade.

The arrangement shown in Fig. 3 suffers from the obvious disadvantage that separate H.T. and L.T. batteries are required for each valve. It was soon discovered that a common H.T. battery could be used and such a circuit is shown in Fig. 4. Comparing this with Fig. 3, the student should have no difficulty in seeing that the use of a single H.T. battery does not modify the previously explained action in any way.

Fig. 5 shows the modern arrangement. This is materially the same as Fig. 4, the only alterations being that the filament of each of the three valves is heated by current drawn from the same accumulator and that it is not found necessary to tune both windings of the H.F. transformer.

The student should carefully follow out the evolution of the very common type of circuit with which we have just dealt until he is quite confident that he thoroughly understands each step, and then he should apply the same priciple to the various other types of circuit, all of which can be resolved into their fundamental constituents in exactly the same way.

The writer is well aware that the above explanation can be criticised on the grounds of incompleteness, but considers that the introduction of unimportant details would serve no useful purpose at this stage and would only confuse the beginner. The explanation is accurate so far as it goes.

J. F. JOHNSTON.

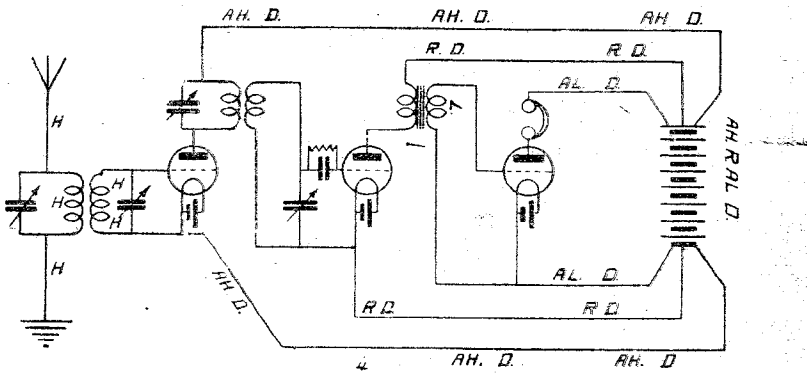


Fig. 4.—Valves in Cascade with Common H.T. Battery.

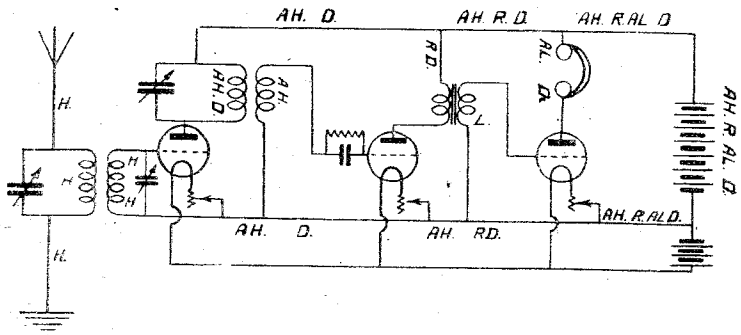
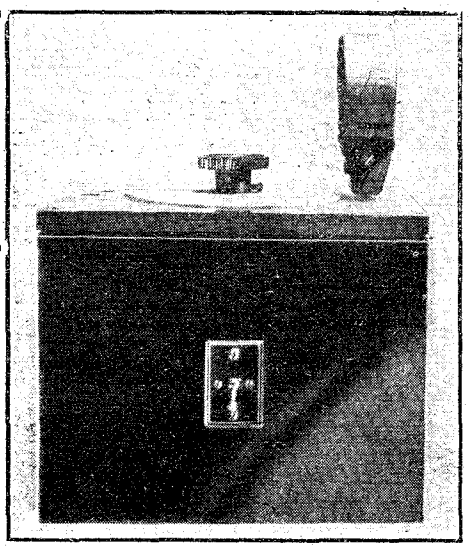


Fig. 5.—Modern Arrangement of 3-valve Circuit.

A HOME-MADE WAVEMETER

The wavemeter is not appreciated at its true value; this article tells you what it does and how it may be made.



The Complete Wavemeter.

A WAVEMETER is one of the most useful things that any wireless enthusiast can possess. With its help the process of searching for distant stations, so long as their wavelength is known and they are within the range of the receiving set, becomes quite simple. Further, it is the greatest help to either the valve or the crystal man as a means of testing his set. With the aid of its buzzer the crystal user can find the sensitive spot without delay, whilst both he and the valve man will find it a help in time of trouble.

If you are getting either weak signals or no signals at all, set your wavemeter to the wavelength to which you have tuned or desire to tune, start it buzzing, and place it near the A.T.I. Then tune in its note as loudly as you can. If it comes in at its usual strength, then probably there is nothing wrong with the receiving set itself, and you must look for the trouble in the aerial or earth.

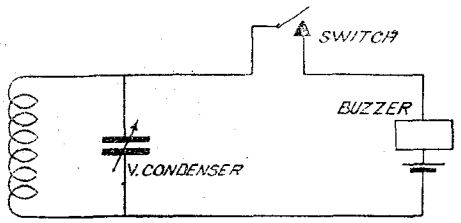


Fig. 1.—Circuit Diagram.

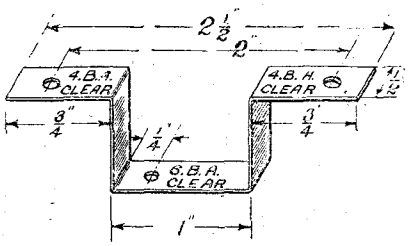


Fig. 3.—Buzzer Bracket.

Again, should a signal which is usually strong come in weakly on a certain night apply the wavemeter test. If its note is as powerful as ever in the receivers, then probably the transmitting station is using less power or receiving conditions are particularly bad.

The simple wavemeter consists of no more than a buzzer, a variable condenser, an inductance coil, a switch, and a single dry cell to supply the current required to work the buzzer. The circuit is shown in Fig. 1. What happens when the wavemeter is working is this: The blade of the buzzer alternately makes and breaks contact. When it makes contact there is a path for current from the negative pole of the battery through the coil and the buzzer back to the positive pole. During the brief instant whilst current is flowing energy is stored up in the magnetic field formed round the windings of the coil. When the blade springs away the current is broken. The stored up energy is given back and goes to charge up the condenser, which discharges in a series of swings to and fro, producing an oscillating current.

By suitable values of inductance and capacity we can make the rate of the condenser's discharge, or the frequency, what we will. Thus the oscillatory circuit, consisting of the coil and the condenser, can be set to any wavelength, and when the instrument is brought near a receiving set tuned to the same wavelength, the note of the buzzer will be heard in the telephones or loud-speaker, since the wavemeter circuit and the tuned circuit of the receiving set are in resonance.

Calibration

We can calibrate the wavemeter in two ways. The first is to use an ordinary dial graduated into degrees on the condenser, and to make a chart showing the wavelength to which any condenser reading in conjunction with a given coil corresponds. Or in place of the ordinary dial we may make use of one marked off into wavelengths instead of degrees. In this case the chart is not required, and we have what is called a direct-reading wavemeter.

For very great accuracy, especially upon the ultra-short waves, the heterodyne wavemeter is superior to that using the buzzer. There are, however, certain objections to the use of the heterodyne wavemeter; it requires, for example, a valve of its own, and for the best results it should not be worked from the same batteries as the receiving set. Further, it must be calibrated for one particular valve, which must always be run at the same filament temperature and with the same plate voltage. The substitution of a valve of a different type, or even of another of the same type as that originally used, may alter its performances considerably.

Method of Using

Actually, a buzzer wavemeter made on the lines described will be found to give extraordinarily accurate and sharp wavelength readings, especially if care is taken to place it always at some distance from the A.T.I. of the receiving set. If the distance between the two is small, close readings cannot be taken, for the note of the buzzer may be audible over a fairly broad band of wavelengths, and it takes a very acute ear to decide upon the exact point of tuning at which the sound is loudest. When, however, the buzzer is placed at some distance from the set, matters are very much easier. The best position for the wavemeter is that which makes the buzzer note just comfortably audible when there is perfect resonance between the wavemeter and the receiving set. Personally I generally place the wavemeter about 6 ft. from the set.

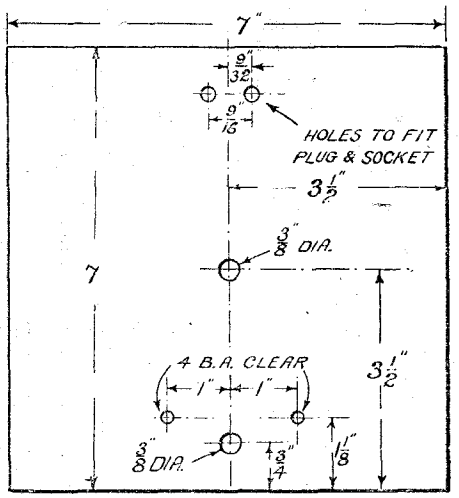


Fig. 2.—Lay-out of Panel.

The buzzer wavemeter is delightfully simple to use either for picking up a desired transmission or for identifying one which has been tuned in, but whose call sign has not been heard. Here is the *modus operandi:* Suppose that we wish to tune the set to the wavelength of 5 S C. We set the wavemeter to 420 metres and switch on the buzzer. We then adjust the controls of the receiving set until its note is heard as loudly and as clearly as possible. Provided that the wavemeter has been carefully calibrated, Glasgow, if within range of the receiver, should be heard when the wavemeter is silenced. To identify an unknown station we set the wavemeter going, adjusting its condenser until resonance is obtained. We then read off the wavelength recorded, and refer-

ence to the lists of home and foreign stations published in AMATEUR WIRELESS enables us to determine with fair certainty where the transmission comes from.

The materials required for constructing the home-made wavemeter are few and inexpensive. The variable condenser should be of the square-law type, whose advantages for wavemeter purposes are very great, as we shall see in a moment. The most suitable capacity is .0005 microfarad. The buzzer must be of a type capable of being tuned to a high singing note, reminiscent of that of the mosquito. An excellent type can be obtained from the Silvertown Manufacturing Co. quite cheaply. To operate it we require a single small dry cell, such as one of those used in an Ever-Ready No. 15 flashlamp battery. A piece of ¼-in. ebonite 7 in. square, a flush mounting plug and socket, and a small on-and-off switch complete our requirements.

The way in which the panel is laid out and drilled is shown in Fig. 2. The size of the holes made for the plug and socket will depend upon the type used. That in the middle of the panel for the spindle of the condenser will in most cases be ⅜ in. in diameter. At the end opposite the position of the plug and socket two 4 B.A. holes are made, as shown, to carry the bracket which supports the buzzer, and

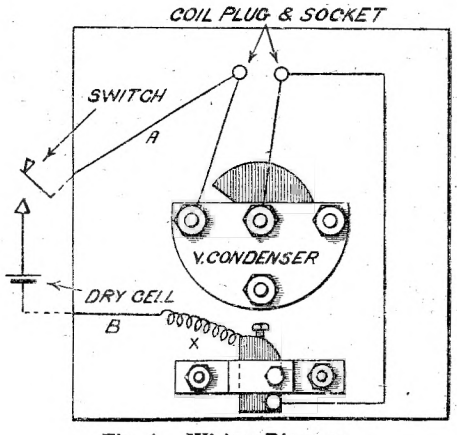


Fig. 4.—Wiring Diagram.

there is a hole ⅜ in. in diameter, which will come immediately over the contact screw of the buzzer, allowing it to be tuned readily with a small screwdriver.

The bracket which holds the little buzzer in place is made as shown in Fig. 3 from a piece of sheet brass 4 in. in length and ½ in. wide. A 4 B.A. clearance hole is drilled in each of the arms of the bracket to coincide with those made in the panel for the fixing screws. In the bottom of the bracket is drilled a clearance hole for a single small screw, by which the buzzer will be attached. The coil plug and socket and the condenser can now be mounted upon the panel, the buzzer being firmly fixed to its bracket and also mounted.

Fig. 4 shows the wiring connections. All except those marked A and B should be made with stiff bare wire, each joint being well soldered. A and B are the leads which run to the switch and the dry cell. These should be of good flex, and they should be made long enough to allow the panel to be removed from its cabinet, so that when necessary the buzzer may be got at quite easily. The switch, which may be of any well-designed type, is mounted, as shown in the photograph, upon one side of the cabinet, and the dry cell, which will last for months without renewing, may be placed inside in a small box. The fine wire X is best soldered to a screw driven through the panel. J. H. R.

(To be concluded)

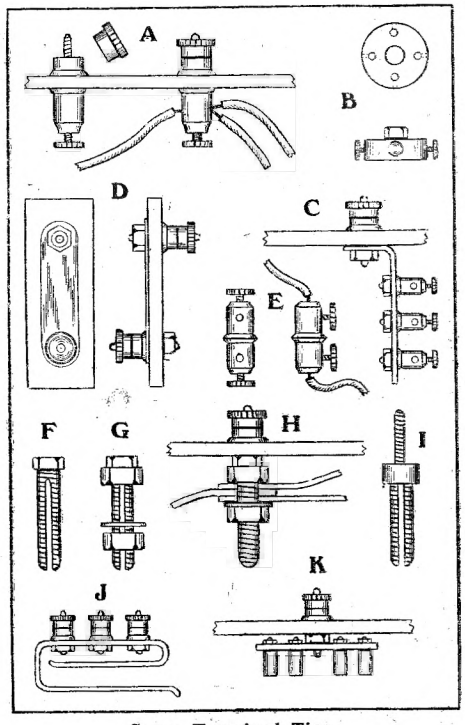
TIPS ABOUT TERMINALS

MANY successful wireless enthusiasts never dream of soldering connecting wires to terminals; if you ask them why, they would probably tell you that it is hardly worth bothering about unless you are going in for a "fixed-circuit" receiver. This is true, for once a cluster of wires are soldered to the shank of a terminal, then usually that terminal is doomed to remain for all time in its original position.

Useful Hints

The accompanying sketches illustrate a few little dodges which may interest the experimenter. At A an ordinary telephone terminal is fitted to the panel in an inverted position, and the hexagon nuts are replaced with two milled nuts taken from an ordinary terminal. The ends of the under-panel connecting wires are clamped in the lower terminal in the usual way. The same idea is embodied in the arrangements shown at B and C. At B a stout brass bush is drilled as shown in the upper sketch to take any convenient number of connecting wires. Tapped diagonal holes in the edge of the bush are provided with small thumb-screws so that it represents a multiple terminal. In the centre of the bush is drilled a hole which is larger than the diameter of the terminal shank, and over this is soldered a brass nut which clamps the terminal to the panel in the usual manner.

At C a number of small terminals are clamped to a small brass strip, which is bent as shown and attached under the terminal nut. D shows two terminals fitted in opposite positions and connected together by means of a small link of copper



Some Terminal Tips.

foil. Such an arrangement is useful for lead-in wires, etc.

How a simple connector for fairly heavy-gauge wires may be made from a pair of large telephone terminals is shown at E. The shanks are sawn off, the bases of the terminals then being filed smooth and sweated together. An easily-made multiple terminal for square-section wire consists of a short length of threaded brass rod which is slotted and soldered at one end to the terminal nut in the manner shown at F. The slotted rod is provided with a washer and two nuts as shown at G, and then screwed over the shortened terminal shank in the manner indicated at H. Readers who possess a lathe should turn the two shanks and the collar in one piece as shown at I.

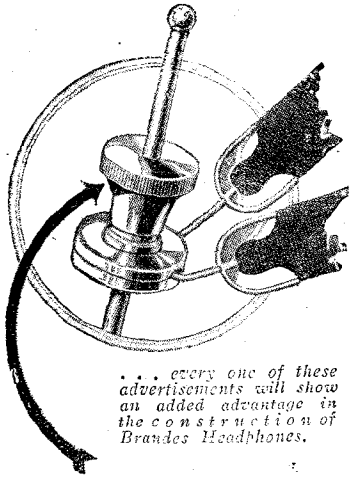
A few extra terminals are often required on the experimental panel. J shows an emergency terminal block which can be very quickly clipped over the edge of a panel, this consisting of a strip of spring brass which is fitted with a number of small terminals and then bent as shown to form a spring clip.

Plugs and Sockets

Readers who favour the plug-and-socket system of connections will find a simple and inexpensive suggestion at K. Here a number of ordinary valve sockets are clamped to a strip of sheet brass, which is then attached to the terminal shank in any convenient manner.

Several manufacturers are now supplying various types of multiple terminals. One fairly well-known type embodies the principle outlined at B; another is a modification of the idea shown at C. O. J. R.

All Brandes products carry our official money-back guarantee, enabling you to return them within 10 days if dissatisfied. This really means a free trial.

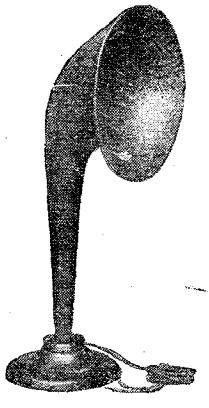


. . . every one of these advertisements will show an added advantage in the construction of Brandes Headphones.

Matched Tone means a technical improvement in telephone construction which should at once grip your attention. If you are intent on better broadcast reception, if you wish to gather the more distant signals with increased strength and clarity, then Brandes Superior *Matched Tone* Headphones are certainly what you want. Matched by ear, the two receivers or ordinary headphones cannot gain an exactly similar degree in tone and volume by a margin of eighty degrees. Brandes, matched by special apparatus, obtain corresponding sensitivity and volume in each receiver to within five degrees and a consequent increase of tone purity, accuracy, and strength. For just home stations or trans-atlantic and trans-continental telephony, get Brandes *Matched Tone* Headphones. *Ask your Dealer for Brandes.*

The lock-nut on the receiver yoke is a clutch that tightens and holds the receivers firmly in place when satisfactory adjustment has been obtained. This point prevents the receivers from slipping, keeps the headphones in correct balance without possibility of working askew, and makes the headband follow the natural line of the head. The whole family can wear the headphones with comfort.

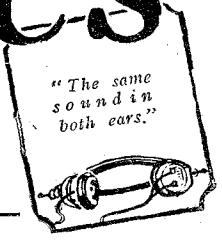
British Manufacture.
(B.B.C. STAMPED.)



The *Table Talker* is another Brandes quality product at moderate price. Designed to meet the need for a simple radio loud-speaking device to entertain a group of people in an average size room, its full round tones are wonderfully clear and pleasing. It is matched to the unit so that air resistance produced will exactly balance the mechanical power of the diaphragm. This means beautiful sound-balance. Gracefully simple of line, it is finished a shade of neutral brown.

Brandes

The Name to know in Radio



Superior "Matched Tone" Headphones

TRADE MARK

HULLO EVERYBODY!!

ALL THESE GOODS SENT POST FREE (U.K. ONLY) EXCEPT WHERE MARKED. FOREIGN POST EXTRA. ORDERS DESPATCHED IN STRICT ROTATION AT EARLIEST POSSIBLE MOMENT.

AERIAL 7/22 100 ft..... 3/-
Copper Strip 3/-
Allen Var. Grid Leak 1/9
BURNDEPT Detector 4/6
Basket Holders 1/3, 1/6
Battery Links, doz..... 1/2
Bushes, Ebonite 1/3

CRYSTALS each, 1/6, Neutron, Gilray, Permanite, Blue Label, Tungstalite

COIL STANDS 2-Way—
Vernier 4/6, 5/-, 5/6
Geared 5/11 Polar 6/-
Shipton Vernier 4/6
"Baby" Ordinary 3/3
With ex. handles 3/6
Nickel ,, ... 4/-
Baby 3-way 4/3
Nickel ,, ... 5/6
Vernier 3-way 6/6
Shipton V. ,, ... 8/-

COILS D.C.C.

For Chelmsford 1/11
With Adapter 2/8
200/2000 SET of 5 ..... 2/6
(Air Spaced Waxless)
Extra Large Air-Spaced Set of 5 Duplex D.C.C. Coils, 25, 35, 50, 75, 100 ..... 2/9
Coil Plugs, Wedge, pr. 2/9
Edison Bell 2 for 2/6
Plugs with Fibre 1/-

DETECTORS (Enclosed)

Micrometer 2/6
Nickel, Large 2/6
Brass ,, ... 2/-
Burndept 4/6
Mic. Met. 6/-

EDISON BELL—
Fixed Condensers.
·001 to ·0005 each 1/3
·002 to ·006 each 2/-
Grid Leaks and Clips 1/6
Dubilier ·001 to ·006 ea. 3/-
·0001 to ·0005 each..... 2/6
Grid Leak, 2 meg..... 2/6
·01 for L.S. 7/6
Anode Resistance on stand, 70,000, 80,000, or 100,000 each 5/6
McMichael's 2-meg. Leak and Clips 2/6
100,000-ohm Res. 2/6

RAYMOND (Ebonite Base)
.001 to .0005 each 1/1
.002 to .006 each 1/3
.01 or .02 each 1/9
(Mansbridge Elsewhere.)
Flex, 2 colour, 12 yd. 2/6
Lighting 12 yd. 2/-
Small Non-Silk 12 yd 1/6

GOSWELL QUALITY

Valve Legs, Set 4 ..... 1/3
Valve Holder..... 1/9
2-way Cam Vernier ... 9/-
3-way Cam Vernier ...12/6
3-way Ordinary 7/6
2-way Panel 3/-
3-way Panel 5/-
Basket Holders..... 1/4

H.F. TRANSFORMERS

McMichael's 300/600 ...10/-
,, 1100/3600 10/-
Energo, 250/700..... 3/11
,, 450/1200 ..... 4/3
,, 900/2000 ..... 4/6
Raymond R.B.C..... 2/9
,, 5 X X 2/9
IGRANIC—Rheostat ... 4/6
30 ohms 7/-
Potentiometer 7/-
Variometer 10/6
Coils (all numbers)

25	5/-	35 ...	5/-
50	5/2	75.....	5/6
100	7/-	150.....	7/10
200	8/8	250.....	9/-
300	9/5	400.....	10/3
		500.....	10/6

LISSEN—Minor 3/6
Stat 7/6
Universal 10/6
Switch 2-way 2/9
Series Parallel 3/9
Anode Res. 2/6
Var. Grid Leak 2/6
Choke 10/6
L.F. T.1 ..... 30/-
T.2..... 25/-
L.F. T.3 ..... 16/6
Coils—

25.....	4/10	35, 40,	4/10
50.....	5/-	60	5/4
75.....	5/4	100	6/9
150.....	7/-	200	8/5

LOUD SPEAKERS

C.A.V. Tom Tit 30/-
C.A.V. Junior 55/-
Sterling Baby 55/-
Sterling Dinkie 30/-
Amplion Junior 27/6
Amplion Dragonfly ...25/-
Beco.....52/6
All models stocked of leading makers.

POLAR CONDENSERS

·001, ·0005 or ·0003 .....10/6
Micrometer 5/6
2-way Junior 6/-

RHEOSTATS

One hole fixing 1/6
C. & S. do. 1/5
De Luxe and Dial 2/6
Burndept 4/6
McMichael Dual 7/6
Shipton Strip—
7 ohm (with fuse)... 3/6
30 or 60 ohm 3/6
Potentiometer 600 ohms 4/6
Crown for DE or R 2/6
L.E.S. Micro Control 3/6
T.C.B. 6, 13, 30 ohms... 4/-
Potentiometer 300 ohms 5/-

SWITCHES

Panel DPDT 1/6
Panel SPDT 1/4
Ebonite DPDT 2/6
Ebonite SPDT 1/9
Simplex Lead in 1/9
Sq. ⊤ Bus Bar 1/-
Switch Arms..... 1/6
(Inc. studs and nuts.)

TERMINALS

Phone or W.O. doz. 1/9
Pillar Large ..... doz. 1/9
Pillar Medium ...doz. 1/3
Nickel 6d. doz. extra.
(All with nuts.)

TRANSFORMERS, L.F.

Ferranti 17/6
Igranic 21/-
R.I. 25/-
Ormond 14/-
G.R.C. 83 .....15/-
Super Success 21/-
Standard Success 16/-
Brunet Shrouded 13/6
Formo Shrouded 18/-
Formo open 12/6
French 9/3

VALVE HOLDERS

Murray Anticap 1/3
Legless Anticap 1/3
Bretwood 1/9
H.T.C. UN PANEL ... 1/9
Solid Rod Standard ... 1/3
Goswell 1/6

VALVES

Myers Universal 11/-
French "R" 7/6
Dutch Detector 5/6
Dutch "R" 5/11
Metal ·06 .....13/11
Radio Micro ·06 .....13/11

VALVES (*continued*)
Bright Emitter B.T.H. "R," Ediswan A.R., Marconi Osram "R" or "R5," Mullard ORA, Cossor L.F. P1, Cossor H.F. P2, Mullard H.F., Mullard L.F. 11/-
Dull Emitter B.T.H. B3, Ediswan A.R.D.E., Marconi D.E.R. Myers, each 18/-
Dull Emitters B.T.H. B5, Ediswan A.R. "06," Mullard D.F. ORA 21/-
D.E. Power Valves Marconi D.E. 6 .....22/6
Power Valves (for ·06) B.T.H., B6 .....30/-
Marconi D.E. 4 .....26/-
Mullard D.F.A. 26/e
Power Valves for B.E. B.T.H. B4, Marconi, Mullard 30/-
(Valves posted buyer's risk.)

WATMEL

Var. gd. Leak 2/6
Anode Res. 3/6

WATES MICROSTAT

New Improved Model. **2/9** Post Free.

BRETWOOD

New Model, variable grid leak 3/-
Anode Resistance 3/-
Anti-Cap Switch 5/-

TELEPHONE DISTRIBUTION BLOCKS, Table Pattern, takes 4 pairs of 'phones 3/6

ENERGO L.F. TRANSFORMER. For supreme Results, Efficiency, Finish, and Permanent Reliability, For 1st stage.....15/-

THE MIC-MET SUPER CRYSTAL DETECTOR **6/-**

ORMOND CONDENSERS with Vernier, one-hole fixing, .0005. Price..... 7/6 Post free.

PANEL SWITCHES. On and Off. Connecticut Nickel. Post Free 1/6

EASIFIX.

Eliminates all ugly, loose wiring and minimises the risk of burning out valves. Each conductor is distinctively coloured and enclosed within an outer-braiding. Complete with Wander Plugs 3/-

OLDHAM PORTABLE ACCUMULATOR

For .06 Valves, 2-in. series will run 6 weeks on one charge. Recharging costs a few pence only. 2 v. 10 amp. continuous 12/6. Will go in your waistcoat pocket.

BRETWOOD
Valve Holder..... 1/9
100 p.c. Efficiency Eliminates poor reception. No soldering stop over or under panel.

HEADPHONES

ERICSSON

CONTINENTAL.
Your Favourite 'phones. Entirely NEW MODEL. Most beautifully finished, exquisite tone. Ridiculous Price, per pair (4000 ohms) 13/11

BRUNET

New Model "TYPE D." Hygienic Horn Headbands. Nickel-plated Stirrup. Black and White Cord. Each receiver stamped with trade mark. 4000 ohms. per pair 16/6
For the MAGIC HOUR! When Fairyland becomes reality, Let the kiddies wear Featherweight 'phones.

BROWN'S "F" TYPE.

4000 ohms..... 25/- pair

N and K

LATEST MODEL. 4000 ohms. Ideal for Crystal reception. Price in AMERICA, £2.
All Stamped N and K. Price here. 17/6
Limited number of old models stamped N and K. 4000 ohms. 12/11 pair
Post 6d. pair.

TELEFUNKEN

(GENUINE). Adjustable. 4000 ohms. Price 17/11

TELEFUNKEN TYPE

So near to Originals. You can scarcely tell the difference except not adjustable. 4000 ohms. Pair 10/9

£50 REWARD! given if the

DR. NESPER

PHONES SOLD HERE ARE NOT GENUINE! BEWARE OF FRAUDULENT IMITATIONS!!
(Injunctions obtained)
Adjustable diaphragm, detachable receivers, double leather-covered head-springs long flexible cords, nickel plated parts. Very comfortable fitting to the head. Per Pair, 12/11. Post 3d. pair

BRANDES

Matched Tone, 25/- pair. 4000 ohms

STERLING Latest Model. 4000 ohms. Wonderful Tone. 25/- pair

G. R. C. 4000 ohms. 20/- pair.

SIEMENS. 4000 ohms 25/- pair.

B. T. H.
Simply cannot be equalled 4000 ohms. 25/-
Perfection and Quality. Weight negligible.

SUPER L.F. (5-1) TRANSFORMER

Windings have insulated layers of 6 sections each, wonderful for amplification. Made in France, by the World's foremost firm.
SPECIAL PRICE 10/-

Genuine BRUNET L.F. TRANSFORMER

(Shrouded)
5-1: 5,000 Primary turns, 25,000 Secondary turns. Post free.....13/6

PERFECT RHEOSTATS

Shipton New Type Strip Rheostat, 7 ohms (with fuse) 3/-
Shipton New Type Strip Rheostat, 30 ohms..... 3/-
Shipton New Type Strip Rheostat, 60 ohms 3/-
Shipton Potentiometer, 600 ohms 4/6
A specially designed spindle gives one-hole fixing and incorporates a tension spring which ensures perfect electrical contact at all times; terminal connections are provided. The 7 ohm Model is fitted with a fuse, which little device may save you the cost of an expensive valve. In operation they are noise free—quite an important consideration.

"UTILITY" SWITCHES

2 Pole c/o Knob..... 4/-
2 Pole c/o Lever 5/-
4 Pole c/o Knob..... 6/-
4 Pole c/o Lever 7/6
Post 3d. each.

QUALITY (GOSWELL) RADIO COILS

Far more efficient than honeycomb or any other type of coil. Exceedingly strong and rigid, mounted on standard ebonite plugs. Brown finish, no wax or shellac used. MOUNTED

25	...	1/6
35	...	1/9
50	...	2/0
75	...	2/3
100	...	2/9
150	...	3/0
175	...	3/6
200	...	3/9 Post 3d. Coil

MANSBRIDGE CONDENSERS

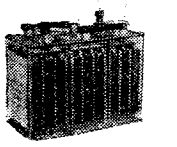
Octopus, Tested at 350v D.C.

.01	2/3	T.C.C.	
.25	3/-	2 mfd.	5/-
1 mfd.	3/8	1 mfd.	3/1
2 mfd. ...	4/6	.25	3/6

Post 2d. each.

"WONDER" Aerial Wire
49 Strands Special Alloy Phosphor Bronze.
For Frame, Indoor, or Outdoor Aerial.
Each strand is a separate conducting surface, is non-corroding, maintains its wonderful results all the time.
110 feet 3/9 post free.
BEWARE of spurious imitations. This is the finest quality.

"HOVIMO" CRYSTAL VALVE. Replaces the old-fashioned detector.
Cat's-whiskerless, Batteryless, Worryless, Fuss and Botherless Wireless **3/6**



ACCUMULATORS

FOR CALLERS ONLY at present.

Rheostat, with Dial, extra value, 2/6

Bretwood Valve-holder 1/9

Manchester "Powquip" 1/6

Ormond 14/6

Shrouded "Powquip," 18/-

Standard "Powquip," 14/6

"R.I." NEW MODEL IN SEALED BOX
Don't Buy Otherwise.
Post **25/-** Free

FERRANTI L.F.

BETTER THAN THE BEST
17/6

IMPORTANT NOTICE

TRADE COUNTER OPEN
will oblige you with any lines in stock, less 20% on Proprietary articles.
NO POST ORDERS TRADE.

EBONITE PANELS

3-16 in.			
3×6 ...	1/8	10× 8 ...	3/6
7×5 ...	1/8	12× 9 ...	5/-
8×6 ...	2/6	12×12 ...	5/9
9×6 ...	2/9	14×10 ...	5/9

CRITERION CONCERT COILS.

Low Self Capacity. Every turn and layer airspaced. Perfect for Reaction. Mounted on Plug.

25 ...	2/-	50 ...	2/6
30 ...	2/3	60	2/9
35 ...	2/3	75 ...	2/9
40 ...	2/6	100 ...	3/-

SET OF 5 (25, 35, 50, 75, 100) 10/- Post 3d.

RIGHT OPPOSITE
DALY'S
GALLERY DOOR

K. RAYMOND

WIRELESS DEPOT

27, LISLE STREET, W.C.2

'PHONE: GERRARD 4637

No responsibility accepted on post orders unless cheques and postal orders are crossed and made payable to the firm. Moneys sent must be registered

HOURS OF BUSINESS:
DAILY - - 9 to 7.45
SUNDAYS - 10 to 1

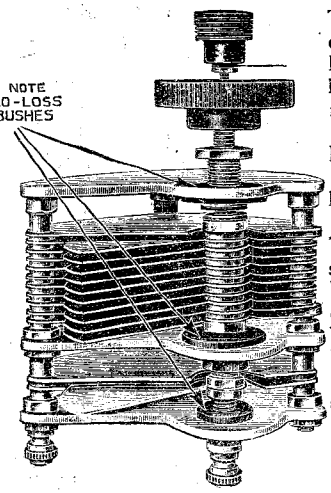
HULLO EVERYBODY!!

REVOLUTION

IN VARIABLE CONDENSERS

SQUARE - LAW LOW - LOSS

(SQUARE-LO-LOSS) with VERNIER.



The only Condenser with the Low-Loss Bushes. Electrical losses reduced to a minimum.

Full capacity as rated.

Exceptional Low Capacity.

The Condenser for short wave-lengths. Why buy a Condenser without Vernier when one WITH costs no more.

·001 - - 8/9
·0005 - 7/9
·0003 - 7/-
Post 6d. Set.

SQUARE LAW with VERNIER

Including Knob and Dial.

Ebonite Ends 1/- extra. TRADE SUPPLIED.

"DE LUXE" MODEL

As shown, with Dial, Knob and Bush

·001 ..... 6/11 | ·0003 ..... 5/-
·0005 ... 5/6 | ·0002 ..... 4/9

POST 6d. SET.

Unsurpassed for Fine Tuning.

"NEW MODEL"

Startling Reductions

ORDINARY Aluminium Ends, Ebonite bushes		SQUARE LAW Aluminium Ends, Ebonite bushes	
·001	6/6	·001	7/6
·0005	5/-	·0005	5/9
·0003	4/6	·0003	5/3

Ebonite Ends 1/- extra. All Complete with Knob and Dial. Post 6d. Set (3 Sets 6d.).

LONDON'S LARGEST STOCKIST OF JACKSON BROS.

"J.B." VARIABLE CONDENSERS

Complete with Knob

SQUARE LAW		STANDARD	
·001	9/6	·001	8/6
·0005	8/-	·0005	7/-
·0003	6/9	·0003	5/9
·0002	5/6	·0002	5/-

Other sizes as advertised by "J.B." Post 4d.

CALLERS! THESE 4 COLUMNS FOR YOU NO POST ORDERS FROM SAME

Warning! Note name RAYMOND on windows. You will not be able to buy these goods otherwise. Nearest Tube Leicester Square. This address is at the back of Daly's Theatre. Open Weekdays 9 to 8, Saturdays 9 to 8.45, Sundays 10 to 1.

ACCUMULATORS

2 v. 40 amps.	9/6
4 v. 40 amps.	16/6
4 v. 60 amps.	18/6
4 v. 80 amps.	23/6
6 v. 60 amps.	27/6
6 v. 80 amps.	33/-
6 v. 105 amps.	38/6

Hart's Stocked. All High Quality.

EBONITE, 3/16 in.

Stock Sizes.

Cut to size ½d. sq. in.	
6 × 6	1/4
7 × 5	1/4
8 × 6	1/10
9 × 6	2/-
10 × 8	3/-
12 ... 6	3/-
12 × 9	4/3
12 × 12	5/6
14 × 10	5/6

¼ in. also Stocked.

Switch Arm, 12 Studs, 12 Nuts, 12 Washers. Lot 10½d.

TAPPED INDUCTANCE COIL

for Chelmsford. A Real Bargain 1/6

WEDGE COIL PLUGS

Fitted Fibre	7d.
Various	7d., 8d., 9d.
Edison Bell	11d.
Plaincoil Plugs	4½d.
Also	5d., 6d., 7d. each.
Fibre Strip	2d. (36 in. by 1 in.).
Empire Tape, doz. yds.	6d.

RAYMOND FIXED CONDENSERS

.001, .0001 to .0005 ... 10d.
.002, .003, .004 ..... 1/-
.006, 1/3; .01, 1/9; .02, 1-9
Ebonite Base Terminals.

DETECTORS (Enclosed).

Micrometer	1/6
Half Opal	1/-
Small Brass	8d.
Large Brass	1-/, 1/3
Nickel	10d. to 1/6
Burndept	4/-
Crystals	Stocked, Neutron, Blue Tungstalite, Permanite
Shaw's Genuine Hertzite	10d.
Uralium	1/-

All known makes.
4 Whiskers (1 gold) ... 2d.
Gold and Silver do. 2d.
7 Waxed Coils 1/8
5 Waxless Coils 1/3
For B.B.C.

SPECIAL!

Vernier 2-way Coil Stands 3/6
Geared do. 5/3

BOXES from 1/11

7 × 5 9 × 6 12 × 9 14 × 10
8 × 6 10 × 8 12 × 10 etc.

H.T. BATTERIES

60 v.	7/6
30 v.	4/6
60 B.B.C.	8/11
30 B.B.C.	5/6
9 v. B.B.C.	2/6
1.5 (D.E.)	1/9

Eveready 66 v., 36 v., 108 v. stocked.

D.C.C. WIRE

per ¼ lb.

18 or 20 g.	9d.
22 g.	10d.
24 g.	1/-
26 g.	1/1
28 g.	1/3
30 g.	1/6

BASKET COILS

Chelmsford	11d.
Also at	1/-, 1/3, 1/9
B.B.C. Duplex Waxless set of 5	1/9
Extra air space, ½ in. (25, 35, 50, 75, 100). Wave-lengths given.	

SWITCHES

D P D T, china base	1/4
S P D T "	10½d.
Panel D P D T	1/-
" S P D T	10½d
Ebonite D P D T	2/3
" S P D T	1/3
Tumbler	1/-
On and off	10½d.

VALVE HOLDERS

Legless	10½d,
Solid Rod	1/-
Climax	1/6
Murray	1/3
Under Panel	1/3
Templates	1½d.

NEUTRODYNE CONDENSERS

Ormond	2/-
Colvern	3/6
Success	3/6
Vernier (Colvern)	2/6

SPECIAL! VARIABLE CONDENSERS

Square Law with Knob and Dial

·0003 .... 4/11
·0005 .... 5/6
Callers' Price

SPECIAL!

Leatherette Boxes with Lid ..... 2/3 and 2/11
Re-echo Crystal Sets 13/11

SPECIAL!

Fine Crystal Set, sloping leatherette Cabinet. Fitted for Chelmsford and B.B.C Wonderful value 9/11
Variometer, Impregnated Board 1/6
With Clips 2/3
Formers ..... from 4d. (Impregnated)
Variometers, inside winding, Ebonite former, similar to Fallon, etc. 6/11

VALVES

Dutch Detectors	4/9
"R" type	4/9
.06	11/-
Phillips "R"	6/11
French "R"	5/11

RADIO MICRO .06

THE WONDER VALVE

H.T., L.T., or D. 3 volts 12/6

METAL .06

Be sure "METAL" is Stamped on Valve and avoid imitations.

One to each Customer at **10/11**

Regular Price 12/6

ALL VALVES REDUCED

(Marconi, Ediswan, Mullard, Cossor, Myers, etc.

VARIOMETERS

Very Special 200/650 metres. All ebonite. Double silk wound callers only 4/-

TERMINALS (Complete)

W.O., Pillar, 'Phone, brass, 1d. each; nickel, 2d. each; stop and valve Pins, ½d.; nuts, various, 6 a 1d,

Valve Sockets	1d., 1½d.
Flush Panel do.	1d.
Spade Tags	6 a 1d.
Do. Terminals	2 for 1½d
Do. Pins	2 for 1½d.
Screws and nuts	2 a 1d.
Switch arms	7d.
Nickel arms	10½d.
Studs, complete	2 a 1d.
'Phone connectors	1d.
2 B.A. Rod ft.	2d.
4 B.B. Rod ft.	2d.
Valve windows	4d.
Washers	12 a 1d.
Shorting plug and socket	3½d
Shellac	5d.

H.F. TRANSFORMERS

For Chelmsford 2/9
For B.B.C. range ... 2/6
Energo, McMichael, Bowyer-Lowe stocked.

MANSBRIDGE FIXED T.T.C. GREEN

.25	2/9
1 mfd.	3/6
2 mfd.	4/6

CONCERT COILS

Set of 5: 25, 35, 50, 75, 100, 10/- set.

Var. gd. Leaks	1/-
Fixed 2 meg.	9d.
Battery Links	3 for 2d.
Ins. Hooks	2 for 1½d.
Egg Insulators	1d.
Reel "	2 for 1½d.
Ins. Staples	5 a 1d.
6 ft. 'phone cords	1/-1/6
Sleeving	3 yards 9d.
Tinned Copper 18 g.	5d.
⅛ Bus bar, hank	6d.
Knobs, 2 B.A.	2d
Wander Plugs	1½d.
Strip Aerial, 100 ft.	2/-
7/22 Heavy, 100 ft.	1/11

COIL STANDS

Ebonite 2-way	1/9
With ex. handles	2/3
Nickel "	2/8
3-way	from 3/11
Basket Holders	8½d.
Best quality	1/-
Basket Spikes	7d., 9d.
Anti cap. handles	9d.
Lead-in Tubes	6d.
Sorbo Ear Caps pr.	1/3

FLEX

2-colour	doz. yards 1/6
Lighting	doz. yards 1/6
Twin silk	doz. yards 1/-
Lead-in, thick,	yd. 3d.
Do., good,	10 yds. 1/-

Rheostats	1/-
Ormond	1/9
Ebonite Former	1/6
With dial	1/11
Shipton, Igranic, Burndept, McMichael, etc., etc.	

SPECIAL!

Customers purchasing 20/- worth of our own good s(at full prices only) are allowed to buy a first-class pair of phones for 5/-, 4,000 ohms, as an advertisement. One pair to each customer. This offer must be taken advantage of at time of purchase.

CRYSTAL SETS

For 5 X X and B.B.C. **7/11**

RIGHT OPPOSITE
DALY'S
GALLERY DOOR

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On Your Wavelength!

2 L O

HAS anyone noticed how much louder 2 L O has become lately and how much more difficult to tune out on an ordinary set within fifteen miles of the transmitter? Whether the power has been increased or not I do not know, but lately I have been getting reception quite comfortably at loud-speaker strength with a detector valve—without reaction—followed by one note magnifier, whereas I invariably used to use two note magnifiers.

Incidentally, the quality of reception seems to have improved. I have been noticing some curious effects when long extension leads are used for loud-speakers. Assuming a loud-speaker is being used in the room where the set is and then one is plugged in downstairs the result is, of course, to throw the aerial tuning out and necessitate retuning. This is not unusual. But I have noticed lately that if the speaker with the long lead is taken out of circuit and the one in the room put back, the tuning does not, as might be expected, return to its original constants. It remains as it became when the long lead was plugged in. In other words, by using the long extension you have put up the wavelength of the receiving circuit *permanently* and the removal of the long lead does not put it down again. To return the receiving circuit to its normal wavelength value it is necessary to cut off for a moment and then switch on again. I am going to try some experiments on this when I find the time.

Amateurs' Splendid Work

Hardly a week passes without our seeing in the newspapers an account of a marvellous feat of transmission and reception accomplished by some amateur wireless enthusiast. To-day, for instance, I see it recorded that Mr. Simmonds has added to his laurels by accomplishing telephonic working with an Australian amateur, Mr. Howden, whose station is near Melbourne, 10,000 miles away. This is not the first time that the spoken word has been conveyed by wireless between this country and the Antipodes, for some time ago Senatore Marconi was heard in Australia when he was conducting experiments from Carnarvon with his beam system of transmission. It is, I believe, the first time that the thing has been accomplished by the ordinary broadcast form of transmission and with the tiny power that amateurs are permitted to use. Another well-known amateur, Mr. Marcuse, has succeeded in establishing communication with the wireless operator of the scientific expedition which is now far from civilisation in the wilds of South America. Some of the finest work in wireless has, as a matter of fact, been done by the amateur. The restrictions imposed upon him have made it essential for him to obtain the utmost efficiency in order to get results with his small outfit.

Good Conditions

Conditions for American reception have been extremely good of late, as I dare say many of you have noticed. Sitting up the other night I was able to pick up no less than five stations, getting K D K A, W B Z and W G Y all at very fair strength on the loud-speaker. There was so little interference from atmospherics, mush or spark signals that the transmissions came through quite as well as those of our own more distant broadcasting stations usually do. One of the best American stations, I think, is W H A Z, but he is unfortunately not an everyday transmitter, and I never can remember which is his particular night. The result is that if I do pick him up I generally do so by accident. His wavelength is 380 metres, which is the same as that of W G Y, so that one cannot get him well unless the latter station happens not to be working at the time.

No Need to Stay Up Late

Though, as I say, I made a night of it, it is often possible to hear quite a lot of American broadcasting without staying up very late. W B Z, whose wavelength is 337 metres, gives a concert at 11 p.m. Greenwich time, and K D K A, 9 metres lower down the scale, opens his musical programme a quarter of an hour later. W O R, on 405 metres, starts at the same time as K D K A, but W G Y is not usually to be heard until a quarter to one in the morning. On a dark overcast night, provided that atmospherics are not bad, one can often pick up American stations as soon as our own close down. Conditions generally improve as time goes on, the best period being often that between 2 and 3.30 in the morning. It is very curious to notice how the strength of these transmissions as received in this country varies from night to night. When conditions are really good many of them come in so strongly that they are as easy to tune in at my station as Aberdeen, Belfast or Hamburg. On these nights the loud-speaker can be brought into use, and sometimes it has to be toned down in order to avoid waking the rest of the household. On other nights I cannot get beyond telephones, and when conditions are really bad one hears either nothing at all or sounds so faint that they are only just identifiable as those of speech or music. Sometimes, too, fading is so pronounced, especially with W.G Y, that signals are roaring in at one moment and at the next they begin to die away, becoming finally quite inaudible.

Although I have received the American stations scores of times I always feel the same thrill of wonder when I manage to pick one of them up and hear what is being said. The other night one station—I forget which it was, but I think it was W G Y—was relaying part of a play acted in New York, and I realised that I was hearing words spoken upon the stage before they reached the ears of members of the audience sitting in the second row of the stalls.

Those Reflex Circuits

I got into very serious trouble a few months ago for speaking disparagingly of reflex circuits. I was inundated with correspondence, and one fiery gentleman in the Midlands challenged me to demonstrate that two reflex circuits side by side on outdoor aerials would not cause interference. I should like him to spend an evening or two with me and I could demonstrate that one such circuit at least is causing a great deal of disturbance in the ether in that little corner of the earth wherein I eat, sleep, write and listen-in. Every time that this particular aversion of mine adjusts his catwhisker I get the full blast of what sounds like a couple of watts of H.F. current from his aerial. His catwhisker is particularly troublesome, at least so it appears, and the whole evening is cut up into a series of horrible screams, growls and grunts from his nasty receiver. I learned quite recently that his set will not work without 120 volts H.T. being applied to the anodes of his valves, and I quite believe that he is speaking the truth! One of our well-known amateur transmitters has transmitted over a distance of 250 miles using such a plate voltage—two miles to a volt.

Canadian Transmissions

The Canadian station C N R A reached England. It is surprising that she did. The usual battery of oscillators, hundreds of morse stations, and Northolt's mush did their best to prevent any reception. One amateur telephonist even chose the exact wavelength of C N R A to discuss problems of modulation. But can anyone tell me why, if any special test is to be carried out, Heaven knows how many morse stations should suddenly appear on the wavelength of the station testing? They are not there normally. Really the problem is becoming acute. Something must be done to restrain both professionals and amateurs from doing their worst in this manner.

On Your Wavelength! (continued)

On normal occasions several U.S.A. stations can be brought in with ease, but when anything like a test is being carried out, the ether becomes one bedlam of noise, every possible source appearing to combine to render the test a failure. If wireless is ever to be anything other than an academic experiment, then something must be done to make stations more selective and to prevent indiscriminate transmitting on any wavelength the operator wishes to use. It is not impossible to keep stations so sharply tuned that no interference is caused.

Northolt

The recent letter from E. W. W. (Coventry), published in the correspondence columns of this paper, is interesting inasmuch as it substantiates the statements I have made from time to time regarding the interference occasioned by Northolt. There is, of course, no doubt that E. W. W. is correct in his statement that Northolt can be heard right down the broadcast band. He may be interested to know, as, no doubt, will many others, that already considerable improvement has been effected in this interference and that the Post Office have promised to look into the matter. It really is a matter of national pride that our stations should not be behind those of every other country. Commercial stations in England do not cause so much interference as do the Post Office stations, and it is time the latter were brought up to a reasonable standard. If publicity can effect this—and it certainly has some influence—we should not be long before we see a change.

The Amateurs

The ether is remarkably clear on the band of wavelengths from 150 to 200 metres nowadays, and I suppose that many people who are not "in the know" have concluded that the amateur has become as extinct as the proverbial "dodo." One evening I did hear 2XR and 2QQ carrying on in their usual breezy fashion somewhere about 200 metres; 5DY and 6YG were also busy. For two hours these were the only amateur stations it was possible to pick up on this (one time) congested wavelength. An examination of the transoceanic wavelength (93 metres and upwards) also failed to bring to light any "brass pounders," so that I concluded that they were all in bed preparing for the early morning tests. This reminds me that I called upon one transoceanic enthusiast a week or so ago about three o'clock in the afternoon, but I found him in bed, getting ready for an "all-night sitting."

The amateur transmitter is not extinct; he has merely hibernated, and when all hope of getting across the Herring Pond vanishes with the arrival of the longer days we shall find him once again perched on the old 200-metre wavelength.

On "Perching"

By this sub-title you will perhaps think that your THERMION has turned his attentions to fields of labour other than wireless, but "perching" is not in this case connected with an aquarium. "Perching" is an offence in the transmitting world, and it is a word coined by the amateur when referring to calculated jamming. I remember that in the good old days of "brass and sparks" that "perching" was often resorted to when it was desired to quieten an unruly station or one which was taking up more than his fair share of ether. The offended station would then change his wavelength to that of the offender, and he would "perch" himself beside him on that wavelength until the other was forced to desist and give his fellow transmitter a little time for transmission.

Needless to say that the tuning of spark transmissions at that time was so flat that it was not necessary to "perch" very close to a station in order to make his signals unreadable, and it was an effective method of preventing a "hog" station from taking more than his fair share of the time available for experiments.

With the advent of sharply tuned valve transmitters "perching" is extremely difficult and unnecessary. The expensive upkeep of a transmitting valve in accumulator "juice" is generally a limiting factor that cannot be altogether disregarded even by the most selfish of transmitters. Thus "the old order changeth——"

The "Squeak" Method

A writer in a daily newspaper has advised readers to tune in distant stations by the "squeak" method; that is, to couple up the coils sufficiently tight as to produce oscillation and then to search for the carrier of the wanted station. The article was headed "Shooting Stations," and if the writer himself has been pursuing the practice advocated it is rather surprising that some person or persons have not "shot" his station long ere this. To search for a station in this manner is an extremely selfish procedure, and, moreover, the terms of the listener's licence forbid him to do so. So, dear reader, please leave the "squeak method" alone and try something less offensive.

DX Work

It has long been my opinion that some of the extraordinary results that have been achieved in long-distance reception during the winter have been due more to an unusual state of the atmosphere than to any marked improvement in apparatus, either receiving or transmitting. Certainly it has seemed that the improvement in results has more than kept pace with the improvement in apparatus. However, I wonder if my recent experiences with Transatlantic broadcasting have been shared by other listeners. I have found during the past few days that reception in England of U.S.A. stations has completely altered in character, much as it did some months back when a station like KDKA, working on the short wave, could not be heard at all over a considerable period. The strength of the carrier wave seems still as good as ever on KDKA and WGY, and also atmospherics do not seem too greatly in evidence, yet somehow the modulated signals are not coming in as they should. KDKA on her 60-odd metre wave is the worst offender. A background effect is audible which has completely spoiled my reception of this station for some days past. It consists of a vibrating noise much like that made by an express train passing over the joints in the lines. Very nearly every electrical fitting in my house has received attention, but the noise still persists. It does not appear to emanate from either my receiver or anything connected with the locality.

To make things worse this particular station is again receiving the attention of an experimenter with a supersonic heterodyne receiver, with the result that a pleasant wailing noise of rather high pitch is assisting the original transmitted wave to vary up and down the scale rather like the rectified A.C. waves of some experimenting transmitters.

I have an idea that the recent exceptional conditions have come to an end. The future may prove me wrong—I hope it does—but I am inclined to think that the days of American reception on one valve are done with for a time at least.

The Same with a Difference

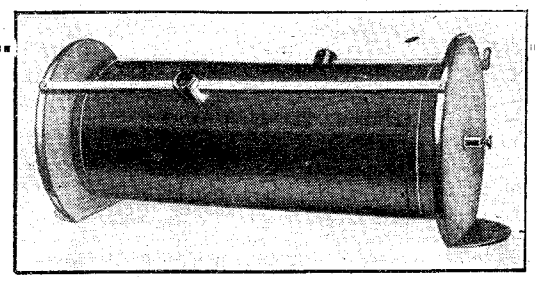
What is the difference between a musical comedy and a comedy with music? This is not a cross-word puzzle and no prizes are offered, but I think the answer will be found to-morrow night at the Leeds-Bradford station when *The Maid of the Inn* is to be performed. Written by Mr. Cecil Moon, pianist and director of the Harrogate Royal Baths Quartet, it possesses a real plot; and that is the answer.

Talks Unlimited

There are too many talks in the B.B.C. but to-morrow Sir Francis Younghusband, the famous explorer, is going to tell Nottingham some of our tasks in India, and we can stand much from the man who really knows his subject. If only we could dispense with some of those afternoon feminine bores at 2LO a revolution in wireless interest would be made.

THERMION.

INDUCTANCES—IN THEORY AND PRACTICE



WHEN a direct current of electricity flows through a wire the only factor that affects the current is the resistance of the wire. Certain kinds of wire are much more *resistive* to electricity than others. Moreover, the resistance of any particular kind of wire depends upon its length and thickness; the longer the wire the higher its resistance, and the thicker the wire the lower its resistance. When an alternating, or oscillating, current is passed through a coiled wire, however, a new factor is brought into play—to wit, "inductance."

By an alternating current we mean a current which changes its direction at a definite number of times per second—or, as we say, at a definite frequency. An oscillating current is merely an alternating current which does this at a high frequency. (For this reason we sometimes distinguish between oscillating and alternating currents by describing them as "high-frequency" and "low-frequency" currents. What follows applies equally to both kinds.)

Oscillating Current

Now, when an oscillating current of a certain frequency flows in a circuit, it may, or may not, experience some difficulty in changing its direction *at that frequency*. It may be oscillating too quickly, or too slowly, for the particular circuit in which it flows. In quite a different circuit, on the other hand, it may experience no difficulty whatever in oscillating at its ordinary frequency. What is it that makes one circuit suitable and another unsuitable for a current of a given frequency? The answer is: *the inductance of the circuit.* The facility with which a current of a given frequency can oscillate in a circuit depends upon the inductance of that circuit.

Natural Frequency

Let us look at the matter from another point of view. When an oscillatory current flows through a wire, we say that that wire is oscillating. Now, every wire tends to oscillate at a certain "natural" frequency of its own. A long wire has a natural tendency to oscillate at a low frequency, and a short wire has a natural tendency to oscillate at a high frequency—just as a long piano wire has a natural tendency to *vibrate* at a low frequency, whilst a short piano wire has a natural tendency to vibrate at a high frequency. When we want to oscillate a wire, therefore, at a given frequency, we cut the wire to such a length that its own natural frequency will be the same as the frequency of the electrical oscillations we are going to pass through it. In this way we make it as easy as possible for the oscillations to take place in the wire, and thus prevent any undue waste of energy. There is always energy wasted in trying to make a wire oscillate at any frequency other than its own natural frequency.

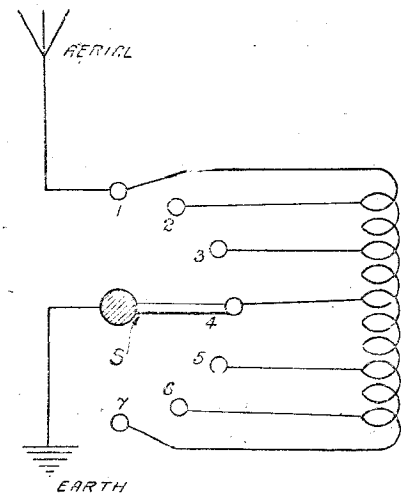


Fig. 1.—Diagram of Variable Inductance Connected to Aerial.

When we consider this elementary fact in relation to aerials it becomes obvious at once that if an aerial is to receive waves of a certain frequency it must possess a certain amount of inductance—or, if we like to regard it from the other point of view, it must contain a certain amount of wire. In order that there shall be no unnecessary waste of energy a receiving aerial must contain just that amount of wire which will make its own natural frequency equal to the frequency of the received waves. If it possesses less, or more, than this amount of wire, some of the energy of the received waves will be wasted in trying to make it oscillate at an *unnatural* frequency, and signals will be proportionately weaker. The ideal aerial, therefore, will be one which can be made longer or shorter at will and with a minimum amount of trouble. In practice this ideal is achieved by the simple method of attaching a coil of wire to the lower end of the aerial—the end that enters the house—and connecting the two together in such a way that any desired amount of the coil can be added to the aerial by the operation of a small switch.

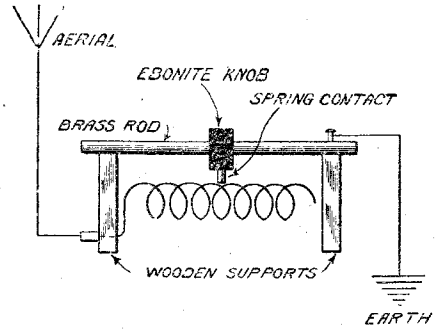


Fig. 2.—Diagram of Slider Inductance Connected to Aerial.

The Inductance in Practice

The process of altering the length of an aerial so that its natural frequency is made equal to the frequency of the waves which strike it is called "tuning." This, as has been stated, is effected by means of a coil of wire, and such a coil is known variously as a "tuner," an "inductance," a "tuning coil," a "variable inductance," a "variable tuner," etc. There are several kinds of these coils, and many ingenious devices have been invented for the purpose of making them "variable."

An ordinary aerial, before it can receive signals, must be connected to earth. The tuning coil must therefore be inserted in the aerial wire at some point along the latter before it reaches the earth. Fig. 1 shows one method of connecting a variable tuning coil to an aerial. Several turns of wire are wound on a cardboard cylinder, and a connecting wire is taken from some turn to a metal stud, several of which are fitted on the panel in a semicircle. A revolving switch S can be brought into contact with any of the studs, and in this way variable quantities of the coil can be added to the aerial. For instance, when the arm of the switch rests on stud No. 4, five turns of the coil are connected up to the aerial. The currents received in the aerial flow down the latter to No. 1 stud, through the first five turns of the coil to stud No. 4, along the metal arm of the switch, and thence to earth. It is always desirable that the tuning coil should be inserted as close as possible to the lower end of the aerial. In other words, the wire that connects the switch to earth—the "earth lead," as it is usually called—should be as short as possible. A coil of this description is known as a "tapped" coil. Although there are many minor ways in which its form may be modified, the principle on which it works is the same.

(*Concluded at bottom of next page*)

AN EXPERIMENTAL PANEL

VERY few amateurs who make up their own sets are satisfied with their first results, so it is a wise plan to first construct an experimental panel of wood upon which to try various circuits.

Figs. 1 and 2 show a suggested experimental panel with the necessary components to wire up practically any one- or two-valve circuit, and there should be plenty of room should any other part be required.

The panel is 1 ft. 3 in. by 1 ft., and the wiring is all upon the surface, except the two wires from condensers to coils and the wire from rheostats, which it will not be necessary to change.

Fig. 3 is a method of making valve-holders which will enable the wires to be easily and quickly changed. It consists of a piece of sheet-metal twisted and bent round at the end and firmly held by the terminal.

An alternative way is shown in Fig. 4, which is self-explanatory. A. L. E.

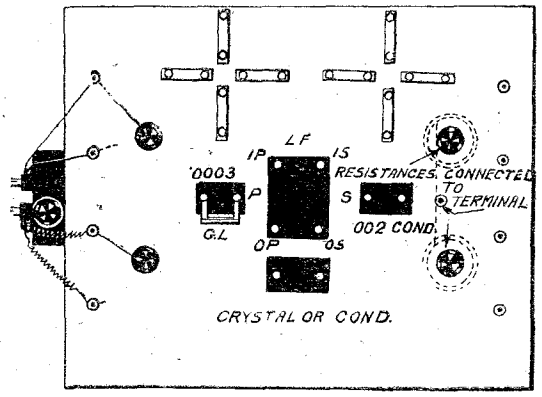


FIG. 2

Fig. 1.—Elevation of Panel.

Fig. 2.—Plan of Panel showing Position of Components.

Fig. 3.—Simple Valve Holder.

Fig. 4.—Another Valve Holder.

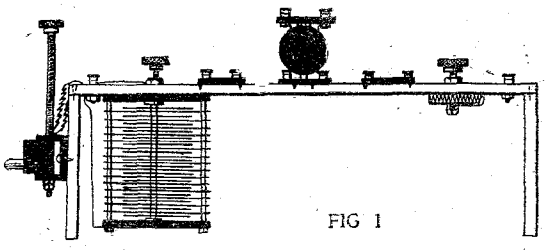


FIG 1

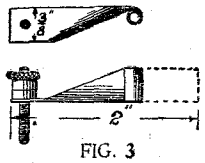


FIG. 3

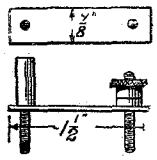


FIG. 4

"INDUCTANCES—IN THEORY AND PRACTICE"
(*continued from preceding page*)

Another simple form of variable tuner is that known as the "slider" coil. The principle on which this type of coil operates is shown in Fig. 2. A coil of wire is fixed between two upright wooden supports. A brass bar stretches from one support to the other at a distance of about ¼ in. above the coil. An ebonite knob rides on this bar, and a small spring contact, which protrudes from the bottom of the knob, presses down on the wire of the coil. A coil of this kind is usually wound with enamelled wire, the purpose of the enamel being to prevent the turns of the coil from making (electrical) contact with one another. The enamel, however, is scraped off the top surface of the wire so as to allow the spring contact to make electrical connection with it at any point.

The spring contact, it should be mentioned, also presses against the brass rod inside the ebonite knob. When the knob is pushed into any position along the rod, therefore, the spring contact connects the latter with the turn of the coil upon which the contact rests. But the brass rod, as shown in the diagram, is connected to earth, whilst the left-hand end of the coil is connected (through one of the wooden supports) to the aerial. Thus any desired amount of the coil can be inserted between the aerial and earth by sliding the ebonite knob along the brass rod. A typical design of such a coil is shown in the photograph.

The inductance of a wire, it may be added, depends upon its shape as well as upon its length. Equal lengths of wire, when wound on drums of different shape, have different inductance values. M. E.

CRYSTAL MEMS

REMEMBER that crystals do not function well if covered with dust and dirt.

Remember that most crystals should have a light springy contact.

Remember that carborundum may be used where a stable detector is desired.

Remember that perikon detectors are not suitable in many reflex sets.

Remember that carborundum needs an applied potential for best working.

Remember that crystals should not be handled with the fingers.

Remember that it is not essential to use a large crystal for loud signals.

Remember that a flat silver strip should be used in conjunction with molybdenite.

Remember that carborundum-silicon is an excellent combination of crystals.

Remember that a crystal does not detect well if preceded by many H.F. amplifiers.

Remember that good contact between the crystal and the cup is essential.

Remember that solder is not suitable for fixing crystals.

Remember that a clean catwhisker is essential for best results.

Remember that crystals are affected by heat.

Remember that it is always preferable to use a catwhisker of some metal which does not oxidise readily.

Remember that insulation in the crystal detector is important.

DISTORTION IN LOUD-SPEAKERS

SOME loud-speakers are inclined to reinforce or accentuate certain notes or tones above others, thus ruining otherwise perfectly good reception, and it is sometimes thought that this distortion must always be associated with the horn type of loud-speaker. Such, however, is not the case. The way to avoid or at least diminish this trouble is to pierce holes the length of the horn at the half-way point, the quarter and the eighth distance from the direction of the narrow part. This will tend to reduce resonance in the horn, and the usual gramophonic type of distortion will be greatly reduced. S. S.

ECONOMY —real and false

THE point is just this: Can you afford *not* to use Wuncell Dull Emitters.

Or, let us put it in another way. You own, perhaps, a 3-valve Set. Now the average bright emitter valve consumes about .7 of an ampere every hour. Three of them, therefore, will consume 2.1 amps. every hour you are using them. If your accumulator is rated at 6 volts 30 amp. hours (that is a good average size) you will get about 15 hours' use from it on a charge.

The cost for this may be anything up to 2/-. Eight shillings for a month's broadcasting—practically £5 per year. Not much when compared with the pleasure you obtain, but still quite an appreciable item in the family exchequer.

* * * * * *

Now let us see what you would be paying if you used Wuncells. First of all you would re-connect your accumulator to give 2 volts only by connecting all the cells in parallel instead of series. This will triple its capacity and give you 2 volts 90 amp. hours, but the charging cost won't be any higher.

Wuncell Valves function best at 1.8 volts and consume .3 of an amp. per hour—your 3-valve Set, therefore, will consume .9 amp. per hour, and your accumulator will last six weeks on one charge.

In other words, you get 5 weeks' broadcasting for nothing every time you get your accumulator charged if you are using Wuncells. And they will save their cost in a couple of months or so.

* * * * *

That is not all. The filament of a bright valve is naturally incandescent. It glows at a white heat and becomes brittle. No matter how careful you are, sooner or later the filament breaks and your valve is useless . . .

But see the Wuncell working. You'll have to look pretty hard before you will realise that the filament is glowing. In daylight it is almost invisible. In fact, it is the nearest approach to the cold valve yet produced.

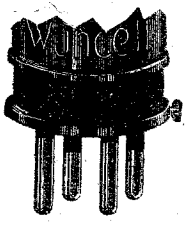
Isn't it obvious that such a low temperature must mean an exceptionally long life? And to make the Wuncell even stronger, we have inserted a centre support to the filament. No wonder *Amateur Wireless* reported that its filament "is practically unbreakable."

* * * * * *

So you'll readily admit that not only do you save quite a considerable amount in running costs, but you get a valve that is likely to last at least three times as long as the ordinary bright emitter. Surely this is real economy.

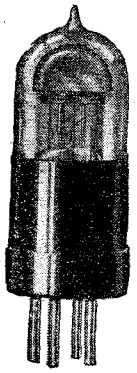
Wuncell exclusive advantages featured:

No. 1



THE man with a multi-valve Set using bright emitters can replace his valves one by one as they become useless by Wuncells W.R.1 and W.R.2. These are the only dull emitters on the market that can be used with a 2-volt, 4-volt or 6-volt accumulator without any alteration to the Set.

Every W.R. type of Wuncell has incorporated in its base a special resistance which can be short-circuited when not required by the screw shown above. When *all* the bright valves have been replaced by Wuncells these resistances can be short-circuited and the accumulator altered to give 2 volts with a greatly increased capacity. Full instructions for this simple alteration are supplied with every Wuncell valve:



Prices:

W.1 For Detector or L.F. Amplifier

W.2 (With red top) for long distance reception

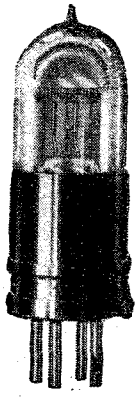
18/- each

*W.R.1 Corresponding to W.1

*W.R.2 Corresponding to W.2

20/- each

** Fitted with internal resistance as above.*

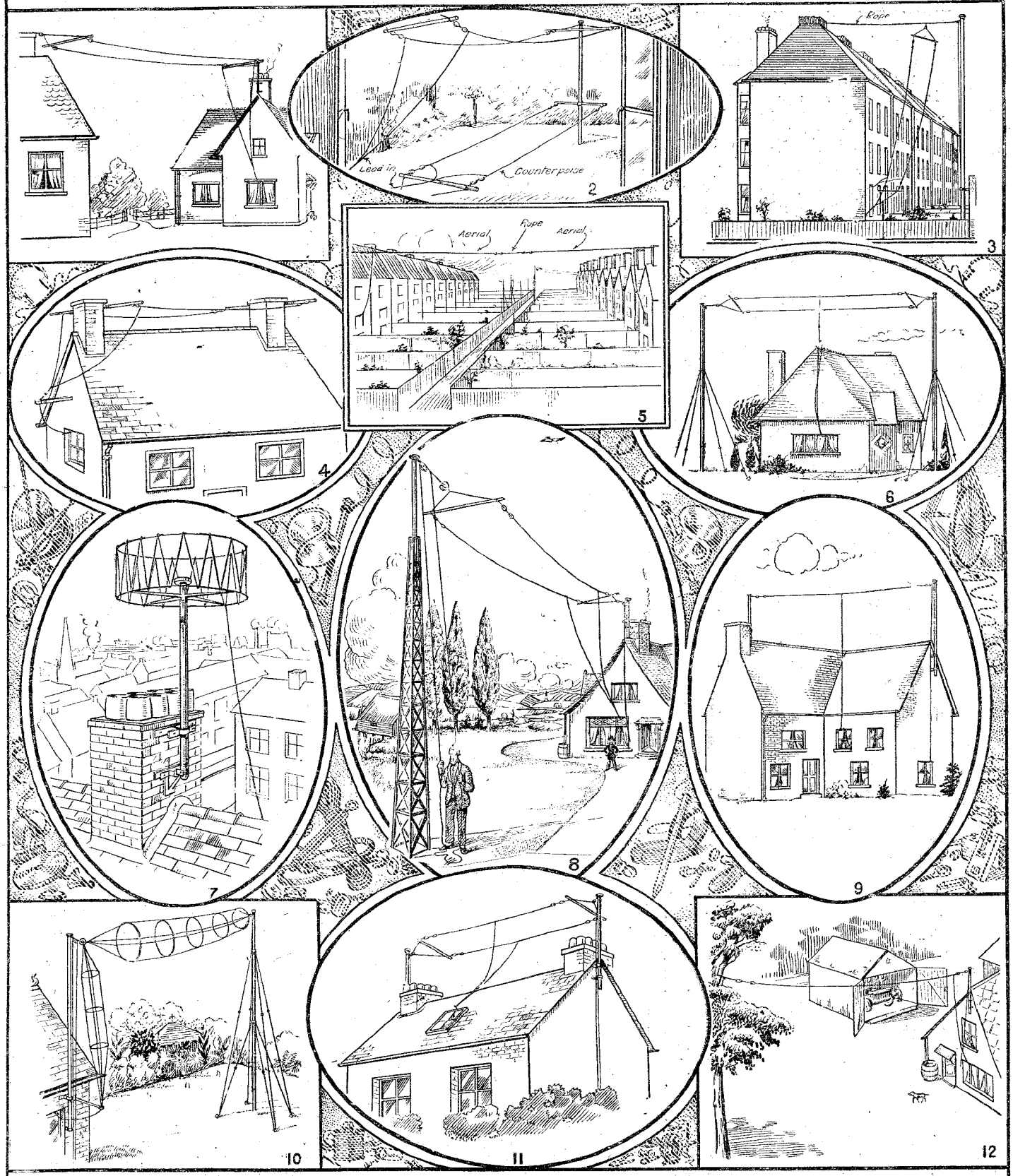


Cossor Wuncell Valves

THE ONLY DULL-EMITTER VALVES SOLD IN SEALED BOXES

Advertisement of A. C. Cossor Ltd., Highbury Grove, N. 5 Gilbert Ad. 2257

AERIAL TYPES



1.—Two-wire Inverted L-type Aerial. 2.—Counterpoise Earth. 3.—Aerial for Use in Restricted Space. 4.—Simply-erected Two-wire Aerial. 5.—Dispensing with the Aerial Mast. 6.—Double-wire T-type Aerial. 7.—"Birdcage" Aerial. 8.—An Imposing Aerial Lay-out. 9.—Single-wire T-type Aerial. 10.—Efficient Cage Aerial. 11.—Simple Double-wire T-type Aerial. 12.—Plain Single-wire Aerial.

SHORT-WAVE HINTS

I HAVE been given a difficult task.

I am to discuss some of the methods and apparatus required for short-wave reception in such a way as to assist those who have some experience of wireless in general and who wish to investigate the possibilities of the lower waveband.

My space is very definitely limited.

This is a vast subject. In the first place there is short-wave reception and short-wave reception. The reception of amateurs on short waves differs distinctly from the reception of broadcasting stations on the same wave-band. Why this should be so I cannot say, but the fact is there.

Again, there are different categories of short waves. You have 150 metres up to

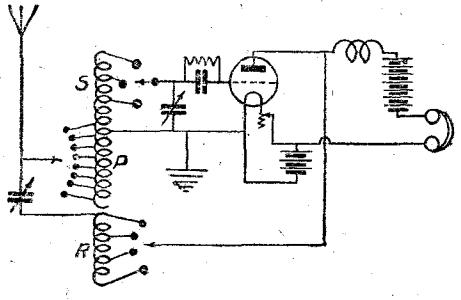


Fig. 1.—Circuit Diagram of Reinartz Receiver.

250—the amateur band. Then comes 90 to 150—another amateur band. Below that the broadcast test band, 50 to 100 metres, and, below that again, freak work on 15 to 50 metres.

I think I can with certainty say that each of these bands requires, for really efficient work, a different receiver.

Let us subdivide these short waves into three bands—high, medium and low. The low—fifty downwards—scarcely comes within our scope at the moment.

The Reinartz

Taking first the high band, we find several excellent receivers of standard design. The best of these for amateur reception is probably the Reinartz or one of its several modifications.

Short-wave work is one of the objects of this type of receiver, and it was designed to give good amplification of weak signals. It has a detector valve with reaction, and should not be used during broadcast hours on an outside aerial. A main point in the Reinartz receiver is the choke coil in the plate circuit, which is for the purpose of ensuring that the H.F. currents pass to the reaction coil and not via the capacity of the telephone windings to earth.

Fig. 1 illustrates one form of this receiver. The coil marked R is the reaction coil and the condenser between R and P is for the fine tuning of reaction. The suggested value of this and the aerial-tuning condenser is .0005 microfarad.

A few additional points may be mentioned. First this receiver will not function with anything like perfection until considerable experience has been gained in its operation. The wavelength range is approximately from 110 metres to 300. Stages of radio-frequency amplification can be added if desired; this was conclusively proved by the Radio Institute of America during experiments with standard apparatus carried out with this object in view.

The Many Circuits

It would be impossible to list even a tenth of the circuits available for work on this higher band of short waves. As a general rule it may be stated simply that a single valve connected through a grid condenser and leak should be used and experiments carried out as to the best way of inducing reaction direct into the aerial circuit. In almost all these receivers home-wound coils are necessary and should be wound continuously on a tube, the break being made afterwards where indicated.

Now to get down to the medium band of short waves, which includes the operating wavelength of K D K A at Pittsburg.

It seems from practical experiments that considerable latitude exists here as to the type of receiver employable. Modifications of the Reinartz receiver are used with varying degrees of success, but, speaking quite personally, I am not inclined to recommend them. The method of winding coils on a tube is detrimental to success, and even where basket coils are used losses occur which cannot be compensated where only one valve is in use.

Immense Distances

There is no doubt that immense distances can be covered with an efficient one-valve receiver on these wavelengths, and the experimenter is not advised to ignore the method by any means. If he does attempt the single-valver the greatest trouble he will have will be centered in his coils. They will have to be low-loss coils and wound with exceptional care even before he commences the tricky task of fitting them into the set.

Another point to watch here is the variable condenser. The nearest available to an American low-loss instrument will work the best. If I had the space available I would discuss low-loss condensers here, for they do not receive their due share of attention in England.

But I think the best system to work on with this band of frequencies is to admit the necessity of losses occurring and effect a compromise, accepting the losses and compensating for them by the use of high-frequency amplification. A Reinartz or modified Reinartz receiver, with a one- or two-stage high-frequency amplifier added, would not work as low as 50 metres, though it is quite feasible on waves of 200 metres. The amplifier would have to be built specially as a short-wave amplifier and balancing of constants would cause serious trouble.

The best results can be obtained as low as 50 metres by sacrificing some of the features of the sensitive single-valve circuit and returning to the straight circuit, which, though taken valve for valve can-

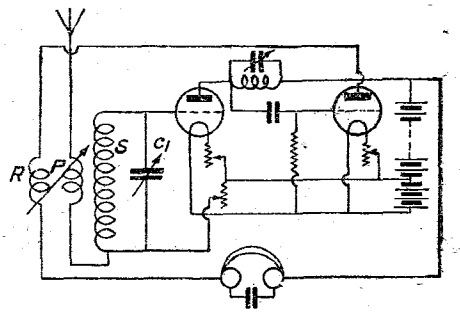


Fig. 2.—Suggested Circuit for Short-wave Receiver.

not compare with the detector with reaction for sensitivity, will allow you to use several valves and thereby get better results.

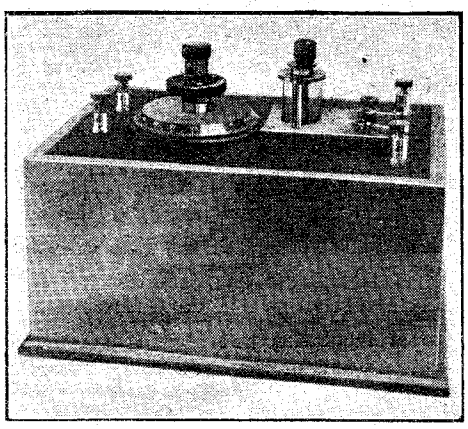
Fig. 2 is a circuit which I suggest for short-wave work. I have not yet had the opportunity of thoroughly testing it, though it appears to be promising. The primary and secondary should be wound on one low-loss former, preferably one upon the other, though loose coupling might be tried for greater selectivity. The reaction coil is wound separately and coupled variably to the primary. The earth connection has not been shown since in many cases it does not appear to be necessary.

Eight turns make the primary, twenty-four the secondary, and four the reaction coil, though these figures require altering in individual cases and must be established by experiment.

Using a basket coil tapped at the twenty-fourth turn out of thirty-two and another for the reaction, K D K A at Pittsburg has been easily heard.

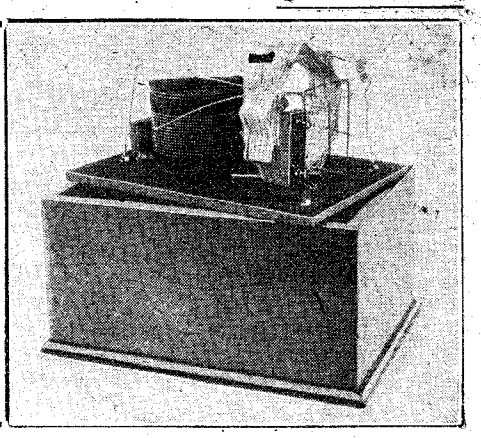
E. C. D.

Although he is screened by mountains on all sides, Signor Franco Pugliesi, the Italian amateur, is heard all over Europe and is well known to English amateurs. The Finnish station 2 M N has received his signals on two valves.



The Complete Set.

CRYSTAL SET WITH LORENZ TUNER



Under Side of Panel.

IT should always be remembered when constructing crystal sets that there is no means of amplification possible, and strong signals will only be heard in the phones if every care is taken to put the received energy to good use.

The aerial coil is the first item that calls for attention, as it is quite possible to lose fifty per cent. of the signal strength if a poorly designed or constructed inductance is used. Low-loss coils are, however, extremely simple to wind provided that a little care is taken. The Lorenz type of low-loss tuning coil is employed in the crystal set described below, which has been specially designed by members of the AMATEUR WIRELESS technical staff.

Components

The following are the components required: One ebonite panel 9 in. by 6 in.; one Dubilier "Vanicon" condenser, .0005 microfarad (with vernier); one .0002 microfarad fixed condenser (Lissen); one .002 microfarad fixed condenser (Lissen); one crystal detector (R.I.); four terminals (Refty); ¼ lb. No. 24 d.c.c. copper wire; 6 ft. of No. 18 gauge tinned-copper wire.

The construction of the coil will be described first, as it is the item of chief interest in the receiver. A piece of ebonite or hard wood, 6 in. by 6 in., is used as the mounting for the former while winding, and on this a circle 4 in. in diameter is marked. Nine evenly-spaced 2 B.A. clearance holes are marked on the circumference of this circle, and nine 2 B.A. rods are mounted therein, secured in a vertical position by means of 2 B.A. nuts. These form the temporary supports for the coil during the winding. The wire is then twisted round one rod, leaving a length of a few inches for making connection when the coil is finished.

Winding the Inductance

Winding may now be commenced. The wire is wound from corner to corner, each alternate rod being missed; since there are an odd number of rods, a coil having linear sides will result, as seen in the photograph. Thirty-two turns are required, and when these have all been wound on, short lengths of wire (or string) may be used for binding the "corners" of the coil together.

The rods can now be unscrewed and slipped out, when the coil will be found to be self-supporting. The method of mounting the coil on the panel can be clearly seen in the photograph.

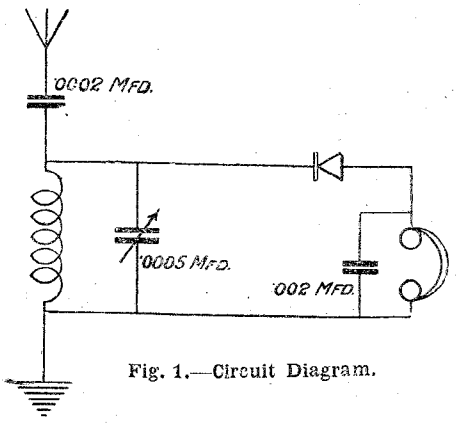


Fig. 1.—Circuit Diagram.

Wiring is carried out with No. 18 tinned-copper wire according to the circuit diagram shown in Fig. 1. A wiring diagram is shown in Fig. 2 for those who

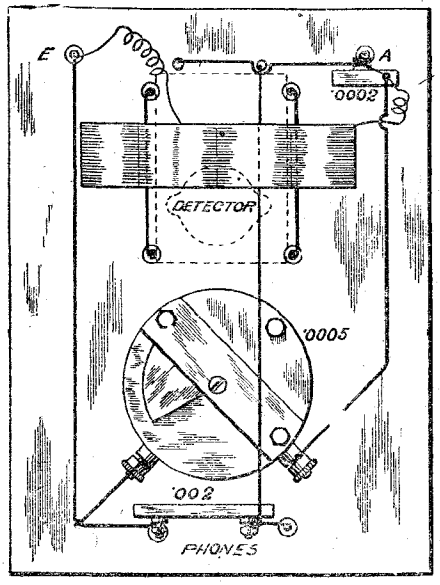


Fig. 2.—Under Side of Panel and Wiring.

prefer to make an exact copy of the original set. The connections are simple and should present no difficulties.

It is important to see that each connection is firmly soldered to its terminal, for it is most annoying if a connection should break free owing to a slight jar or knock. A clean, well-tinned iron is the secret of successful soldering.

It will be seen that the constant aerial tuning system is employed, the small .0002 microfarad fixed condenser in the aerial lead rendering the circuit more or less aperiodic. This arrangement will be found very useful under experimental conditions because, although sharp tuning is obtainable by the use of the condenser, tuning is practically unaffected by the length of the aerial. It is not necessary to use a short aerial for low-wave reception—in fact the tuning will remain the same even if the aerial is disconnected. Signal strength will, of course, suffer.

Tuning on this set is extremely sharp owing to the low losses in the aerial coil, and it should thus be possible to eliminate much of the interference and jamming sometimes heard on crystal receivers.

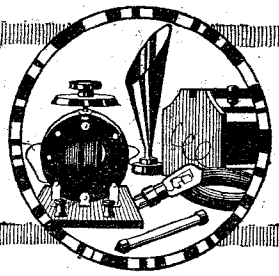
EDUCATIONAL BROADCASTING

THE B.B.C. is of the opinion that the educational side of broadcasting could be much further developed, and despite the somewhat poor results that have rewarded experiments in this direction, a further attempt is being made to introduce wireless as a serious aid to education.

A programme and syllabus of talks and lectures has been issued, and will be sent on request, we understand, to any schoolmaster. The table of lectures was reproduced on page 120 in AMATEUR WIRELESS No. 137, and it will be seen that a very extensive field of subjects is covered.

There is no doubt that the lectures and interesting talks will be of great use, for scores of appreciative letters from teachers have proved conclusively that *under favourable conditions* children grasp and retain the instruction conveyed by wireless lessons.

The whole success of educational broadcasting depends upon the satisfactory reception in the schools, and for this purpose highly efficient loud-speaker apparatus is required.



PRACTICAL ODDS AND ENDS

Glass Detectors

IT may happen through an accident that the glass cover of a crystal detector gets broken, and as most detectors are held together by the glass cover it will be impossible to continue reception.

A temporary substitute for the glass cover may be made by rolling up a strip of thin ebonite sheet, presspahn or similar material. The detector can be reassembled in the ordinary way. B. A.

Potentiometers

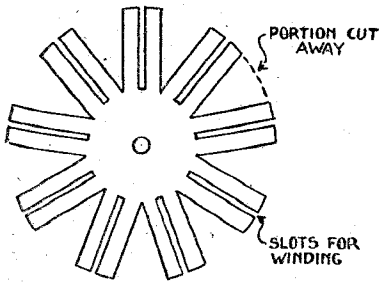
EXPERIMENTERS who use a potentiometer, either for controlling the potential applied to a carborundum crystal or in the grid circuit of a high-frequency amplifier, should remember that current is flowing all the time the potentiometer is connected across the battery or accumulator.

It is advisable, therefore, to employ a switch to disconnect the potentiometer and the accumulator when the set is not being used.

When the potentiometer is used for applying a potential to a carborundum crystal a dry cell is sufficient to supply the necessary current provided that a switch is fitted to relieve the battery of strain when the set is not in use. K.

Improved Basket Coils

FOR rigidity and efficiency the basket coil wound on a disc with nine slots is very hard to beat, but it can be further improved by increasing the air spacing as shown in the diagram. The writer found

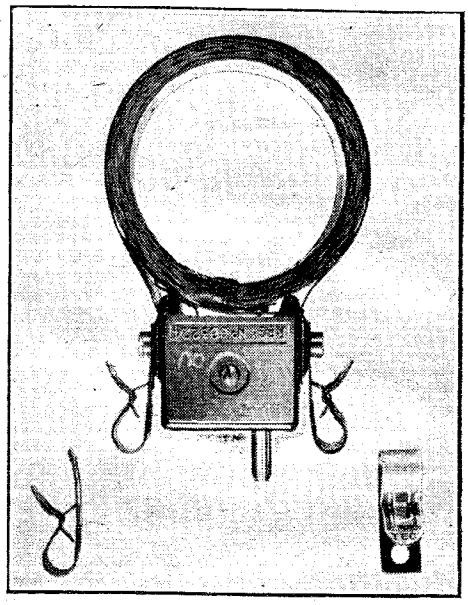


Details of the Coil Former.

a slight increase in signal strength of the local B.B.C. station, but on long-distance reception the further the station the greater the increase in volume, Breslau on a two-valve set came in at twice the strength of that obtained with solid formers. A. W.

Coil Clips

IT is often required to add a condenser or alter a tuning condenser during various tests without materially altering the original wiring.



Clips Mounted on Coil Base.

The following idea will be found very useful where quick changes of the connections are required, and if necessary the arrangement may be made permanent.

The spring-clip terminals illustrated may be bought from several dealers advertising in "A.W." for a few pence a dozen, and, if mounted as shown on the coil holders, are always handy and ready for any addition or alteration required. W. B.

Faulty Grid Leaks

A FAULTY grid leak or grid condenser may be easily detected, but without measuring instruments it is not always easy to find out which of the two is wrong.

If the value of the grid leak is too high or the value of the condenser in this circuit too low, it will be found that when the reaction is coupled up instead of the set oscillating properly it tends to produce popping sounds. This is a sign of an insulated grid or a wrong value of grid leak. The usual values that work best together in the circuit are a .0003 fixed condenser and a 2-megohm leak. Buy good components (not necessarily expensive ones) and make sure of getting a condenser that is of correct capacity and of proper insulation and a grid leak that is constant and of the resistance stated. A variable grid leak can be used if desired, but a good fixed one is quite as good as the best variable and infinitely preferable to some cheap variable leaks, which are neither quiet nor constant. In addition, of course, a fixed grid leak makes the operation of the set far more simple, since it makes one less adjustment to be considered. C. D.

Home-made Loud-speaker Tip

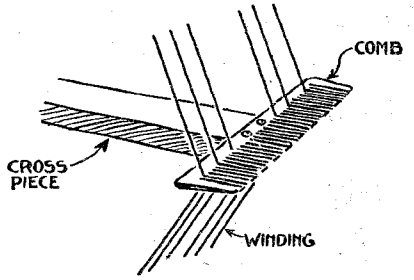
MANY would-be makers of loud-speakers find no difficulty in either making or obtaining a suitable horn, but they do find difficulty in attaching the horn to the earpiece.

To overcome this difficulty, obtain a rubber motor horn bulb and cut a round hole about $\frac{1}{16}$ in. smaller in diameter than that of the earpiece to be used in the bulb. Force the other end on to the horn and wrap it round tightly with adhesive tape. On the top of this wire may be wound to hold it more securely.

This arrangement allows quick and easy detachment of the earpiece and makes a sound-tight joint. A. D.

Frame Aerials

THE winding of a frame aerial should always be kept tight and evenly spaced or the natural wavelength of the whole aerial will suffer. Insulation of the windings, too, is just as important as the insulation of an outside aerial. Slotted ebonite strips may be employed for insulating and supporting the turns. The so-



Comb Insulator.

called "ebony" combs are quite good insulators and may be screwed on the edge of the wooden cross-pieces as shown in the diagram. The spacing of the wires is easily determined by this arrangement, as the number of spacing slots may be varied at will. U.

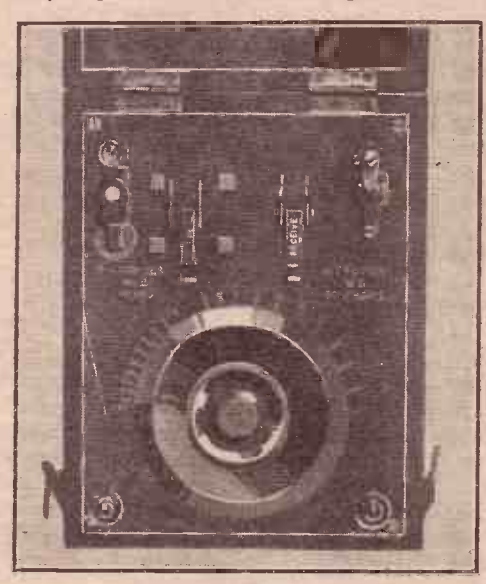
TRANSMISSION STEP BY STEP.—I

A short series of practical articles describing and illustrating the actual apparatus used for amateur transmission.

A Simple Buzzer Transmitter.

PROBABLY the reader is familiar with the ordinary type of buzzer wavemeter which is used for the calibration of receivers. A circuit diagram illustrating the connections of such a piece of apparatus is shown by Fig. 1. When the buzzer A is energised by current from the battery B by closing the switch S, oscillations of a high frequency are set up in the circuit formed by the condenser C1 and the inductance L1. These oscillations may be increased or decreased in periodicity by effecting variations in the capacity of the condenser C1. If, then, the buzzer wavemeter is put into operation near a valve or crystal receiver and the receiver is in tune with or set to the same wavelength as the wavemeter, the rectified H.F. oscillations can be heard in the telephones of the receiver.

Now it is well known that a closed circuit such as is formed by the inductance L1 and the condenser C1 is a good oscillator but a poor radiator of high-frequency current, and correspondingly an open circuit is a comparatively poor oscillator but a good radiator. We can therefore utilise these facts in building up a piece of elementary transmitting apparatus which will have an effective transmission range of two to three miles under favourable conditions. The schematic drawing Fig. 2 and the theoretical diagram Fig. 3 illustrates such an arrangement. The buzzer A should be of a robust design and fitted with an adjustable armature or vibrator. Surplus Army buzzers of various types are available and the power buzzer is a good model to obtain, the only drawback being that they require more current to operate them than the lighter types. The type illustrated in the photograph will work well on a 6-volt accumulator or dry battery.



Wavemeter.

The operating key K takes the place of the switch S in the wavemeter and the variable condenser C1 has a value of .0005 microfarad. The aerial tuning condenser C2 has a value of about .001 microfarad.

As regards the tuning coils, these have to be of a suitable value of inductance, and as spark transmission is forbidden on the low wavelengths of 150 to 200 metres (the gear described is of the nature of a spark transmitter), the amateur must confine his attention to the 440-metre wave outside of broadcasting hours. Therefore the inductances L1 and L2 may consist of two coils normally used for the reception of broadcast. Nos. 50 and 75 Igranic coils are suitable.

To use the transmitter the armature of the buzzer is screwed up until a depression of the key causes it to give out a regular high-pitched note and the dots and dashes of the morse code are certain and well defined. The aerial should be disconnected during this operation, and then, after reconnecting, the inductances L1 and L2 are tuned by the condenser to the required 440-metre wavelength. Care should always be taken to see that the tuning is sharp, and this may be effected by keeping the coils loosely coupled, although by so doing less energy is put into the aerial. This is compensated for by the fact that your transmission is less liable to interference by other stations and is therefore easier to receive at the receiving end.

As comparatively little energy is put

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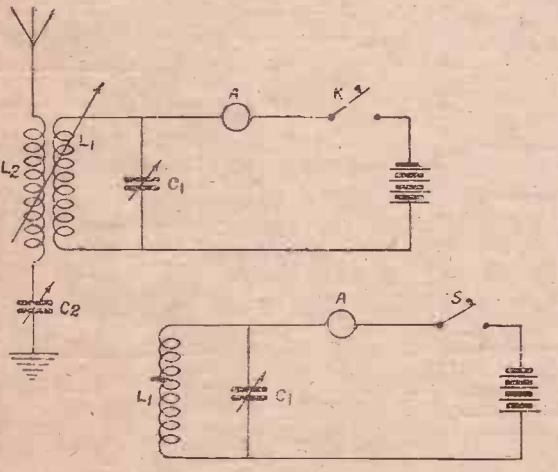
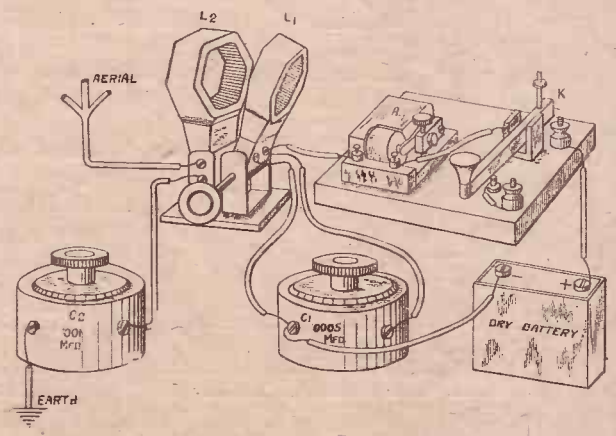
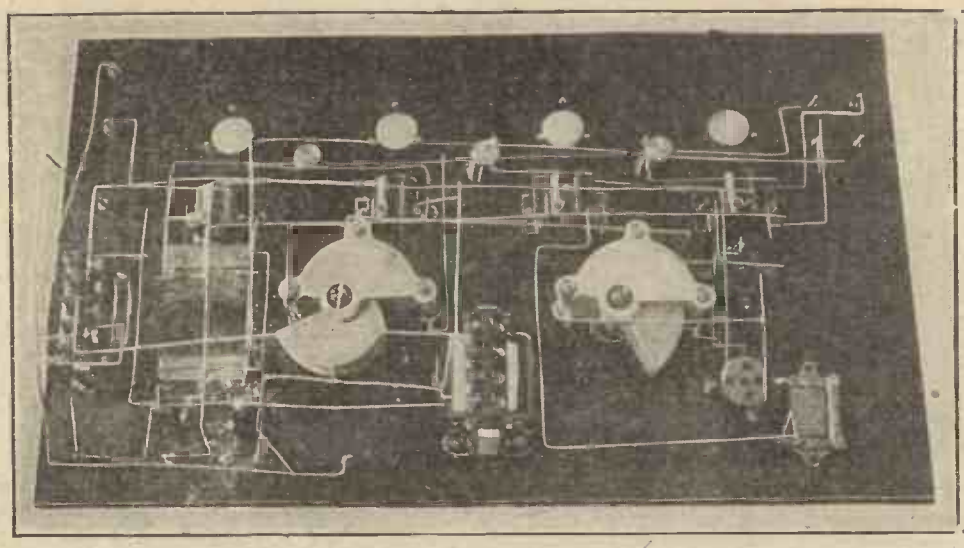


Fig. 3 (top left).—Buzzer Transmitter Circuit.

Fig. 1 (bottom left).—Wavemeter Circuit

Fig. 2 (right).—Buzzer Transmitter "Hock-up."

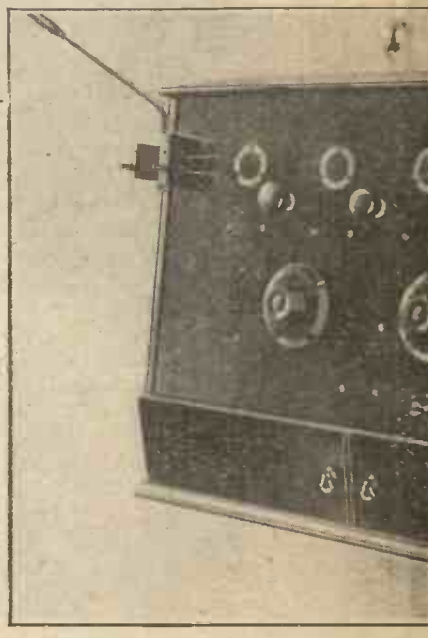




View of Under Side of Panel showing Wiring

THE "
ULTRA-SE
FOUR-V

A unique receiver with d
coupling for selectivity



The Ultra-selective Fo

THE receiver to be described in this article was developed as the result of an attempt to produce a highly-selective set for family use. Obviously such a set must be very simple to control, and for this reason the usual loose-coupling method of obtaining selectivity, employing (in conjunction with a stage of H.F. amplification) five tuning controls, was ruled out.

It was decided, therefore, to build a four-valve receiver capable of receiving the main broadcasting stations on a loud-speaker and possessing the advantages of being neat in appearance, proof against damage to valves, able to reproduce true distortionless music and speech, simple to tune, selective, and provided with means of cutting out one or both stages of low-frequency amplification.

Referring to the circuit diagram Fig. 1, it will be seen that the tuner consists of an aperiodic aerial coil coupled in a fixed manner to a tuned secondary coil. In the special double transformer coupling between the first and second valves lies the secret of the extreme selectivity. These transformers are of the ordinary Igranic high-frequency type, which if used in the ordinary way have their *secondaries* tuned. Two of these transformers are required, and it is advisable to get them specially matched, for if the electrical properties of one differ from those of the other, tuning will become flat and the volume of reception greatly diminished.

The primary of one of the transformers is connected to the plate of the first valve and to positive H.T. The secondary of this transformer is joined in parallel to the *secondary* of the other transformer and a variable condenser of .0005 microfarad is shunted across the two coils as shown. The remaining primary coil is connected on one side to the grid condenser and leak and on the other side to positive L.T.

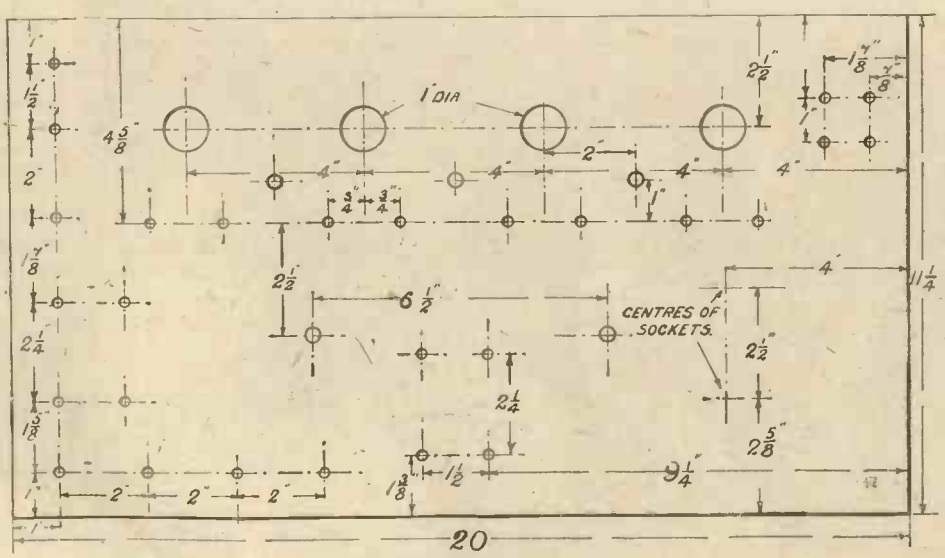


Fig. 2.—Drilling Plan of Panel.

The Low-frequency Circuit

There is nothing unusual in the actual switching arrangements and connections in the low-frequency side of the circuit until we come to the battery connections. This shows a method of obtaining grid bias on the L.F. valves from the H.T. battery. The full voltage of the H.T. battery is applied to the positive and negative H.T. terminals, between which is a third terminal connected to a wander-

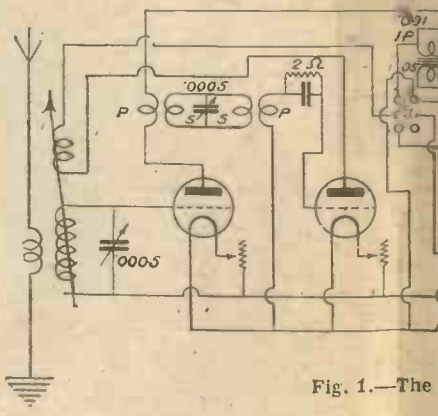
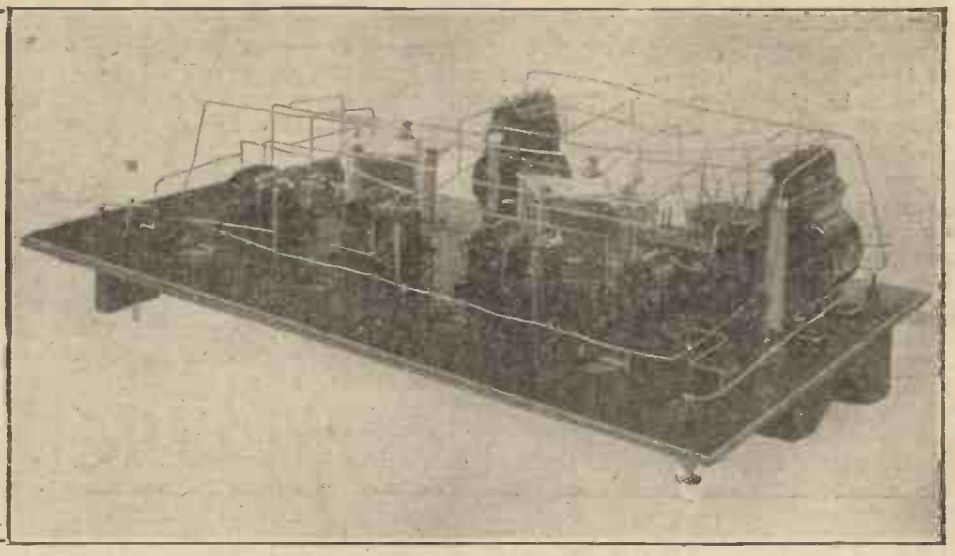


Fig. 1.—The

A.W." LECTIVE ALVER

ouble H.F. transformer and ease of control.

ur-valve Receiver.



Another View of Under Side of Panel.

plug. By tapping off a suitable voltage from the *negative* end of the H.T. battery with this wander-plug the correct grid bias will be applied to the grids of the L.F. valves.

List of Component Parts Required

For the benefit of those who would like to construct a set identical to the original receiver shown in the photographs a list of the components used is given. At the side of each item the maker's name appears, but it should be understood that other well-known reliable makes having the same electrical values may be substituted.

One Radion "Mahoganite" panel, size 12 in. by 21 in., for cutting to 11¼ in. by 20 in. (American Hard Rubber Co.).

Two valve sockets for H.F. transformers.

Four special valve holders (Aermonic).

Four valve windows (A. F. Bulgin).

Three filament rheostats (Enterprise Manufacturing Co.).

Two double-pole double-throw lever switches (Wilkins and Wright, "Utility" lever type).

Two .0005 microfarad square-law variable condensers, with vernier (Wilkins and Wright).

Two L.F. transformers, first and second stages (Igranic).

Two matched H.F. transformers (Igranic).

One "Unitune Major" aperiodic aerial coupler, 300-600 metres (Igranic).

One Igranic concert coil, C_3.

One two-way left-hand coil holder (Burne-Jones).

One .0003-microfarad grid condenser and 2-megohm grid leak (Dubilier).

One .001-microfarad fixed condenser (Lissen).

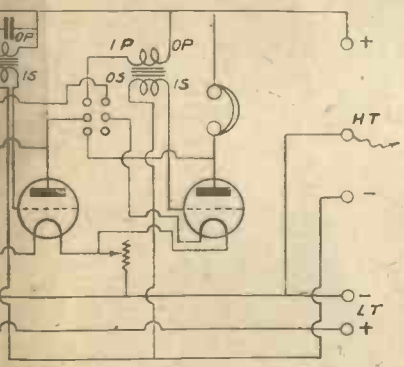
Seven Refty terminals.

One mahogany cabinet to suit panel (Pickett Bros.).

The Cabinet

Instead of buying the cabinet ready-made it can be constructed at home from ⅜-in. thick mahogany. The dimensions are as follows: Base, 8 in. by 20¾ in.; back, 14½ in. by 20 in.; top, 4¾ in. by 21 in.; sides, 20 in. high, 8 in. wide at the bottom, 4 in. wide at the top.

The back should be made removable so that easy access to the valves is possible. A dark mahogany polish on the finished cabinet, together with the mahoganite panel, will give a pleasing effect. Wooden cleats should be screwed round the open-



Circuit Diagram.

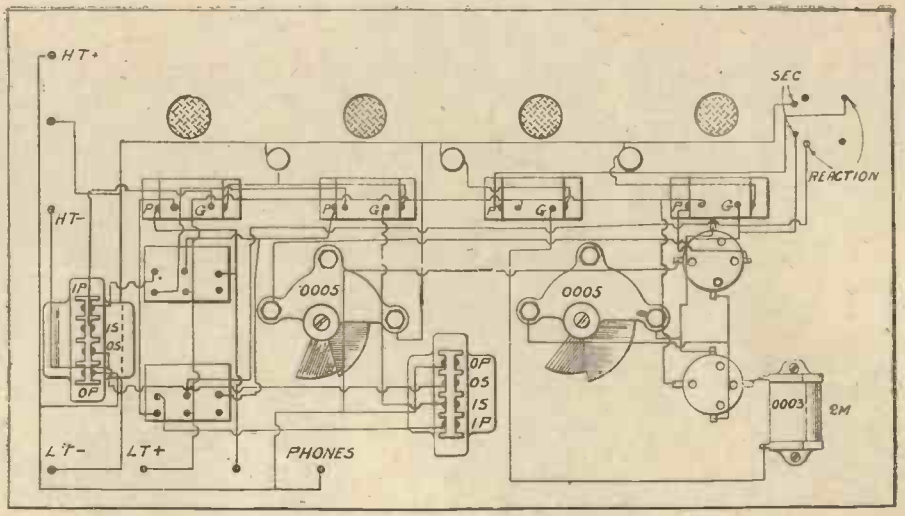


Fig. 3.—Wiring on Under Side of Panel.

ing for the panel $\frac{3}{16}$ in. from the edges so that the panel will fit in flush with the sides of the cabinet.

The Panel

This should be of good quality. Too much stress cannot be laid on the necessity of using high-grade ebonite for insulating panels. The writer has actually known cases where a set has refused to work owing to the fact that the highest resistance between two near points on the panel was 2 megohms! The American Hard Rubber Co., Ltd., 13a, Fore Street, London, E.C.4, keep in stock a suitable panel measuring 12 in. by 21 in. This panel will have to be cut to the size indicated, 11¼ in. by 20 in. A panel-drilling layout is given in Fig. 2, and with this there should be no difficulty in marking out the holes. The components are mounted as shown in the photographs and in the wiring diagram, Fig. 3.

It may be found that the condenser dials stand out from the panel, spoiling the appearance of the set. This may be remedied by inserting an ebonite distance-piece between the condenser and the under side of the panel, thus lessening the length of the one-hole fixing screw sticking up through the panel.

Provided that thick copper wire is used for wiring up there is no necessity to screw down the fixed condensers. The wire should be stiff enough to keep them in place.

No aerial and earth terminals are mounted on the panel. The aerial and earth wires are connected to the two terminals on the Igranic "Unitune" coil. The two-coil holder is mounted on the top left-hand corner in such a manner that the reaction coil swings out to the left—away from the set.

On the right-hand side, looking at the front of the panel, are seen the two switches for cutting out the L.F. valves. Great care should be taken to wire these switches up exactly as shown in the wiring diagram, Fig. 3.

Operating the Set

When all the wiring has been finished and carefully checked so that there is no possibility of burning out the valves, the H.T. and L.T. batteries and phones should be connected up to the proper terminals. An Igranic Unitune Major is plugged into the fixed arm of the two-coil holder and the concert coil into the moving arm. As already stated, the aerial and earth are connected to the two terminals on the Unitune Major. Plug the two H.F. transformers and the valves into their sockets and, keeping the reaction and aerial coils well away from one another, rotate slowly the two condenser dials until signals are heard. Now bring the reaction coil closer to the aerial coil, thereby strengthening the signals considerably. If no strengthening effect is noticed, reverse the wires connected to the reaction coil.

With regard to the valves, either bright- or dull-emitters may be used. The carbon rheostats are suitable for either type of valve.

The selectivity of the receiver may be realised by the fact that during a short test on an aerial within sight of 2 L O, this station could be cut right out and Birmingham tuned-in.

AROUND THE SHOWROOMS

Success Transformer.

L.F. Transformer

LATELY I have been testing a Super Success transformer made by Beard and Fitch, Ltd., of 34-36, Aylesbury Street, E.C.1. As will be seen from the photograph, this is of a somewhat unconventional design.

Actually the transformer is of the hedgehog type with the core in a vertical position, the whole being enclosed by a japanned brass tube with ebonite end pieces. It was tried on a two-valve set (detector and L.F.); the signals were remarkably free from distortion and amplification good.

The construction of the Super Success transformer is such that it will stand a good deal of hard usage. It is an instrument that I can thoroughly recommend. The price is 21s.

"Wireless Ear"

SOME clever people have found a new disease that they call "wireless ear." Listeners will not worry themselves much about this, but it must be admitted that there are phones not any too comfortable to wear for long periods.

In this connection I have been interested in the Macondo pneumatic ear pads sold by McLeod and McLeod, of 329, High Holborn, W.C.

These pads are attractive in appearance and have only to be stretched to fit tightly over the earcaps. Their corrugated surface, part of an air cushion, allows of a free passage of air and prevents perspiration. I have found the pads to be particularly comfortable in use.

Tungstalite Gold Label

THERE seems to be no end to the number of new crystals that make their appearance on the market, and it speaks well for the trade generally that they are nearly all satisfactory in use.

A new-comer among crystals is the Gold Label brand made by Tungstalite, Ltd., of 47, Farringdon Road, E.C.1. I have tested this and found it sensitive over the entire surface.

The crystal is sold with a special silver catwhisker, and results with this were certainly better than with an ordinary copper contact.

Each crystal is packed in a glass-topped airtight container and is accompanied by a numbered guarantee. If you find a piece of Tungstalite that is defective the guarantee entitles you to a new specimen, or you can have your money back.

Tungstalite Gold Label should be of special use in reflex sets, for, owing to its fine grain, the catwhisker has little chance of slipping off.

Super-heterodyne Sets

FEW amateurs in this country have yet tackled the construction of super-heterodyne receivers, mostly because of the difficulty of obtaining the necessary transformers.

Many firms in the states sell complete kits of transformers, and I see that these kits are now being sold in this country. For instance, Gaston E. Barbaix, of 27-29, Anning Street, E.C.2, are importing a set of five Rauland transformers for building super-heterodyne receivers.

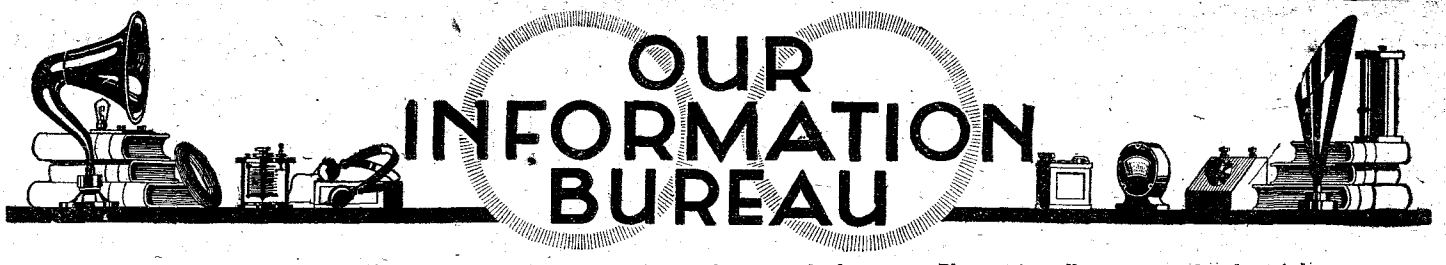
VANGUARD.

"TRANSMISSION STEP BY STEP.—I" (*continued from page 311*)

into the aerial by means of this apparatus an extremely sensitive and expensive hot-wire meter or thermo-couple would be required to indicate such energy, so that it will be necessary to rely upon a valve receiver placed at a distance (say immediately beneath the aerial) in order to ascertain whether the aerial is being energised. Having once confirmed that the tuning and radiation are O.K., a note should be made of the coil and condenser settings for future reference.

The apparatus described will prove extremely interesting to the beginner and will afford a working knowledge of the behaviour of a loose-coupled transmitter and its advantages and also provide a means of practising the morse code under actual working conditions before investigating the simple spark transmitter to be described in a subsequent article.

A. J. C.



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, lay-outs, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 336).

Night Effects

Q.—Are signals stronger by day or by night? —J. H. (Woking).

A.—By night, because the light of day absorbs some of the energy of wireless waves. —U.

Accuracy of D.F.

Q.—Can a ship's position be found accurately by wireless?—M. B. (Wimbledon).

A.—Yes; best results should be correct to within half a geographical degree.—K.

Crystals

Q.—Please give the chemical formula of bornite, carborundum and copper pyrites.—A. G. (Bromley).

A.—Bornite $Cu_2\ S_2\ Fe\ S_2$. carborundum SiC_1, copper pyrites $3\ Cu_2\ S_3\ Fe_2\ S_3$—U.

Call Signs

Q.—Is there a central office for controlling call-letters everywhere?—B. T. (Hove).

A.—Yes, the Bureau of the International Radio-Telegraphic Convention at Berne.—K.

L.F. Amplification

Q.—Which method of low-frequency amplification gives the least distortion—a microphone amplifier or a valve note magnifier? —E. S. (E. 15).

A.—We do not think there is much to choose between the two methods of low-frequncy amplification provided each is properly designed. The question of cost should be considered.—U.

Oscillation and Radiation

Q.—Is it correct to assume that there is no radiation from the aerial when telephony is received without distortion, using a circuit employing reaction?—D. M. (Hammersmith).

A.—Reaction effects may easily take place which cause radiation from the aerial even though no noticeable distortion is introduced into the received speech. There is not, however, likely to be radiation if turning the tuning condensers does not produce any squeals or howls.—U.

Frame Aerials for Broadcasting

Q.—What is a suitable size of frame aerial for the reception of broadcasting?—F. A. (Leyton).

A.—If the frame is 3 ft. square you will require ten turns of wire spaced ½ in. apart.

The aerial should be tuned by means of a small variable condenser in parallel with it, having a capacity not greater than .0005 microfarad. No aerial tuning inductance in the apparatus will, of course, be necessary.—U.

Accumulator Charging

Q.—How can I prevent the danger of overcharging when charging my accumulator?—E. R. (Kensington).

A.—You need not fear any danger from overcharging, provided that the charging rate itself is not too high. Towards the completion of a charge the cells will "gas," and this should be allowed to continue for an hour or so before switching off.—U.

Joining the B.B.C.

Q.—What formalities are to be complied with for a manufacturer to become a member of the B.B.C.?—B. H. (Portsmouth).

A.—We understand that any *bonâ-fide* manufacturer may become a member of the B.B.C., and we suggest you communicate with the secretary for further particulars.—U.

Fixed Condenser Plates

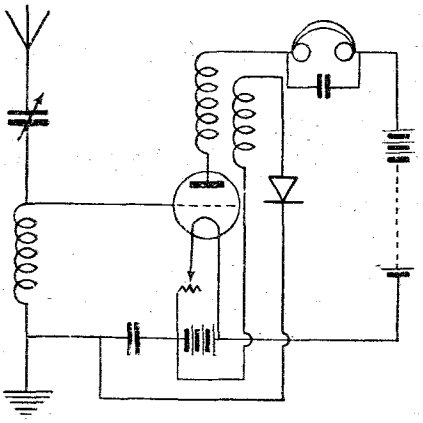
Q.—Is there any advantage in using copper-foil instead of tinfoil for fixed condensers? —R. W. (Hants).

A.—Both are electrically sound, but copper-foil may be found easier to cut and press to shape. This foil, too, is not so liable to have pin-holes, and is probably better in high voltage circuits.—K.

Reflex Receivers

Q.—Please give a circuit of a simple reflex single-valve circuit without an L.F. transformer.—P. O. (Cardiff).

A.—The circuit required is shown here and it will be seen that an aperiodic H.F. transformer is employed. This makes the circuit more simple, but better results would be obtained if either the primary or the secondary winding be tuned by means of a small condenser.—U.



Circuit of One-valve Reflex Set.

Frame Aerial Efficiency

Q.—What is the efficiency of a frame aerial as compared with the ordinary type of outdoor aerial?—M. A. (Brighton).

A.—The frame aerial will probably only have from 5 to 10 per cent of the efficiency of the elevated outdoor type. Considerable amplification is necessary in order to make the results obtainable on a frame compare with those obtained in the ordinary way.—U.

Radio or Audio Frequency?

Q.—Is high-frequency amplification better than low-frequency?—A. B. (Leeds).

A.—This all depends on what is desired. Low-frequency amplification will amplify anything that is rectified by the detector so that a large volume of sound is to be had. High-frequency amplifies the signals before they reach the detector, thus bringing in signals that would not otherwise be heard with the detector and low-frequency amplification alone.—K. U.

The Vernier Condenser

Q.—What is the vernier condenser and what is its use?—A. C. (Rye).

A.—The word vernier is being very carelessly used nowadays in connection with almost every piece of wireless apparatus which affords a particularly exact adjustment. A better name would be "fine-tuning" condenser. Such a condenser is simply a small variable condenser, comprising only three or, at the most, five plates so that a considerable movement of the knob gives only a small change in capacity.

By connecting a condenser of this description in parallel with a large variable condenser, the preliminary adjustments are made upon the large condenser, and then the fine tuning condenser is brought into action to effect the final accurate adjustment.—K.

Outdoor or Indoor Aerials?

Q.—Is it necessary to have an outside aerial with a simple type of apparatus or can an indoor aerial be used?—D. L. (Rye).

A.—Indoor aerials, when used by an experienced operator in conjunction with good apparatus, can be made to give quite satisfactory results, but for a beginner a regulation outside aerial is much to be preferred.—U.

Oscillating and Heterodyning

Q.—Is the oscillation of a valve during the reception of C.W. necessarily radiating energy from the aerial, or is one creating a nuisance only on the occasions when too tight a coupling causes a hooting audible in one's own phones?—C. B. (Croydon).

A.—Interference is being caused all the time that the valve is in a state of oscillation. Howling caused by too tight coupling of the coils must never be allowed as it will considerably shorten the life of the valve. Really pure clean speech can never be obtained while the set is in a state of oscillation, and only a slight coupling of the reaction coil should be employed.—U.

Interference

Q.—I am very much troubled by certain rushing noises which are located quite definitely on fixed wavelengths, one of the most troublesome being a band between about 420 and 440 metres I have tried the wavelength frequently with a wavemeter, and find it approximately constant.—A. P. (Rochdale).

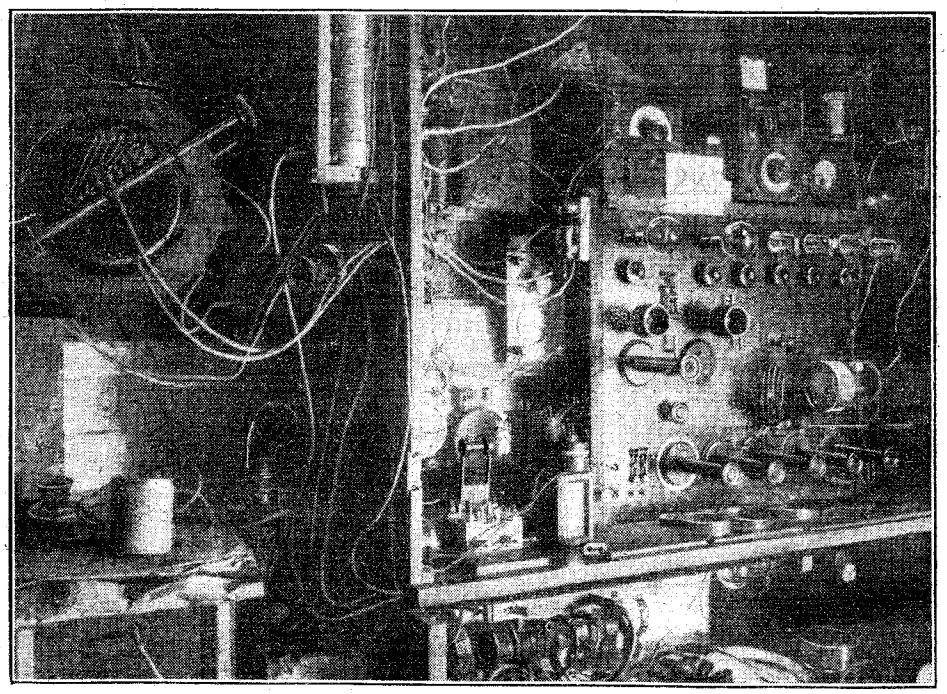
A.—There is no need to suspect the set, since the trouble is almost certainly that irritating form of interference known as "mush." This is a rather peculiar form of harmonic frequently radiated by high-powered arc stations, among which certain post office installations are notorious.

There unfortunately appears to be no remedy as far as receiving apparatus is concerned other than the use of really selective circuits, and even these do not appear to give very much relief.

Fortunately the particular bad band referred to does not cover one of the B.B.C. stations.—K.

TRANSMITTING STATION 2 K T

OF all the amateur wireless stations in Great Britain, probably 2 K T is one of the best known. The station dates back to pre-war days, when, of course, it was known by a different call sign. Since those exciting days of "sparks and crystals" many changes have taken place in its arrangement and equipment. The



Mr. Nickless' Station—2 K T.

enthusiasm of the owner and operator, Mr. J. E. Nickless, M.I.E.E., has, however, not changed with the passing of time. Besides being an extremely energetic experimenter, Mr. Nickless is also president of the South Woodford Radio Society, president of the Ilford Radio Society, and a committee member of the Transmitting and Relay Section of the Radio Society of Great Britain.

In view of the great calls upon his time by the holding of such offices one would naturally expect that his voice would not often be heard in the ether, but, to the contrary, he can be heard almost any night of the week and every Sunday morning. Reports of the reception of his station have been received from over the whole of the British Isles and from the Continent; also certain American stations have reported receiving him, but up to the time of writing these reports have not been confirmed.

These results are perhaps all the more surprising when one knows the unsatisfactory conditions under which the station is worked. The aerial, 50 ft. high by 60 ft. long, is in a dip between two hills, tucked away in Snaresbrook, Essex, and the general climatic conditions are generally such as to be what the weather forecaster would term "some mist and fog." Consequently at certain seasons of the year moisture permeates everything.

The little megger generator is driven by a ½-h.p. motor which is fed from the 50-volt house-lighting accumulators. This supplies the plate current for a Mullard 0-150 valve and also, when occasion demands it, for choke-control purposes, a Marconi A.T. 40 valve. When using the Mullard 0-150 valve as an oscillator and working on a wavelength of 200 metres the aerial ammeter shows a reading of 1 ampere.

Modulation

Few who have heard the speech from 2 K T would recognise that he mainly uses the grid-control method of modulation, yet such is the case. Morse keying is effected in the grid circuit of the transmitter.

The photograph illustrates a portion of the wireless room. The six-valve receiver panel may be seen to the right-hand centre of the picture. The circuit employed is a "straight" circuit comprising two H.F., rectifier and three L.F. valves, with suitable switch-gear to select any number of valves from these.

To the left-hand side of the picture can be seen an old spark "jigger" converted for short-wave transmission work (90 metres upward), and it serves very well in this capacity. The wavemeter and other instruments may be readily identified.

A great deal of the success achieved by 2 K T must in part be due to the efficient aerial and earthing systems. The aerial is well insulated and the twin wires are spaced about 10 ft. apart. The earth system is a perfect network of heavy copper bar and wire. The roof of the wireless room, which is covered with lead-sheet, is also utilised and tuned to earth so as to form a small counterpoise.

The station is spread over two rooms. In one is housed the motors, generator and a petrol engine with the house-lighting accumulators, and in the other are the actual transmitter, receiver and sundry tools and appliances.

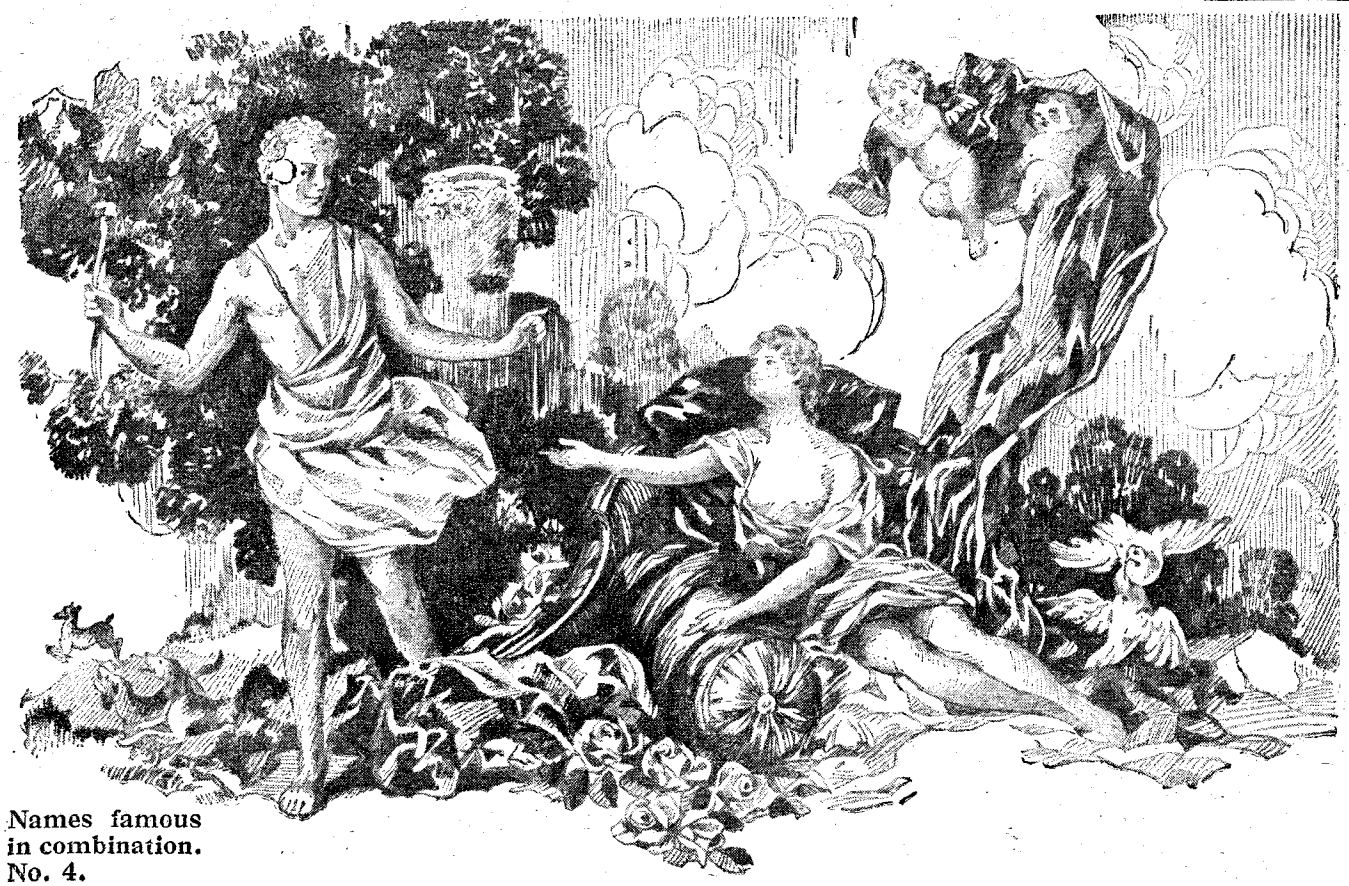
Mr. Nickless is mindful of the assistance and reports he has received from time to time from many old wireless friends, including 2 F K, 2 O M, 2 N M, 2 F Q, 2 P X, 5 Q V, 5 P Z, and many others too numerous to mention. A. J. C.

GRID CONNECTIONS

THE grid of a high-frequency amplifier is usually connected to the negative pole of the filament battery, the rheostat wire being inserted between this pole and the moving arm or pointer connected directly to one of the filament terminals. With this arrangement the positive end of the filament is plus 4 volts (if a 4-volt accumulator is used), whilst the negative end of the filament is higher than zero by the amount of the voltage drop across the rheostat resistance. The filament as a whole is thus kept at a higher potential than the negative pole of the filament battery.

As the grid is connected directly to the L.T. negative terminal it is therefore automatically set at a lower potential than any point on the filament. This ensures (*a*) that the valve is working on the straight-line part of its characteristic curve, and (*b*) that there is no grid current flowing to damp the aerial circuit and lessen sensitivity.

If the rheostat resistance is changed over so as to come between the positive pole of the battery and one filament terminal, the result will be to decrease the potential difference between grid and filament. The grid is sometimes connected to L.T. positive instead of L.T. negative in order to reduce any tendency to self-oscillation. The grid, being at a positive potential, allows grid current to flow. Altering the grid connection in this way will often stabilise a noisy reflex circuit, although the change-over involves a certain loss in selectivity. M. A. L.



Names famous in combination. No. 4.

Venus and Adonis

FROM the idealised figures of mythology to affairs of modern interest is perhaps a far cry; yet certain names famous in combination are conceded their due renown whatever the period of conjunction.

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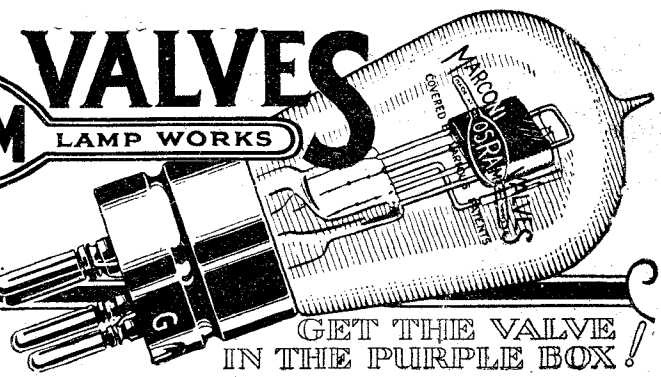

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PROGRESS AND INVENTION

Earth Tubes

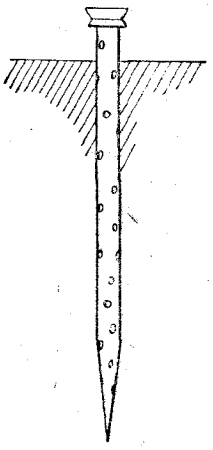
THE provision of an efficient earth system always presents a problem to the amateur. The water-pipe, unless it has only a very short run before it reaches the earth, is highly inefficient. In many cases also it is not easily accessible and a long stretch of wire has to be employed, which still further reduces the efficiency.

A direct connection to earth is preferable, but the difficulty then has to be solved of selecting a suitable earth plate or connection.

A very neat type of earth connection is described in Patent No. 226,869/23 (Henry Quartermaine, Woking, Surrey).

It will be seen in the diagram that this earth consists of a length of metallic tubing, pointed at one end to facilitate the insertion of the tube into the earth, and having a terminal at the other extremity for connection to the set. Holes may be provided in the length of the tube so that water, if poured down the open end, can damp the surrounding earth.

An improved type of cap is described in the specification to prevent damage to the tube when it is hammered in. An earth of this description has the disadvantage that it has not a very great superficial area for contact with the ground, but a number of earth tubes can, of course, be used in series.



(Earth Tube (226,867/23)

For receiving purposes a single tube of this description should be sufficient, provided that the surrounding earth is a good conductor, but for transmission it would be advisable to use more than one tube.

Dull-emitters

DULL-EMITTER and low-consumption valves have been so developed that the filament has nearly reached the ideal "cold" stage,

Naturally, a filament which can emit electrons when only sixty milliamps are passed through it is very thin and fragile. This, indeed, is the weak point of all low-consumption valves.

An invention of Dr. Leonard Angelo Levy (Shoot-up-hill, Cricklewood, Middlesex), described in Patent No. 226,654/24, should be successful in producing a less fragile dull-emitter. Instead of using a solid metal conductor as the filament, it is proposed to use a core of some insulating material, such as fused silica, coated with the metal.

Platinum may be used for coating, or some oxide of barium or strontium having a high electronic emission may be used.

Metallic thorium can also be used for coating the fused silica, and it is suggested that this should be deposited in the form of thorium chloride. The chloride may then be reduced in hydrogen at a suitable temperature, and the pure metallic coating remains.

RADIOGRAMS

UP to the present over 20,000 would-be broadcast artistes have been given auditions by the B.B.C.

Of the million-odd licence holders in Great Britain to-day approximately 65 per cent. are crystal users.

Mr. Godfrey Isaacs, who had to resign from the Marconi Co. because of his health, is now very much better.

Another of the popular "query" programmes will be given on February 28.

A suggestion that proceedings of the Liverpool City Council of exceptional public interest should be broadcast is to be put before the Lord Mayor by the British Broadcasting Company.

The growth of the use of wireless in Canada is shown by the fact that the total receiving licences registered in the Department of Marine is now over 78,000.

Broadcasting failed at Sheffield recently owing to mice having eaten some cotton-wool of the microphone equipment.

The B.B.C. has picked up a message from KDKA, the well-known American station, embodying an appeal on behalf of St. Paul's Cathedral.

The P.M.G. has promised to see what steps can be taken to protect homing and wild pigeons from damage by wireless aerials.

The staff at 2 L O have formed a Rugby team.

The B.B.C. are still carrying out experiments with regard to echo effects and reverberation in studios.

The Glasgow Education Authority, in conjunction with the Scottish engineering staff of the B.B.C., has designed a receiving set, which is being demonstrated as the standard set for schools. It comprises a crystal detector with a two-valve power amplifier.

Primarily for the benefit of miners on late-shift work in the west of Scotland coalfields, the Glasgow station is to start forenoon transmissions. These will be given from 11.30 a.m. to 12.30 p.m. two days per week.

A chamber music programme will be given on Thursday, February 19.

Items by Miss Ruby Holder, Mr. Ronald Courley and Miss Joan Hastings will be broadcast on February 20.

A popular programme will be given on February 21, and will include items by the Band of H.M. Scots Guards.

During the whole of the perilous journey of the French motor expedition which is crossing the Sahara communication with Paris by wireless is being established.

There are ten wireless amateurs at Maderia, two of them owning low-power transmitters.

Mr. R. L. Royle, of Palmer's Green, London, effected two-way communication with 3 B Q, Australia, on January 30.

Australia already possesses four broadcasting stations: Sydney (2 F C), 1,100 metres (5 kilowatts); Sydney (2 B L), 350 metres; Perth (6 W F), 1,250 metres; Melbourne (3 L O), 1,720 metres.

A new record for transmission on short waves was made when Mr. J. L. Reinartz succeeded in exchanging messages with another amateur across the American continent on a wavelength of only 21 metres.

2 L O had an unusual experience recently when they received an urgent request to find someone to broadcast an address opening a bazaar at Birmingham. The B.B.C. secured the services of Viscount Curzon, who spoke from 2 L O direct to Birmingham Town Hall, where loud-speakers were installed.

Experiments which the French broadcasting station, Radio Sud-Est, at Lyons, has made in transmitting its concerts simultaneously upon wavelengths of 87 and 440 metres have met with great success.

The Crosley Radio Corporation, U.S.A., are just completing the installation of their new transmitter some thirty miles from Cincinnati. It is definitely decided

(*Continued on page* 322)

"WIRELESS" SUCCESS

Mr. E. J. BARNARD, Welling, Kent, writes:

"I think I ought to tell you how much I value 'THE AMATEUR MECHANIC.' It has proved of great assistance in a variety of jobs, and especially as to the article on Wireless Telegraphy. I constructed an instrument entirely according to the instructions, and was rewarded with success on the first trial, as I succeeded in picking up the telephonic message from London to Geneva at 9.40 a.m. Considering that my aerial is only 42 feet long and 18 feet high, I think these are grounds for self-congratulation. **I may add that until I became interested in the article in your 'Amateur Mechanic,' I had not the slightest elementary knowledge of Wireless Telegraphy."**

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RADIOGRAMS (*continued from page 320*)

to use the new artificial language "Ido" for all the transmissions.

The wavelength of the Nottingham broadcasting station has been altered from 322 metres to 326 metres.

Inquiries are being made by the B.B.C. in reference to a proposal to provide landlines for broadcasting purposes between the Swansea relay station and various local churches.

Major H. Lefroy, M.P., who was prominently associated with army wireless during the war, has been appointed a director of Marconi's Wireless Telegraph Co., Ltd.

Announcements from W K A Q, the San Juan broadcasting station, Porto Rico, are made in English as well as Spanish.

So far 28,000 licences have been issued from Leeds post offices, and as there are about 112,000 inhabited houses wireless installations may be found in one of every four residences.

A programme of vocal and instrumental music will be broadcast on February 23.

The S.B. programme to be given on February 24 includes items by Miss Gladys Palmer and Mr. Dale Smith. A shortened version of *The Beggar's Opera* will also be broadcast.

Broadcasting may be expected shortly from a new station which the Norwegian Broadcasting Company is now constructing, and which should be ready to begin transmissions some time in the latter part of February. The station will be equipped with a 1,500-watt Marconi transmitter.

Mr. Ramsay MacDonald has promised to broadcast a lecture from 2 L O on "The Meaning and Limitations of Open Diplomacy."

The proprietors of several American hotels and apartment houses are now supplying wireless sets in every room.

A new broadcasting station has been erected at Moscow, to work upon a wavelength of 1,200 metres.

Wireless amateurs in Batavia, in the Dutch East Indies, are attempting to have the ban on wireless sets removed.

There is a good deal of speculation among crystal-users just now with regard to the possibilities of some material increase in the transmission power of 5 P Y.

The wireless programme broadcast recently from Moncton, New Brunswick, by the Canadian National Railway was heard well in Liverpool and the south of England, but was very indistinct in London.

Mr. S. K. Lewer (6 L J), of West Hampstead, states that he has recently been receiving signals from many of the 1st District American amateurs at midday.

Two new broadcasting stations are to be erected at Bilbao and at Cadiz. Both stations will transmit with a power of 500 watts.

There are only four receiving sets in Bulgaria, and to each of the amateur owners a special government authority has been given. Authority is being sought by a Bulgarian company to broadcast, but it is stated that permission will only be given to broadcast agricultural subjects.

The wavelengths of the two great French military stations at Lyons (La Doua) and Bordeaux (Croix d'Hins) have been increased from 15,200 metres to 15,400 and from 19,100 to 19,500 metres respectively.

The changing of the wavelength of Radio-Paris from 1,780 metres to 1,125 metres is being considered by the French Post Office because of interference by the Dutch station at Schweningen.

Grumbles from Edinburgh people about too many programmes being sent on from Glasgow to their relay station have culminated in a ballot being organised by a trader in the Scottish capital. The figures obtained were significant, being as follows: For the London programmes, 477; for Glasgow, 46; no change, 49.

A wireless telephone service between ships and the shore, which may be linked up with the General Post Office land telephone lines, is now undergoing experiment at Southampton.

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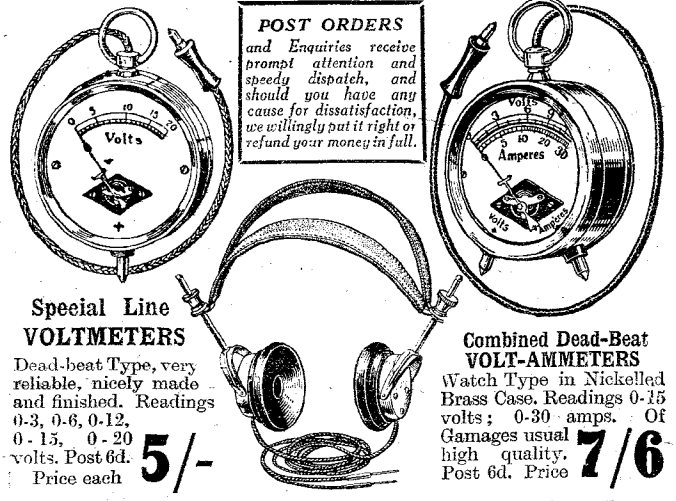

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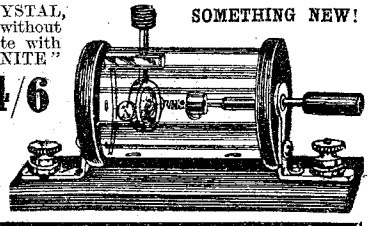

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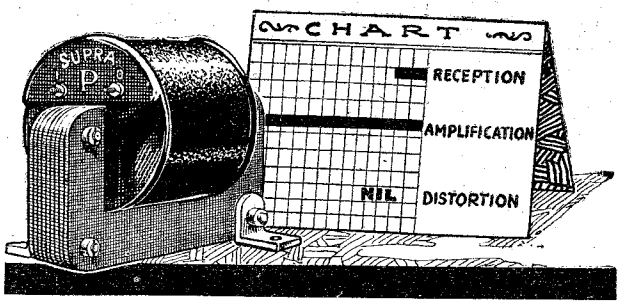

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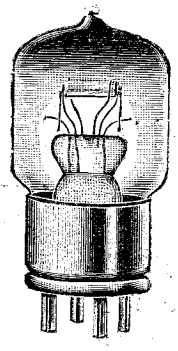

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BROADCASTING DEVELOPMENTS IN AUSTRIA

ALTHOUGH the Vienna broadcasting service was only officially inaugurated in October last, wireless has taken such a hold on the Austrian capital that over 100,000 receiving licences have been issued to date.

In view of this initial success the broadcasting company has decided to increase the length of its transmissions by about four hours daily and to include in its programmes features which have found favour in other countries. English lessons are in great request. A new studio is planned and will be built on the lines of those used by the B.B.C. The relaying of concerts from the local halls is already an accomplished fact. An exchange of correspondence between the director of Radio-Wien and the B.B.C. has, according to information received from Vienna, brought about excellent results. Herr Oskar Czeija, the director, recently stated that good material for the broadcasting of plays had been put at his disposal by 2 L O, and negotiations in progress with the London station raised hopes regarding the relaying of concerts from 2 L O in Vienna and those in the Austrian capital for London listeners.

The local Union of Musicians and Artistes has declared open war on broadcasting. In view of the excellent concerts transmitted to listeners, many of the hotels and restaurants have discharged their orchestras and replaced them with loud-speakers. Since Radio-Wien has included relays of programmes from the principal halls, competition has been acutely felt, and protests have been lodged with the authorities.

The alternative put forward by the Union is that no broadcasting should take place during theatre hours—that is, between 7 and 11 p.m. Should this proposal not be accepted, musicians, composers and artistes threaten to boycott the studio, in which case the broadcasting company may find some difficulty in compiling its programmes. According to a Vienna correspondent the position has reached a critical point.

The Municipality of Vienna is also insisting on the payment of an amusement tax.

J. G. A.

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THERE must be a very strong point of view and a very special object in going to the enormous expense of producing at least 200,000 copies of the booklet which we present with this issue. We are giving that booklet away! We are doing our best week by week to make "Amateur Wireless" meet the needs of the amateur public. A very large number of that public know of our efforts and loyally support us, but there is a further number that knows us not. Now, the publication of this free booklet gives us a chance of an introduction to them, and that is absolutely the whole of the object we had in mind in going to this expense and trouble—except, of course, we know that our enterprise will give our regular readers a certain amount of definite pleasure.

We much appreciate the fact that we have an enormous number of regular readers week by week. Many of them write to us, send us their queries, criticise us and occasionally give us a word of appreciation. But we expect that a very large number of wireless people will see "A.W." for the first time this week, and it is to them that we make our special appeal. Will they do us the favour of ordering "Amateur Wireless" to be sent them every week? By filling in the form given at the foot of this announcement they will be adopting the easiest possible way of seeing that "Amateur Wireless" reaches them regularly. The greater the number of our regular readers the more generally useful we can be to everybody, and we sincerely trust that old readers and new ones alike will combine on this occasion to speak a kindly word for us with the object of extending our already immense circulation.

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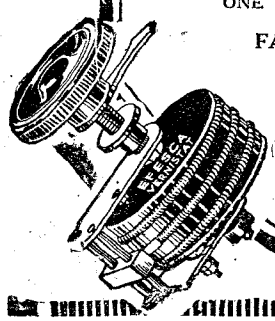

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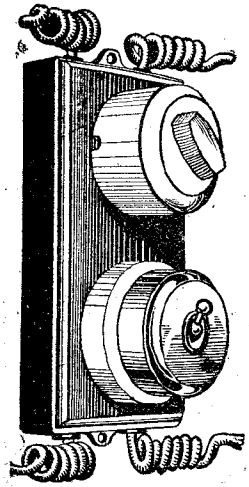

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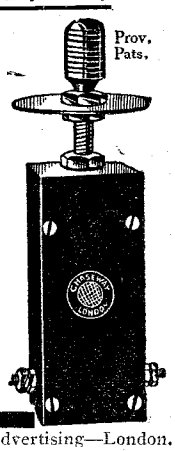

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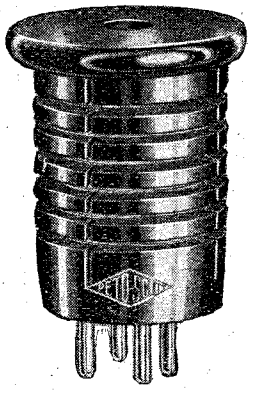

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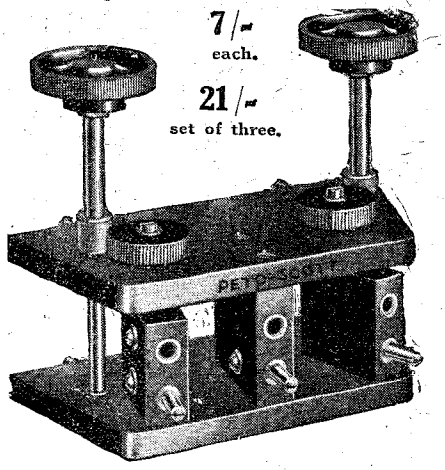

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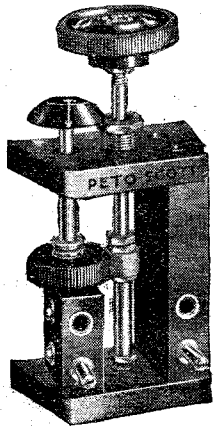

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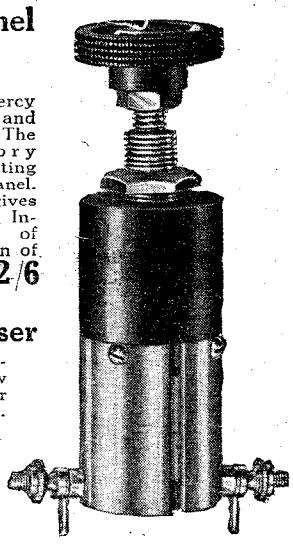

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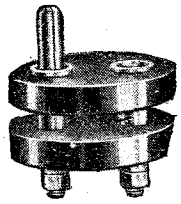

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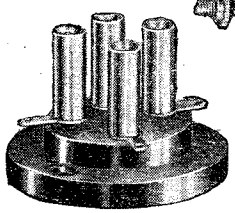

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NOTE.—*In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.*

GREAT BRITAIN

The times given are according to Greenwich Mean Time.

London (2LO), 365 m. 1-2 p.m., con.; 3.15-3.45 p.m., lec.; 4-5 p.m., con.; 5.30-6.15 p.m., children; 6.40 p.m. talk; 7-7.30 p.m., time sig., news, talk; 7.30-9.30 p.m., music; 9.30-10.0 p.m., time sig., news, talk; 10.0-10.30 p.m., music. Mon. and Wed. the Savoy Bands are relayed until 11.0 p.m., and on Sat. until midnight. Sat. only, 4-5.30 p.m., con.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 435 m. **Birmingham** (5IT), 475 m. **Bournemouth** (6BM), 385 m. **Cardiff** (5WA), 351 m. **Glasgow** (5SC), 420 m. **Manchester** (2ZY), 375 m. **Newcastle** (5NO), 400 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 331 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 346 m. **Liverpool** (6LV), 315 m. **Nottingham** (5NG), 322 m. **Plymouth** (5PY), 335 m. **Sheffield** (6FL), 301 m. **Stoke-on-Trent** (6ST), 306 m. **Swansea** (5SX), 481 m.

CONTINENT

The times are according to the Continental system; for example, 16.30 is 4.30 p.m., and 08.00 is 8 a.m. (G.M.T.).

AUSTRIA.

Vienna (Ravag), 530 m. (1 kw.). Daily: 08.00, markets (exc. Sun.); 10.00, con.; 12.05, time sig.; 12.20, weather; 14.30, Stock Ex. (exc. Sun.); 15.00, news, con.; 15.10, children (Wed.); 17.10, lec. (Wed., Thurs., Sat.), children (Mon., Fri.), women (Tues.); 18.30, news, weather; 19.00, time sig., con., news; 21.00, dance (Wed., Sat.).

Graz (relay), 700 m. Testing.

Innsbrück (relay station). Under construction.

BELGIUM.

Brussels (SBR), 265 m. (1½ kw.). 17.00, orch., children (Wed. and Thurs.); dance (Tues. and Sat.); 18.00, news; 20.15, lec., con., news (opera, Mon. and Wed.).

Haeren (BAV), 1,100 m. 13.00, 14.00, 16.50, 18.50, weather.

CZECHO-SLOVAKIA.

Kbely (OKP), 1,160 m. (1 kw.). Weekdays: 09.00, 10.30, 12.30, 16.00 and 17.00, con. (Wed. and Sat.); 18.30, lec., news, weather, con. (time sig., 19.00), daily; 10.00, con. (Sun.).

Komarov (OKB), 1,800 m. (1 kw.). Weekdays: 13.00, Stock Ex., weather, news; 17.30, con. (Thurs.); 09.00, con. (Sun.), also testing on 1,180 m.

Strasnice (430 m.). Testing shortly.

DENMARK.

Copenhagen (Kjobenhavns Radiofoni station), 475 m. (1 kw.). 18.35, notices, lec., con.* (Tues., Thurs., Sat.). * This con. is also relayed by the Aalborghus station on 510 m.

Lyngby (OXE), 2,400 m. and 2,700 m. Weekdays: 18.20, news, Stock Ex. (2,700 m.); 20.00 and 21.00, news, weather, time sig. (2,400 m.). Sundays: 15.00 and 20.00, news (2,400 m.).

Ryvang, 1,190 m. Concert, 14.00 (Wed.), 15.00 (Sun.), 19.00 (Fri.), 19.30 (Tues.).

FRANCE.

Eiffel Tower, 2,600 m. (6 kw.). 06.40, weather (exc. Sun.); 11.00, markets (exc. Sun. and Mon.); 11.15, time sig., weather; 14.45, 15.35, 16.30,* Stock Ex. (exc. Sun and Mon.); 18.00, con. (not daily); 18.45, Paris fashions (in English)—temp—(Wed. and Sat.); 19.00, weather; 20.30, con. relayed from PTT (Fri.); 22.10, weather (exc. Sun.).

* On 1st and 15th of each month at 16.45.

Radio-Paris (SFR), 1,780 m. (2 kw.). Sundays: 12.45, orch.; 13.45, news; 16.45, con.; 20.30, news, &c.; 21.00, dance music. Weekdays: 12.30, orch., Stock Ex., news; 16.30, markets, Stock Ex., con.; 17.45, Stock Ex., news, women; 20.30, lec., news, con.; 21.00, dance (Thurs.). Frequent relays of 5 X X after 22.00. *Le Matin*, Paris, provides a special con. every 2nd and 4th Saturday in the month at 21.00 or 22.00 G.M.T.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 450 m. (400 w.). 14.00, lec. relayed from Sorbonne University (Thurs.); 15.00, outside relay (Sat., irr.); 15.45 and 17.00, lec. relayed from Sorbonne (Wed.); 16.00, outside relay (irr.); 20.00, Eng. talk (Tues.); 20.30, lec. or con., almost daily, con. relayed by F. L. (Fri.); 20.45, lec. (Sun.), organ recital 3rd Sun. each month; 21.30, con. (Sun.). Power will be shortly increased.

"Le Petit Parisien," 345 m. (300 w.). 21.30, con. (Sun., Tues., Thurs.), dance (Sat.).

Lyons-la-Doua, 550 m., 10.30, gramophone con.; news, etc. (irr.).

Radio-Lyon, 287 m. (2 kw.). 12.00, 17.15, 20.30, news; con. (irr.).

Toulouse Aerodrome (MKD), 1,525 m. 09.42, 19.42, weather.

GERMANY.

Berlin (2), 505 m. (1½ kw.). 08.00, sacred con. (Sun.); 09.00, markets, news, weather; 10.00, factory con. and tests; 10.30, educat. hour (Sun.); 11.15, Stock Ex.; 12.00, time sig., news, weather; 13.15, Stock Ex.; 14.00, lec. (Sun.), markets; 14.30, children (Sun., Wed.); 15.00, Esperanto (Sat.); 15.30, orch., French (Tues.); 17.30, lec., women; 18.00, French (Mon.), lec. (Tues.); 18.30, lec., Engl.

(*Concluded on page* 328)

"BROADCAST TELEPHONY" (*cont. from page* 326)

(Thurs.), theatre news (Tues.); 19.30,* con., weather, news, time sig.; 21.30, chess (Mon.), dance until 23.00 (Thurs., Sat., Sun.). * If opera relayed, at 18.30.

Berlin (Telefunken Co.), 290 m. Tests.

Königswusterhausen (LP), 2,450 m. (5 kw.). Wolff's Buro. Press Service: 06.00, 20.00. 2,800 m. (5 kw.): 10.30, con. (Sun.), Esperanto lec. 3,150 m.: Telegraphen Union, 06.45-18.45, news, con. (Fri., irr.). 4,000 m. (10 kw.): Express News Service, 06.00-20.00 (daily); lec. (Tues. and Fri., time irr.).

Bremen, 330 m. (1 kw.). Relay from Hamburg.

Breslau, 418 m. (1½ kw.). 10.15, Stock Ex., weather; 11.00, factory con. (weekdays), sacred con. (Sun.); 11.55 (Sun.), time sig., weather, Stock Ex.; 14.00, news (weekdays); 15.00, children (Sun.); 16.00, orch., children (Fri.); 16.45, con. (Sat.); 17.00, shorthand (Sat.), Mah Jongg (Wed.); 18.00, Esperanto (Mon.), Engl. (Thurs.), lec. (other days); 19.00, con., weather, time sig., news; 20.30, dance (Sun.); 21.15 (Mon.).

Cassel, 228 m. (1½ kw.). Relay from Frankfort.

Dresden, 280 m. (1½ kw.). Relay from Leipzig.

Frankfort-on-Main, 470 m. (1½ kw.). 07.30, sacred con. (Sun.); 10.10, Stock Ex.; 10.55, time sig., news; 15.00, children (Sun.), Stock Ex. (weekdays); 15.30, con., women; 16.00, con. (Sun.); 17.00, markets, lec., children (Wed.); 18.00, lec. (daily), shorthand (Wed.), Esperanto (Fri.); 18.30, educat. hour; 19.00, lec., Engl. (Mon.); 19.30, con. (daily), jazz band (Fri.); 20.30, time sig., weather, news; 21.00, dance or late con. (not daily).

Gleiwitz (relay station). Under construction.

Hamburg, 395 m. (1½ kw.). Sunday: 07.55, time sig., weather, news, lec., women; 10.00, sacred con., chess; 12.00, con., lec.; 16.00, children; 17.00, con.; 18.00, Engl. conv.; 19.00, sport, weather, news, con. or opera; 21.00 onwards, as weekdays. Weekdays: 06.25, time sig., news; 07.30, theatre news; 11.55, time sig.; 12.20, Engl. (Wed.); 14.00, political news, markets; 15.00, women; 15.30, lec., Esperanto; 16.05, orch., 17.00, con., lec.; 18.25, lec., Engl. conv. (Tues. and Fri.), Spanish (Mon. and Thur.); 19.00, weather, con. or opera; 21.00, weather, markets, news; 21.50, news (in English), dance (not daily). Will shortly be increased to 5 kw.

Hanover, 296 m. (1½ kw.). Relay from Hamburg. Will shortly become a main station.

Königsberg, 463 m. (1½ kw.). 08.00, sacred con. (Sun.); 10.15, markets; 11.55, time sig., weather; 13.15 and 15.00, markets; 15.30, children (Tues., Wed., Sat.), orch.; 18.30, lec., Esperanto (Thurs., Sat.); 19.00, con. or opera; 20.00, orch., lec., weather, news, dance (Thurs., Sun.).

Leipzig, 454 m. (1¼ kw.). 07.30, sacred con. (Sun.); 10.00, educat. hour (Sun.); 11.00, markets, orch., time sig.; 15.00, markets; 15.30, orch., children (Wed.); 16.30, lec. (Tues.); 17.30, lec. (Tues.), experimenters (Wed. and Sat.); 18.00, lec.; 19.00, lec. (irr.); 19.15, con. or opera, weather, news; 21.00, con. (not daily). Will shortly be increased to 5 kw.

Münich, 485 m. (1½ kw.). 10.30, lec., con.; 13.00, news, weather, time sig., snow forecast; 14.00, con., lec. (Sun.); 15.30, orch. (16.00 Sun.), children (Wed.); 17.00, agric. talk (Mon.), con.; 18.00, lec., Engl. (Mon. and Fri.), Italian (Tues.), Russian (Sat.), Esperanto (Thurs.); 19.30, con.; 20.30, news, weather, time sig.; 21.00, late con. (Sun.), lec. (Tues.), dance (Sat.).

Munster, 410 m. (1½ kw.). 11.00, sacred con., news (Sun.); 11.30, news (other days); 11.55, time sig.; 14.30, markets; 15.30, children (Sun.), lec. (weekdays); 18.40, weather, lec., time sig.; 19.20, women, con. or opera, news, dance (Sat.); 21.00, English, Spanish or Esperanto, news, dance (Sat.).

Nuremberg, 340 m. Relay from Munich.

Stuttgart, 443 m. (1½ kw.). 06.30, time sig., weather (weekdays); 10.30, con. (Sun.); 15.00, time sig., con., news (Sun), children (Sat.); 16.45, children (Wed.); 18.30, lec. (weekdays); 19.00, con. (daily); 20.15, time sig.; 22.00, weather, news, dance (Sun.).

FINLAND.

Haelsiukki, 400 m. (temporary w.l.). Testing daily.

HOLLAND.

Amsterdam (PCFF), 2,000 m. Daily: 07.55 16.10 (exc. Mon. and Sat., when 10.10-11.10), news, Stock Ex., time sig., 09.55 and 16.10. (PX9), 1,050 m.: con., 20.40, con. or organ recital (Mon.).

Hilversum (HDO), 1,060 m. (1½ kw.). 17.40, children (Mon.); 19.40, lec. (Fri.); 19.40, con. (Sun.), relay of Mendelberg orch. (Thurs.); con. (Sun.); 19.55, Radio talk (Wed.); 21.40, lec. (Sun.).

Vossegat (Bé), 1,050 m. 12.10 and 19.40, weather.

Soesterberg, 1,050 m. 19.26, weather.

Bloemendaal, about 200 m. 09.40 and 16.40, sacred service (Sun.).

HUNGARY.

Buda-Pesth. New broadcasting station will be opened in March.

ITALY.

Rome (1RO), 425 m. (2 kw.). 14.15, con. (not Sun.); 15.45, time sig., news, Stock Ex.; 19.30, news, con.; 21.25, weather, dance.

Centocelle (ICD), 1,800 m. (6 kw.). 15.00 and 19.30, news, con.

JUGO-SLAVIA.

Belgrade, 1,650 m. (2 kw.). 17.30, con., news, weather (Tues., Thurs., Sat.), weather, news only (Mon., Wed., Fri.).

NORWAY.

Christiania, 340 m. (300 w.). Testing, daily, about 19.30.

PORTUGAL.

Lisbon (Aero-Lisboa), 375-410 m. 21.30, tests, music, speech (Wed. and Fri., irr.).

Montesanto (CTV), 2,450 m. (15 kw.). Tests music (irr.); 13.00 and 23.00, weather.

RUSSIA.

Central Wireless Station, 1,450 m. Sundays: 12.45, lec.; 15.30, news; 16.15, con. Weekdays: 13.00, markets; 15.30, news or con.

Sokolniki Station, 1,010 m. Sundays: 09.00, lec.; 10.00, radio talk; 13.30, lec.; 14.30, con.; 17.00, lec. and con. (Tues., Thurs., Fri.).

Trades Union Council Station, 750 m. 17.00, con. (Mon., Wed.).

SPAIN.

Madrid (Radio-Iberica), 392 m. 21.00, weather, Stock Ex., time sig., con., news; (*Continued on page* 330)

AN INNOVATION IN VALVE DESIGN

WITHIN the past year very considerable alterations have been made in valve design, both as regards internal and external arrangements. Now comes another innovation which is a distinct step forward. This is a valve produced by Cossors which has been specially designed to avoid capacity effects. The mounting of the valve is composition (a feature which is to be embodied in all Cossor valves in the future); this, of course, is not unusual, but where the novelty lies is in the fact that the composition is hollow, and if the valve is viewed from the end of the base it is possible to see into the interior. The leads from the legs simply pass into the valve through the hollow shell mounting, only one of them being enclosed in a glass tube. Such an arrangement will obviously reduce capacity to a minimum—in fact the actual capacity is hardly measurable—a feature which will make the valve of great value for short-wave work. In our next issue we hope to give a sectional sketch of this valve.

The Government of India has offered to grant a licence to the Indian Radio Telegraph Company to operate a beam wireless station in India for communication with the United Kingdom.

"BROADCAST TELEPHONY" (*cont. from page 328*)

22.00, *La Libertad* con. (Tue. and Fri.). Sunday: 16.30, con.

Barcelona (EAJ1), 325 m. 17.30 or 18.00, lec., Stock Ex. markets, con. or relay of opera; 20.30, news and con.

Seville (EAJ5), 350 m. 18.30, lec., con., news.

SWEDEN.

Stockholm (SASA), 430 m. (500 w.). Sundays: 09.55, sacred service; 16.00, children; 17.00, sacred service; 19.00, con.; 20.30, news, weather. Weekdays: 11.30, weather, Stock Ex., time sig. (11.55); 18.00, lec. (irr.); 19.00, con., lec., news, weather.

Gothenburg (SASB), 290 m. (500 w.), also 700 m. 10.00, fishery reports (700 m.); 11.55, time sig.; 19.00,* programme s.b. from Stockholm.

Malmoe (SASC), 270 m. 11.00, weather; 19.00,* programme s.b. from Stockholm.

Boden (SASE), 2,500 m. 18.00, con. (Tues., Fri., Sun.)—temp

* Local programmes are also broadcast at times.

Sundsvall (SASD), 680 m. (500 w.). To open about March.

Falun (SMZK). Tests. Occasional relay of 5XX.

SWITZERLAND.

Geneva (HB1), 1,100 m. (500 w.). 13.15, lec. No Sun. transmissions.

Lausanne (HB2), 850 m. (500 w.). 07.05, weather; 12.30, weather, markets, time sig., news; 16.00, children (Wed.); 17.55, weather, news; 20.15, con. (exc. Wed.), dance (Thurs. and Sat.).

Zurich (Höngg), 515 m. (W.L. not definitely fixed) (500 w.). 11.00, weather; 11.55, time sig., weather, news, Stock Ex.; 15.00, con.; 17.15, children (Mon., Wed., Fri.); 18.00, weather, news; 19.15, lec., con., dance (Fri.); 21.00, news. Sundays: 15.00 and 19.15, con., news, weather.

AGRICULTURAL MARKET INTELLIGENCE

THE B.B.C., in conjunction with the Ministry of Agriculture and Fisheries, have arranged each Thursday evening from 6.35 to 6.40 to broadcast a bulletin giving the latest foodstuffs market information.

The bulletin will include such items as current prices of agricultural produce, wheat, oats, potatoes and cattle-feeding stuffs.

While the bulletin will be intended primarily for farmers and agriculturists, it will probably be of general interest to large numbers of the community.

Cutting Out the H.F. Valve

SIR,—Readers who propose fitting a switch to cut off the H.F. valve should take certain precautions, otherwise they are likely to short both batteries.

When in the "off" position of the H.F. switch the top end of the aerial inductance is connected via the plate of the H.F. valve to the grid condenser of the detector valve. Both batteries are then shorted through the A.T.I. and anode coil.

I myself get over the difficulty by fitting a three-pole double-throw switch, in which one pole switches the aerial connection from the H.F. grid to detector grid, the second pole makes and breaks contact between H.T. + and anode coil, and the third pole makes and breaks the filament circuit of the valve.

One is apt to be forgetful to remove the anode coil before switching off or even to switch off the rheostat, so that in switches for L.F. valves it is a good plan to make use of a D.P.D.T. switch.

I should like to say how much I appreciate almost all the articles in "A.W."—P. S. B. (Newcastle, Staffs.).

Other Correspondence Summarised

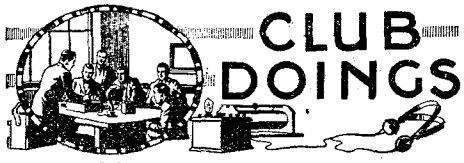
L. N. C. (Lancs.) has received six B.B.C. stations and Brussels on his home-made crystal set.

K. G. (Ashton-under-Lyne), referring to the letter of 2 A Y F (Southsea) in No. 140, writes us that he quite easily picked up W B Z, Springfield, when his aerial and earth were disconnected.

S. G. (Glasgow) wishes to make known the fact that he has received very valuable advice in the use of their instruments from the General Radio Co., with the result that he is now able to bring in the main American sations on their one- and two-valve sets.

C. B. (30, Charleston Street, Walworth, S.E.17) has about thirty back numbers to which other readers are welcome, if they will forward the necessary postage.

[Owing to pressure upon our space it has been necessary to hold over many letters. —ED.]



Inland Revenue Radio Society

Hon. Sec.—MR. J. O. CLAXTON, 570, Salisbury House, London Wall, E.C.2.

THE second ordinary meeting was held on February 6, and opened with morse practice. Mr. D. G. Dyne, B.Sc., gave a paper on "Thermionics in Relation to the Valve," and Mr. M. A. Beetlestone, M.I.E.E., spoke on the subject of "Elementary Electricity."

Dublin Wireless Club

Hon. Sec.—MR. A. C. BRIDLE, Hillsdene, Portmarnock, Dublin.

A MEETING was held on February 5 with Mr. H. J. Duncar in the chair. Mr. T. H. Lurring delivered a lecture on "The Care and Maintenance of Accumulators," in which he described the construction of accumulators, and explained how to keep them in good condition.

Barnet and District Radio Society

Hon. Sec.—MR. J. NOKES, Sunnyside, Stapylton Road, Barnet.

AT the annual general meeting held on January 29 it was decided to utilise part of the balance left for the provision of additional books for the library and some apparatus to enable the experimental part of the work to be carried on in a progressive manner. It was also decided that instead of forming a separate section for juniors, young people under the age of 17 should be admitted to full membership at an annual subscription of 2s. 6d. instead of 5s. It was arranged that instead of meeting twice a month as heretofore, the society should have a regular meeting on the third Thursday in each month. The president then conducted a number of experiments on light and sound waves and gave a short talk on the relation between the waves created by sound, light and radio.

Ilford and District Radio Society

Hon. Sec.—MR. F. W. GEDGE, 157, High Road, Ilford.

MR. E. G. DENNIS lectured on February 3 on 'How It Was Done in the Navy." He is an ex-C.P.O. and was able to speak with authority upon the development of wireless in the Navy.

ANNOUNCEMENTS

"Amateur Wireless and Electrics." Edited by Bernard E. Jones. Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. It will be sent post free to any part of the world—3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to the Proprietors, Cassell & Co., Ltd.

General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets.

Contributions are always welcome, will be promptly considered, and if used will be paid for.

Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed.

Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," La Belle Sauvage, London, E.C.4.

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No nipping, no heavy head pressure, just a gentle lightness hardly felt. Can be worn for hours. Just the telephone for the feminine listeners-in of your family. At all good agents. If unobtainable locally send us your nearest dealer's name.

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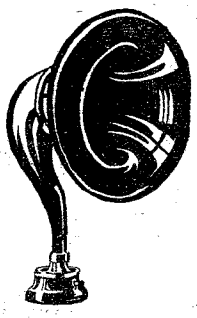

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A worthy contemporary of Revo Headphones — the Revo Loudspeaker in three sizes, Senior, Junior and Baby: 80/-, 48/-, 30/- respectively. Like the Telephones are guaranteed for 12 months.

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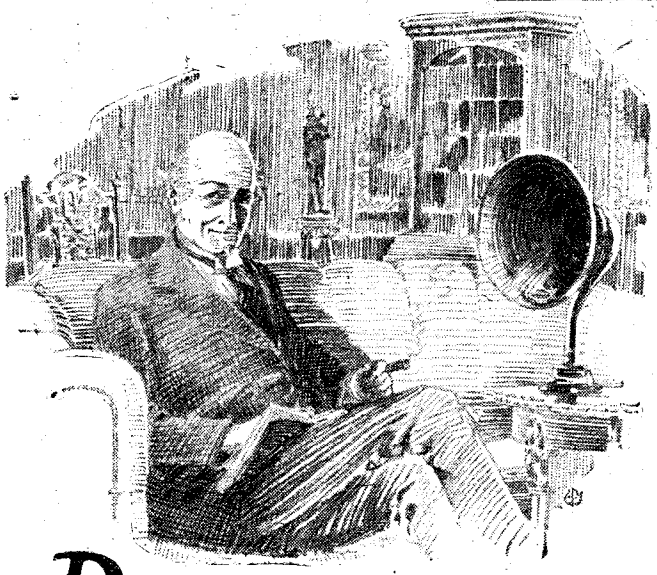
The Name for Perfect Radio



Portmanteau Words

I'm afraid I must confess a distinct weakness for Portmanteau Words; chiefly, I suppose, on account of their descriptive convenience. They always seem to mean exactly what they say, and, except perhaps in a rare case such as that of the immortal "Brugglesmith," their meaning is evident at sight.

Take, for instance, the word Volutone. No doubt can rest in anyone's mind as to what *that* means.

Volume and Tone—the two essentials of a first-class Loud Speaker. Full Volume and Perfect Tone, a joy to listen to and a treasure to possess.

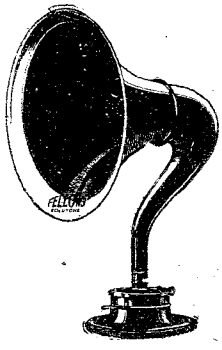
But even this all-embracing word fails to convey its handsome appearance. The instruments' pleasing lines have a beauty rarely found in something that hitherto has usually been regarded purely as a piece of mechanism.

Go and have a look at a Volutone. Your local retailer is almost certain to have one in stock.

And when you have satisfied yourself as to its appearance, make a point of hearing it as well.

I think you'll agree then that I was quite right when I coined that essentially accurate word—**VOLUTONE.**

Muriel Fellows



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E.P.S. 97

CHIEF EVENTS OF THE WEEK

SUNDAY, February 22nd.

London and 5 X X	3.0	Oratorio: "The Creation" (Haydn)
London and 5 X X	9.0	Casano's Octet.
Birmingham	3.0	Chamber Music Programme.
Bournemouth	3.0	Band of 2nd Batt. The Argyle and Sutherland Highlanders.
Cardiff	9.0	Handel Programme.

MONDAY

London and 5 X X	7.30	Barnardo's Musical Boys.
	8.15	D'Erlanger Programme.
Bournemouth	7.30	*With Hounds, The Country Side*, and Comic Opera.
Newcastle	7.30	Grand Variety Concert.
Glasgow	7.30	The J. H. Squire Celeste Octet.
Belfast	7.30	Handel Programme.

TUESDAY

5 X X	7.30	Popular Orchestral Programme.
ALL STATIONS except 5 X X	7.30	Programme of Old English Music.
	8.25	A Shortened Version of *The Beggar's Opera*.

WEDNESDAY

Birmingham	7.30	Coleridge-Taylor Programme.
Bournemouth	7.30	The Morality Play *Everyman*.
Manchester	7.30	Symphony Concert.
Newcastle	7.30	Selections from Opera, and the J. H. Squire Celeste Octet.
Glasgow	7.30	Popular Night.

THURSDAY

London	7.35	Light All-British Concert.
Manchester	7.35	Light Programme.

FRIDAY

Birmingham	7.30	First English Production of *Boris Godunov*.
Cardiff	7.30	A Popular Programme.
Manchester	7.30	Dramatic Night.
Aberdeen	7.30	Music and Drama—*A Tale of Two Cities*.
Glasgow	7.30	Melody in the Western Isles.
Belfast	7.30	Light British Music.

SATURDAY

London	7.30	Sixth Query Programme.
Bournemouth	7.30	"A Mixed Menu."
Birmingham	7.30	Popular Instrumental Programme.
Cardiff	7.30	In Honour of Saint David.
Manchester and 5 X X	7.30	Grand Opera, *Samson and Delilah*.
Belfast	7.30	Band of 1st Batt. The Highland Light Infantry.

"**Making a Brooder for 50 Chicks**" is the title of an illustrated article appearing in the current issue of "The Amateur Mechanic and Work" (3d.), and should be of interest to many readers. Other articles and features appearing in the same number are: "House Repairs: Badly-fitting Doors," "Setting Slide Valves of Engines," "Motor-cycle Practicalities," "Do You Get Good Crystal Results?" "Wire Ropes for Aerials: How to Splice and Fix the Ends," "Resistance Attachment for Dull-emitter Valves," "How to Construct a Recess Cupboard," "Simple Terra-cotta Work," "Lock for Electric Lamps," "Hints on Using Rawlplugs," "Our Small Car Page," "Fitting New Springs to Cycle Lamps."

A new motor lifeboat, equipped with wireless, has been built for the Cunard Line. The boat, which has accommodation for thirty people besides the crew, has just completed her trials successfully at Southampton.

A miscellaneous light programme of music will be given on February 22.

WIRELESS IN PARLIAMENT

From Our Own Correspondent.

SIR WM. MITCHELL-THOMSON, the Postmaster-General, introduced in the House of Commons last week his promised Bill to "re-enact and amend the law relating to wireless telegraphy, and to make provision with respect to visual and sound signalling and the use of etheric waves for the transmission of energy." The measure was read a first time.

In reply to Sir H. Brittain, Sir Wm. Mitchell-Thomson said that the sites for the Canadian and South African "beam" stations had been selected and terms of purchase agreed. It was hoped that legal arrangements for the purchase of the various properties concerned would be sufficiently advanced to enable the sites to be placed at the disposal of the contractors before the end of the present month. The sites were near Bodmin (Cornwall) and Bridgwater (Somerset).

PREPAID ADVERTISEMENTS.

Advertisements under this head are charged FOURPENCE PER WORD, minimum charge FOUR SHILLINGS.

Amateur Wireless COUPON

LISSENIUM

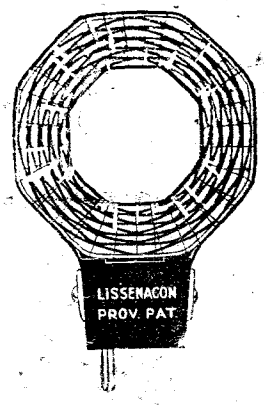
TYPES OF MAGNETIC CONCENTRATION—

With many types of coils the magnetic field is mostly concentrated in the centre of the coil, and the field does not extend to any appreciable degree. The characteristics of the magnetic field in such coils are closely analogous to the ordinary solenoid inductance.

In the case of LISSENAGON (pronounced LISSEN-AGON) coils, however, the magnetic field, in addition to being very strong in the centre of the coil, is also distributed on each side of the coil. This accounts for the remarkably strong magnetic linkage obtained with LISSENAGON coils in reaction circuits, and ALSO FOR THE PECULIAR EFFICIENCY OF THE COILS WITH EDDY CURRENT TUNING.

LISSENAGON TUNING CHART. Note the Intermediate Coils 30, 40, and 60.

TABLE I Wave-length range when used as Primary Coils with Standard P.M.G. Aerial and ·001 mfd. condenser in parallel.			TABLE II. Wave-length range when used as Secondary Coils with ·001 mfd. condenser in parallel.		
No. of Coil.	Minimum Wave-length.	Maximum Wave-length.	Minimum Wave-length.	Maximum Wave-length.	PRICE.
25	185	350	100	325	4/10
30	**235**	**440**	**130**	**425**	4/10
35	285	530	160	490	4/10
40	**360**	**675**	**200**	**635**	4/10
50	480	850	250	800	5/-
60	**500**	**950**	**295**	**900**	5/4
75	600	1,300	360	1,100	[illegible]
100	820	1,700	500	1,550	9
150	965	2,300	700	2,150	[illegible]
200	1,885	3,200	925	3,000	8/-
250	2,300	3,800	1,100	3,600	8/9
300	2,500	4,600	1,400	4,300	9/6



IF YOU [illegible]R WANT COILS WHICH [illegible]N-SIFY TUNING —USE LISSEN-AGON COILS.

SIGNALS ARE ALWAYS STRONGER—

when capacity is low and inductance is high. If, where, say, a No. 35 coil is ordinarily used with added capacity to tune it to a given wave-length, a No. 60 coil can be used, AND WITHOUT ADDED CAPACITY, other things being equal, it follows that signals would be stronger.

In the new LISSEN CRYSTAL SET a form of tuning has been introduced which permits of a No. 60 LISSENAGON (pronounced LISSEN-AGON) coil being used, and dispenses with the [illegible] of added capacity to tune it. A big signal voltage is built up. But, apart from its high inductance efficiency, too, there are other considerations which place this receiver far above all other crystal sets, NO MATTER WHAT THE PRICE.

THERE IS AN UNDISTURBED ELECTRICAL CIRCUIT, for instance. The only moving part is the metal plate, and although this is entirely unconnected with the electrical circuit, its influence on the inductance is effectively applied through the medium of the magnetic field created.

In conjunction with the principle of EDDY CURRENT TUNING employed in this new LISSEN CRYSTAL SET, LISSENAGON COILS ARE PECULIARLY EFFICIENT. No other coils give the same results.

By fitting the appropriate LISSENAGON (pronounced LISSEN-AGON) coil, the LISSEN CRYSTAL SET can be used for any station within range. Two coils would be needed for London and Chelmsford, for instance—to change over from one station to the other, take one LISSENACON coil out, and plug the other one in.

On long aerials it would be possible to use a coil one size less in each case, *e.g.*, No. 40 instead of 50; 50 instead of 60; 60 instead of 75 [illegible] of 250.

NOTE.—One LISSENAGON [illegible] must be ordered with each set—[illegible] will not be sold without a LISSENAGON coil because the use of the [illegible] ensures very high efficiency.

No paper — no cardboard — no loc
wires — connections are stamped-c
receiver is an i[illegible]ument throughc
MOST EFFICIENT CRYSTAL Sz
MOST EFFICIENT INDUCTANC

LISSEN L

Printed and Published in England by Cas[illegible]

KDKA ON A CRYSTAL!

SOLVING THE PROBLEM OF CURRENT SUPPLY

Amateur Wireless
And Electrics

Vol. VI. No. 143. SATURDAY, FEBRUARY 28, 1925 Price 3d

PRINCIPAL CONTENTS

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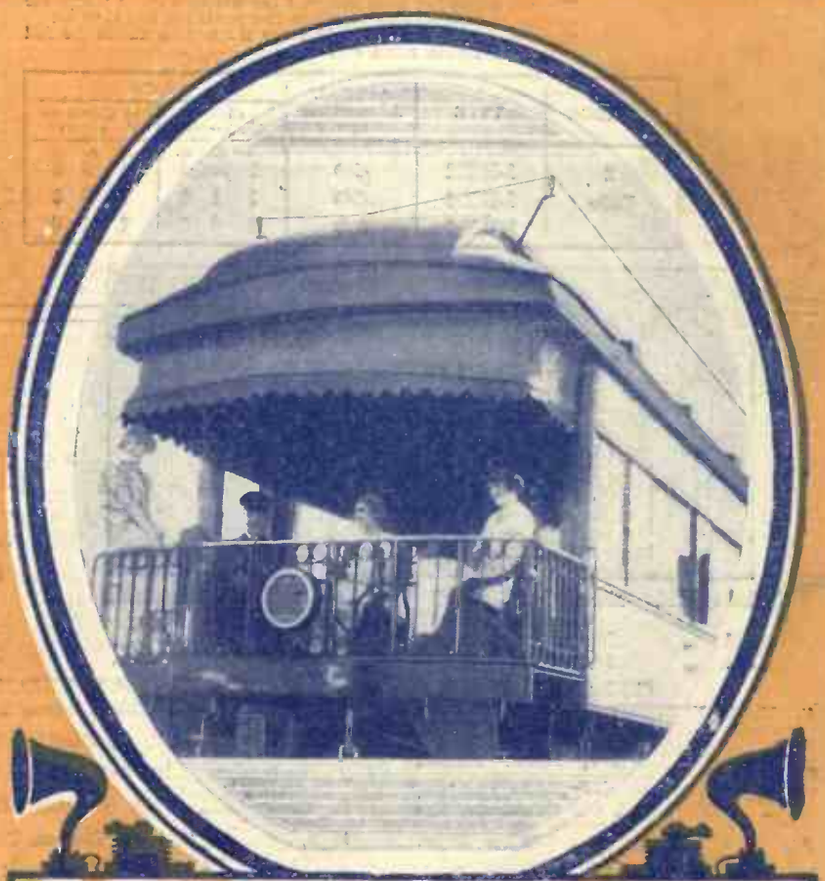

WIRELESS ON CANADIAN RAILWAYS

The Library car of a Canadian National Railway trans-continental express, equipped with a wireless receiving set. The aerials can be plainly seen, the wires extending from above the observation platform to the front of the car.

Meeting the demand

Type DTG

To meet the demand for batteries capable of being discharged at slow rates over long periods, the types illustrated have been designed.

Type DTG

These cells are particularly suitable for sets using .06 Dull Emitter Valves.
The cells are each 2 volts so that two of these cells will replace 3 dry cells.
Capacity when used for very slow intermittent work—20 ampere hours.
They are supplied dry, but fully charged and need only the addition of electrolite to make them ready for service.

Price
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This type is a development of the DTG, having more than double the capacity of the 5/- cell.
Capacity on slow intermittent work—45 ampere hours.

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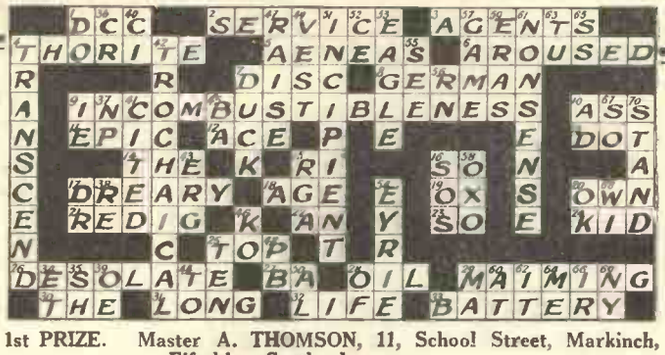
The above types are in strong moulded glass boxes.

Type HZ ***(in celluloid boxes)***

The HZ series has been designed for use in circuits where the number of burning hours between charges is not less than 30. They need be re-charged only every six months unless the full capacity has been taken out.

VOLTAGE	TYPE	ACTUAL Ampere-Hour Capacity	PRICE Cell only Un harged	PRICE In Container Type "O"
			£ s. d.	£ s. d.
2 Volts	1-H Z 2	40	0 17 6	1 3 6
	1-H Z 3	60	1 1 0	1 8 0
	1-H Z 4	80	1 4 6	1 12 6

Type HZ



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ARNOLD H. KNIGHT, Inwood, Alton Road, Parkstone, Dorset.
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Amateur Wireless and Electrics

Vol. VI. No. 143 February 28, 1925

KDKA ON A CRYSTAL!

A Personal Account of a Remarkable Achievement

PROBABLY many readers will have seen brief reports in the daily press upon my reception of K D K A on a crystal set without any means of amplification. The Editor of AMATEUR WIRELESS has asked me to give further details of this achievement, which surely must constitute a record, and it is with pleasure that I do so in the following short notes.

A Difficult Task

To convince amateurs of the genuineness of my claim is a difficult task, but I will endeavour to do so as briefly as possible.

While searching for stations on my variometer and tapped-inductance tuned crystal set I established contact with K D K A (East Pittsburgh, U.S.A.) on approximately 326 metres at 24.55 G.M.T. on January 2. Apparently a speech or lecture was in progress. The speaker's voice was very distorted; it faded quickly three minutes later. Numerous oscillators then came in (rather faintly) and faded entirely with the speech at 01.01.

The Second Reception

Nothing more was heard but powerful oscillation at 01.05, 01.20 and 01.27 until 01.35, when speech was again heard. At 01.38 speech came in much stronger and without oscillation, but distortion prevailed, and at 01.41 the speech faded rapidly.

Listening was continued until 02.45, but nothing more was heard, conditions apparently developing unfavourably judging by the slight decrease in signal strength of familiar morse stations on 600 metres, one of which, I may mention, could be heard eighteen inches from the phones.

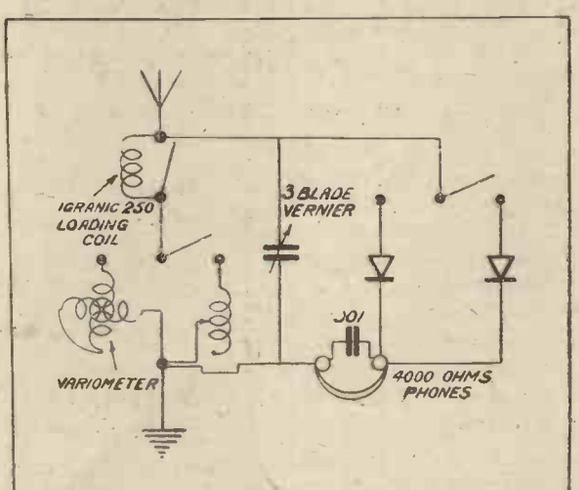
The actual time during which speech was heard was 9 minutes 20 seconds. I should like to point out that this was not freak reception, and it is the second time I have heard America within a week, though on the first occasion reception was too weak to be absolutely sure. Apart from this, I have tuned in all the B.B.C. stations and six Continental stations.

I made a point of visiting all owners of valve sets in the village later that morning, to ascertain whether they were working at the time that I received K D K A, but they were not; therefore the results could not be due to them.

Nothing appears to be impossible in wireless. A couple of years ago we had accounts of crystal reception of a few hundred miles, and many doubts were expressed as to whether the results were not probably due to some near-by valve set. Anyhow we heard much of "freak" reception on crystal sets. Here we have the personal account of Mr. Stafford, who lives near Thrapston, Northants, who claims to have received K D K A of Pittsburgh, U.S.A., on a crystal set of somewhat unusual design.

Success After Three Months

I have been trying to receive an American station for the past three months, listening on an average three nights per week, and am astonished to think I had not received one before, considering the exceptionally good strength of signals on the date mentioned. A notable feature of this reception was that for the first two minutes of reception two degrees movement to the right or left of the variometer would cut out speech, but a few seconds later it became stronger and could be heard anywhere between 250 and 500 metres.



Circuit Diagram of the Crystal Receiver with which the author received K D K A of Pittsburgh, U.S.A.

Possibilities of the Crystal

I am not quite convinced that the actual possibilities of the crystal under favourable conditions are yet realised, and think that as now experimenters may be assured that it is possible to bridge the Atlantic we shall soon hear of more receptions.

My own success I attribute to exceptionally good conditions at the time and the circuit used, which is the result of twelve months of experiment. Also, there is the possibility that K D K A might have been employing more power than usual in view of the fact that it was transmitting a special programme to this country a little earlier. The circuit is shown by the illustration.

Aerial and Earth

The crystals in use at the time were midite (with phosphor-bronze catwhisker) and hertzite (with german silver catwhisker). I have a 100-ft. aerial, 80 ft. in length and 20 ft. high.

My earth consists of a biscuit-tin, a cycle wheel and a tin of water (each with a separate lead to the set) buried in natural iron-ore upon which the house is built. My house is near Thrapston, Northants.

S. M. S.

DX AND THE CRYSTAL

THE sensitivity of a crystal set depends on the efficiency of the aerial, crystal combination and phones.

A gold or steel catwhisker when used in conjunction with a silicon crystal provides a sensitive stable detector.

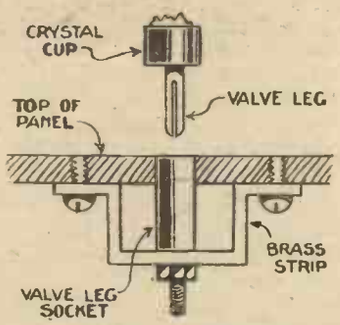
The aerial should be as high and unshielded as possible, because any leaking away of current means less strength in the headphones and a few more miles off that D X station you are trying to get.

PRACTICAL ODDS AND ENDS

Changing Crystals

A USEFUL hint for a quick-change crystal cup is shown in the sketch.

Many people find that the drawback to using up their small pieces of crystal by



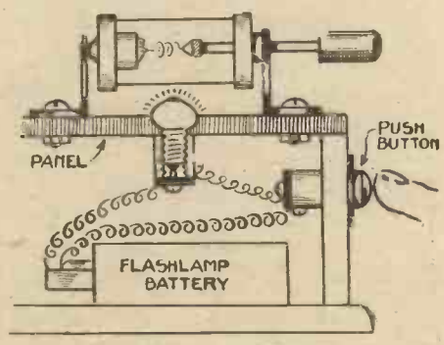
Details of Crystal Cup Mounting.

soldering them into a cup with Wood's metal is the fact that much trouble is entailed in interchanging them. The following is a convenient method for overcoming this difficulty. A valve pin is screwed into the crystal cup before soldering in the crystal, and a valve leg socket is fitted in the panel by means of a brass strip set away from the under side and secured by two screws. The socket should be flush with the panel when fitted.

C. A. C.

A Crystal Tip

CRYSTAL users may have found difficulty in adjusting the crystal contact when the set is placed in a dark corner or is shaded from the light. The diagram illustrates a simple method of overcoming



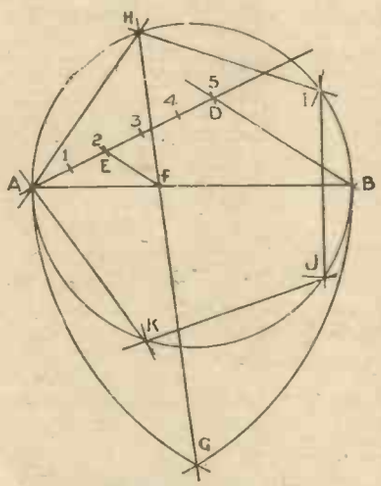
Illuminating the Crystal.

this difficulty. The simple method of "counter-sinking" the flashlamp bulb is clearly shown, and sufficient light will be given by this method to illuminate the catwhisker.

J. B.

Marking Out Formers

THOSE who have retained some of the geometrical training of their school days find the making of basket-coil formers very simple. This need not involve the use of a ruler, as it is only our old school-day's problem of drawing a polygon inside a circle. The sketch shows a pentagon so inscribed, the method of working being as follows: Draw a circle, divide centrally at AB; at an angle to AB draw line AC and mark off from A the number of equal parts necessary to correspond to number of sides required (in this case five). From No. 5 (D) draw line DB; parallel to this draw the line EF at No. 2; with radius AB draw the intersections AG, BG, through F draw the line GFH, then



Marking Out Formers.

AH gives the radius for marking off IJK, and connect. The parallel lines are easily drawn with two set-squares.

J. W.

Condensers

ONLY the best mica should be used as the dielectric for making up fixed condensers. Celluloid is liable to catch fire should a heavy static discharge break down the insulation of the aerial condenser.

K.

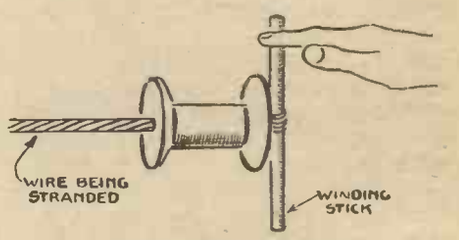
Stranding Wire

LITZENDRAHT or other similar stranded wire is highly efficient for wireless use, but the cost of such wire often makes its use prohibitive.

The diagram illustrates a method of stranding a number of lengths of "straight" copper wire of fairly fine gauge.

The cotton-reel is placed over the strands, as it facilitates the final straightening out, and forms a convenient holder which may be supported in the left hand, while the winding stick is rotated with the right.

The number of strands should be limited to about seven or the finished wire will be lacking in flexibility.



Method of Stranding Wire.

Stranded wire of this description is very suitable for winding low-loss coils.

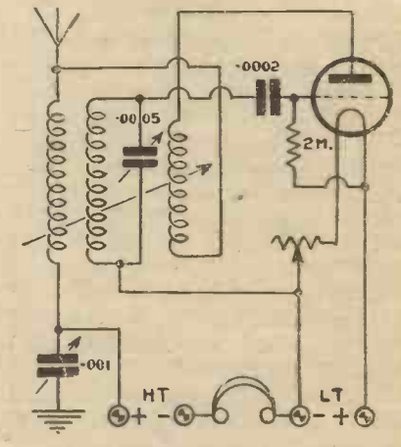
Y. L. B.

A Novel Circuit

MANY experimenters who own single-valve receivers are on the look-out for a circuit which will give selectivity and sharp tuning combined with a greater volume of sound than is usually obtainable with a one-valve set.

The diagram illustrates an interesting circuit which, it is claimed, gives excellent results.

The values of the condensers are marked

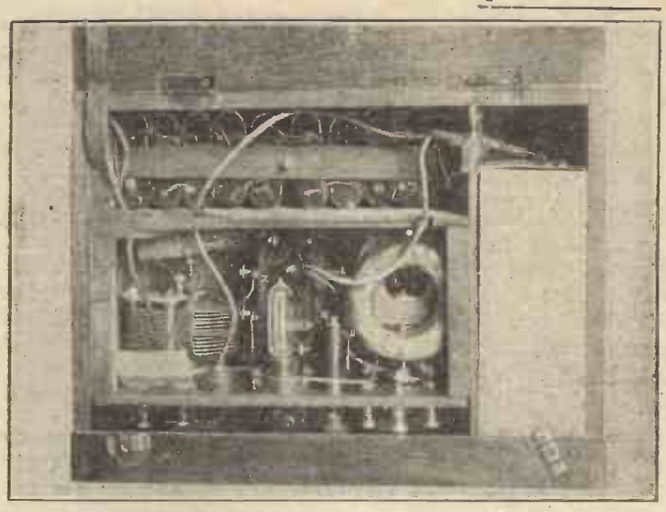


A Novel Circuit.

in, but the sizes of the coils will, of course, depend on the length of the aerial.

On an aerial of only 45 ft., double wire, very satisfactory results are obtainable.

R. F.



Figs. 1 and 2.—Two Views of the "All-In" Portable Receiver.

AN "ALL-IN" PORTABLE RECEIVER

THE type of portable set which includes a small frame aerial, with its three or four valves, has its uses on the rare occasions when one cannot throw up some kind of makeshift aerial. But at a picnic, on the tennis courts, or in the general run of places where portable sets are most in use, it is not generally difficult to sling up a length of insulated wire.

The little set illustrated on this page contains enough dry cells to run it for about six months, and, besides being easily portable, is the most economical type of receiver when attached to the permanent aerial at home. What is much more important, it will stand a great deal of rough use without sustaining serious injury. A set such as this, using one peanut valve, has, to the writer's knowledge, been dropped three or four feet on a number of occasions without loss of efficiency. Moreover, it can be (and is) left adjusted for the family to switch the L.T. current on and off as required for listening.

Many experimenters will "jib" at the crystal, but little trouble need be anticipated if a reliable detector is purchased. It may sound incredible to valve users, but it is not uncommon for a whisker to remain adjusted for a week at a time.

Some readers, too, may be doubtful of the advisability of squeezing the components of a reflex circuit on to a panel only 8¾ in. by 5 in. with a depth of 3⅞ in., particularly when both valve and coils are inside. The arrangement shown in the photograph, however, which is the result of some experimenting, is perfectly stable.

"What will it do?" is always the first test for a set, and here are a few facts about this one. At five miles from 2 L O, using a badly-shielded 6-ft. length of steel gauze only 3 ft. above the ground as an aerial, clear signals are received. A 3-ft. frame aerial at the same distance gave really good reception. At eight miles on an average aerial an Amplion Junior gave pleasant loud speaking in the open. At twenty miles loud speaking was still obtained. The telephone range is probably 100 miles, but both Aberdeen and Glasgow can be picked up in London when 2 L O has closed down.

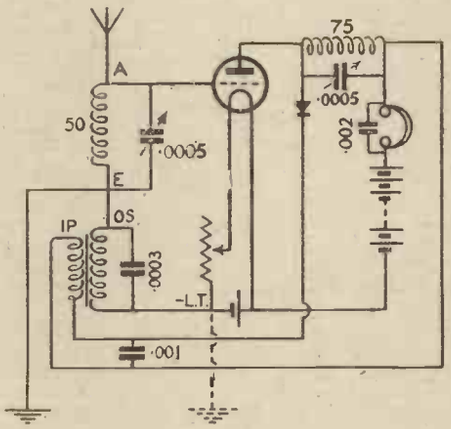


Fig. 4.—Circuit Diagram.

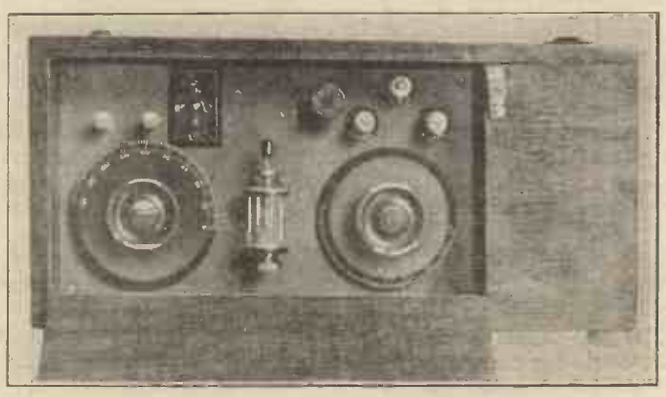


Fig. 3.—View of Panel.

In addition to the usual earth terminal it will be seen there is an alternative connection to the – L.T.; this enables either of the more popular reflex circuits to be used. When the earth terminal is in use the secondary of the transformer is between the – L.T. and the earth; this position appears the more efficient, as besides a greater range there is less fear of A.C. hum and other disturbances being picked up as is commonly the case when, alternately, the transformer is in the aerial circuit. The – L.T. connection places the .0003-microfarad condenser in series with the aerial coil, which should be of 50 or 60 turns to work with small aerials; this connection is therefore useful to cut down the wavelength when a large-capacity aerial is used.

Within reasonable distance of a broadcasting station little difference in volume will be noticed if an earth connection is dispensed with; the aerial tuning will, of course, be different, as the batteries form a capacity earth.

The first photograph (Fig. 1) shows the appearance of the set when closed and gives some idea of its size; the overall measurements are only 12¼ in. by 9 in. by 5¼ in. This might be further reduced if special components were purchased.

In the second photograph (Fig. 2) the top is open, show-

(Concluded at bottom of next page)

FRAME AERIAL AND ONE VALVE

MANY single-valve enthusiasts are deterred from using frame aerials because at least one H.F. valve is usually considered necessary, and because considerable loss of signal strength is experienced when a frame aerial is used with a "straight" valve circuit. Results with a single-valve circuit and frame aerial are often poor when compared with a single-valve with reaction and an out-door aerial. This is chiefly due to the fact that full reaction effects are not obtained.

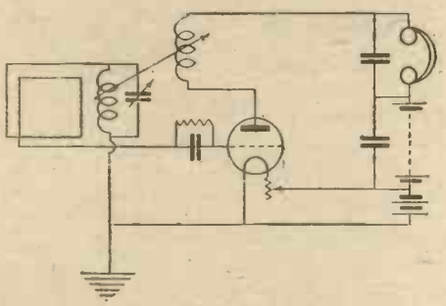


Fig. 2.—A Second Experimental Circuit.

The First Circuit

The circuit Fig. 1 was tried with a view to getting over this difficulty. It will be seen that the frame aerial, which is tuned with a condenser, is connected across the grid and filament of the valve in the usual manner, but that there is included in the anode circuit a coil tuned with a variable condenser. When the anode circuit is thus tuned to the same frequency as the aerial circuit, reaction effects are obtained and oscillations can be produced. At a distance of about five miles from 2 L O this station came in strongly on the phones on one valve, and signals could be heard some eight or ten feet away. There was not quite sufficient strength, however, to work a loud-speaker. A No. 75 duolateral coil was used in the anode circuit, tuned with a small condenser. A variometer covering the broadcast band could be used in the anode circuit instead of the tuned coil where it is desired to receive only broadcasting. A disadvantage of this circuit is that two circuits have to be tuned, and distant stations can easily be missed.

Another Circuit

The circuit Fig. 2 was then tried. In this case one side of the frame aerial is connected through the grid leak and condenser directly to the grid of the valve. The other side of the frame is connected to the A.T.I. and the A.T.I. is connected to earth. A connection is also made between the earth side of the tuning coil and the positive leg of the filament. Tuning is effected by means of a variable condenser connected in parallel with the A.T.I. A reaction coil is included in the anode circuit of the valve and is coupled to the A.T.I. in the usual manner by means of a two-coil holder. With the coupling sufficiently tight, oscillations were readily produced on all wavelengths. In fact the set oscillated rather more easily than it did when connected to an outdoor aerial.

2 L O came through with no appreciable diminution of strength when compared with reception on a 60-ft. outdoor aerial. (It should be mentioned, however, that the outdoor aerial is somewhat screened.) With the addition of a note magnifier strong signals were obtained on a loud-speaker, music and speech being clearly audible over the greater part of the house.

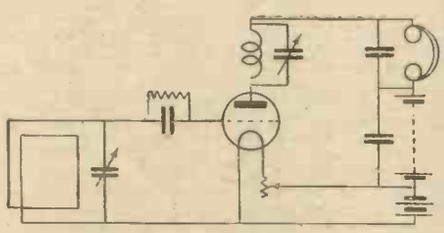


Fig. 1.—An Experimental Frame-aerial Circuit.

High Wavelengths

The higher wavelengths were reached by plugging in larger coils. C.W. stations can be received without fear of causing interference by oscillation, since the radiation from a frame aerial is small.

The Frame

A frame aerial 2 ft. square and with ten turns of wire was used. The turns should be well spaced, and to attain this the wire, instead of being wound round the edge of the frame, is passed through staggered holes as shown in Fig. 3. By this means the distance between adjacent turns of wire is nearly doubled.

The effect of connecting the earth to the negative filament may be tried, but the writer found the positive preferable.

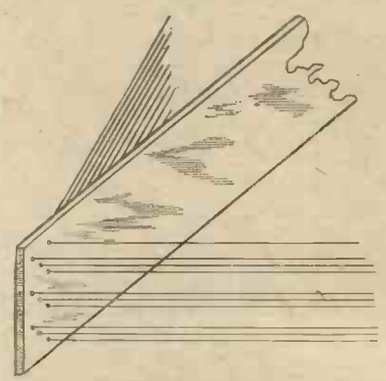


Fig. 3.—Method of Winding Frame.

A number of variations of the circuits given will doubtless suggest themselves to the experimenter. Electrostatic reaction might be tried by connecting a small variable condenser between the anode circuit and the aerial circuit. A combination of electrostatic and magnetic reaction can be tried by using the usual reaction coil and connecting a small variable condenser between the anode circuit and the aerial circuit.

All of the circuits described are stable and can easily be handled by a beginner. E. T. B.

"AN ALL-IN PORTABLE RECEIVER" (*continued from preceding page*)

ing the arrangement of the components. Examining this from left to right, we see the anode coil and tuning condenser, the valve horizontally placed above the transformer and the aerial coil on an ebonite shelf above the condenser tuning it. In separate compartments are two 1.5-volt cells in parallel, and the H.T. composed of four-volt units. The distribution of the components on the vertical panel should be clear from the third photograph (Fig. 3). Fig. 4 shows the circuit diagram.

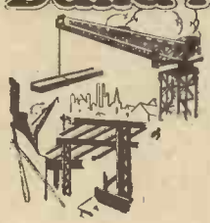
Readers who intend constructing a similar set will find it advisable to measure their components and draw a scale diagram before drilling the panel or making the cabinet. S. E. N.

INTERFERENCE TROUBLE

DR. DELLINGER, of the American Bureau of Standards, speaking upon a question that exists in even a more acute form in his own country than here, declares that there is no simple cure-all for interference. However, both natural and man-made interference is slowly being coped with, the former being, in fact, the more difficult problem. The slight electrical movements always going on in the atmosphere, similar to tiny lightning discharges, cause a certain background of noise in a receiving set, which will probably never be entirely eliminated any more than variations of weather can be prevented.

To prevent overlap of broadcast programmes in crowded areas he advocates the use of a fewer number of high-powered stations located at a considerable distance away from the big centres of population. This policy is already being seriously considered both in this country and in America by those responsible for the future development of the broadcasting system. M. A. L.

Build for permanence



NO architect ever passed the plans of a new building without first making sure that the foundations are correctly proportioned and capable of withstanding the strains and stresses that are likely to be met during the years to come. He builds for permanence.

And so it should be with the man who builds a Wireless Set. He, too, builds for the future. He does not want to find, when his Set is finished, that a leaky ebonite panel prevents goods results being obtained. He does not want to labour in vain, so he looks to his foundation—the ebonite panel.

All ebonite, unfortunately for the wireless enthusiast, is not of one recognised quality. Some is good—some is bad. Some is suitable for wireless use—some is not. How are you to tell? The only safe way is to use a guaranteed brand such as Red Triangle Panels—every one of which is positively guaranteed to be leakproof—impervious to moisture and finished with a smooth surface which does not require sandpapering before use. But Red Triangle Ebonite—for all its advantages—is not costly. Indeed, it often costs less than the ebonite of doubtful ancestry which you may be able to buy locally.

For your next Set try Red Triangle Ebonite—afterwards you'll use no other.

12 Stock Sizes :

6 × 8	3/–	7 × 10	4/3	8 × 12	6/–	12 × 14	10/6
6 × 18	8/–	8 × 6	3/–	10 × 12	7/6	12 × 16	12/–
7 × 5	2/3	8 × 10	5/–	10 × 24	15/–	12 × 18	13/6

All ¼-in. Thick.

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All Britain, 16 x 9 x ¼	9/–	Neutrodyne Tuner, 12 x 10 x ¼	7/6
S.T. 100, 12¼ x 9¾ x ¼	7/–	Neutrodyne Receiver, 12x10x¼	7/6
Puriflex, 14 x 10½ x ¼	9/2	3-Valve Dual, 24 x 10 x ¼ ...	15/–
Transatlantic IV., 16 x 8 x ¼...	8/–	Harris Crystal Set, 9 x 5¾ x ¼	4/4

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Big Results for 7/6

and the reason why!

Perhaps you are inclined to be sceptical about the performance of the "Brownie" Wireless—25-30 miles from a B.B.C. Station or 120 miles from Chelmsford, clear-toned reception is assured. Therefore we ask you to listen-in with the "Brownie"—let your own ears *prove* how thoroughly these claims are substantiated. Its undoubted success is in no small measure due to the *remarkable sensitivity of the famous D.L.5 Crystal.* Get a "Brownie" and enjoy broadcasting to-day. All fittings nickelled. **7/6**

Loading Coil for Chelmsford 1/6.
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A Condenser made up of such sheets will resist, for example, the continued application of the full voltage from a High Tension Battery, whereas a condenser with an inferior dielectric may develop a short circuit—a fault which may possibly ruin a succession of H.T. Batteries before it is located.

Apart from insulation resistance, however, there are still very powerful arguments in favour of the Mica Condenser. The use of Mica enables Condenser losses (due to hysteresis, leakage, etc.) to be reduced to a minimum, especially as Mica has a high "specific inductive capacity" so that the volume of the dielectric in a condenser in which losses can occur is reduced to a minimum.

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E.P.S. 78

On Your Wavelength!

Now or Never

THE Radio Society of Great Britain is taking a very grave view of the pending parliamentary action concerning the Wireless Telegraphy Act of 1904 so far as it affects the transmitting amateur. The official view is that the legislation is intended to strengthen the existing Act, but every society in the country that is affiliated to the parent society is being circularised and asked to support them in representing that if the Bill passes into law as it stands it will seriously prejudice and hinder research work and lead to stagnation in wireless progress. Strong representations are being made to members of the House of Commons that the effect of the Bill will be such as to give to the Postmaster-General the power to close down at his own pleasure all existing amateur stations and to refuse to grant further licences if he so desires. It is felt in responsible quarters that the whole future of the experimenting amateur is now at stake, and if the Bill is passed through the Commons as it stands his hard-won privileges are gone for ever.

The Amateur Experimenter

The importance of the amateur experimenter cannot be over-emphasised. He formed the nucleus of our wireless men during the Great War. It is entirely due to him that the use of short waves has been developed and their carrying propensities so ably demonstrated.

A year or so ago prominent authorities laughed to scorn the idea that the amateur could ever transmit to America on such a wavelength as 90 metres. Now the boot is on the other leg. Large commercial stations are sending out "feelers" on the short waves, and it is rumoured that they have an eye to adopting them in preference to the long waves at present in use.

This is one of many things due to the "amateur." He has earned his spurs and should be accorded a permanent place in the ether without fear of the sudden curtailment of his activities. It is for him to see that he pulls his weight in the present struggle by signifying to the Radio Society that he is in agreement with the policy of that body. He must secure for himself official recognition of his usefulness to the State now and for ever.

The Poor Transmitter

A kind-hearted correspondent has asked me whether there is such a thing as a Society for the Prevention of Cruelty to Amateur Transmitters. The inquiry was prompted by the recent proposals in the daily press to allow 2 L O to continue to afflict us with the Savoy Havana Band every night of the week until midnight. My thoughtful correspondent points out that the amateur transmitter has had an exceedingly thin time this winter in the way of periods free from broadcasting, and although they are not compelled to close down during broadcasting, they do so out of consideration for their neighbours. He further pointed out that should the broadcast programmes be prolonged as suggested, the amateur transmitter may become as extinct as the proverbial dodo. I lament the loss of the hours available to listen to these hard-working enthusiasts, for they have been considerably curtailed this winter.

What is an Artificial Aerial?

Many would-be amateur transmitters have had their catwhisker knocked off their crystals so to speak by the reception of an artificial aerial licence from the Post Office in lieu of the genuine radiating aerial licence which they wanted. They are further greatly perturbed by the fact that in their "permit to transmit" they are informed that the transmitter must not be connected to earth and is to be as non-radiating as possible. I have no doubt but that many of them have flung the apparently useless document into the fire, suffering under a sense of injustice, and have forthwith turned pirates. The dummy aerial is useful, however. The aerial consists of resistance, inductance and capacity, the three ingredients from which a "true-to-life" aerial is made, and it is easily made up in box form and need not occupy a space greater than ten cubic inches. With it and a couple of instruments one can learn enough to justify a further application for the radiating licence, so why not use it and turn it to account?

An Unkind Joke

Some few months ago several low-power stations in England were greatly surprised to receive a "K" call at terrific strength from an American amateur transmitter, and forthwith replied using power as low as 5 watts in some instances. Great was their amazement and satisfaction when, on changing over, the station promptly replied: "Yr sigs. vry f.b. hr o.m." and they pulled out their pencils and logged the great event. Later several other stations also worked the American amateur with still lower power, and it wasn't until one or two of the real D.X. fiends smelt a rat that it was discovered that the American was really an American—with the difference that he was on a visit to France, from whence came the signals. I'm told that several of our enthusiasts never touched a key again.

Another Fine Feat

Yet another laurel must be added to those already earned by wireless experimenters. On February 13 Mr. G. L. Morrow picked up at his station at Berkhamsted a short-wave signal from the Royal Air Force station at Mosul. The sender stated that he had an important message for the Air Ministry which he could not get through direct, and asked if any amateur who could read him would reply. Mr. Morrow signalled to him to send his message, which he did, and it was duly transmitted to the Air Ministry over the land-line. It seems that owing to jamming, communication could not be established direct between Mosul and the Ministry, and as his message was of great urgence it was extremely fortunate that the operator at Mosul had the inspiration of trying the short waves and that there was an experimenter able to pick up what he said. It just shows how extraordinarily useful the work of the amateur wireless enthusiast is and what a bad policy it is on the part of the Post Office authorities not to give more encouragement to his efforts.

The Professional Amateur

Strictly speaking, though, I do not know that Mr. Morrow ought really to be called an amateur, for I think that I am right in saying that he is still one of Captain Eckersley's henchmen at the B.B.C. As Mr. West's assistant, he took a prominent part in the relaying by the B.B.C. of K D K A and other American stations. But in wireless the term amateur seems to be used—by the Post Office, at any rate—in rather a curious way, for you will find in the official lists of amateur call-signs 2 L O, 5 I T, 2 B D and all the other broadcasting stations, both main and relay! In fact every station which does not belong to the Post Office or one of the Ministries, and is neither a shipping nor a commercial plant, is classed as amateur. If you glance through the list of amateur call-signs you will find that it contains the names of a large number of the best-known wireless engineers and research men, all of whom are surely very far from being amateurs at the game.

A Fine Situation

Mr. Morrow's station is at the top of a spur of the Chiltern Hills and stands about 500 feet above sea-level. His aerial, which is of the sausage type, is suspended from very high masts and is not screened by buildings, trees or hills from any direction. I have heard it said that when he wanted to build a house he chose a site that was first rate from a wireless point

On Your Wavelength! (continued)

of view, then decided where the aerial must be, and told the architect to design a house to fit in with it. Whether this is so or not I cannot say, but the fact remains that the position of his station is such as to make the mouth of any less fortunately (or should I say wisely?) situated amateur water. Readers of AMATEUR WIRELESS may remember that he contributed some months ago a series of articles on transmission, and that he is part author of the little book "Wireless Telephony Explained." Those who indulge in the fascinating pastime of searching round for amateur transmissions are probably familiar with his call-sign 6 U V.

An Old Friend

I have had rather an amusing experience lately. My big set being out of action for a few days for alterations, I rigged up an old one that had not been used for more than a year to take its place temporarily. The big set contains what I have heard described as "every modern inconvenience." It has potentiometers and variable grid leaks, and a separate grid-bias arrangement for each of the note magnifiers and different high-tension positive leads for each class of valve, and square-law condensers, and in fact everything that the wit of man can devise to obtain stability, sensitiveness, signal strength and purity of tone.

When, therefore, I fished out the poor old set which contains comparatively few of these improvements I explained apologetically to the members of my household that they must not expect too much from it. Then when all the connections were complete, I switched on and tuned in, expecting to find 2 L O weak and rather harsh. But to tell you the truth, reader, I found him amazingly strong, and there was so little difference in the purity of the reception that it was hardly worth talking about.

Comparison

Stability was really the only thing in the old set which was not quite up to the mark, for it showed a proneness to those annoying hand-capacity effects which we all know and which are conspicuous by their absence in the more up-to-date set. Now here is a very curious point: I had expected noticeable distortion because the low-frequency intervalve transformer used in the old set is one of the earliest patterns of good make that were available for amateur constructors. Actually it was purchased at the beginning of 1922. In those days low-frequency transformers were supposed not to have advanced much beyond the standard required for the reception of telegraphy. The big set contains a first-rate modern transformer specially designed not to over emphasise any frequency. As a matter of fact the ancient transformer performs so amazingly well that I think it would take a very acute musical ear to detect any difference between the quality of its reproductions and those of the late 1924 model.

I am a thorough believer in making every set as efficient as possible by incorporating in it any circuit or gadget likely to improve its performances. Still, I think that possibly we can overdo things a little; I mean that we may fit up any number of variables in a receiving set without obtaining any very marked advantage from their use. I have seen a set with nearly forty controls, and I must confess that my own possesses twenty-three. I should mention, by the way, that before I brought the old set into play I fitted up a grid-bias battery, for without this distortion is simply bound to occur on anything like a strong signal. What does rather nonplus me is that, though the old set is provided with coils and variable condensers of kinds which we now regard as inefficient owing to the losses for which they are reputed to be responsible, I had not the slightest difficulty in bringing in distant foreign stations at extremely good strength. Truly wireless is full of mysteries!

The New 2 L O

Very soon now, possibly even before these notes appear in print, the new 2 L O will be working and we shall know the best—or the worst. From a purely selfish point of view I could wish that there was not to be any increase in his power, for with his present 1.5 kilowatts, though he is nearly thirty miles from me, his tuning is far from sharp even on a receiving set fitted with four tuned circuits. On the best of nights it is exceedingly difficult to bring in either Manchester or Cardiff when 2 L O is working, and one often finds that the blotting-out effect which he exercises extends to Bournemouth as well. Will the increase in power mean a still wider band for 2 L O? I rather fancy that it will. If it does I shall be sorry, for I must say that I do like to be able to pick up at will any station which is sending out a particularly interesting programme or single item.

At the same time it must not be forgotten that most wireless folk in this country are crystal users, and anything which will extend the range of crystal reception is to be welcomed. We all want to see wireless becoming more and more popular as a hobby. The best way of ensuring this is to bring it within the reach of every purse. The valve set, even of the simplest kind, costs a certain amount of money, for valves themselves and the batteries which are needed for running them are expensive. A home-made crystal set, however, which will give good results indeed can be rigged up by anyone complete for less than a pound. And there is another side, too, that is worth thinking about: Apart from purely experimental work, it is really best to confine your reception to your nearest broadcasting station if you want to get results that are as near perfection as possible as regards purity, clearness and freedom from interference.

The Ideal Broadcast Set

I believe that the ideal set for broadcast reception on the loud-speaker consists of a crystal detector followed by one, two or three note magnifiers, according to the distance between the broadcasting station and the receiving aerial. A transformer should be used between the crystal and the first valve, whilst the other two should be coupled by the resistance-capacity method. A receiver made on these lines will give wonderful results provided that the components are thoroughly good, and with 2 L O's increased power it will be possible to use it at much greater distances from London.

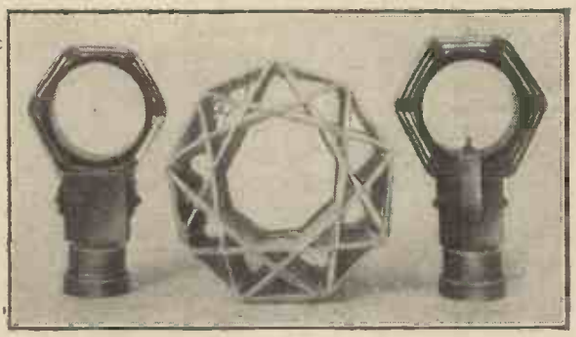
Expert Transatlantic Reception

The time is now coming gradually nearer when expert experimenters in Transatlantic reception will be able to prove their worth. When all is said and done the comparative merits of receivers for this work cannot be judged in the winter period, for American stations can then be tuned in by most people and the comparison is one of degree rather than of fact. Now it is the man who gets W G Y loudest; in a month or so it will be the man who gets America at all.

Birmingham "High-brows"

I am so glad that Mr. Hayes, of the Birmingham and Midland Institute, was kind enough to translate that first Act of *Boris Godounov* from the original of Alèxander Pushkin, for the Russian language is very hard to distinguish from bad "atmospherics," and I might have blamed my next-door neighbour again. Performed by the University of Birmingham Literary and Dramatic Society, with special music by Professor Granville Bantock, to most high-brows it would be certainly interesting, if not really entertaining. Personally I admit I felt more inclined to tune in to Manchester, where the 2 Z Y Dramatic Company was announced to produce *The Case of Lady Camber*. We most of us remember Horace Annesley Vachell's play when it was at the Savoy Theatre, London, in 1915; it was a success, even in war-time, and as its charm, like most of Mr. Vachell's works, depends most on literary dialogure rather than actual situation, I consider it a very wise choice for broadcasting purposes. THERMION.

LOW-LOSS COILS



MANY wireless enthusiasts find themselves rather puzzled by the question of coil efficiency. How is it, for instance, that one coil gives better results than another? What exactly are the losses of which we hear so much nowadays? How do they occur? What can be done to prevent them? To find answers to these questions and others upon the same subject we must first of all see briefly something of the functions of the inductance coil.

The main thing to bear in mind is that the valve, for whatever purpose it may be employed, is a potential-operated device. In a circuit such as that shown in Fig. 1 tiny differences in grid potential produce enormously greater effects in the plate circuit. To obtain the highest efficiency from the valve we must ensure that incoming oscillations make the greatest possible changes in its grid potential. In other words, we require the largest potential differences that we can obtain between the points X and Y across the inductance coil L in Fig. 1. If the coil is a good one these potential differences will have a maximum value, but if it is of poor design they will be reduced and the valve cannot give its best results.

A simple analogy is shown in Fig. 2. Here we have a wheel worked by a stream of water brought to its vanes by a pipe leading from a tank placed at a much higher level. At A the conducting pipe is sound, and the full measure of the water is delivered to the vanes of the wheel. At B, on the other hand, the pipe is shown full of leaks, so that the pressure of the water upon the vanes is a very small one. Obviously A is a very much more efficient arrangement than B; B owes its inefficiency to the leaks which allow the water to escape without doing useful work. Difference of potential electrically is just the same thing as a head of water mechanically. It will suffer in precisely the same way from losses or leaks in the conductor.

Current Leak

Now let us see how oscillating currents can leak away in a coil. For all practical purposes we may take it that alternating or oscillating currents pass through a condenser. I make this statement with some diffidence, for when I did so in a recent article I was immediately attacked by a correspondent for stating what he described as "this ancient fallacy." Actually currents do not pass through the condenser, but the effect is precisely the same as if they did.

Let us take it, then, that oscillating currents do pass through a condenser. Any two conductors whose potential is different form a condenser if placed reasonably close to one another; in other words, there is capacity between them. Now let us think of what happens in a coil of twelve turns, such as that shown in Fig. 3, across which there is a potential difference of 3 volts. The fall in potential is quite regular from top to bottom of the coil. That is between turn No. 1 and turn No. 6 there will be a P.D. of 1½ volts and so on. Between each pair of adjacent turns the potential difference will be one-twelfth of 3 volts, or a quarter of a volt. If we place the turns in a single layer, as seen in Fig. 3, there will be no great amount of capacity between them, since each turn lies next to the one between which and itself there is the smallest potential difference. But the capacity will be very much increased if we arrange them in two layers, as shown in Fig. 4, placing turn No. 7 over turn No. 1, for here we shall have a potential

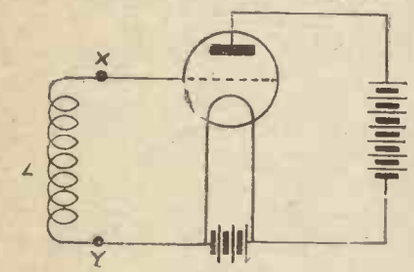


Fig. 1

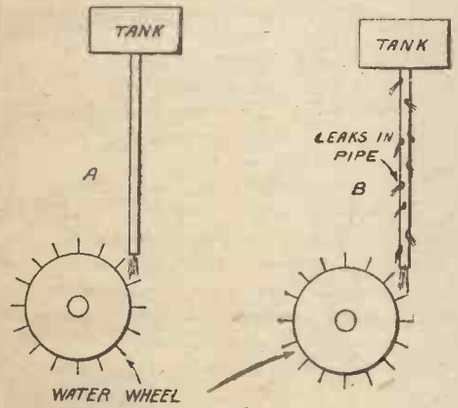


Fig. 2

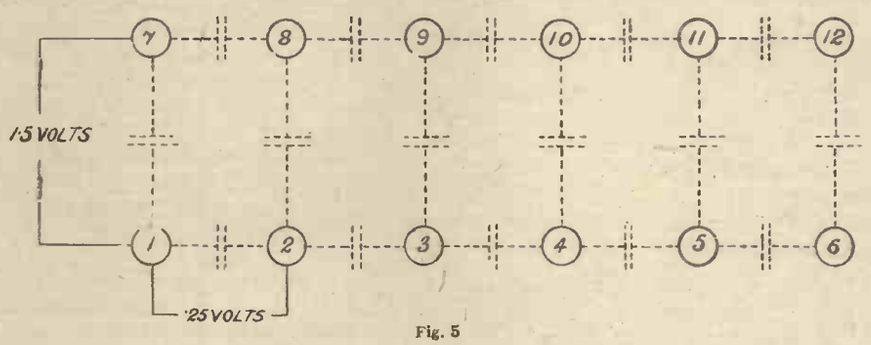


Fig. 5

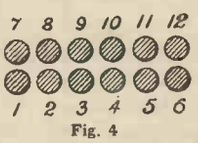


Fig. 4

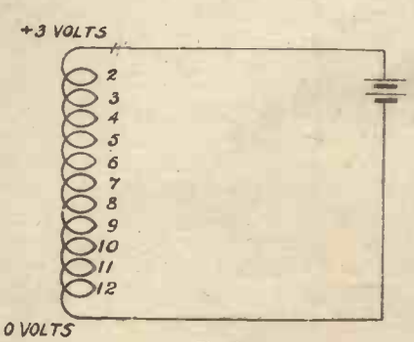


Fig. 3

Fig. 1.—Diagram Explaining Effect of Losses.

Fig. 2.—Hydraulic Analogy.

Fig. 3.—Action of Oscillating Currents in Coil.

Fig. 4.—Capacity in Coil Windings.

Fig. 5.—Diagram Showing Effect of Capacity in Coil Windings.

difference of 1.5 volts between the first turn and the seventh, the second and the eighth and so on.

Tiny Condensers

We may in fact regard the coil as provided with a large number of tiny condensers, as shown in Fig. 5. Each of these forms a leak just like the holes in the water-pipe of which we spoke before. It follows, then, that to obtain efficiency we must reduce the internal capacity, or *self-capacity,* of the coil to a minimum. For long-wave reception the amount of self-capacity present in a coil is not of enormous importance, provided that it is not unreasonably large. But the shorter the wavelength the higher the frequency, and the higher the frequency the more easily does current pass through a condenser of given size. Hence a type of winding which may give quite good results when used for the reception of 5XX may be utterly useless on the ultra-short waves, behaving to high-frequency currents very much as a pipe made of gauze would to water.

Reducing Self-capacity

Before we can tackle the problem of reducing self-capacity we must understand something about condensers. A condenser consists of two conductors, between which there is a non-conductor known as the dielectric. For a given dielectric the capacity between plates of a certain size will be increased if the distance between them is reduced. We thus see that to produce an efficient coil the turns must be separated. Again, for a given distance between the plates, the capacity varies according to the dielectric constant of the insulating material which separates them. For example, if we cut two plates to a given size and separate them by $\frac{1}{32}$ in. of air the capacity between them will be .00025 microfarad. By plunging the plates into mineral oil we can increase the capacity to about .0005 microfarad, since the dielectric constant of oil is roughly double that of air. Similarly, mica has a dielectric constant which may be as much as eight times that of air; ebonite gives four times the capacity, and so on.

Insulation

If in winding a coil we use covered wire we are providing a dielectric of silk, cotton, rubber or enamel. Each of these has a dielectric constant much higher than that of air, so that its presence makes for increased capacity in the coil. Again, if we dress the wound coil with shellac or with paraffin-wax we increase the dielectric constant of the material separating the windings and so make the capacity of the coil greater. Air has the lowest dielectric constant, and we thus see that to obtain the minimum self-capacity in a coil air spacing should be used.

But there is another side to the question of dielectrics, and that is their efficiency. When a condenser is charged up the electrons in the dielectric are strained in their orbits. In a really good dielectric none of them is torn away from its atom, but in a bad one there is actual leakage of current through the dielectric owing to the detachment of electrons. In other words, the more perfect any substance is as an insulator the more efficient will it be as a dielectric. When we come to examine dielectrics we find that air is by far the most efficient and that silk, cotton, rubber, enamel, shellac and paraffin-wax are all much inferior. Thus in a coil wound with covered wire we have, beside capacity losses, other losses due to the inefficiency of the dielectric matter separating the turns. Once more we see why air spacing is to be preferred to any other kind.

Conclusion

We come, then, to these conclusions as regards the design of a low-loss inductance.

(1) Its turns must be so arranged that there is the greatest possible amount of separation between those at widely different potentials.

(2) Self-capacity can be kept at a minimum only by the use of air spacing.

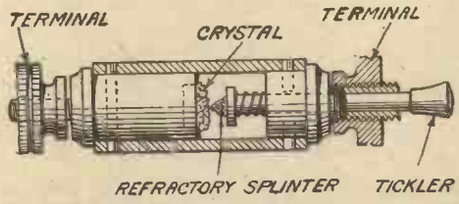
(3) The use of covered wire will lead to losses due to dielectric inefficiency and bare wire is therefore to be preferred.

There is one other very important consideration that must be taken into account. The addition of resistance to any oscillatory circuit flattens its tuning. Therefore the coil must be wound with wire of a gauge sufficient to reduce high-frequency resistance to the smallest possible amount. In coil winding the golden rule to observe, in addition to the three mentioned above, is always to use wire of the heaviest gauge compatible with compactness. J. H. R.

A NEW DETECTOR

FOR some considerable time the essentials of a crystal detector for the reception of broadcasting have been regarded as consisting of a catwhisker and a crystal provided with means so that one can be adjusted lightly to make contact with the other.

A new detector lately placed on the market by Radio Instruments, Ltd., of 12, Hyde Street, New Oxford Street, London, W., however, makes a distinct departure from this practice. A cursory examination of this detector would lead one to suppose that it was a perikon detector and of the cartridge type. Actually it is neither, for the contact is adjustable, and in place of the usual perikon combination there is a crystal and a pointed piece of refractory material.



Cut-away View giving Only an Approximate Idea of the R.I. New Detector.

The sketch gives an idea of the general lines upon which the detector is constructed, though this is not a definitely accurate representation of the interior. As will be seen, it is of the cartridge pattern with terminals at each end. Through one terminal a spring-controlled plunger rod passes, to the inner end of which is secured the piece of refractory material to which reference has already been made. It may be mentioned that the principal virtue of this detector lies in this special material with which the plunger rod is tipped. This material is only available to Radio Instruments, Ltd.

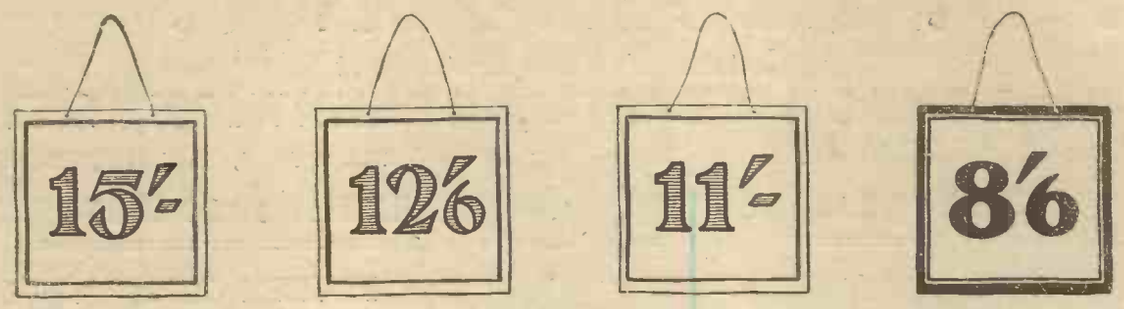
The terminal at the other end of the detector is part of the crystal cup in which the crystal is secured in the ordinary way.

One very noticeable feature is the excellent construction and finish. The barrel portion is polished ebonite and the terminals are highly polished brass and lacquered.

To set the detector all that it is necessary to do is lightly to pull out the plunger rod and release it again. There is no need to fiddle about to get the exact pressure, as this is automatically governed by the spring. During a test at a distance of seven miles from 2LO excellent results were obtained, and the operation of finding the "spot" was so simple that it could be performed in the dark, neither a fine perception of touch nor of sight being required.

The results of our own tests go to confirm the reports of preliminary tests made by a number of amateurs and research workers throughout the country. While some remarkable claims as to distance have been made (not by the R.I. firm) for this new detector, that is not the particular virtue that the makers have sought. They have done their best to produce a detector in which the crystal setting remains absolutely permanent, and there is no question as to whether they have succeeded. We have had the detector in use for a few weeks only, but in some other tests that have been carried out the crystals have been in use for many months and the original setting remains perfectly good. We can speak most certainly as to the permanency and genuinely good performance of this new device.

The price complete is 6s.



When bright filament valves cost 12/6 the Silver Clear Louden was put on the market at 10/-.
In the last four months it has more than trebled its sales.
New prices are now in force for valves, and once more the Silver Clear Louden maintains its lead. From February 23rd the price of the Louden Valve is reduced to 8/6.

LOUDEN 8/6 VALVES

Louden Valves - Silver Clear

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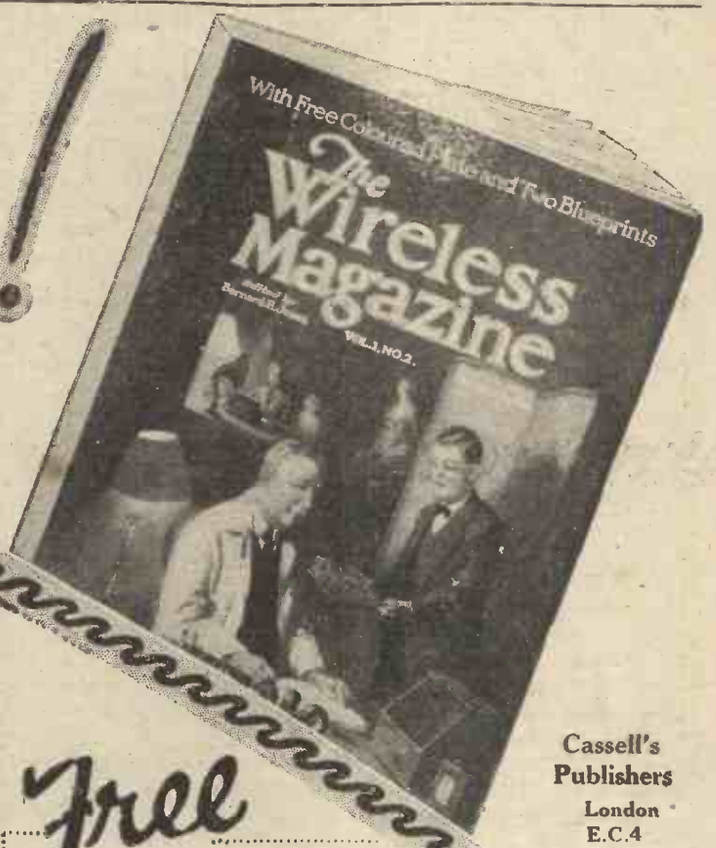

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March Number

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SOLVING THE CURRENT-SUPPLY PROBLEM

The first of two articles describing how both plate and filament current may be obtained from the mains.

THOSE amateurs whose premises have the public electricity supply are in the enviable position of having a constant source of power supply, which, if used in a proper manner, will prove an economical, clean and easy method of supplying a single- or multi-valve set with both H.T. and filament current. As regards filament lighting, the mains may be used either by a direct method, where the valve filaments are fed directly, or by an indirect method, where accumulators are charged from the supply and then discharged through the filaments.

The method to be described first has the advantage that the H.T. current as well as the filament current is supplied from the mains. Before dealing with the method proper, however, it is thought that a few words as to calculations and precautions would not be out of place. As regards the former, the reader should make a study of Ohm's law and the simple calculations involved. This law shows that the strength of a current due to an electromotive force falls off in proportion as the resistance in the circuit increases, and is represented by the equation $I = \frac{E}{R}$, where I = current in amperes, E = electromotive force in volts and R = resistance in ohms.

From this it is apparent that to find the resistance of a circuit we use the equation $R = \frac{E}{I}$, and to find the voltage we use the equation $E = I \times R$.

A still further calculation which is involved is that relating to the power used. In this case, to find the number of watts consumed we multiply the voltage by the amperes consumed in the circuit. It will be seen that the calculations are simple and need not deter the novice from installing the various circuits according to his requirements.

Now a word as to precautions. Under certain conditions it is exceedingly dangerous to meddle with the mains. In most public supply systems the power is transmitted on the three-wire system, where the two outer wires have a difference of potential of 480 volts between them, and a neutral or earthed wire in conjunction with either of the "outers" has a difference of potential of half this amount—that is, 240 volts. The earthed wire may be either positive or negative, and it becomes apparent that whichever is the case, should a person place his body between the earth and the opposite wire in the supply he will receive a shock of greater or lesser magnitude. When handling the mains, even if the main switch is off, it is as well always to make a point of wearing rubber gloves or to stand upon a dry piece of wood or a stool. Remember that dampness is a conductor of electricity and that touching a damp wall might result in a shock which may easily prove fatal. Handle only one wire at a time, and if possible always with the main switch off. The importance of these precautions cannot be over-emphasised.

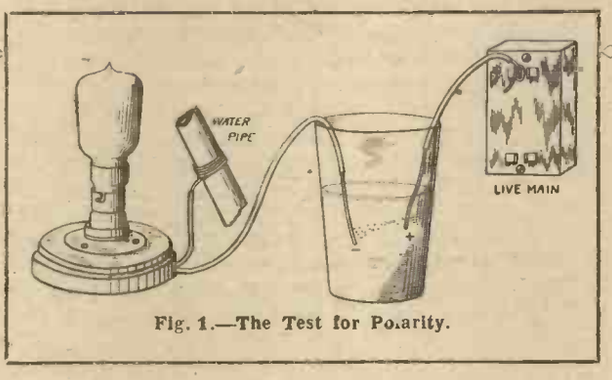


Fig. 1.—The Test for Polarity.

The first thing to be done is to ascertain of which polarity is the earth. This may be done by tightly binding a wire around the water main or attaching it to the "bonding wire," which will be found projecting on the outside of the armoured cable which is the company's property. A glass of water should next be placed on the floor in a good light so that the water can be readily observed, and removing the cover from one of the fuses (a pair of which will be found near the main switch), withdraw the fuse and attach a piece of wire to the live terminal (that is, the terminal nearest the main switch) with a lamp in the circuit as shown in Fig. 1. Next plunge this wire and that on the water-pipe into the glass of water (taking care that they do not touch) and see if any bubbles rise from the wires through the water. If no bubbles rise both wires are of the same polarity, and the wire should be removed from the fuse circuit and the cover replaced. Repeat the operation with the other fuse, and it will be seen that bubbles will rise from one wire if one side of the supply is earthed as suggested above. The wire from which the most bubbles emanate is the negative. The lamp is placed in series with the circuit (as illustrated in the sketch Fig. 1) as a precaution, as it will ensure against the possibility of a "dead short-circuit" and prevent the company's fuse blowing. If you do "blow" the fuse it will be necessary to get the company's representative to replace it. The lamp will glow a dull red if the wires under test are of opposite polarity.

The fuse block may now be marked, according to its polarity, near the fuse. We will assume that it is positive and the earth negative. The remaining fuse may also be marked negative. We have now to consider what amount of current is required for the filaments. As the ques-

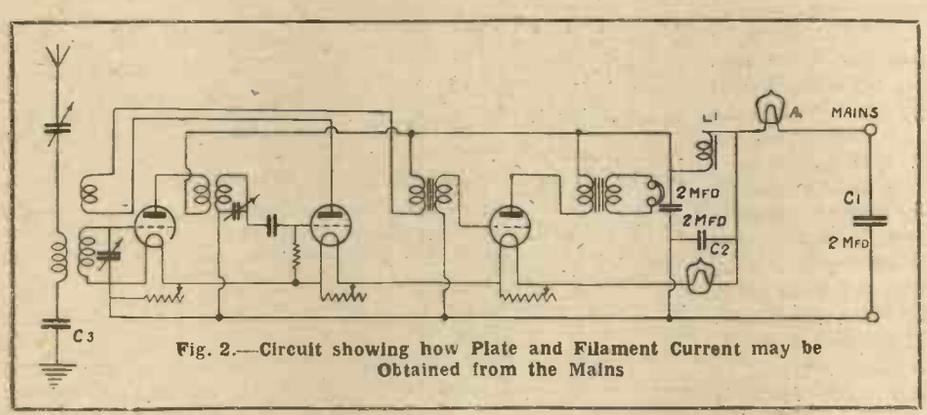


Fig. 2.—Circuit showing how Plate and Filament Current may be Obtained from the Mains

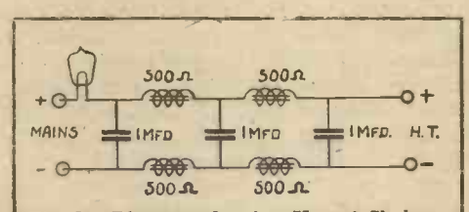


Fig 3.—Diagram showing Use of Chokes.

tion of current supply for a single-valve set is not a very great problem, we will pass over this and consider the requirements of a multi-valve circuit employing bright-emitter valves. The circuit which is most generally used amongst amateurs is a three-valve circuit employing either one H.F. amplifier, a detector and a low-frequency amplifier, or a detector and two low-frequency amplifiers.

Technical Details

The circuit is shown in Fig. 2. The H.T. leads are connected across a 120-volt lamp and another lamp is between the plate lead and the positive of the 240-volt supply, which is the voltage generally in use in town supply systems. The negative side of the H.T. is fed through the filaments in series and thence to the negative of the mains. It will be seen that the filament current flows through the filaments and joins up with the H.T. The two lamps in series on the 240-volt mains should be of a suitable wattage to supply the three valves.

In this case we will assume that the lamps used are 120-volt lamps and that they normally pass .75 ampere. Lamps of larger wattage would, of course, pass more current. Also two lamps in parallel will pass twice the quantity passed by one if they are of the same wattage.

The resistance of the lamps is found by Ohm's law, and in the case under consideration we have 120 ÷ .75, which equals 160 ohms each. Should the valves be 4-volt valves these generally pass .6 ampere per valve, and their resistance is therefore 4 ÷ .6, which equals 6.6 ohms each, or a total resistance of approximately 20 ohms for the three valves. We now have a total resistance in the circuit of 340 ohms (120-volt lamps) plus 20 ohms for the valves. Again Ohm's law shows that 240 ÷ 340 equals .7 ampere, which is the current which will flow around the circuit when the pressure (240 volts) is applied.

The Rheostats

It is obvious that .7 ampere would pass through the filaments (which would, of course, overload them) unless some auxiliary resistance is provided. As valves performing different functions require different values of filament current it will be necessary to provide suitable resistances in the circuit and, moreover, to place them in such a position that they absorb a certain amount of current; in other words, they must be placed in "shunt," for it is obvious that if they are placed in an ordinary position, as with a normal set, the L.F. filament rheostat will be a "master" rheostat, in which capacity it is not wanted. A glance at the circuit will show the resistances, or rheostats as we term them, connected "in shunt."

The designing of the rheostats must now be undertaken. We have seen that .7 ampere is flowing round the circuit and that the valves require only .6 ampere. A little consideration shows that as the current flow is .7 ampere and each valve requires .6 ampere, the rheostat must carry at its maximum .1 ampere, whilst .6 ampere will flow through the filament. The resistance of the rheostat is therefore 6 × 6.6 (filament resistance), which is approximately 40 ohms.

The size of the wire has now to be considered. The required filament variation of a normal 4-volt bright-emitter valve is generally from .4 to .6 ampere, according to the value of the H.T. grid potential, etc., so that the rheostats at the lower amperage will be carrying .3 ampere (the difference between .7 and .4), and the resistances at this position will be .4 ÷ .3 × 6.6, which is 8.8 ohms. A stop may therefore be provided to prevent the resistance from being reduced below that value. The wire must be thick enough to carry slightly more current than this—about .5 ampere. The size of the wire may be decided by reference to the tables compiled by the manufacturers of the particular wire which it is intended to use.

Smoothing Circuit

As regards the smoothing circuit, the value of the two fixed condensers C1 and C2 (Fig. 2) may be from 1 to 2 microfarads, and the iron-core choke L1 may consist of an ordinary speech or intervalve choke as is ordinarily used for coupling L.F. valves. Care must be taken, however, that the choke is in the position indicated. It will heat up very badly if it is situated between the lamp A and the main's terminal and will probably burn out by reason of the comparatively heavy current passing through the windings. Furthermore, *the extra resistance involved will upset the calculations arrived at.*

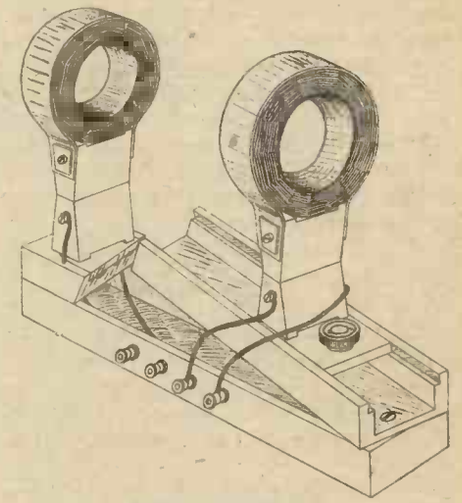
Alternatively a series of chokes of comparatively low resistance (about 500 ohms each) may be used as indicated in Fig. 3. The method described has been used with great success at different times by the author, and it is thought that the amateur will, by the aid of the example given, have no difficulty in working out suitable values for his own supply should it vary from the example shown. The greatest difficulty with this circuit is with regard to the smoothing arrangements. Where bad cases of mains hum are encountered special chokes will have to be designed and constructed to overcome the difficulty. As regards cost the method is economical. Assuming that an average current of .5 ampere is used, we have 240 × .5 = 120 watts. The cost of one Board of Trade unit is approximately 6d., and one unit is equal to 1,000 watt hours, therefore 1,000 ÷ 120 = 8.3 hours for sixpence. It might be remarked in passing that it is important that the high value blocking condenser C3 always be inserted in the earth lead when a set is coupled to the public supply mains. Furthermore, note that low-resistance phones are incorporated in the set so as to isolate the wearer's head from contact with the mains. A. J. C.

(To be concluded.)

A SIMPLE TWO-COIL TUNER

As will be seen from the illustration, an ordinary pencil case is used for the tuner described below.

The round end of the sliding lid is cut off and glued into the round portion of the slide. About two or three inches of the remaining lid is then cut off, and at one end of this is screwed a coil holder of standard pattern, and at the other end a small knob is fixed. On the raised portion of the box is screwed the other coil holder; it is best screwed to the round part of the lid before gluing. The grooves for pencils, in the swivel part of the box,



Simple Two-coil Tuner.

can be levelled with a chisel and glass-paper.

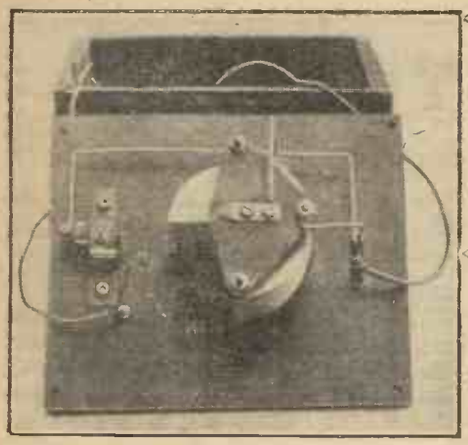
The leads are brought to a terminal block at the side, or, as an alternative, to terminals fixed directly into the side, the holes, of course, being bushed with ebonite. In the sketch the leads are shown outside the box, but they can be taken inside equally well.

It will readily be seen that tuning can be effected by sliding the coil holder backwards and forwards by the knob, and for fine adjustments it can be swivelled round away from the fixed coil.

If the coil stand is mounted on a suitable base, the terminal block can be screwed to the base and the leads be brought under and recessed into the base. This will give quite a smart appearance to the finished coil stand. L. C.

If you attach your aerial to a tree, have the aerial wire 15 ft. from the tree to avoid loss.

Clearer signals are obtained with the detector valve adjusted below maximum signal strength.



Under Side of Panel.

A HOME-MADE WAVEMETER

The second and concluding article on the construction of a useful accessory.

THE adjustment of the buzzer to give a really good, high-pitched note might be found a difficult and exasperating business if tackled without some knowledge of the anatomy of this small component. The parts of the buzzer are shown in Fig. 5. Upon the frame F are mounted the magnet M and the supporting pillar P. The pillar has a short horizontal arm, which carries

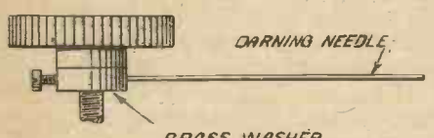


Fig. 7.—Knob and Pointer.

the contact screw A. Immediately above the magnet pole is the armature or blade, which consists of a thin piece of springy metal shaped like a shovel. It is fixed to the frame by a screw E. This screw also secures a small V-shaped metal strip D, against which the adjusting screw B bears.

To tune the buzzer easily and quickly proceed as follows. Loosen the screw A until its point is right away from the blade. Then by means of the adjusting screw B bring the blade just clear of the magnet pole. The space between the blade and the magnet should be about $\frac{1}{64}$ in. Now attach the single cell to the small covered wire X (this wire is also seen in Fig. 4) and to the second contact of the buzzer, which may be either a second short piece of fine covered wire or the screw K in the pillar. With a fine screwdriver turn the screw A very gently down until its point just touches the contact on the blade. The buzzer will now begin to sound, though its note may not be anything like that required. By turning the screw A down a little further a good, high-pitched, singing buzz will, as a rule, be produced, though it may be necessary to make further adjustments of the screw B. Sometimes it will be found that when the right sort of note has been obtained, the buzzer will not start when current is switched on. In this case all that is required is a smart tap on the panel of the wavemeter. The higher the note that can be obtained, the easier will it be to take accurate readings with the meter. Once the setting of the screw B has been found, it will seldom require to be touched again, and any slight alteration in the buzzing note can be effected through the hole in the panel by means of the screw A.

We can now mount the panel upon its cabinet, which should be 7 in. square and about 4 in. in depth. The next process is to calibrate, and here we shall find that the use of a square-law condenser makes matters quite straightforward. By employing only four standard plug-in coils we can make the wavemeter tune from about 60 metres to 4,000. Personally I use Igranic coils, the numbers being 25, 50, 150 and 400. With a .0005 low minimum condenser—that seen in the photograph is a Bowyer-Lowe square law—the approximate ranges of the coils are as under. It is as well to strip two turns from the No. 25 coil to make quite sure of getting down to a sufficiently low wavelength with the smallest coil. We can well spare these, since there is a considerable overlap between this coil and the No. 50 coil.

Coil.	Min. Wave-length	Max. Wave-length
25 (less two turns)	60	220
50	175	525
150	475	1,425
400	1,200	4,000

If you intend to keep the condenser dial and to use charts proceed as follows: Let us suppose that we are going to calibrate the No. 50 coil. Take a piece of graph paper, marking off on the left-hand side

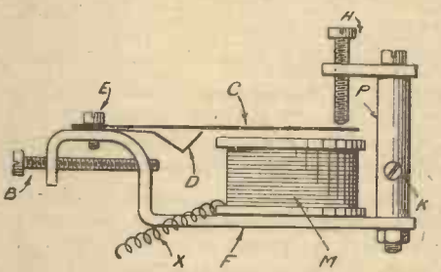


Fig. 5.—Details of Buzzer.

vertical divisions representing the condenser scale degrees. Mark off a horizontal line ruled at right angles to this into divisions, representing 50 metres apiece from 150 metres to 550. Now tune in your nearest broadcast station as sharply as possible, after which set the wavemeter going, and adjust it until you obtain its note at its loudest in the receivers. Note the reading, and make on the chart a dot corresponding to the condenser reading and to the known wavelength of the station.

Now tune in another station whose wavelength is as far as possible above or below the first. Mark in this reading as before. Place a ruler on your squared paper, so that its edge touches the two dots made; draw a straight line, joining them, and produce it in both directions. This straight line will show you just how to set the wavemeter dial in order to obtain any wavelength. You may have a little difficulty in calibrating the No. 25 coil, but here you will find considerable assistance in the calibration waves sent out at intervals from the Eiffel Tower. For the 150 coil you can make use of G N F or

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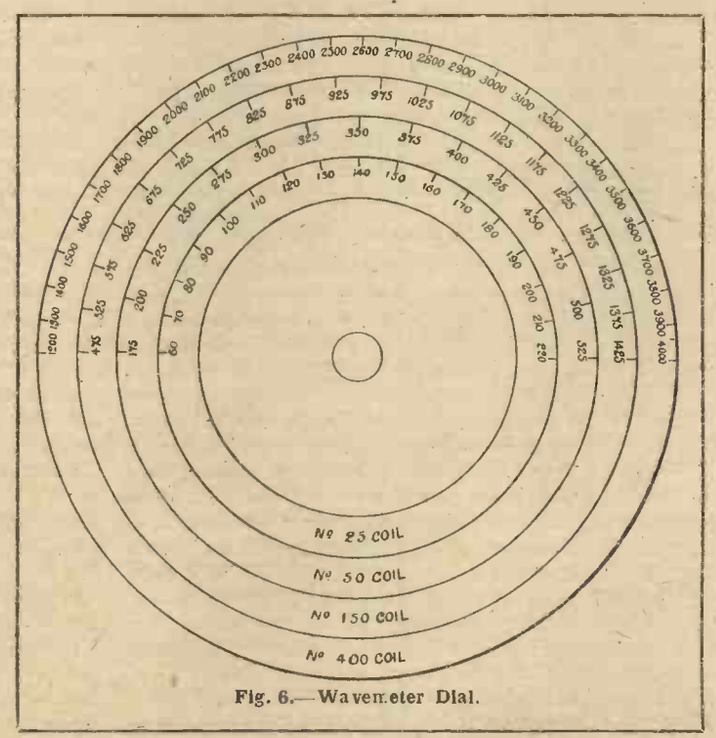


Fig. 6.—Wavemeter Dial.

WHAT OF THE FUTURE?

WHEN we recall the caution of the B.B.C. when they originally embarked upon the enterprise of providing a broadcasting service in Great Britain and the restrictions as to the apparatus to be used by listeners, the obvious dislike of the home constructor and so on which characterised those early days, it is astounding to remember that all this took place a bare two years ago. The most astute brains connected with the beginnings of broadcasting so little foresaw what was to come that they were afraid of commercial failure if they had to rely on the income from licences and could not ensure a profit from the possession of a virtual monopoly of the supply of receiving apparatus.

After Two Years

Well, two short years have put a very different complexion on the whole matter, and now that the last remnants of the "sealed set" monopoly have gone and the design, construction and sale of sets has become wholly unfettered, it may, perhaps, be permissible to turn to the consideration of the future of this great new factor which has been so firmly established in our daily lives. For it is obvious that, come what may, broadcasting will remain such a factor.

The Programme Controversy

I do not propose here to discuss the great "programme" question. Like that of "The Decay of the British Drama," which has been, probably since long before Shakespeare's day, such a staple topic for the playwright, the actor, the playgoer, the dramatic critic and even the ordinary non-technical journalist, this controversy will doubtless go on. What *is* broadcast and what *ought to be* broadcast will never be entirely the same thing in the opinions of any two individuals. But there can be little doubt that, in the long run, the "public" in the mass will get the broadcast matter it wants, just as it gets the plays it wants. That is the B.B.C.'s business, and if at any time those responsible fail to give the public what it wants they will quickly become aware of the fact and supply will be regulated, as always, by demand.

But it may not be devoid of interest to try to speculate, however dangerous such speculation may be, on the probable composition of the future "listening public" and on the type of set they will use.

The Amateur

Until the advent of broadcasting the wireless amateur was a person whose interest was in the technique of wireless communication. Wireless was a scientific hobby, comparable to the dozens of scientific hobbies which have flourished, in a more or less obscure way, for generations. A man "took up" wireless as he might "take up" botany or geology, chemistry or photography. And since a good deal of expense and some hard brain work in mastering technique (including, of course, morse) were entailed, the hobby had a limited, if ardent, following.

The Broadcast Listener

Broadcast telephony has changed all that. Probably nine-tenths of the present-day wireless enthusiasts were first attracted by the prospect of listening to "aerial music." A good few have subsequently acquired "wireless mania" of the technical type. But it is questionable whether the bulk even of present-day listeners care much for the science of radio communication. When we realise that the "mass of listeners" is pretty certain to mean, within the next year or two, the mass of the entire population of the realm, it is not likely that the whole nation will take the trouble to learn even the elementary technique of such a highly specialised science.

Sets of the Future

What kind of sets, then, will these non-technical listeners of the future use? Will the ready-made commercial receiver hold the field? Personally, I do not believe that it will. There will be a great and an increasing sale of such sets. The man with plenty of cash and no inclination to the use of tools will buy his set as he now buys a gramophone. But I believe that there will also be a great and an increasing sale of components wherewith constructors (ignorant, perhaps, of the most rudimentary theory) will build their own sets. For building a wireless set from printed instructions is, of all the jobs an ordinary "handy man" can do, one of the easiest and one which (if the instructions are adequate and properly followed) can be relied upon to turn out at any rate passably well. There is, and will probably continue to be, a real saving in home construction.

The "Salt of the Earth"

The oldest class will, of course, continue to exist and to grow in actual numbers, while it shrinks proportionately to the total. Such a man will go on re-designing and trying out new sets and new circuits, testing every new device he hears of, television apparatus, "liquid valves," oscillating crystals, etc., accumulating masses of data, which often he is unable to digest, but much of which eventually bears fruit when it filters through other brains. He will be, in fact, in the future as now, "the salt of the earth," and the "herald of the irresistible advance of science!" At least *I* think so. But, then, I am a hopeless "wireless maniac" myself, so may hold biased views.

H. W. S.

"A HOME-MADE WAVEMETER" (*continued from preceding page*)

some other station working upon 600 metres, aerodromes on 900 metres, or the Dutch concerts on 1,050 metres. The biggest coil is quite easily dealt with with the help of Chelmsford on 1,600 and the Eiffel Tower on 2,600 metres.

For direct readings the method is a little different. We must first of all scrap the condenser's own dial. Instead of this we fix to the top of the panel a cardboard disc 4 in. in diameter, which we mark off into circles, as shown in Fig. 6, corresponding to the four inductance coils. Next we make a hole with a very fine drill into the brass collar below the condenser knob. Into this we insert a fine darning needle, which after its eye and point have been broken off must be just over 2 in. in length. Push the thickest end of the needle into the hole in the collar, and fix it firmly in position. Fig. 7 shows the knob complete with its pointer.

The circles on the dial should be drawn with indian ink, but the first marks should be done in pencil. Proceed as before to tune in a powerful broadcast station, and adjust the wavemeter to resonance. We will imagine that this station is 2 L O. Now make a mark on the circumference of the No. 50 coil circle, which will show the position which gives 365 metres. Next tune in another station, and adjust the condenser of the wavemeter as before. We will suppose that this station is Newcastle. A second dot is made on the circumference of the 50-coil circle, and with a pair of dividers you can measure the distance between the two dots. On a piece of paper draw a circle of exactly the same size as the outer one of the No. 50 coil. On its circumference mark off two dots the same distance apart as those marked on the wavemeter. This segment represents 35 metres on the wavemeter scale. With the aid of a protractor measure the number of degrees which it contains. You can then without difficulty discover the number of degrees corresponding to 100 metres. Mark off your wavemeter scale into 100-metre divisions, and you will have a roughly-calibrated scale. As Newcastle's wavelength is 400 metres, you can now put in in pencil the approximate position of 250, 300, 350, 400 and 500 metres.

J. H. R.

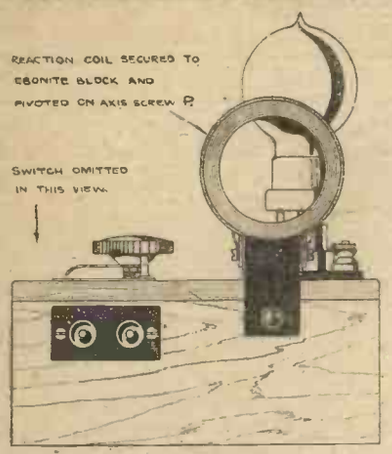


Fig. 2.—Side View of Receiver.

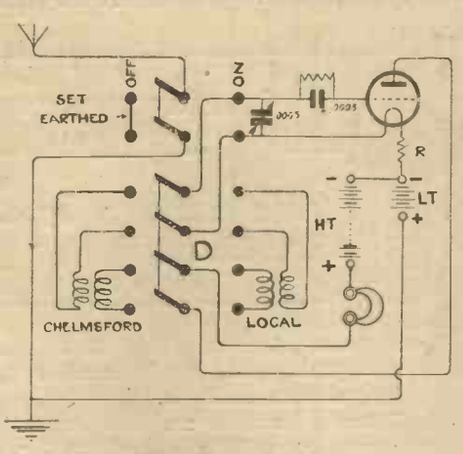


Fig. 1.—Circuit Diagram.

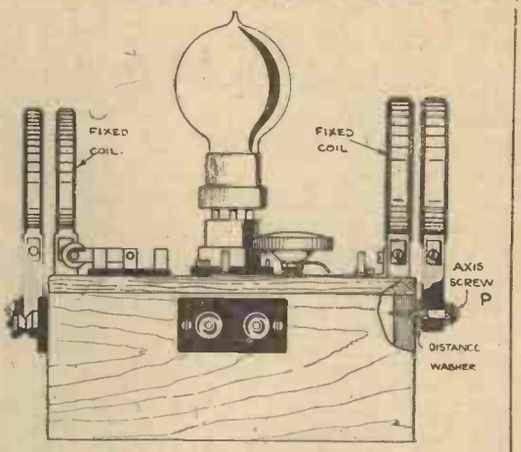


Fig. 3.—Front View of Receiver.

5XX OR THE LOCAL STATION?

Details of a single-valve receiver with reaction for reception of Chelmsford or the local station.

NOW that the high-power station transmits on certain days a programme different from the local station, users of valve sets will, no doubt, desire to change over from one to the other with the least possible trouble. The following receiver was designed with this object in view, and in practice it is certainly very convenient and very simply operated.

In the circuit (see Fig. 1) an aerial and a reaction coil are used for each station, and either one pair or the other is brought into use by the quadruple-pole switch D. It is a feature of this circuit, too, that the reaction coils on each A.T.I. are permanently set for their particular stations, and once set they require no further adjustment.

Another switch (double-pole throw-over) is used to put the set into action by placing the aerial and earth in circuit, and also making the low-tension circuit complete by using the earth arm also as a single-pole switch. When this switch is reversed the set is automatically earthed, and so renders it free from lightning risk; at the same time this operation breaks the filament circuit.

The control of this set resolves itself into switching the set to the "on" or "tune" position, and placing the quadruple-pole switch to the desired station. A slight retuning of the .0005-microfarad condenser is, of course, necessary; but as the two positions for the stations are found by experiment and marked on the dial, no difficulty is found in this operation whatsoever.

In this receiver a dull-emitter valve is used, and when controlled by the usual 4-ohm variable resistance and a fixed resistance of 16 ohms, the position of the variable resistance makes practically no difference to either the apparent brightness of the filament or to the actual reception. This, of course, is the writer's experience when using a plain detector valve and reaction circuit, in which case for tuning purposes the filament current is not critical. It will be noticed in the arrangement drawings (Figs. 2, 3 and 4) no filament resistance is included.

The set is built up on a mahogany cabinet. The terminals are mounted in pairs on pieces of ebonite 2 in. by 1 in. by ⅛ in. thick. The aerial and earth terminals are mounted separately at the back. The drawings show their positions. The cabinet is 6¾ in. by 6¾ in. by 3½ in. deep, and is made from ⅜-in. material.

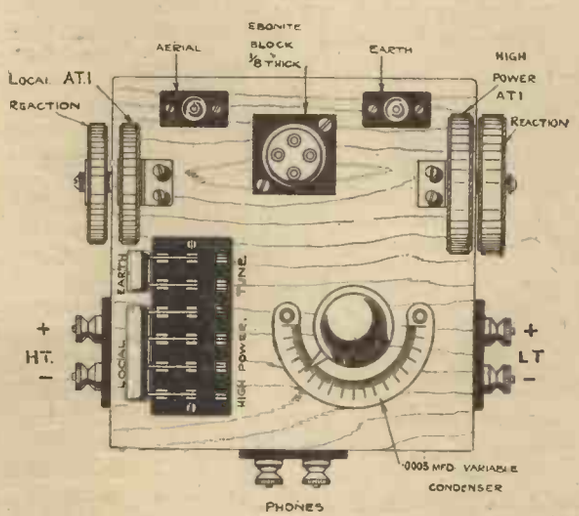


Fig. 4.—Plan View of Receiver.

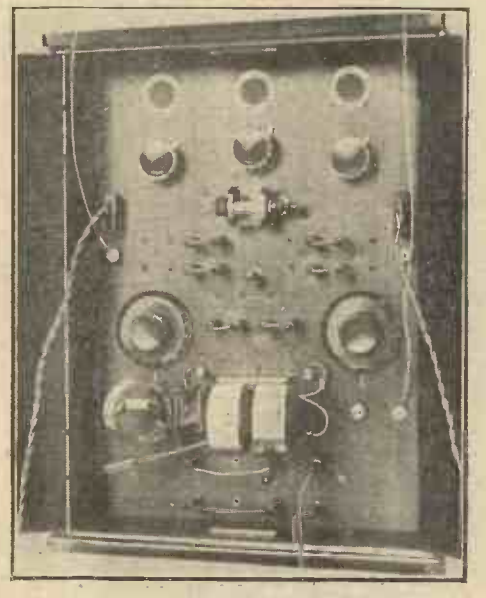
The tuning coils are built up of separate honeycomb coils, the fixed ones being mounted on a standard ebonite holder, and secured to the top of the cabinet by a small angle bracket. The adjustable ones (these are on the outside) are mounted on a strip of ebonite 2 in. by 1 in. by $\frac{5}{16}$ in. thick, having a hole in the lower end to take an axis screw, about which the coil and its holder rotate. If a spring washer is interposed, sufficient pressure can be applied so that the coil will be held rigidly in any desired position.

Other components, such as the grid condenser and leak, are placed inside the cabinet, as also is the fixed filament resistance, which consists of 12 in. of No. 38 Eureka wire wound round a length of ⅜-in. diameter rod about 2 in. long. This length provides a resistance of 12 ohms.

H.

LOCATING A CONDENSER "SHORT"

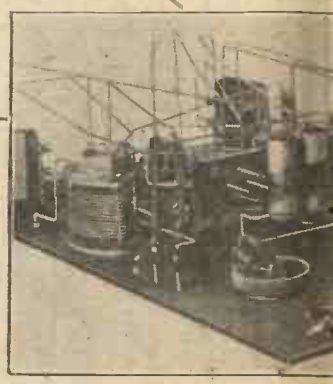
A CONDENSER "short" is usually manifested by a slight scraping sound where the rotary blades touch the stationary ones. Sometimes the contact is so slight as not to give rise to any perceptible noise. Even in this case the rubbing point can sometimes be detected visually by placing a sheet of white notepaper under the condenser in a strong light and looking sideways through the plates as they are slowly rotated. M. A. L.



Front View of Experimental Receiver.

A THREE-VALVE EXPE

This receiver, by the simple insertion of plugs, permits of



View of Back

THE receiver to be described employs three valves, but it allows any number of valves to be used, according to the nature of the circuit. Thirteen different circuits can be obtained by simply inserting suitable shorting plugs in the sockets fixed in the panel. The sockets are widely separated to minimise capacity effects. The use of telephone switches is avoided, as these have an appreciable capacity.

The first valve can be used either as a detector or as an H.F. amplifier, while the second, though usually used as an L.F. amplifier, can also be used as a detector following the first H.F. valve. The third valve always acts as a low-frequency amplifier, and separate input and output terminals have been provided for this.

Components

Cheap components should not be used, particularly L.F. transformers and fixed condensers. The most important is the ebonite panel, which should be of the best-quality ebonite available.

Three inductances are used for tuning purposes, as will be seen from Fig. 1. The aerial coil is a No. 50 Igranic connected in parallel with a variable condenser of .0005-microfarad capacity, while the anode and detector coils are each No. 75 Igranic, the latter being shunted by a variable condenser of .0003-microfarad capacity.

The following is a list of the components required (see Fig. 2):

Variable condensers—C1, .0005 microfarad; C2, .0003 microfarad. Fixed condensers—C3, .0001 microfarad; C4, .0005 microfarad; C5, .0003 microfarad; C6, .001 microfarad; C7, .001 microfarad. Inductances—L1, No. 50 Igranic; L2, No. 75 Igranic; L3, No. 75 Igranic; panel, 17 in. by 12 in. by ¼ in.; ebonite, 9½ in. by 6 in. by ¼ in.; two L.F. transformers; three rheostats (5 ohms); three valve windows; one crystal detector (Mic-Met type); one grid leak (Lissen); one grid battery; forty valve sockets; twenty-four valve legs; sixteen plugs and sockets; six large and four small terminal screws; three coil plugs; two extension handles; connecting wire; quantity of 4 B.A. and 6 B.A. nuts and screws; 2 B.A. threaded rod with nuts.

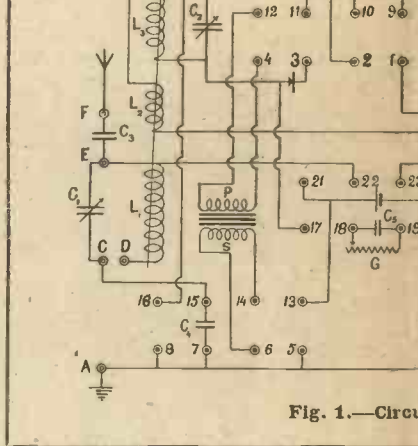


Fig. 1.—Circu

The Panel

The layout of the panel is shown by Fig. 3 (p. 362), from which the positions of the necessary holes can be marked on the ebonite panel. After drilling the holes, the panel should be given a matt finish by rubbing its surface with fine glass-paper.

Fig. 2 shows the plan of the panel, R1, R2, R3 being the rheostats, while C1, C2 are the aerial and detector tuning condensers. The inductances marked L1, L2 and L3 represent the aerial, anode and detector coils respectively.

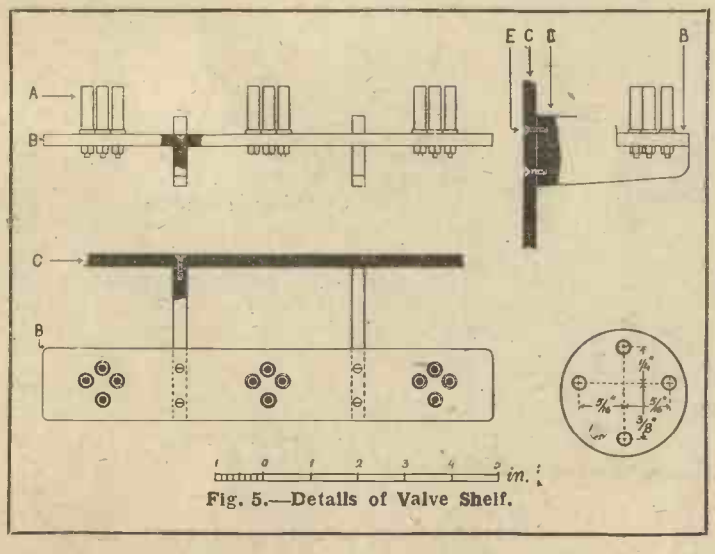


Fig. 5.—Details of Valve Shelf.

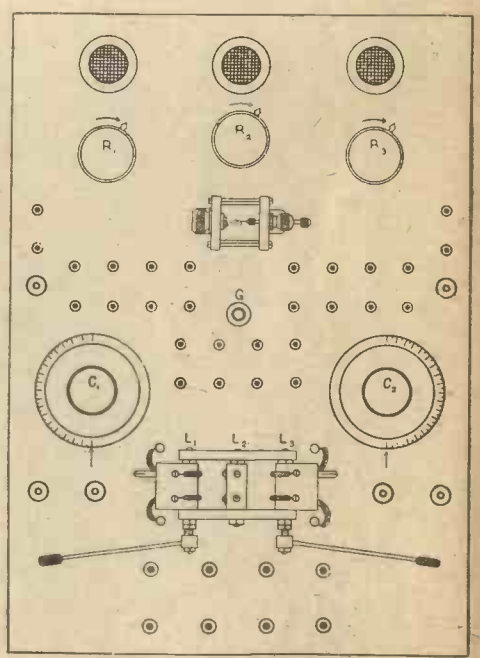
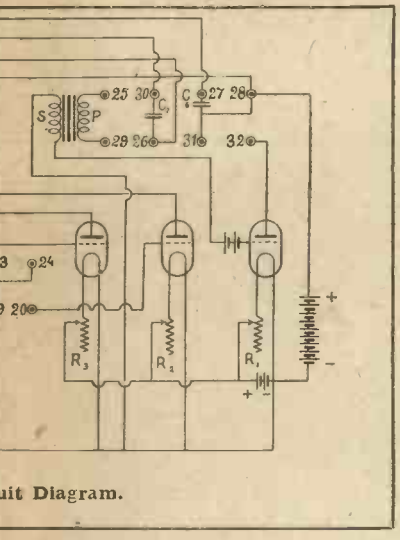


Fig. 2.—Arrangement of Components on Panel.

ÉRIMENTAL RECEIVER

the choice of a number of experimental circuits.

k of Panel.



uit Diagram.

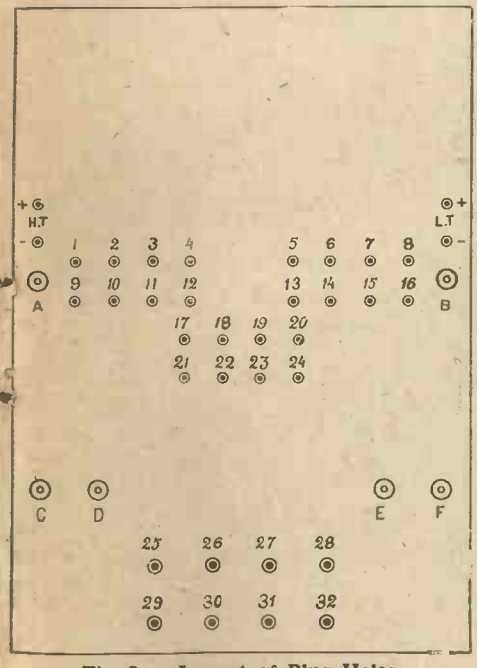


Fig. 3a.—Layout of Plug Holes.

The grid leak G is fixed in the centre, above which is mounted the crystal detector. The valve sockets, mounted flush with the panel, are represented by small circles in the middle of the panel; they are numbered to facilitate the connections. Fig. 3A shows the aerial and the earth terminals, A being the earth terminal, while E is to be connected with the aerial. If constant aerial tuning be employed the aerial should be connected to F. The frame aerial, if used, is connected to the two terminals C and D, which will otherwise be kept short-circuited by a brass strip.

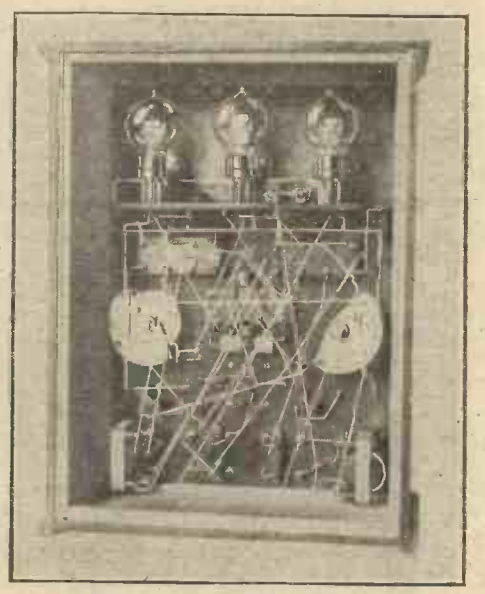
The phones can either be connected to the sockets (26-30) or (27-31), according to the circuit employed, details of which are given later. The sockets (25-29) and (28-32) are the input and output terminals of the third L.F. amplifier valve respectively.

Plugs and sockets are used to connect the H.T. and L.T. batteries with the receiver, and care should be taken to connect the right poles of the batteries to the sockets marked H.T. and L.T.

Components to be Made

Coil Holder.—The details of the coil holder that can cheaply be made to fit the exact space on the panel are shown in Fig. 4. First the coil plugs C should be drilled at the bottom and tapped 2 B.A., in which is screwed a length of 2 B.A. rod, tightened by a lock-nut B. The side pieces A are then cut, each being 3 in. long, ⅞ in. wide and ¼ in. thick, and drilled with three holes to take the rods.

The centre plug is fixed by a nut to one of the side pieces, while extension arms G, provided with ebonite handles K, are attached to the two side plugs. Before screwing the extension handles a spring washer E, followed by two nuts F, is fixed on the panel M by brass screws L, for which holes are drilled in the side pieces A and tapped to suit the screw threads.



Rear View with Back Removed.

The connections to the moving plugs are made by small lengths of flexible wires, which connect the plugs with four small terminal screws fitted on the panel. The centre plug, being a fixed one, requires no flexible wires, and direct connections can be made by soldering the connecting wires with small brass strips screwed on to the plug.

Valve Holders.—Fig. 5 shows the method of mounting the valves. An ebonite piece B, 9½ in. long, 1½ in. wide and ¼ in. thick, is drilled as shown in the diagram.

The next step is to cut two pieces of ebonite of the shape D, whose dimensions can be easily ascertained from the diagram. These pieces are drilled at suitable places and tapped to receive the screws E used for fixing these supports against the panel C and for fixing the piece B.

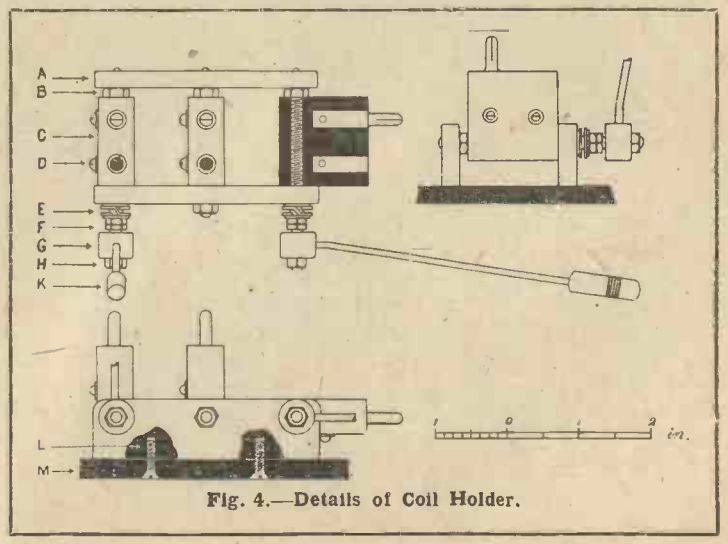
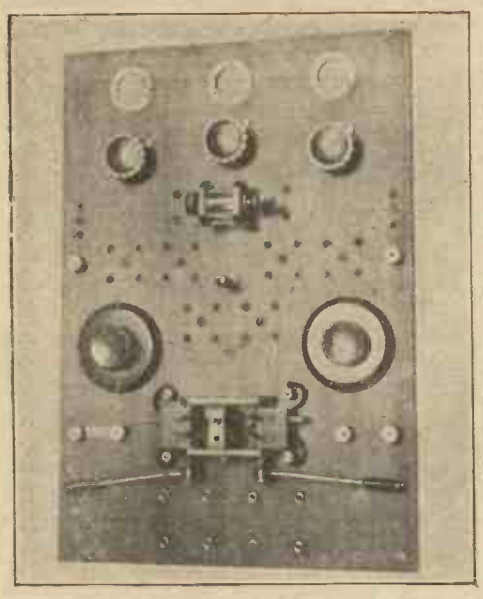


Fig. 4.—Details of Coil Holder.



Views of Panel and of Panel in Case.

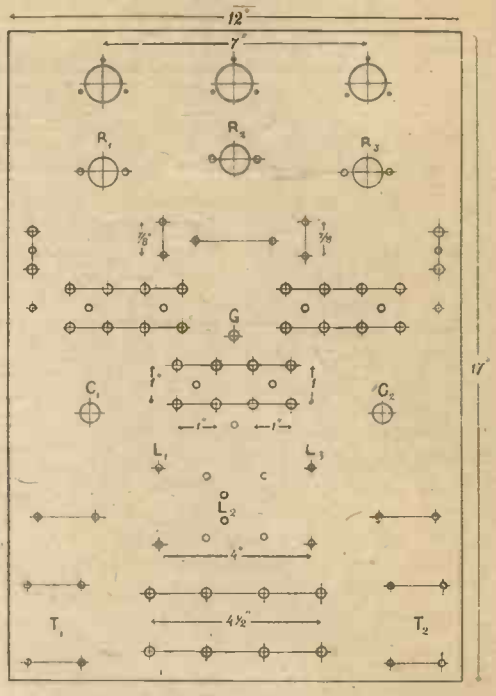


Fig. 3 (above).—Drilling Layout of Panel.

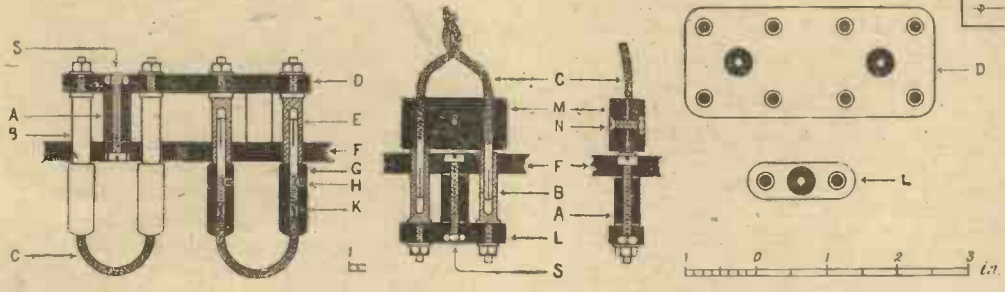


Fig. 6 (left).—Details of Plugs and Sockest.

Valve Sockets.—The valve sockets to connect the various circuits are arranged in three groups. Each group, consisting of eight sockets, is fixed on a single ebonite piece D 3½ in. long, 1½ in. wide and ¼ in. thick (Fig. 6). The sockets B are first fixed on the ebonite piece D, the distance between them being 1 in. The ebonite piece is then clamped to the panel F by long screws and nuts S, with small pieces of ⅜-in. ebonite tube A between the panel and the ebonite piece.

The plugs for connecting the sockets can be made by soldering valve legs at each end of a small piece of flexible wire C (Fig. 6). Short lengths of ebonite tube G are then slipped over the valve legs to cover the soldered joint K, screwed in position by small screws H.

Fig. 6 also shows the arrangement of the valve sockets and plugs fitted as H.T. and L.T. terminals, the sockets being fixed as before with the exception that only two sockets are fitted on the small ebonite piece L. The plugs can be made by clamping together two pieces of ebonite M, 1½ in. long, ¾ in. high and ¼ in. thick, by a screw and a nut N. Two holes $\frac{3}{32}$ in. in diameter and 1 in. apart are drilled along the surface of contact of the two pieces. The pieces are then unclamped and the valve legs (at the ends of which are soldered the ends of the flexible leads C) are inserted in the grooves and the pieces clamped again by the screw N. The ebonite pieces will thus hold the valve legs in position, forming a suitable plug to fit in the sockets. M. J. C.

(To be concluded)

HIGH-VOLTAGE VALVES

THE latest type of receiving valve is one in which the filament is heated from the ordinary supply mains carrying 100 volts and upwards of either alternating or direct current. The "main" filament terminals are mounted on a standard electric-light base, while the "auxiliary" filament, grid and plate connections are made to separate leads coming from the top and side walls of the bulb respectively. The main filament, which is used to heat the true filament indirectly—that is, by radiation—is composed of a high-resistance ribbon fitted inside a quartz tube, which in turn is surrounded by an "alundum" sleeve, which constitutes the electron-emitting filament proper.

Owing to the indirect method employed for heating the active filament the valve is quite free from "hum." M. A. L.

CRYSTAL DETECTORS

PROBABLY the most annoying thing about the average crystal detector is the catwhisker. If made of the usual fine-wire spiral this has an unhappy knack of becoming badly tangled at critical moments. For this reason the writer prefers to use a short length of fairly stiff wire, something like a gramophone needle.

With a little practice such a catwhisker can be adjusted as finely as is usually necessary and does not get easily bent. In this case it is advisable to mount the crystal in a cup that can be moved about without difficulty. The idea is, in fact, to keep the catwhisker rigid and make the crystal movable. U.

A cheap set will work much better with a good pair of telephones.

BIASING THE L.F. VALVE

UNLESS a very fine adjustment is required it is not necessary to use a potentiometer for biasing the grids of low-frequency amplifiers. One flashlamp cell inserted directly in series with the grid of the first L.F. amplifier and two in the second, with a corresponding adjustment of the high-tension in each case, will usually give quite satisfactory results. The cells will certainly last much longer in this way than when shunted by a potentiometer coil. When a special power amplifier is used, three or even four cells should be joined in series with 120 volts or upwards on the plate. J. K.

The best material is the cheapest in the long run.

Until you learn to adjust properly your receiving set, do not condemn it.

AROUND THE SHOWROOMS

Sparta Aerial Wire

PERHAPS the most important part of any wireless receiving station is the aerial, for if this is not absolutely the best that can be obtained really good signals will never be heard without the use of a great deal of juice to light a multitude of valve filaments.

A good aerial cannot be put up with unsuitable wire, and the beginner should make sure that his is of the lowest possible resistance.

Wire that has a low resistance for direct current may have quite a high resistance for the high-frequency currents used in wireless. H.F. currents flow along the surface of the wire, and for that reason aerial wire should have a large surface area.

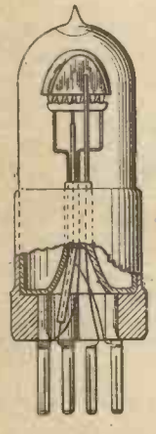
This is usually brought about by using stranded wire. One of the best types that I have come across is that made by Fuller's United Electric Works, Ltd., of Chadwell Heath, Essex.

It consists of sixteen strands of about No. 26 enamelled copper wire woven round a strong hemp core, the latter being specially treated to resist changing atmospheric conditions.

Cossor Valve Bases

IN short-wave work the capacity between the legs of a valve are far from negligible, and the experimenter on low wavelengths uses specially designed valves.

Now, however, he will not have to trouble about this, for Cossors have produced a new valve base (which is being standardised on all Cossor valves) specially designed for low capacity between the legs, as referred to in our last issue. The construction of this new base is



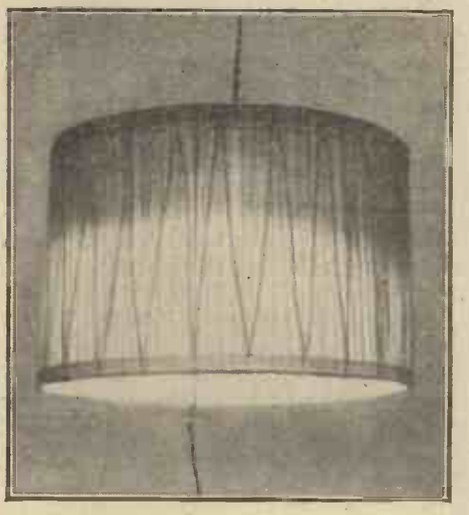
Sectional Diagram of New type Cossor Valve, Base showing Air Gap between legs.

clear from the diagram, which shows a valve in section.

To prevent anybody from taking a Wuncell-type valve for a P type, all the new bases will be coloured black and red respectively—black for dull-emitters and red for bright-emitters.

Perfex Indoor Aerial

THE difficulty of installing an outdoor aerial has led to many ingenious arrangements being devised. The latest and



probably the most artistic device of this nature is the "Perfex" aerial.

This aerial, shown in the photograph, resembles and also does duty as a lamp-shade. Encased in the silk covering is the aerial wire, which consists of air-spaced woven wire laced between the top and bottom ring spreaders. A small eyelet at the bottom of the shade permits the attachment of a lead-down wire, which can be disconnected when the receiver is not being employed. In use this aerial has been found to give gratifying results.

The "Perfex" aerial is, of course, non-directional. The address of the makers is Wireless Apparatus, Ltd., 35, Panton Street, Haymarket, London, S.W.1.

VANGUARD.

We are informed by Siemens Brothers and Co., Ltd., Woolwich, that they are able to make a reduction in the prices of headphones. The price of the phones is now 20s.

PROGRESS AND INVENTION

Loud-speakers

THE quality of sound produced by an ordinary wooden horn loud-speaker is good, provided that the diaphragm and phone part of the speaker is well made. The cost of producing a curved wood horn is high, and manufacturers are on the look-out for a suitable horn which is less costly to produce and yet will give the required purity of speech. A straight wooden horn, suitable for gramophones or loud-speakers, is the subject of Patent No. 227,545/23 (Sir Charles Forbes, Castle Newe, Strathdon, Aberdeenshire). The horn described has a cross section in the shape of an equilateral triangle, the sides of the triangle forming tangents to the circumferences of circles, the areas of which vary in size in the correct progressive proportions. Good-quality plywood, such as birch, should be used for the sides of the horn, which are glued or otherwise secured together.

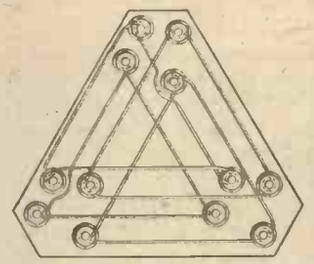
Parallel Valve Holder

FOR power amplification where power valves are not available it is often desirable to use two standard receiving valves in parallel in order to obtain the necessary amplification. This necessitates the use of extra wires straying about the panel unless a suitable holder is available for connecting the valves in parallel.

A holder of this description is described in Patent No. 226,895/23 (G. A. Mitchell, Leicester), and is shown in the diagram.

A base of ebonite or other suitable insulating material has the required number of sockets mounted on it, one of these being connected to the circuit in the usual manner. The other sockets are wired up in parallel, that is, with grid connected to grid and plate to plate; the connections between the valves may be effected by wires connected to the valve contact sockets.

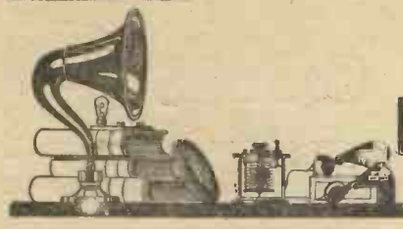
If desired, one of the sockets may be fitted with valve pins on the under side of the base so that the whole mounting



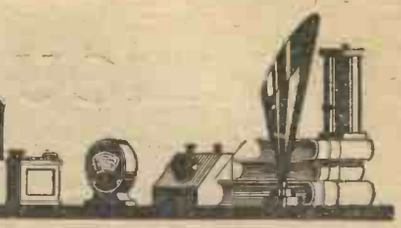
Parallel Valve Holder (226,895/23).

can be plugged when desired, thus eliminating the use of any extra wires.

Such an arrangement should be very useful for use in low-power transmitters or L.F. amplifiers where it is not convenient to use power valves.



OUR INFORMATION BUREAU



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, lay-outs, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 384).

Bending Sheet Ebonite

Q.—Can thin sheet ebonite be safely bent, or is it liable to split ?—A. J. (Leeds).

A.—Thin sheet ebonite will bend quite easily if it is thoroughly warmed, either in boiling water or in steam.—K.

Filling Small Holes

Q.—Can small holes in a panel be filled so as to hide them ?—B. F. (Newcastle).

A.—Black sealing-wax is suitable, or Chatterton's compound may be employed. The surface of the panel should afterwards be levelled and polished.—U.

Gas Pipes and Lightning

Q.—When using an indoor aerial, is it safe to connect the earth lead to a gas-pipe ?—O. J. (Cannock).

A.—It would in the case of indoor aerials be quite safe, but scarcely advisable to do so. A gas-pipe makes a very poor earth, and in all cases it would be best to connect the lead to a water-pipe.—U.

Loose-coupled Tuners

Q.—Is it to be expected that the signal strength will be louder when a double-circuit tuner is used instead of a single-circuit tuner ?—W. N. (W. 12).

A.—The object of a two-circuit tuner is not always to give increased signal strength, although it will slightly increase the signals on occasions. The great advantage is the gain in selectivity which may be obtained, and it is generally worth while from this point of view alone to use a two-circuit tuner.—U.

The Disadvantages of the Telephone Transformer

Q.—What are the disadvantages of the telephone transformer ?—D. T. (Beeston).

A.—No transformer is 100 per cent. efficient, and a slight, though hardly noticeable, diminution of signal strength will result if a telephone transformer is used.

There is also the possibility of distortion arising from the use of the iron as the core, while stray coupling effects with other transformers in the set may cause howling.—U.

Doubling the Aerial Wire

Q.—As my garden is very short, would it be better to double the aerial back so that the bend is supported by the pole and the free end is at the house, a few feet away from the lead-in ?—T. F. (Bexhill-on-Sea).

A.—Although this would increase the length of wire it would not increase the *electrical* distance from the free end to the lead-in. Owing to the undesirable bend in the middle, this aerial would probably be much less efficient than the short single wire.—U.

Aerials for Long-wave Reception

Q.—Which type of aerial is most efficient for long-wave reception ?—C. L. (Newbury).

A.—An aerial having large capacity is of great advantage when tuning to long wavelengths, as less inductance has to be added than would otherwise be the case with low-capacity aerials. However, "static" effects prove troublesome. The weight of a multiple wire aerial demands very strong "fixings," and with the inevitable sagging of the wires the effective height is somewhat reduced. A two-wire aerial will probably be best, provided that a spacing of at least 4 to 6 feet between the wires is possible.—U.

Crackling Noises

Q.—I am unfortunately experiencing considerable trouble from crackling noises in my set, which I am unable to trace. I have tried several high-tension batteries, grid leaks, and even accumulators, but the noise still persists.—F. P. (S. W.).

A.—As you appear to have examined all the most likely sources of this trouble, and as your connections are well soldered, it is very probable that the trouble is due to a defective intervalve transformer or, alternatively, to the insulation of your telephones being defective. In both these cases the remedy is obvious, but we suggest that to determine from which source the noise arises you borrow a pair of telephones which you know to be in perfect condition and test them against your own.—U.

Two-valve Set

Q.—I intend to build a two-valve set, and should like to know suitable dimensions for the aerial tuning coil, the anode inductance, and the reaction coil which is to be coupled with the anode coil. It is proposed to tune from 200 to 450 metres.—V. L. (Harrow).

A.—As you wish to receive only short wavelength signals, the aerial coil may consist of a winding 4 in. in diameter and 5 in. long of No. 22 d.c.c. Ten tappings should be taken. The anode coil should consist of a winding 4 in. in diameter and 4 in long of No. 30 d.c.c. with ten tappings. The reaction coil may be 3 in in diameter and 4 in. long, with No. 34 s.s.c. wire, with four tappings.—U.

H.F. Transformer

Q.—How many turns of wire (a specimen of which is submitted) will be required for a high-frequency transformer ?—S. S. (Limpsfield).

A.—Each primary and secondary slot should be wound with 100 turns of the No. 38 s.s.c. wire, sample of which was submitted. The primary of the transformer should be tuned with a condenser having a maximum value of not more than .0003 microfarad.—U.

Fixed Detector Adjustment

Q.—Which is the best method of keeping a crystal detector in adjustment once a good spot has been found ?—L. D. (Watford).

A.—In order to keep a crystal detector in perfect adjustment, drop some hot beeswax around the wire.

In practice this has kept the catwhisker in place for months. It eliminates the necessity of seeking for the elusive spot every time the set is used.—U.

Resistance

Q.—What is meant by the resistance of a wire ?—E. P. (Romsey).

A.—The property possessed by all substances of offering opposition to the passage of electric currents is known as resistance. The effect of resistance is to produce heat. It is a determining factor in arriving at the amount of electricity that will flow in a given circuit at a given voltage, and where a maximum flow is desired the minimum resistance must be secured.—U.

Plants and Wireless

Q.—Do plants respond to wireless waves ?

A.—Professor Bose, who has devoted much study to the subject, is of opinion that they do, but it is probable that the waves would have to be very small ones. It is certainly true that trees have the property of picking up electrical energy from wireless waves, because they can be used as aerials.

"Stand-by" Switches

Q.—How does the term "stand-by" apply to a switch in wireless ?—C. A. (N.W.).

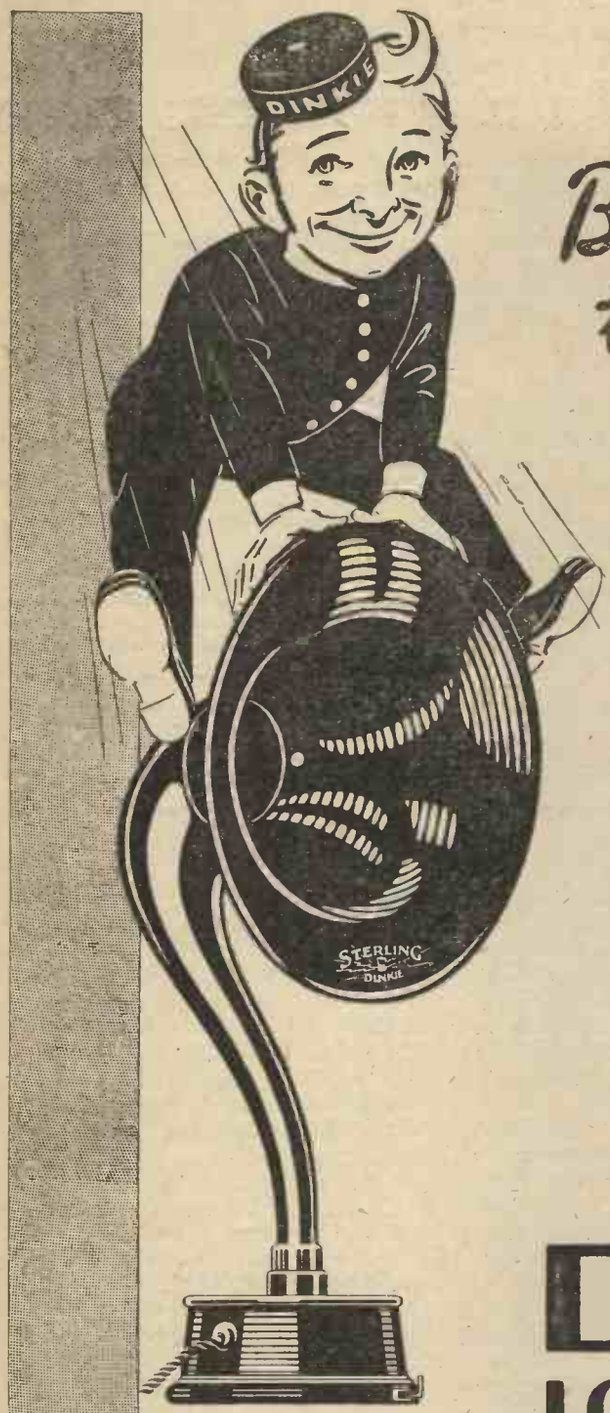
A.—The term first became general in commercial wireless when a station was controlling all messages of a certain area. Other stations would be told to wait for a definite time, and others would be told to "stand-by" to receive messages, or because it was nearly their turn to transmit.

The term was applied to a switch because a different tuning adjustment was necessary in the different circumstances. On the "tune" side (that is, loose-coupled system) the receiver is as selective as possible to the station received.

On the "stand-by" side, single-circuit tuning was employed to enable all stations within range to be heard.—U.

MR. GEORGE GROSSMITH On the Staff of the B.B.C.

In response to an invitation from the British Broadcasting Co. Mr. George Grossmith has accepted the appointment of advisory director of programmes. The photograph shows Mr. George Grossmith listening-in.



By Leaps & Bounds to Record Sales

"Dinkie"—the little fellow with the loud voice! A loud speaker without equal in its class. Small in size but big in volume. Small in price but big in value. "Dinkie" reproduces clearly, loudly, and in perfect tone all that is broadcast.

Your radio dealer will willingly demonstrate Dinkie's powers before purchase.

The Sterling "Dinkie" Loud Speaker is supplied in a brown-tinted finish complete with flexible cord. Dimensions: Height overall, 13 in.; diameter of flare, 7 in.; diameter of base, 4 in.

PRICE

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STERLING DINKIE LOUD SPEAKER

30/-

At your Radio Dealers

Advt. of **STERLING TELEPHONE AND ELECTRIC COMPANY, LTD.**
Manufacturers of Telephones and Radio Apparatus, etc.
210-212, TOTTENHAM COURT RD., LONDON, W.1 Works: DAGENHAM, ESSEX

THAT IDEAL SET!

EVERY experimenter has at one time or another dreamt of a perfect set which would be the embodiment of all his favourite ideas in wireless. Such a set would be a model of neatness and simplicity, combining extreme ease of operation with unheard-of range and power. Simply by turning a knob one would be able to pick up any station desired without the slightest trace of interference from other transmissions.

Putting them in their order of relative importance, purity, selectivity, range and volume are the requirements of the ideal set. Some measure of success has been attained in each of these, but there is still a good way to go before perfection is finally attained.

Distortion

One of the most difficult as well as the most important of wireless problems which has yet to be solved is the question of distortion. There are so many points where this distortion can occur. Take even the first link in the broadcasting chain—the microphone; in spite of every precaution, it is impossible to prevent a certain amount of distortion owing to the tendency of the microphone diaphragm to vibrate at its own frequency. Then come the bank of valves which amplify the current from the microphone; it is difficult to keep the amplification quite even over all frequencies. The receiver is liable to the same troubles; L.F. transformers are a fruitful source of bad reproduction, as well as are reaction effects, the grid leak, rectification and faults in the phones.

Hence the first thing of all to be tackled before wireless reception is perfected is this question of distortion; for this reason it is not unlikely that the conventional method of L.F. amplification (transformer coupling) may be eventually superseded in favour of something better. Already many wireless enthusiasts who prefer purity of tone to excessive volume are installing resistance-capacity amplifiers. It is true that the same measure of "step-up" is not obtainable with this method, but at least the quality is perfect.

Selectivity

Next in importance to the question of purity is that of selectivity, which means, roughly speaking, the power of receiving one transmission without interference from other stations. Enthusiasts who live near a main broadcasting centre often experience great difficulty in hearing other stations through this jamming.

The question of range is also important, since without it we cannot pick up distant stations which are broadcasting attractive items. A sensitive set is therefore a necessity, but it must not be too complicated. Nothing discourages the novice so much as the formidable array of knobs and handles with which he is often confronted. The crystal is the natural rectifier, but unfortunately it is not nearly sensitive enough; if a super-sensitive type could be discovered the valve would soon become obsolete.

H.F. Amplification

The present systems of high-frequency amplification are far from satisfactory owing to the inconvenient number of controls and the irritating lack of stability when more than three H.F. valves are used. Various methods of aperiodic H.F. amplification and also the famous neutrodyne principle have done something to solve the problem, but an ideal radio-frequency amplifier has yet to be discovered.

Lastly, we come to the question of volume, which is really a matter for a number of valves arranged in such a way that no distortion is introduced. Three stages of resistance-capacity L.F. amplification will give sufficient volume for the largest room.

In the opinion of the writer the ideal set of the future will consist of two dull-emitter valves, the first arranged as a super-sensitive detector and the second as a dual amplifier. Both valves will be so designed as to need a very small plate potential, and the invention of a perfect wave-trap will enable the owner to pick up any transmission he desires without interference from his home station.

The year 1925 should be full of surprises in every branch of wireless, and the problem of the ideal set may be nearer solution.

G. J. M.

CAPACITY EFFECTS

A VALVE set is most liable to the distressing effects of hand and body capacity when tuned up to its most sensitive condition for the reception of distant signals. As most of us are aware, in the aerial tuning less hand-capacity effects are usually experienced if the condenser, when in series, is connected with the moving plates to aerial and fixed plates to coil, while, with the condenser across the inductance, the fixed plates are better connected to aerial and the moving plates to earth. Extension handles to condensers and moving coils are useful and, indeed, in many cases essential.

Wiring Precautions

To those who have hitherto been content with these precautions and who have observed the usual methods with regard to widely spaced wiring which does not run parallel and which crosses at a large angle, the following additional hints, if made use of, will be found advantageous. When building the set, keep wiring and connection which will be at high potential away from the upper surface of the panel, so far as this can be made possible. If a grid-leak of the variable type is used in the detector unit, with one end (usually a circular plate of brass) supported on the panel, see that you do not connect this end to the grid—the end farthest from the panel should be so connected, and the end next to the panel to the filament. This will help to avoid trouble when the hand is brought near to it and when adjusting the leak. Similarly, when using a stabilising variable resistance between the grid and filament of the first valve the same rule applies. In using the tuned-anode method of H.F. coupling, or transformer coupling with the primary tuned, connect the positive H.T. to the moving plates of the condenser.

In all cases it is better for the operator to keep away from the aerial lead-in when operating the set in a highly sensitive condition, as the least movement of the body may throw the set into oscillation or render signals, already faint, inaudible. When demonstrating the capabilities of your receiver to friends it is not wise to allow them to be too close, particularly on the aerial side of the set, or they may by their movement carry away bodily the little far-distant signals.

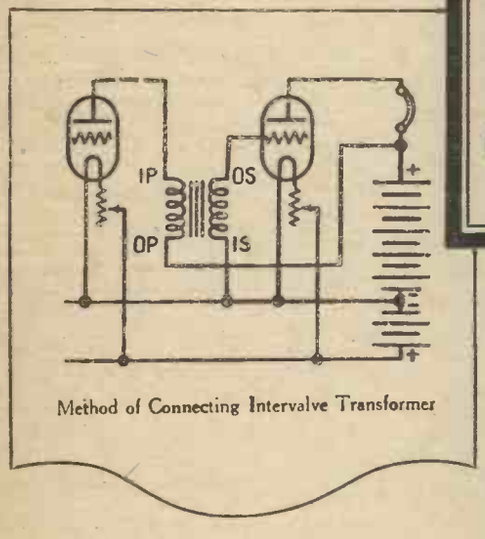
A. P.

FREEZING BY WIRELESS

AN apparatus has been invented by a Scandinavian engineer by which it is claimed to be possible to radiate intense cold in much the same way as broadcast programmes are at present conveyed through the ether. Further particulars of the alleged invention are not at present available, but it is apparently intended to enable housewives to connect the domestic meat safe up to the garden aerial and so preserve milk, butter, meat and other perishables for an indefinite period.

M. A. L.

IGRANIC
"E" Type
Audio-frequency
Transformer



Method of Connecting Intervalve Transformer

This "E" Type Igranic Transformer

is even better than its predecessors

Further exhaustive and searching experimental work carried out under all conditions has indicated some slight improvements which have resulted in even greater efficiency being obtainable from the Igranic Audio-Frequency Transformer. This latest model we call the E type—and if you would realise to the full the pleasure of distortionless reproduction of speech or music you should build this component into your receiver.

It is made in ratios of 1 to 5 for first stage of amplification—and for second and subsequent stages, 1 to 3. The metal shrouds act as magnetic screens and thus interaction is non-existent even when two or more transformers are mounted closely for multi-stage amplification. The impedance at speech frequency is suitable for most types of valves. **Prices, 1:5, 21/-; 1:3, 19/6**

Write for List Z424.

IGRANIC RADIO DEVICES INCLUDE:

Honeycomb Duolateral Coils, Fixed Condensers, Filament Rheostats, Intervalve Transformers, Variometers, Variocouplers, Bi-plug Coil Holders, Tri-plug Coil Holders, Battery Potentiometers, Vernier Friction Pencils, etc. etc.

All carry a six months' guarantee and are stocked by all reputable dealers.

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ELECTRIC
LIMITED

149, Queen Victoria Street, London. Works: BEDFORD.

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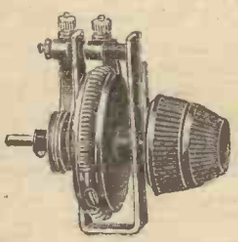
These are the foundations of a BETTER set

GRANIC
"E" Type Transformer

IGRANIC
High Frequency Transformer

IGRANIC-FRESHMAN
Fixed Condenser

IGRANIC
Honeycomb Duolateral Coil



IGRANIC
Rheostat (Vernier type)

NEW WIRELESS LEGISLATION

An Explanatory Note on the Bill now before Parliament

THE provisions of the new Wireless Act sponsored by Sir W. Mitchell-Thomson, the Postmaster-General, have aroused widespread interest and no little criticism in wireless circles generally.

The existing Act, which dates from 1904, is admittedly out of date and unsuited to deal with the situation created by the introduction of broadcasting and the enormous development that has since taken place in wireless. The new measure repeals the older Act and consolidates all existing regulations governing the use, not only of wireless receiving and transmitting apparatus, but also all apparatus used for visual or sound signalling.

Broadcasting Apparatus

So far as the use of ordinary broadcasting receiving apparatus is concerned, the new penalties laid down for refusing to take out the necessary licence are:

"On summary conviction, imprisonment with or without hard labour for a term not exceeding three months, or to a fine not exceeding £50, and for a continued offence, a further £5 for each day during which the offence continues."

This appears unnecessarily severe having regard to the nature of the "crime," but it must be remembered that under the old Act the penalty was:

"On summary conviction a fine of £10, or, on conviction under indictment a fine not exceeding £100, or imprisonment with or without hard labour for a term not exceeding twelve months."

Present Powers

There appears little to choose between the two so far as severity is concerned, but the general concensus of opinion is that both are far too drastic under existing conditions. It is admitted that up to the present the authorities have never attempted to press their legal powers to the full extent. Public opinion would certainly not tolerate such punishments except under abnormal circumstances such as exist in war-time, and it seems an unnecessary and dangerous weapon to place in the hands of the Post Office officials.

Right to Search

Another clause that has excited much comment is the one giving the right to enter and search any premises in which the presence of unlicensed wireless apparatus is suspected. Here too it must be stated that nothing is added to the legal powers already in existence. Under the 1904 Act any magistrate could, on reasonable grounds, issue a search warrant authorising a competent officer to enter a suspected house and seize any wireless apparatus found therein.

Certain of the new clauses appear at first sight to prejudice the rights and privileges of the bona-fide experimenter. These are bound to meet with strong opposition in the passage of the Bill through the House of Commons. Criticism is therefore deferred until it is known what their final form will be.

It is interesting to note that a clause has been inserted in the new Act declaring that all references to wireless transmission shall be deemed always to have included apparatus for reception. This definitely clears up a point which has for some time been a bone of contention in the daily press, although readers will remember that "A.W." has always maintained the opinion now legally expressed.

BARRISTER-AT-LAW.

WIRELESS TELEGRAPHY AND SIGNALLING BILL

GENERAL POST OFFICE.

IN view of statements which have appeared in some organs of the Press to the effect that new and inquisitorial powers of search are sought to be conferred by Clause 1, Subsection 4, of the new Wireless Telegraphy and Signalling Bill, the Postmaster-General desires it to be known that the subsection referred to is almost purely a consolidation of the existing provisions and merely re-enacts, with minor amendments, Section 1, Subsection 4, of the Wireless Telegraphy Act, 1904. Procedure by repeal and re-enactment with amendments was adopted in order to avoid the inconvenience of legislation by reference to the existing Act. The powers of search conferred thereby have existed for twenty years, exist to-day and continue to exist, whether the new Bill becomes law or not.

February 16, 1925.

"**An Electric Latch-lock,**" that was designed as an emergency lock to be used only when everyone was away from home, is illustrated and described in the current issue of "The Amateur Mechanic and Work" (3d.). The following articles and features appear in the same number: "A Long-range Two-valve Set," "Making Money by Inventing," "An Easily-made Mirror," "Our Small Car Page," "Fixing Wireless Tackle," "Notes by the Way," "Repairing Cast-iron Domestic Articles," "Preventing Rain Driving Under Doors," "A Basket-shaped Plate-drainer," "Cleaning Small Brass Articles," "Motor-cycle Practicalities," "Care of Acetylene Lamps."

FINSTON ONE-HOLE FIXED CONDENSERS

Another big step forward in radio. Amateurs, experimenters, and other enthusiasts have long needed a model with the easiest fixing possible, viz., the one-hole method. Like our other components the Finston One-hole Fixed Condenser will give the utmost satisfaction and is immune from trouble in the most exacting and protracted use.

Guaranteed within 5 per cent of stated capacity, this accuracy has never before been obtainable by the public. The only one-hole fixing condenser on the market. Buy one. Test one. It will prove our statements and thoroughly satisfy you.

FEATURES: Reliability of Capacity. Finest grade Mica Dielectric Highest possible quality Copper Foil. Adapted for Terminal or soldered connections.

CAPACITIES: .0001 to .002, price 2/- each. .003 to .006, price 2/6 each.

If your dealer cannot supply Finston Components, send your order to us together with his name and address, please!

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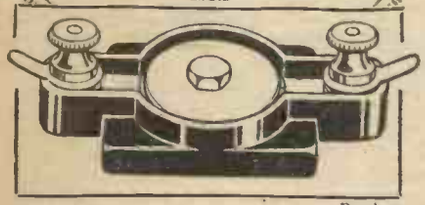
2, FINSBURY AVENUE, LONDON, E.C.2



Barclays 714

'07 VALVES *for* 13/3

Equal in performance to any '06 or '07 obtainable. Send for the concert-tested PLIOTRON S. S. post free with makers' instructions for use.

24 Hours' Approval upon receipt of cash order.

Max. con. '07, fil. volts 2·3, anode 40-80.

English "R" Valves, fil. volts 4·5, anode 45-100, 8/6.

Concert tested, post free, 24 hours' approval.

Responsibility for *all postal damage* accepted if damaged valve is returned within 24 hours of receipt.

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ACCUMULATORS. Best quality. Guaranteed

	Cash	3 m'thly payments		Cash	3 m'thly payments
4 v.—40	17/-	6/3	6 v.—40	25/-	9/-
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Carr. and Packing, 1/6 any size.

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Our wide experience in transformer repair has shown us all the common faults that are likely to occur in L.F. Transformers.

The distortionless all British **"Renown"** L.F. Transformer which we have designed and manufactured is unequalled for distortionless powerful amplification and its immunity from breakdown is a special feature. **Price 8/4 Post free**

GUARANTEE: Try this transformer against any in existence and if it is not equally as efficient in every respect, return it to us within 14 days and we will refund cash without quibble. *Should* this transformer *ever* breakdown we will rewind it making it equal to new for **2/9**

100 HENRY Amplifier chokes. 7 6

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The Living Artiste

LOTS of people think that good suits cost too much—that a good car costs too much—that fine furniture costs too much. Yet there are people who buy all these things and who know that they get very good value for their money.

They are just the kind of people who believe that in the building of a Wireless Set it is well worth while using only Eureka Transformers. They are not necessarily well-to-do—they don't do it to impress their friends. They do it because they cannot resist the appeal of quality.

Into the manufacture of Eureka Transformers goes much care and forethought. In fact, it would not be too much to say that each Transformer receives the individual attention that is usually accorded to expensive scientific instruments. An incessant demand—not only from all parts of this country, but also from the Continent and from the Colonies—has certainly necessitated their manufacture on a mass production basis, but no test is too stringent and no safeguard too great to ensure the original Eureka quality being fully maintained.

As a direct result we have yet to hear of a dissatisfied Eureka user—while the wonderful flow of correspondence from wireless enthusiasts is a spontaneous tribute to Eureka excellence, and its ability to "re-create the living Artiste."

Portable Utilities Co., Ltd.,
Fisher Street, London, W.C.1.

Concert Grand 30/-

Supreme EUREKA for Tone

Eureka No. 2. 22/6 *(For Second Stage)*

Gilbert Ad. 2235.

WHILE wireless is said to have introduced many new words into the English language, a reader points out that an expression to adequately describe the feelings of those who suffer from the effect of other people's oscillations is still wanted.

The Forfarshire Education Authority has decided to take no steps in regard to the question of introducing wireless into schools. Another minor Scottish setback was given by the Edinburgh Town Council, which, without discussion, declined to entertain a proposal to have its proceedings broadcast.

The B.B.C. now produces 35,000 hours a year of ever-changing programmes.

Scottish amateurs are wondering what the B.B.C.'s intention is with regard to the Edinburgh station. At very short notice the wavelength of this relay centre was changed from 323 to 465 metres, but, after only three evenings with the new arrangement, the wave was suddenly brought back to the original.

Very successful results have been obtained in a series of tests which have been carried out by Air Ministry experts in the wireless control of aeroplanes.

Listeners-in have been asked by the Liverpool broadcasting station director to take part in a discussion on the question of whether the local programmes are to continue to be relayed from London or whether, in order to obtain better results, they would prefer the Manchester programme.

The *Leviathan*, which left New York on February 28, until her arrival on March 6 will broadcast every night after the British stations have closed down performances by the ship's bands, songs by gifted passengers, and talks by eminent people crossing the Atlantic. Transmission will probably be on a wavelength of 317 metres, although it will vary at times from 200 to 345 metres.

An "All British" concert will be broadcast on February 26.

At 7.30 p.m. on February 28 will be given another of the popular "query" programmes.

Passengers on the fast train from Chicago to California, which is completely equipped with wireless receivers, clearly hear the programmes from the Fortworth (Texas) broadcasting station.

An indication of the tremendous growth of the wireless industry was given in the annual statement of the Radio Corporation of America, showing that its income has doubled in two years.

A broadcasting company has been established at Oslo, Norway, and will begin working in a few days.

A Melbourne experimenter succeeded recently in relaying an American broadcasting station to the Melbourne station for retransmission. Music, mainly orchestral, came through clearly, the reception being frequently equal to local transmission.

An 88-miles journey in the driving-cab of an L.M.S. engine, to memorise the sounds of an express train for a wireless drama, has been the experience of Mr. A. Whitman, of the dramatic department of the B.B.C.

Canadian and South African beam stations will be erected near Bodmin (Cornwall) and Bridgwater (Somerset).

Wireless receiving licences collected by the Post Office in 1923-24 amounted to £250,055.

On the express train to Ventimiglia, on the Italian frontier, a wireless installation succeeded in picking up two American amateur stations and one Australian. The only aerial used was one of the electric-light wires.

Had it not been for strikes and other delays the Government's wireless station at Rugby would have been in working order this month.

The popular programme to be broadcast on March 2 contains orchestral items, and songs by Lea Felissa.

A "nautical" programme will be given on March 3.

A programme devoted to the works of Sullivan will be broadcast on March 4.

A Victorian amateur has succeeded in sending a direct wireless telephone message to England.

The first Irish Wireless Exhibition, which was to have been held from February 23 to February 28, has been cancelled as a direct outcome of the discouraging attitude of the Free State Minister for Posts and Telegraphs.

It has been felt desirable that a complete wireless installation, with loud-speakers, should be presented to the Cardiff Royal Infirmary, and an effort has been set on foot by the Cardiff Press Bowling Club to achieve this worthy object.

In place of the scale on the piano, the British Broadcasting Company have reverted to the high-pitched whistle for tuning-in purposes.

Telegrams may now be sent by wireless from Germany to the Dutch East Indies between the hours of mid-day and midnight.

According to Mr. Arthur Burrows, director of programmes of the British Broadcasting Company, "it will be necessary to have an open studio to which the public will be admitted in the ordinary way as to a place of public entertainment, if ideal broadcasting is to be obtained."

A wireless message broadcast from Mosul, Mesopotamia, was picked up by an amateur wireless enthusiast at Cowes recently.

The intention to petition against what they believed was too much simultaneous broadcasting has been abandoned by Levenshulme listeners.

Mr. Ramsay MacDonald states that one of the things that struck him when in the West Indies was the inadequacy of the Imperial wireless news service.

The Cardiff City Council have rejected a suggestion by the British Broadcasting Co. that their meetings should be broadcast.

With a single-wire aerial 15 ft. long M. Leon Deloy, a French amateur, has established bilateral communication with the American station 3 C H G, situated some thirty miles south-west of Philadelphia.

New York's police department, following the lead of London and Paris, is experimenting with wireless for quick communication between headquarters and the district stations.

The newly-formed Spanish Radio-Union is building at Madrid a new high-power broadcasting station.

In Spain, the last of the older nations to take up wireless, more than 100,000 licences for receiving sets have been issued.

Major-General George A. Squier, U.S. Army Chief Liaison Officer during the war, has invented a new telegraphic alphabet to replace morse. He asserts it is one hundred and fifty-six times more rapid than the code, and that the adoption of his system would save many thousands of pounds a year.

Swiss wireless clubs are regarding with interest and some nervousness the proposal to forbid amateurs to use more than 50 watts power.

The B.B.C. has started an amateur dramatic club of its own, and hopes to give a play in one of the suburban theatres some time in April.

In order to give the engineers a clear evening for line tests once a week, the B.B.C. have arranged to close down all stations on Friday evenings from 10.30 onwards.

The Discovery of 1925

A Crystal Detector that does not require adjustment

Only a wonderful scientific discovery backed by the R.I. reputation could have made this permanent mineral detector a possibility.

So many vain attempts have been made to attain the ideal of a detector, free from all adjustment, that the radio public have doubted that it could be ever achieved..

HERE IS THE WAY OF IT

The combination of a new mineral of high refractive index, and another suitable mineral, were found to give perfect detection irrespective of surface condition and free from bane of catwhiskers.

There is no question of hunting for the sensitive spot.

IT IS ALWAYS EVERYWHERE ON THIS WONDERFUL DISCOVERY.

However, the spirit of the experimenter demands satisfaction and so one of the elements is mounted with a trigger action to change the point of contact *if desired*.

As a proof of this, the manufacturers are prepared to supply the detector without the trigger adjustment.

The advantages of the P.M.

Absolute permanency under vibration.
Extreme sensitivity always everywhere.
Easy operation of any circuit in which it is employed.
Elimination of distortion if used as a rectifier.

Its inherent stability makes it particularly suitable for all valve and reflex circuit users. If you are interested, write for descriptive leaflet. If you are keen, buy one to-day.

THE R.I. REPUTATION IS BEHIND IT.

Everybody is talking about this sensation of 1925. They will ask you if you have got one yet.

PRICE: including metal brackets and necessary screws for mounting **6/-**

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Radio Instruments Ltd
12 Hyde Street, Oxford Street
Telephone: REGENT 6214 (3 lines) W.C.1. Telegrams "Instradio London."

NOTE.—*In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.*

GREAT BRITAIN

The times given are according to Greenwich Mean Time.

London (2LO), 363 m. 1-2 p.m., con.; 3.15-3.45 p.m., lec.; 4-5 p.m., con.; 5.30-6.15 p.m., children; 6.40 p.m. talk; 7-7.30 p.m., time sig., news, talk; 7.30-9.30 p.m., music; 9.30-10.0 p.m., time sig., news, talk; 10.0-10.30 p.m., music. Mon. and Wed. the Savoy Bands are relayed until 11.0 p.m., and on Sat. until midnight. Sat. only, 4-5.30 p.m., con.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 435 m. **Birmingham** (5IT), 475 m. **Bournemouth** (6BM), 385 m. **Cardiff** (5WA), 351 m. **Glasgow** (5SC), 420 m. **Manchester** (2ZY), 375 m. **Newcastle** (5NO), 400 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 331 m. **Edinburgh** (2EH), 465 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 346 m. **Liverpool** (6LV), 315 m. **Nottingham** (5NG), 322 m. **Plymouth** (5PY), 335 m. **Sheffield** (6FL), 301 m. **Stoke-on-Trent** (6ST), 306 m. **Swansea** (5SX), 481 m.

CONTINENT

The times are according to the Continental system; for example, 16.30 *is* 4.30 *p.m., and* 08.00 *is* 8 *a.m.* (*G.M.T.*).

AUSTRIA.

Vienna (Radio Wien), 530 m. (1 kw.). Daily: 08.00, markets (exc. Sun.); 10.00, con.; 12.05, time sig.; 12.20, weather; 14.30, Stock Ex. (exc. Sun.); 15.00, news, con.; 15.10, children (Wed.); 17.00, lec. (Tues., Wed., Thurs., Sat.), children (Mon., Fri.); 17.20, women (Tues.); 18.00, news, weather; 19.00, time sig., con., news; 21.00, dance (Wed., Sat.).

Graz (relay), 675 m. Testing.

Innsbrück (relay station). Under construction.

BELGIUM.

Brussels (SBR), 265 m. (1½ kw.). 17.00, orch., children (Wed. and Thurs.); dance (Tues. and Sat.); 18.00, news; 20.15, lec., con., news (opera, Mon. and Wed.).

Haeren (BAV), 1,100 m. 13.00, 14.00, 16.50, 18.50, weather.

CZECHO-SLOVAKIA.

Kbely (OKP), 1,160 m. (1 kw.). Weekdays: 09.00, 10.30, 12.30, 16.00 and 17.00, con. (Wed. and Sat.); 18.30, lec., news, weather, con. (time sig., 19.00), daily; 10.00, con. (Sun.).

Komarov (OKB), 1,180 m. (1 kw.). Weekdays: 13.00, Stock Ex., weather, news; 17.30, con. (Thurs.); 09.00, con. (Sun.).

Strasnice (430 m.). Testing.

DENMARK.

Copenhagen (Kjobenhavns Radiofoni station), 475 m. (1 kw.). 18.35, notices, lec., con.* (Tues., Thurs., Sat.). * This con. is also relayed by the Aalborghus ship station on 510 m.

Lyngby (OXE), 2,400 m. and 2,700 m. Weekdays: 18.20, news, Stock Ex. (2,700 m.); 20.00 and 21.00, news, weather, time sig. (2,400 m.). Sundays: 15.00 and 20.00, news (2,400 m.).

Ryvang, 1,190 m. Concert, 14.00 (Wed.), 15.00 (Sun.), 19.00 (Fri.), 19.30 (Tues.).

FRANCE.

Eiffel Tower, 2,600 m. (6 kw.). 06.40, weather (exc. Sun.); 11.00, markets (exc. Sun. and Mon.); 11.15, time sig., weather; 14.45, 15.35, 16.30,* Stock Ex. (exc. Sun and Mon.); 18.00, con. (not daily); 18.45, Paris fashions (in English)—temp—(Wed. and Sat.); 19.00, weather; 20.30, con. relayed from PTT (Fri.); 22.10, weather (exc. Sun.). Frequent tests on 1,500 m.

* On 1st and 15th of each month at 16.45.

Radio-Paris (SFR), 1,780 m. (2 kw.). Sundays: 12.45, orch.; 13.45, news; 16.45, con.; 20.30, news, &c.; 21.00, dance music. Weekdays: 12.30, orch., Stock Ex., news; 16.30, markets, Stock Ex., con.; 17.45, Stock Ex., news, women; 20.30, lec., news, con.; 21.00, dance (Thurs.). Frequent relays of 5 X X after 22.00. *Le Matin*, Paris, provides a special con. every 2nd and 4th Saturday in the month at 21.00 or 22.00 G.M.T. Tests probable on 1,125 m.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 450 m. (400 w.). 14.00, lec. relayed from Sorbonne University (Thurs.); 15.00, outside relay (Sat., irr.); 15.45 and 17.00, lec. relayed from Sorbonne (Wed.); 16.00, outside relay (irr.); 20.00, Eng. talk (Tues.); 20.30, lec. or con., almost daily, con. relayed by F. L. (Fri.); 20.45, lec. (Sun.), organ recital 3rd Sun. each month; 21.30, con. (Sun.). Power will be shortly increased.

"Le Petit Parisien," 345 m. (500 w.). 21.30, con. (Sun., Tues., Thurs.), dance (Sat.).

Lyons-la-Doua, 550 m., 10.30, gramophone con.; news, etc. (irr.).

Radio-Lyon, 287 m. (2 kw.). 12.00, 17.00, 20.00, news; con. (irr.).

Toulouse Aerodrome (MKD), 1,525 m. 09.42, 19.42, weather.

GERMANY.

Berlin (2), 505 m. (1½ kw.). 08.00, sacred con. (Sun.); 09.00, markets, news, weather; 10.00, factory con. and tests; 10.30, educat. hour (Sun.); 11.15, Stock Ex.; 12.00, time sig., news, weather; 13.15, Stock Ex.; 14.00, lec. (Sun.), markets; 14.30, children (Sun., Wed.); 15.00, Esperanto (Sat.); 15.30, orch., French (Tues.); 17.30, lec., women; 18.00, French (Mon.), lec. (Tues.); 18.30, lec., Engl. (Thurs.), theatre news (Tues.); 19.30,* con., weather, news, time sig.; 21.30, chess (Mon.), dance until 23.00 (Thurs., Sat., Sun.). * If opera relayed, at 18.30.

Berlin (Telefunken Co.), 290 m. Tests about 22.30 daily.

Königswusterhausen (LP), 2,450 m. (5 kw.). Wolff's Buro. Press Service: 06.00, 20.00. 2,800 m. (5 kw.): 10.30, con. (Sun.), Esperanto lec. 3,150 m.: Telegraphen Union, 06.45-18.45, news, con. (Fri., irr.). 4,000 m. (10 kw.): Express News Service, 06.00-20.00 (daily); lec. (Tues. and Fri., time irr.).

Bremen, 330 m. (1 kw.). Relay from Hamburg.

Breslau, 418 m. (1½ kw.). 10.15, Stock Ex., weather; 11.00, factory con. (weekdays), sacred con. (Sun.); 11.55 (Sun.), time sig., weather, Stock Ex.; 14.00, news (weekdays); 15.00, children (Sun.); 16.00, orch., children (Fri.); 16.45, con. (Sat.); 17.00, shorthand (Sat.), Mah Jongg (Wed.); 18.00, Esperanto (Mon.), Engl. (Thurs.), lec. (other days); 19.00, con., weather, time sig., news; 20.30, dance (Sun.); 21.15 (Mon.).

Cassel, 288 m. (1½ kw.). Relay from Frankfort.

Dresden, 280 m. (1½ kw.). Relay from Leipzig.

Frankfort-on-Main, 470 m. (1½ kw.). 07.30, sacred con. (Sun.); 10.10, Stock Ex.; 10.55, time sig., news; 15.00, children (Sun.), Stock Ex. (weekdays); 15.30, con., women; 16.00, con. (Sun.); 17.00, markets, lec., children (Wed.); 18.00, lec. (daily), shorthand (Wed.), Esperanto (Fri.); 18.30, educat. hour; 19.00, lec., Engl. (Mon.); 19.30, con. (daily), jazz band (Fri.); 20.30, time sig., weather, news; 21.00, dance or late con. (not daily).

Gleiwitz (relay station). Under construction.

Hamburg, 395 m. (1½ kw.). Sunday: 07.55, time sig., weather, news, lec., women; 10.00, sacred con., chess; 12.00, con., lec.; 16.00, children; 17.00, con.; 18.00, Engl. conv.; 19.00, sport, weather, news, con. or opera; 21.00 onwards, as weekdays. Weekdays: 06.25, time sig., news; 07.30, theatre news; 11.55, time sig.; 12.20, Engl. (Wed.); 14.00, political news, markets; 15.00, women; 15.30, lec., Esperanto; 16.05, orch., 17.00, con., lec.; 18.25, lec., Engl. conv. (Tues. and Fri.), Spanish (Mon. and Thur.); 19.00, weather, con. or opera; 21.00, weather, markets, news; 21.50, news (in English), dance (not daily). Will shortly be increased to 5 kw.

Hanover, 296 m. (1½ kw.). Relay from Hamburg. Also own con., 16.00.

Königsberg, 463 m. (1½ kw.). 08.00, sacred con. (Sun.); 10.15, markets; 11.55, time sig., weather; 13.15 and 15.00, markets; 15.30, children (Tues., Wed., Sat.), orch.; 18.30, lec., Esperanto (Thurs., Sat.); 19.00, con. or opera; 20.00, orch., lec., weather, news, dance (Thurs., Sun.).

Leipzig, 454 m. (1¼ kw.). 07.30, sacred con. (Sun.); 10.00, educat. hour (Sun.); 11.00, markets, orch., time sig.; 15.00, markets; 15.30, orch., children (Wed.); 16.30, lec. (Tues.); 17.30, lec. (Tues.), experimenters (Wed. and Sat.); 18.00, lec.; 19.00, lec. (irr.); 19.15, con. or opera, weather, news; 21.00, con. (not daily). Will shortly be increased to 5 kw.

Münich, 485 m. (1½ kw.). 10.30, lec., con.; 13.00, news, weather, time sig., snow forecast; 14.00, con., lec. (Sun.); 15.30, orch. (16.00 Sun.), children (Wed.); 17.00, agric. talk (Mon.), con.; 18.00, lec., Engl. (Mon. and Fri.), Italian (Tues.), Russian (Sat.), Esperanto (Thurs.); 19.30, con.; 20.30, news, weather, time sig.; 21.00, late con. (Sun.), lec. (Tues.), dance (Sat.).

Munster, 410 m. (1½ kw.). 11.00, sacred con., news (Sun.); 11.30, news (other days); 11.55, time sig.; 14.30, markets; 15.30, children (Sun.), lec. (weekdays); 18.40, weather, lec., time sig.; 19.20, women, con. or opera, news, dance (Sat.); 21.00, English, Spanish or Esperanto, news, dance (Sat.).

Nuremberg, 340 m. (800 w.). Relay from Munich.

Stuttgart, 443 m. (1½ kw.). 06.30, time sig., weather (weekdays); 10.30, con. (Sun.); 15.00, time sig., con., news (Sun), children (Sat.); 16.45, children (Wed.); 18.30, lec. (weekdays); 19.00, con. (daily); 20.15, time sig.; 22.00, weather, news, dance (Sun.).

FINLAND.

Haelsinkki, 400 m. (temporary w.l.). Testing daily.

HOLLAND.

Amsterdam (PCFF), 2,000 m. (1 kw.). Daily: 07.55-16.10 (exc. Mon. and Sat., when 10.10-11.10), news, Stock Ex., time sig., 09.55 and 16.10. (PX9) (400 w.), 1,050 m.: con., 20.40, con. or organ recital (Mon.).

Hilversum (HDO), 1,060 m. (2½ kw.). 17.40, children (Mon.); 19.40, lec. (Fri.); 19.40, con. (Sun.), relay of Mendelberg orch. (Thurs.); con. (Sun.); 19.55, Radio talk (Wed.); 21.40, lec. (Sun.).

Vossegat (Bé), 1,050 m. 12.10 and 19.40, weather.

Soesterberg, 1,050 m. 19.26, weather.

Bloemendaal, about 200 m. 09.40 and 16.40, sacred service (Sun.).

HUNGARY.

Buda-Pesth. New broadcasting station will be opened in March.

ITALY.

Rome (1RO), 425 m. (2½ kw.). Week-days: 16.00, orch., Stock Ex.; 19.30, time sig., news, con.; 20.15, news, Stock Ex., con.; 21.10, dance; 21.20, news, weather. Sundays: 09.30, sacred con.; 15.45, children, Stock Ex.; 16.15, orch. (relayed from Hôtel di Russia); 16.45, jazz band; 19.35, con.; 21.30, dance.

Milan, 650 m. (temp. W.L.). Testing shortly.

JUGO-SLAVIA.

Belgrade, 1,650 m. (2 kw.). 17.30, con.,

(*Concluded on page* 374)

"BROADCAST TELEPHONY" (*cont. from page* 372)

news, weather (Tues., Thurs., Sat.), weather, news only (Mon., Wed., Fri.).

NORWAY.

Christiania, 340 m. (500 w.). Testing, daily, about 19.30.

PORTUGAL.

Lisbon (Aero-Lisboa), 375-410 m. 21.30, tests, music, speech (Wed. and Fri., irr.).

Montesanto (CTV), 2,450 m. (15 kw.). Tests, music (irr.); 13.00 and 23.00, weather.

RUSSIA.

Central Wireless Station, 1,450 m. Sundays: 12.45, lec.; 15.30, news; 16.15, con. Weekdays: 13.00, markets; 15.30, news or con.

Sokolniki Station, 1,010 m. Sundays: 09.00, lec.; 10.00, radio talk; 13.30, lec.; 14.30, con.; 17.00, lec. and con. (Tues., Thurs., Fri.).

Trades Union Council Station, 450 m. 17.00, con. (Mon., Wed.).

SPAIN.

Madrid (Radio-Iberica) (3 kw.), 392 m. 22.00, weather, Stock Ex., time sig., con., news; *La Libertad* con. (Tues. and Fri.). Sunday: 16.30, con. (irr.).

Barcelona (EAJ1), 325 m. 18.00, lec., Stock Ex. markets, con. or relay of opera; 20.30, news and con.

Seville (EAJ5), 350 m. 18.30, lec., con., news.

Bilbao (Radio-Vizcaya), 375/450 m. (W.L. not fixed yet). Testing shortly.

SWEDEN.

Stockholm (SASA), 430 m. (500 w.). Sundays: 09.55, sacred service; 16.00, children; 17.00, sacred service; 19.00, con.; 20.30, news, weather. Weekdays: 11.30, weather, Stock Ex., time sig. (11.55); 18.00, lec. (irr.); 19.00, con., lec., news, weather.

Gothenburg (SASB), 290 m. (500 w.), also 700 m. 10.00, fishery reports (700 m.); 11.55, time sig.; 19.00,* programme s.b. from Stockholm.

Malmoe (SASC), 270 m. 11.00, weather; 19.00,* programme s.b. from Stockholm.

Boden (SASE), 2,500 m. 18.00, con. (Tues., Fri., Sun.)—temp

* Local programmes are also broadcast at times.

Sundsvall (SASD), 680 m. (500 w.). To open about March.

Falun (SMZK). Tests. Occasional relay of 5XX.

SWITZERLAND.

Geneva (HB1), 1,100 m. (500 w.). 13.15, lec. No Sun. transmissions.

Lausanne (HB2), 850 m. (500 w.). 07.05, weather; 12.30, weather, markets, time sig., news; 16.00, children (Wed.); 17.55, weather, news; 20.15, con. (exc. Wed.), dance (Thurs. and Sat.).

Zurich (Höngg), 515 m. (W.L. not definitely fixed) (500 w.). 11.00, weather; 11.55, time sig., weather, news, Stock Ex.; 15.00, con.; 17.15, children (Mon., Wed., Fri.); 18.00, weather, news; 19.15, lec., con., dance (Fri.); 21.00, news. Sundays: 15.00 and 19.15, con., news, weather.

———

A rumour that in the near future the Glasgow station will depend almost entirely upon 2 L O for its programmes is officially denied. The tendency, on the contrary, for some time has been towards making Scotland more self-supporting in a broadcasting sense.

Seven people responded to an appeal broadcast recently for volunteers to undergo a blood transfusion operation required for a patient suffering from blood poisoning.

"Connecting Your Transformers"

SIR,—Your contributor, Mr. Gerald Whitley, in No. 138 does not enunciate any theory to support his statement that IS should be connected to the grid of the valve. I believe most experimenters advise interchanging IS and OS to find which operates the better.

Mr. Whitley appears to assume a flow of negative electrons from + to − and incidentally reversing the induced secondary current.

We have ample authority to be sure that there is an emission of negative electrons from the filament to the plate, and that the source of these electrons is the negative pole of the accumulator. We are told that this is equivalent to a current from + to −. In any case we are not much concerned with the direction in potential which sets up a corresponding variation of potential in the secondary of the transformer, thereby producing an alternating current. IS and OS are therefore rapidly alternating in potential and are alternately positive and negative.—E. B. (Leigh-on-Sea).

U.S.A. Without Aerial

SIR,—*Re* the reception of W G H, Tuckerton, U.S.A., without an aerial, reported by 2 A Y F in your issue of February 7, I would like to state that, if the reception referred to was in morse on about 110 metres, I can get this station any evening on a single valve without aerial or earth. Also I have logged as many as eleven U.S. amateurs in an evening using the same set.—2 A C K (Wales).

"What Your Condensers Do"

SIR,—In connection with the question "What Your Condensers Do," there is considerable evidence in favour of A. F. W.'s statement that oscillating currents do not pass through a condenser.

Siemens showed that the glass of a Leyden jar is sensibly warmed after being charged and discharged several times rapidly. If we picture to ourselves what most probably happens when, as A. F. W. says, the current stops short at the condenser plate the functioning of a condenser presents no difficulty.

The current—that is, the flow of electrons stops, obviously because it cannot get through the dielectric, but in doing so it delivers a shock, there is an impact, and as the result of which a portion of the energy or E.M.F. of the electron stream is delivered up to the dielectric, and, further, there is a change in momentum of the current. Now the molecules, of which the dielectric is composed, are perfectly elastic, and so it does not strain our imagination unduly when we consider the whole molecular mass to be pushed on one side an infinitesimally small degree; immediately there is the recoil, and could we observe the dielectric closely enough, it would, I think, be seen to vibrate, its period of vibration being of the same order as the frequency of the current. While this is happening on one side of the dielectric something must be happening on the other. What we observe is an oscillating flow of current exactly similar to the inflowing current. With the impact a portion of the energy is given up to the dielectric, and this must make itself manifest in some way; it does so by increasing the velocity of the molecules of the dielectric, and so we observe a heat effect.—C. G. P. (Weston-super-Mare).

"Seeing Music"

SIR,—I am glad to see that someone has pointed out the fallacy of "Thermion's" remark about his milliammeter needle.

If his milliammeter needle dips on loud signals he wants more negative grid bias or less H.T., and if it rises he is using too much negative grid bias or too little H.T.—F. G. S. (Theydon Bois).

SIR,—With reference to the letter from C. E. W. (Parkstone) in No. 141 of "A.W.," may I say that in the note which I wrote about seeing music by means of the milliammeter I omitted to mention that the result was produced by cutting out temporarily the grid-bias battery? The milliammeter is, as a matter of fact, most useful for assisting one to obtain the correct amount of negative bias on the grids of the note magnifiers, for when the proper potential is applied its needle remains stationary.—THERMION.

African Broadcasting Stations

SIR,—Please allow me to draw your attention to an error in the Supplement issued with No. 132. African stations are as follows:

Station	*Wavelength*	*Call Sign*
Cape Town	375 metres	Cape Town Calling
Durban	400 ,,	Durban Calling
Johannesburg	400 ,,	J.B.
Grahamstown	Being Erected	

Durban (V N D), 600 metres, and Walfish Bay (V N V), 600 metres, are not broadcasting stations.

On January 27 at 9 p.m. the Swedish cruiser *Fylgia,* which had left here on Monday, transmitted some music played by their band; this was sent out on a wavelength of 1,000 metres (ordinary carbon microphone being used). This was picked up by the broadcasting station here and relayed. The items were very clear, although spoilt a bit by atmospherics. The *Fylgia* was 230 miles out at sea.—D. C. (Cape Town).

5 X X and Radio-Paris

SIR,—After reading the letter from Capt. Eckersley which you published I was surprised. I cannot understand anyone in this district having difficulty in separating

(*Continued on page* 378)

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The WOODHALL No. 1 Variometer.

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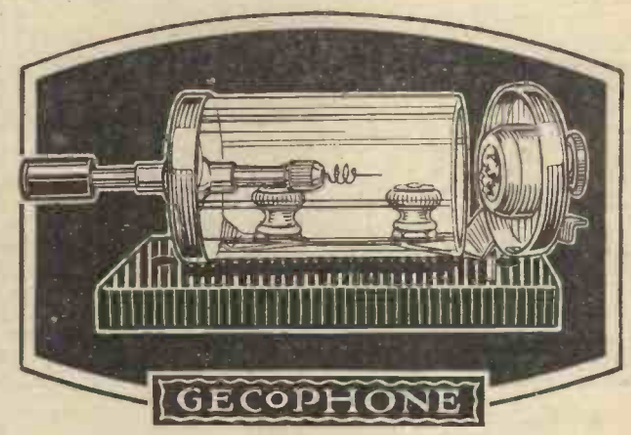

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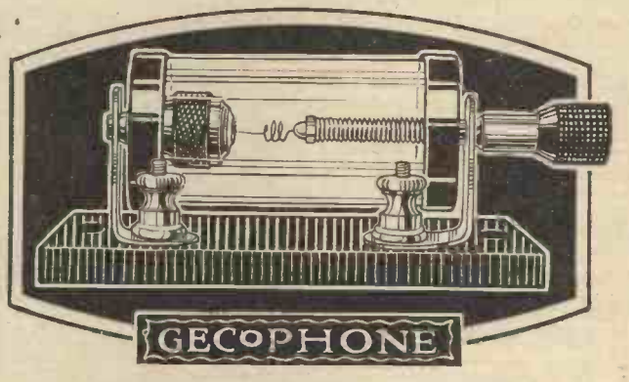

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MANSBRIDGE Fixed Condensers

Octopus Tested at 350 volts D.C.		TCC Green	
.01	2/3	2 mfd.	4/8
.25	3/-	1 mfd.	3/11
1 mfd.....	3/3	.25 ...	3/6
2 mfd.....	4/3	Post free.	

N and K Latest model Stamped N and K

4,000 ohms 17/6
(Price U.S.A. £2)
Limited number old model Stamped N & K, post 6d. 12/11

BRETWOOD

Valve Holder..... 1/9
100 p.c. Efficiency Eliminates poor reception. No soldering stop over or under panel.

"UTILITY" SWITCHES

2 Pole c/o Knob 4/-
2 Pole c/o Lever 5/-
4 Pole c/o Knob 6/-
4 Pole c/o Lever 7/6
Post 3d. each.

DETECTORS (Enclosed)

Micrometer 2/6
Nickel, Large 2/6
Brass ,, ... 2/-
Burndept 4/6
Mic. Met. 6/-

HEADPHONES

BROWN'S FEATHERWEIGHT

4,000 ohms 20/-

ERICSSON E. V. CONTINENTAL.

Your Favourite 'phones. Entirely NEW MODEL. Most beautifully finished, exquisite tone. Ridiculous Price, per pair (4000 ohms) **13/11**

BRUNET

New Model "TYPE D." Hygienic Horn Headbands. Nickel-plated Stirrup. Black and White Cord. Each receiver stamped with trade mark. 4000 ohms. per pair 16/6

TELEFUNKEN TYPE

So near to Originals. You can scarcely tell the difference except not adjustable. 4000 ohms. Pair 10/9

GENUINE "BRUNET" L.F. TRANSFORMERS

Shrouded type
Ratio 5-1 5,000 Primary
25,000 Secondary
13/6 Post Free
3 to 1 Ratio can be obtained.

THORPE K 4 5 PIN VALVE

For Unidyne Circuit
Post free.....17/6
5 Pin holder 1/3

SUPER L.F. (5-1) TRANSFORMER

Windings have insulated layers of 6 sections each, wonderful for amplification. Made in France, by the World's foremost firm.
SPECIAL PRICE 10/-

PERFECT RHEOSTATS

Shipton New Type Strip Rheostat, 7 ohms (with fuse) 3/-
Shipton New Type Strip Rheostat, 30 ohms..... 3/-
Shipton New Type Strip Rheostat, 60 ohms 3/-
Shipton Potentiometer, 600 ohms 4/6

D.C.C. DUPLEX Reactone Coils

Set of 5 ..... 3/-
Chelmsford 1/9
Ledion Coils, set of 5 ... 2/3
Chelmsford 1/6

H.T.C. VALVE HOLDERS

Under panel 1/6
Over panel 1/9
Now Stocked

£50 REWARD! given if the DR. NESPER PHONES SOLD HERE ARE NOT GENUINE! BEWARE OF FRAUDULENT IMITATIONS!! (Injunctions obtained)

Adjustable diaphragm, detachable receivers, double leather-covered head-springs long flexible cords, nickel plated parts. Very comfortable fitting to the head. Per Pair, 12/11, Post 3d. pair

Brandes Matched Tone, 4,000 ohms 20/-
B.T.H. 4,000 ohms 20/-
Siemens 4,000 ohms 20/-
Sterling 4,000 ohms ...25/-
G.R.C. 4,000 ohms 20/-

TELEFUNKEN (GENUINE). Adjustable. 4000 ohms. Price 17/11

RAYMOND

Light as a feather 4,000 ohm phones, post free 8/11

STERLING Square Law and Vernier VARIABLE CONDENSERS

.001 .....30/6
.0005 .....25/6
.00025 .....23/6

"FINSTON" FIXED CONDENSERS

Wonderful line.
.001 to .0005 ..... 1/3
.002 to .006..... 2/1

"FINSTON" Filament Rheostat with dial 2/-

QUALITY (GOSWELL) RADIO COILS

Far more efficient than honeycomb or any other type of coil. Exceedingly strong and rigid, mounted on standard ebonite plugs. Brown finish, no wax or shellac used. MOUNTED

25	...	1/6
35	...	1/9
50	...	2/0
75	...	2/3
100	...	2/9
150	...	3/0
175	...	3/6
200	...	3/9

Post 3d. Coil

MANSBRIDGE CONDENSERS

Octopus, Tested at 350v D.C.
.01 ..... 2/3
.25 ..... 3/-
T.C.C.
2 mfd. 4/8
1 mfd. 3/3
1 mfd. 3/11
2 mfd. ...4/3
.25 ..... 3/6
Post 2d. each.

"WONDER" Aerial Wire
49 Strands Special Alloy Phosphor Bronze.
For Frame, Indoor, or Outdoor Aerial.
100 feet. 3/6 Post 2d.

ACCUMULATORS FOR CALLERS ONLY at present.

Rheostat, with Dial, extra value, 2/-

Bretwood Valve-holder 1/9

Manchester "Powquip" 15/6

Ormond 14/6

Shrouded "Powquip," 18/-

Standard "Powquip," 14/6

"R.I." NEW MODEL IN SEALED BOX

Don't Buy Otherwise, Post **25/-** Free

FERRANTI L.F. BETTER THAN THE BEST 17/6

IMPORTANT NOTICE

TRADE COUNTER OPEN

will oblige you with any lines in stock, less 20% on Proprietary articles.

NO POST ORDERS TRADE.

EBONITE PANELS

3-16 in.			
3×6 ...	1/8	10× 8 ...	2/6
4×5 ...	1/8	12× 9 ...	5/-
5×6 ...	2/6	12×12 ...	5/9
7×6 ...	2/9	14×10 ...	5/9

CRITERION CONCERT COILS.

Low Self Capacity. Every turn and layer airspaced. Perfect for Reaction. Mounted on Plug.

25 ...	2/-	75 ...	2/9
35 ...	2/3	100 ...	3/-
50 ...	2/6		

SET OF 5 (25, 35, 50, 75, 100) 10/- Post 3d.

RIGHT OPPOSITE DALY'S GALLERY DOOR

K. RAYMOND

WIRELESS DEPOT

27, LISLE STREET, W.C.2

'PHONE: GERRARD 4637

No responsibility accepted on post orders unless cheques and postal orders are crossed and made payable to the firm. Moneys sent must be registered

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SUNDAYS - 10 to 1

HULLO EVERYBODY!!

RAYMOND VARIABLE CONDENSERS

SQUARE LAW

One-hole fixing. Ebonite Bushes. Aluminium ends. Highly recommended.

PRICES include KNOB and DIAL.

Post Cd. Set

WITH VERNIER

.001	...	...	8/9
.0005	...	...	7/9
.0003	...	...	7/-

Ebonite ends 1/- extra.

WITHOUT VERNIER

.001	...	...	7/7
.0005	...	...	5/9
.0003	...	...	5/3

Ebonite ends 1/- extra.

DE LUXE ORDINARY

Complete with Knob and Dial.

.001	alum. ends	6/11
.0005	,, ,,	5/6
.0003	,, ,,	4/11
.0002	,, ,,	4/6

Post, 3d. set.

TWIN CONDENSERS

Equal Parts of .0005, .0003 and .00025.

With Knob and Dial.

.0005	Ebonite Ends	18/11
.0003	,, ,,	12/6
.00025	,, ,,	12/6

LONDON'S LARGEST Stockist of JACKSON BROS.'

"J.B." VARIABLE CONDENSERS

Complete with Knob and Dial.

SQUARE LAW		STANDARD	
.001 ...	9/6	.001 ...	8/6
.0005 ...	8/-	.0005 ...	7/-
.0003 ...	6/9	.0003 ...	5/9
.0002 ...	5/6	.0002 ...	5/-

Other sizes as advertised by "J.B." Post, 4d.

CALLERS! THESE 4 COLUMNS FOR YOU NO POST ORDERS FROM SAME

Warning! Note name RAYMOND on windows. You will not be able to buy these goods otherwise. Nearest Tube Leicester Square. This address is at the back of Daly's Theatre. Open Weekdays 9 to 8, Saturdays 9 to 8.45, Sundays 10 to 1.

ACCUMULATORS

2 v. 40 amps. 9/6
4 v. 40 amps. 16/6
4 v. 60 amps. 18/6
4 v. 80 amps. 23/6
6 v. 60 amps. 27/6
6 v. 80 amps. 33/-
6 v. 105 amps. 38/6
Hart's Stocked. All High Quality.

EBONITE, 3/16 in.

Stock Sizes.

Cut to size	½d. sq. in.
6 × 6	1/4
7 × 5	1/4
8 × 6	1/10
9 × 6	2/-
10 × 8	3/-
12 ... 6	3/-
12 × 9	4/3
12 × 12	5/6
14 × 10	5/6

¼ in. also Stocked.

Switch Arm, 12 Studs, 12 Nuts, 12 Washers. Lot 10½d.

HART'S ACCUMULATORS

special purchase
4 v. 40 amps. 17/11
100 only

WEDGE COIL PLUGS

Fitted Fibre ..... 7d.
Various ..... 7d., 8d., 9d.
Edison Bell ..... 11d.
Plaincoil Plugs ... 4½d.
Also 5d., 6d., 7d. each.
Fibre Strip ..... 2d.
(36 in. by 1 in.).
Emoire Tape, doz. yds. 6d.

RAYMOND FIXED CONDENSERS

.001, .0001 to .0005 ... 10d.
.002, .003, .004 ..... 1/-
.006, 1/3; .01, 1/9; .02, 1-9
Ebonite Base Terminals.

DETECTORS

(Enclosed).

Micrometer 1/6
Half Opal 1/-
Small Brass ..... 8d.
Large Brass 1-/, 1/3
Nickel ..... 10d. to 1/6
Burndept 4/-

CRYSTALS STOCKED

Blue Tungstalite, Permanite, Shaw's Genuine Hertzite ... 10d.
Uralium 1/-
All known makes.
4 Whiskers (1 gold) ... 2d.
Gold and Silver do. 2d.
7 Waxed Coils 1/8
5 Waxless Coils 1/3
For B.B.C.

SPECIAL!

Vernier 2-way Coil Stands 3/6
Geared do. 5/3

BOXES from 1/11

7 × 5 9 × 6 12 × 9 14 × 10
8 × 6 10 × 8 12 × 10 etc.

H.T. BATTERIES

60 v. H.T. 5/11
Very Special Value
B.B.C. H.T. 60 v. ... 8/11
B.B.C. H.T. 36 v. ... 5/6
B.B.C. Grid bias 9 v. 2/3
Ever Ready, Siemens, 36 v., 66 v., 108 v.
Also Flag, etc., 1.5

D.C.C. WIRE ¼ lb.

18 swg. ..... 9d.
20 ,, ... 9d.
22 ,, ... 10d.
24 ,, ... 11d.
26 ,, ... 1/-
28 ,, ... 1/2
16 D.C.C. ... per lb. 2/6

CHELMSFORD COILS, 11d.

Also at 1/-, 1/3, 1/6
Duplex set of 5
Extra air space
25, 35, 50, 75, 100 per set 1/9

LEGLESS VALVE HOLDERS

Solid Rod Holders ... 1/-
Murray Holders 1/3
H.T.C. ..... 1/6 and 1/9
Valve Templates ..... 1½d.

SHAW'S HERTZITE

only genuine if in sealed box with signature ... 10d.

COLVERN VERNIER 2/6

Do. Neutrodyne 3/6
Ormond Neutrodyne 2/-

CRYSTAL SETS

Fine Value

Re-echo set 13/11
Brownie sets 7/6
"Rodeo" sets 7/11

ORDERS TAKEN FOR BOXES

To your own sizes few days delivery

MANSBRIDGE 2 MFD. 4/3

Ditto 1 mfd. 3/6
Ditto .25 ..... 2/9
Also cheaper make

500 FIXED CONDENSERS

Clearing at 4d.
Various capacities.

VARIOMETERS

Inside winding 6/11
Edison Bell 10/-
Igranic 10/-
Very good value 1/6
Many others

HEADPHONES

N & K Model 4000 ... 8/11
Telefunken Type 8/11
Lightweight 7/11
Dr. Nesper 11/9
Ericsson EV 11/9

SPECIAL!

Leatherette Boxes with Lid ..... 2/3 and 2/11
Re-echo Crystal Sets 13/11

CALLERS SNIP

Square Law Variable Condensers
.0005 ..... 5/-
.0003 ..... 4/11
Complete with Knob and Dial

WARNING

Customers entering premises adjoining without seeing the name

RAYMOND

on windows, do so at their own risk.

VALVES

Dutch Detectors 4/9
"R" type 4/9
.06 Dutch 11/-
Phillips "R" 6/6
French "R" 5/11

RADIO MICRO .06 THE WONDER VALVE

H.T., L.T., or D.
3 volts 11/-

METAL .06

Be sure "METAL" is Stamped on Valve and avoid imitations.
One to each Customer at **10/-**

ALL VALVES REDUCED

Marconi, Ediswan, Mullard, Cossor, Myers, etc.

VARIOMETERS

Very Special 290/650 metres. All ebonite. Double silk wound, callers only 4/-

TERMINALS (Complete)

W.O., Piller, 'Phone, brass, 1d. each; nickel, 2d. each; stop and valve Pins, ½d.; nuts, various, 6 a 1d.
Valve Sockets 1d., 1½d
Flush Panel do. 1d.
Spade Tags ..... 6 a 1d.
Do. Terminals 2 for 1½d
Do. Pins 2 for 1½d.
Screws and nuts 2 a 1d.
Switch arms ..... 7d.
Nickel arms ..... 10½d.
Studs, complete 2 a 1d.
'Phone connectors 1d.
2 B.A. Rod ft. ..... 2d.
4 B.A. Rod ft. ..... 2d.
Valve windows ..... 4d.
Washers ..... 12 a 1d.
Shorting plug and socket 3½d
Shellac ..... 5d.

H.F. TRANSFORMERS

For Chelmsford 2/9
For B.B.C. range ... 2/6
Energo, McMichael, Bowyer-Lowe stocked.

MANSBRIDGE FIXED T.T.C. GREEN

.25 ..... 2/9
1 mfd. 3/6
2 mfd. 4/6

Var. gd. Leaks 1/-
Fixed 2 meg. ..... 9d.
Battery Links 3 for 2d.
Ins. Hooks 2 for 1½d.
Egg Insulators ..... 1d.
Reel ,, 2 for 1½d.
Ins. Staples ..... 5 a 1d.
6 ft. 'phone cords 1/-1/3
Sleeving 3 yards 9d.
Tinned Copper 18 g. 5d.
⅛ Bus bar, bank 6d.
Knobs. 2 B.A. 2d
Wander Plugs ..... 1½d.
Strip Aerial, 100 ft. 2/-
7/22 Heavy, 100 ft. 1/10

COIL STANDS

Ebonite 2-way 1/9
With ex. handles ... 2/3
Nickel ,, ... 2/8
3-way ..... from 3/11
Basket Holders ..... 8½d.
Best quality 1/-
Basket Spikes ... 7d., 9d.
Anti cap. handles ... 9d.
Lead-in Tubes ..... 6d.
Sorbo Ear Caps pr. 1/3

2-col. Flex, 36 ft. 1/6
Lighting ,, ,, ... 1/6
Twin silk doz. yards 1/-
Lead-in, thick, yd. 3d.
Do., good, 10 yds. 1/-

Rheostats, C. & S. ... 1/-
Ormond 1/9
Ebonite Former 1/6
With dial 1/11
Shipton, Igranic, Burndept, McMichael, etc.

SPECIAL!

Customers purchasing 20/- worth of our own goods (at full prices only) are allowed to buy a first-class pair of phones for 5/-, 4,000 ohms, as an advertisement. One pair to each customer. This offer must be taken advantage of at time of purchase.

VALVES for UNIDYNE CIRCUIT, 11/-

SPECIAL LINE IN L.F. TRANSFORMERS FRENCH 7/11

RIGHT OPPOSITE **DALY'S** GALLERY DOOR

K. RAYMOND

WIRELESS DEPOT

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No responsibility accepted on post orders unless cheques and postal orders are crossed and made payable to the firm. Moneys sent must be registered

HOURS OF BUSINESS:
DAILY - - 9 to 7.45
SUNDAYS - 10 to 1

CORRESPONDENCE (continued from page 374)

5XX and Radio-Paris. Perhaps in the south conditions differ considerably.

Here I can easily tune out 5XX when receiving Paris, although Chelmsford is considerably louder.

My set is a plain "straight four" (one H.F., detector, two L.F.), home-made and somewhat crude, and the aerial is of the crow's-nest type. I may say that this type of aerial appears to be quite as efficient as the ordinary P.M.G. pattern, and I think if many people realised this there would be many more in use. I have received several American stations on mine on three valves only.—G. M. H. (Saltburn).

Other Correspondence Summarised

C. W. K. (Hants) has received KDKA, WGY, Radio-Paris, L'Ecole Supérieure, Radio-Iberica and all B.B.C. stations on his one-valve set.

C. P. (Norfolk) has received a French station and KDKA on his two-valve receiver made from instructions given in No. 127.

W. S. W. (Shepherd's Bush) can receive KDKA any evening on his two-valve Reinartz receiver made from instructions given in No. 127.

R. A. B. (Derbyshire), referring to the recent discussion on the merits of H.F. amplification, states that he received WBZ on his two-valve receiver (detector and L.F.) with an extra L.F. when required.

DEATH OF Mr. OLIVER HEAVISIDE, F.R.S.

THE originator of that elusive conception known as the "Heaviside layer" died recently in Torquay at the age of seventy-four. Although a Fellow of the Royal Society, a Faraday medallist of the Institute of Electrical Engineers, and the holder of various honorary degrees and other distinctions, Mr. Heaviside for many years lived in absolute seclusion, wholly indifferent to the outside world and to the astounding progress of the science in which his name will long be honoured as a pioneer.

At the early age of twenty-four he abandoned a commercial career in order to devote himself to mathematical research, being especially attracted by the brilliant work of Clerk Maxwell on the fundamental phenomena of electromagnetic induction. In collaboration with Laurenz he succeeded in throwing the Clerk Maxwell equations into a more easily-handled form by employing an ingenious substitution, now known as the Heaviside-Laurenz unit.

At a time when eminent authorities denied the possibility of long-range wireless transmission, affirming that the ether waves would spread outwards in all directions and be lost in interstellar space, Heaviside insisted strongly to the contrary. He maintained that the semi-conductive surface of land and sea would "bind" the ether waves in much the same way as a metallic conductor binds and guides a high-frequency current.

In particular he suggested the probable existence of an upper conductive layer, formed of ionised air and located some thirty or forty miles high—at the extreme verge of the atmosphere. This he maintained would form an upper conductor or boundary supplementary to the lower conductor formed by the earth's surface. The ether waves would be confined to the zone between the two, and would thus be restrained from straying outwards into the farthermost spaces.

Subsequent research has fully corroborated these intelligent anticipations, and has shown that the existence of the Heaviside layer provides an essential clue to much that would otherwise be inexplicable in the "mechanism" (and irregularities) of wireless transmission and reception.

Mr. Heaviside's career presents a typical example of unrewarded genius. After long and arduous labours in the difficult field of abstruse mathematics, he presented the fruits of his genius to the world at large, leaving the financial harvest to be reaped by others. B. A. R.

So extensive have been the thefts of apparatus, cable, etc., of late by wireless enthusiasts from Post Office manholes that the attention of the police has been drawn specially to the matter.

REDUCED PRICE

25/-

Carriage Paid, ready for mounting.

Clearer Speech and Music

with the

M-L TWIN-COIL L.F. INTER VALVE TRANSFORMER

ONE amateur enthusiast writes: "Your transformers are definitely superior in quality of production of speech and music." Another says: "The greatly improved reception since fitting these transformers is indeed amazing."

These opinions, arriving daily, confirm our own tests. With the M-L transformer you get both speech and music clearer. There is a complete absence of distortion, greater amplification and a longer range.

Stoutly built and well finished, it is dust and damp proof. The coils are completely enclosed. Insulation has received special attention, and there is no danger of burning out. Primary to secondary ratio, 1—4.

To get the best from your set use an M-L transformer.

The M-L ANODE CONVERTER

A PERMANENT substitute for the high-tension battery. Ideal for power amplifier work. Worked from the ordinary 6-volt accumulator, the consumption is low — 1.15 amperes. Perfectly smooth reception. Continuous adjustment of H.T. voltage and not by steps.

Supplied in the following standard voltage ranges:

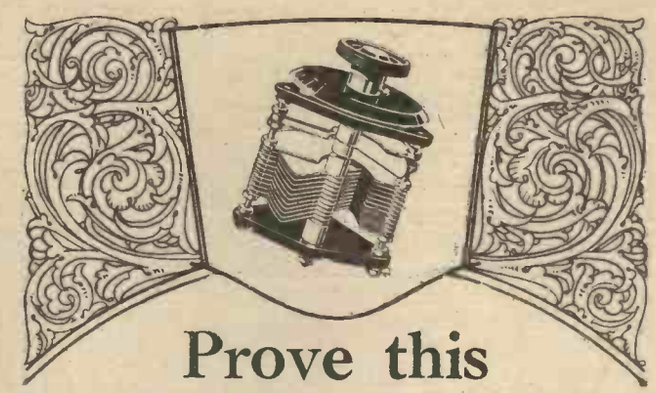
Type B 6–120 volts **£11 5 0** } For two stage power amplification

Type C 12-300 volts **£13 10 0** } For two stage power amplification

Type D 12-500 volts **£18 0 0** } For low power transmission work.

We invite applications from traders for terms. Write for details.

The M-L Magneto Synd., Ltd., Wireless Dept., Victoria Works, Coventry.



Prove this by your own knowledge

The reasoning behind the Bowyer-Lowe Square-Law Condenser is so conclusive that it convinces every experimenter who follows it.

Your own experience tells you that the wavelength range of a Condenser depends on its capacity ratio; that is the ratio between its maximum and minimum capacity. Reduce the minimum capacity and up goes the ratio.

Now, the fixed plates of the Bowyer-Lowe Square-Law Condenser present so little edge to the moving plates in the minimum position that the capacity ratio is equal to 150 to 1, the highest in wireless. You know, too, that low losses make for richness and purity of reception. See how losses are reduced to a minimum in the Bowyer-Lowe Square-Law Condenser through the use of grade "A" Ebonite, careful designs and scrupulous manufacturing methods. These things MUST result in better reception.

You understand how the square law effect makes a set selective and easy to calibrate. The Bowyer-Lowe Square-Law Condenser is NO larger than ordinary condensers. You can fit it in your sets without altering them in any way. Therefore by installing this condenser you must be able to increase the efficiency of any set.

The Bowyer-Lowe Square-Law is the ONLY Condenser which obtains the square law effect with INCREASED selectivity and REDUCED losses. Insist on having it in every receiver you make.

All good dealers sell them at prices from 11/6.

Bowyer-Lowe Tested SQUARE-LAW CONDENSERS

For best results use Bowyer-Lowe Condensers in conjunction with Bowyer-Lowe MATCHED H.F. Transformers. Every one is guaranteed to match perfectly every other in the same range. All ranges and Neutrodyne model at uniform price of 7/-.

Write for our FREE Catalogue

containing 36 pp. of information about all the Bowyer-Lowe Tested Components with blanks for your notes. Send 1½d. stamp to cover postage.

Bowyer-Lowe Tested Radio Components

BOWYER-LOWE Co., LTD., LETCHWORTH.

WIRELESS IN PARLIAMENT

From Our Own Correspondent.

MR. GROVES and Lt.-Col. Dalrymple White suggested, in the House of Commons last week, that the Postmaster-General might well consider the introduction of a regulation that corks, or other devices, as used on army aerials, be used on wireless aerials to warn or deter birds from contact.

Sir Wm. Mitchell-Thomson, however, said that he had at present no evidence of the extent to which injury was caused to pigeons through collision with wireless aerials, but he had asked the National Homing Union to furnish him with information on the subject. When he received it he would consider whether he could with advantage take any action on the matter.

In reply to a further question on the same subject by Brig.-Genl. Meakins, Sir Wm. Mitchell-Thomson said that ten representations with respect to the destruction of racing pigeons by broadcasting wires had been received by the Post Office and one by the British Broadcasting Co. There were about 1,200,000 wireless licences in existence, and the number of outdoor aerials was estimated to be more than a million.

Mr. T. Henderson asked the Postmaster-General whether he was aware that on July 1, 1924, the cost of wireless licences was reduced from 15s. to 10s., and that great dissatisfaction existed owing to the refusal of his department to grant a rebate to licence-holders who had been charged the higher rate; and would he give this matter further consideration?

Sir Wm. Mitchell-Thomson said that under the wireless licensing system in force before July 1 last two types of licence were issued, one at 15s. and the other at 10s., the latter containing certain restrictions on the apparatus that might be used. A uniform type of licence at 10s. was introduced on July 1 by agreement with the British Broadcasting Co. Refundment as proposed would not be practicable under the financial provisions of the agreement between the Post Office and the British Broadcasting Co.

We regret that owing to pressure on our space the instalments of the "Extensible Unit Set" and "Experimental Transmission" have had to be held over.

TRADE NOTES AND CATALOGUES

FROM Craik and Smith, Allen Street, E.C.1, we have received an interesting catalogue of wireless goods.

An interesting catalogue of wireless generators has been sent us by Evershed and Vignoles, Ltd., Acton Lane Works, Chiswick, W.4.

This well-illustrated booklet contains full details of hand- and motor-driven generators for supplying the H.T. necessary for transmission, and, in addition, a number of practical circuit diagrams a number of practical circuit diagrams are given showing the use of these generators.

Generators of the type described in the catalogue have been supplied to the Air Force for emergency signalling work on aeroplanes.

CHIEF EVENTS OF THE WEEK

SUNDAY, March 1

London and 5 X X	3.0	St. David's Day Programme.
London and 5 X X	9.0	De Groot and the Piccadilly Orchestra.
Birmingham	3.0	Light Classical Programme.
Bournemouth	9.0	J. H. Squire Celeste Octet.
Cardiff	8.15	Welsh Service, Conducted by the Arch Druid.
Manchester	3.0	Welsh Programme.
Newcastle	7.30	Philharmonic Concert.

MONDAY

Birmingham	7.35	Music and Plays.
Bournemouth	7.35	"England, Ireland, Scotland and Wales."
Manchester	7.35	Symphony Concert.
Aberdeen	8.0	An Hour of Poetry and Fairy Music.
Glasgow	7.35	*The Heart of Midlothian.*
Belfast	7.35	Songs and Folk Music.

TUESDAY

5 X X	7.30	Excerpts from Shakespeare.
ALL STATIONS except 5 X X	7.30	"The Sea."
ALL STATIONS except 5 X X	10.0	"The Country."

WEDNESDAY

London and 5 X X	7.30	Sullivan Programme.
Birmingham	7.30	A Jubilee Celebration and Ballads.
Bournemouth	7.30	Winter Gardens Evening.
Cardiff	7.30	Symphony Concert Relayed from Bristol.
Newcastle	7.30	Selections from Opera.
Belfast	7.30	Symphony Concert.

THURSDAY

London	7.35	Chamber Music Evening.
Manchester and 5 X X	7.35	The Halle Orchestra.
Newcastle	7.35	"A Night in Hawaii."
Glasgow	7.35	Border Scenes.
Belfast	7.35	Musical Comedy Night.

FRIDAY

London and 5 X X	7.30	Italian Night.
Bournemouth	7.30	British and French Music.
Cardiff	7.30	"Voices from the Void."
Manchester	7.30	Concert relayed from Houldsworth Hall.
Glasgow	7.30	Birthday Programme.

SATURDAY

London and 5 X X	7.30	Popular Operatic Evening.
Birmingham	7.30	The Opera, *Faust.*
Cardiff	7.30	"Dancing Round the World."
Manchester	7.30	"A Night in Hawaii."
Glasgow and 5 X X	7.30	Ballad Concert.

Dublin Wireless Club

A MEETING was held on January 22, when Mr. H. J. McCann, B.L., presided, and a loud-speaker demonstration was given.

Coventry and District Co-operative Radio Society

Hon. Sec.—MR. A. CURTIS, 35, Berkeley Road, Earlsdon, Coventry.

ON January 21 a very successful "junk" sale was held, when a large assortment of useful components found ready buyers. Mr. Burt, the society's librarian, acted as auctioneer.

Kensington Radio Society

Hon. Sec.—MR. H. JOHNSON, 36, Cromwell Grove, W.6.

THE fourth annual meeting took place on January 15, when the president, Mr. Reeves, was in the chair. The treasurer's and secretary's reports were read and approved, and various suggestions were put forward to make the monthly and informal meetings more attractive than at present.

Beckenham and District Radio Society

Hon. Sec.—MR. H. WEST, 3; Manor View, Beckenham.

A WELL-ATTENDED lecture was given on January 22, when Mr. Partridge spoke on "Short-wave Transmission and Reception." The society propose to hold an exhibition and competition at an early date.

Preston and District Radio Research Society

Hon. Sec.—MR. R. CHARNLEY, 120, Lune Street, Preston.

ON January 22 a lecture was given by Mr. S. J. Holt, who dealt with many points in wireless reception. The lecture was preceded by a lesson in morse by Mr. F. Murray.

North Middlesex Wireless Club

Hon. Sec.—MR. H. A. GREEN, 100, Pellatt Grove, Wood Green, N.22.

THE club held its 157th meeting on January 21 at Shaftesbury Hall, Bowes Park, N, when Mr. A. S. Manders delivered a lecture on "A Low-loss Tuner."

Hackney and District Radio Society

Hon. Sec.—MR. G. E. SANDY, 114, Parnell Road, E.3.

ON January 19th a most successful dinner took place at the Elephant Hotel, Dalston, followed by a musical programme. On January 26 Mr. G. A. V. Sowter, B.Sc., talked on the technical aspects of crystal reception.

North Middlesex Wireless Club

Hon. Sec.—MR. H. A. GREEN, 100, Pellatt Grove, Wood Green, N. 22.

ON February 4 Mr. J. H. Forbes gave a lecture on "Supersonic Heterodyne Circuits," which was mainly devoted to an account of his own experience in operating such circuits.

ANNOUNCEMENTS

"Amateur Wireless and Electrics." Edited by Bernard E. Jones. Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. It will be sent post free to any part of the world—3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to the Proprietors, Cassell & Co., Ltd.

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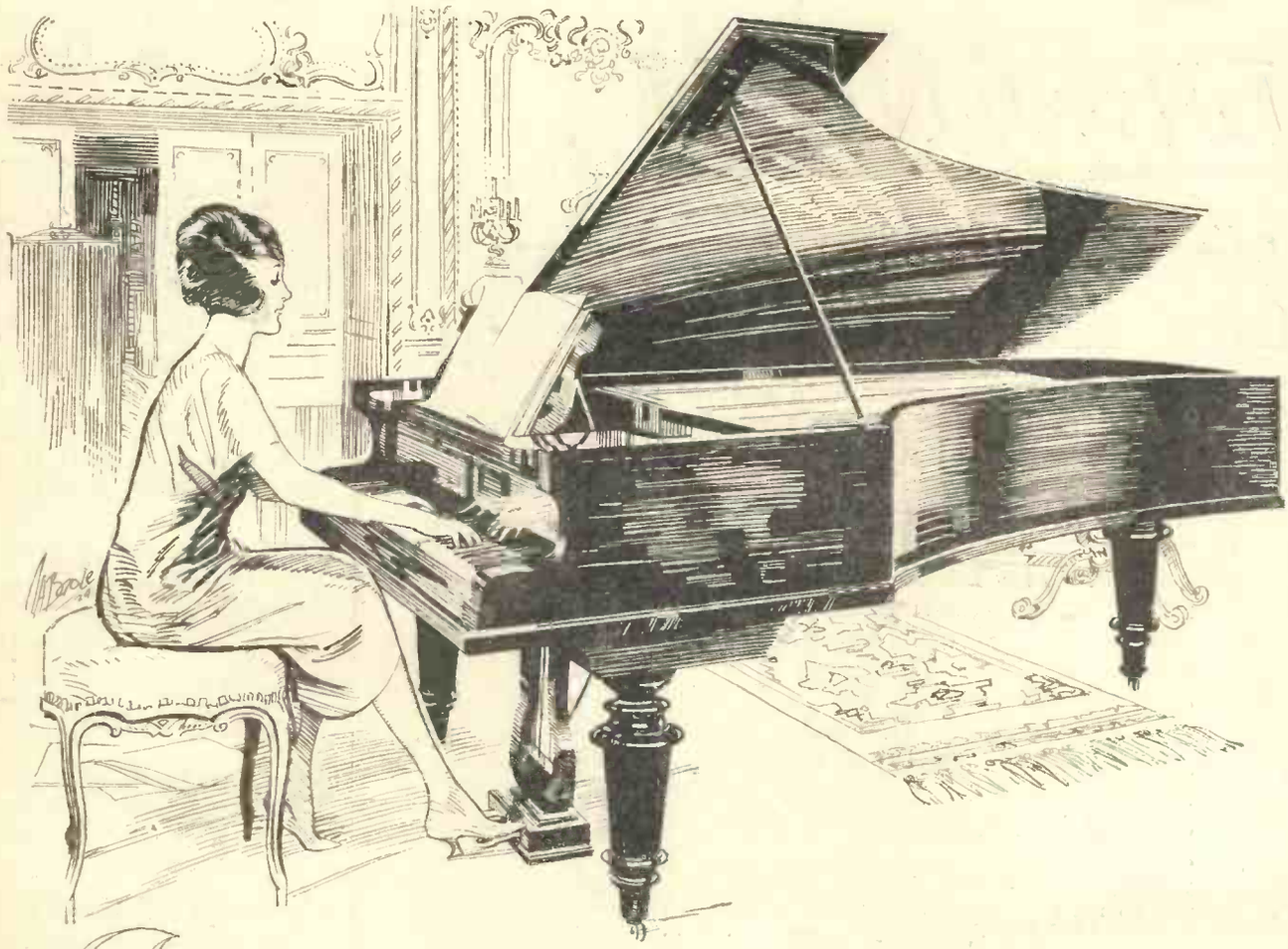

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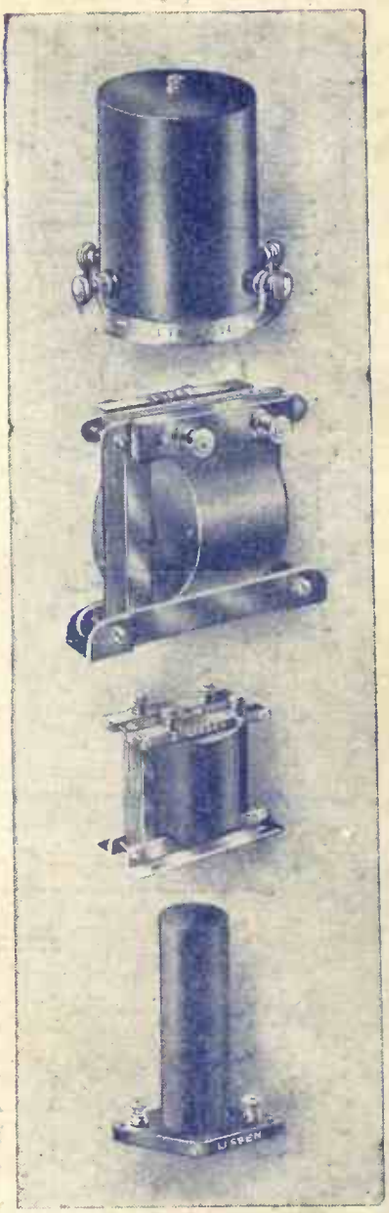

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