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SCIENTIFIC ADVISER: SIR OLIVER LODGE, F.R.S., D.Sc.

64 Pages

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FEATURES IN THIS ISSUE.

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POPULAR WIRELESS

AND WIRELESS REVIEW.

October 4th, 1924] THE RADIO WEEKLY WITH THE LARGEST CIRCULATION. [Every Friday, Price 3d.

Technical Editor: G. V. DOWDING, Grad.I.E.E. | Editor: NORMAN EDWARDS, A.M.I.R.E., F.R.G.S. | Scientific Adviser: Sir OLIVER LODGE, F.R.S.

RADIO NOTES AND NEWS OF THE WEEK.

Next Week's Special Number.

LAST week I had to announce the mournful tidings that the very last Booklet describing the "P.W. Combination Set" had been given away.

Fortunately there is good news for readers this week, for the Editor tells me that the next three numbers of "P.W." have been specially enlarged, and will contain all sorts of interesting and exclusive features.

* * *

Free to Readers.

ON Friday next every copy of "P.W." will contain a special presentation booklet, "The Pocket Fault-Finder."

It will tell you how to trace every fault that ever lurked in a wireless set—in the aerial above, in the set beneath, or in the wire that is buried under the earth. In fact, the only fault you will *not* be able to find is with the price—it is *free* to all our readers!

* * *

Captain Eckersley's Map.

AMONGST other exclusive features next week will be a long article by Captain Eckersley, dealing with the Chelmsford High-Power Station. This is illustrated by a map—specially designed by Captain Eckersley and copied by our staff artist—which no owner of a crystal set can afford to miss.

* * *

A Warning.

A SPECIAL article from the pen of Sir Oliver Lodge, an article by Mr. C. B. Cochran, and a contribution for experimenters specially written by Mr. G. V. Dowding (Technical Editor of "P.W."), are amongst the other attractions which will appear in the course of the next three weeks. And in addition there is "Wireless and The Police," a special article by an ex-Chief-Detective Inspector of Scotland Yard.

So if you don't purchase next week's copy of "P.W." early, *and the next two issues*, you will need the services of an ex-chief detective inspector of Scotland Yard to help you to find a copy for sale!

* * *

K D K A's Aerial.

VERY few further details of K D K A's new aerial—which was referred to last week, have been received from the Westinghouse Company; but I hear that the copper tube I referred to will be supported by a pole about 50 ft. high, and that greatly improved results are expected from the transfer to a new site at East Pittsburg.

* * *

Trouble.

COMPLAINTS of interference between 2 L S and the Leeds station of the R.E. (Territorial Force) Signal Corps, have broken out again. Since the signalling company returned from camp in the Isle of Man the trouble which was experienced last July has arisen again, due to the fact that the R.E. are quartered in barracks directly opposite the B.B.C.'s station.

WHAT THEY SAY.

"The ideal broadcasting voice is a clear, pleasant voice with a strong sympathetic note. A voice that comes easily, without effort. Above all, a friendly voice. . . ."—W. Jesse Collings, writing in "The Star."

* * *

"Among all the amazing inventions and developments of the past twenty or thirty years—the coming of king petrol, the conquest of the air, submarine navigation, and so on—wireless is the most fascinating and miraculous. It does not seem to belong to our prosaic world, but to the realm of magic. . . ."—"Alpha of the Plough" ("Manchester Evening News.")

* * *

". . . In the old days Glasgow and Birmingham stations were five metres apart in wave-length (415 and 420 respectively), and it was possible, using a manufactured set at a distance of only two miles from Birmingham, to receive Glasgow while Birmingham was working. There should be, therefore, no difficulty whatever in separating Glasgow and Belfast."—E. V. Thomson (of B.B.C., Belfast) in a letter to the "Irish News."

* * *

"The more trouble you take with your aerial outside, the less trouble you will have with your set inside."—Capt. Eckersley (Chief Engineer, B.B.C.).

* * *

"We in England are far behind the great countries of the world in the use of wireless for propaganda and commercial purposes. We have not taken full advantage of this new and universal medium. . . ."—Sir Robert Donald, G.B.E., LL.D. (Chairman of the Imperial Wireless Telegraphy Committee, and formerly Director of War Propaganda in neutral countries), writing in the "Daily News."

* * *

"We want to give the intelligent listener something worthy of his intelligence. I hope to see—perhaps in ten years' time—a great free wireless university in this country. Properly planned courses of lectures would be given, and examinations held at the end of each session. To each station would be attached tutors who would correct work done during the term. . . ."—Mr. J. C. Stobart, Director of Education to the B.B.C., interviewed by "The Sheffield Independent."

* * *

THE WEEK'S QUERY.

"I have a set of seven 'Oojah' basket coils, and I can get Chelmsford every night except Sunday afternoon. But I get him in the evening all right. Why is this?"

More Changes.

LIVERPOOL is complaining of a similar trouble, and it is possible that in both cities the B.B.C. will have to find a new site.

It is unfortunate that both parties concerned in the transmissions are compelled to work chiefly during the evenings, and therefore are "on the air" simultaneously.

The "Pirate's" Wish!

AFTER being in custody for ten days, Herr Bodenstedt, of Cologne, was fined 200 gold marks (£10 15s.) for possessing an unlicensed wireless set. So what with fines, imprisonment, inconvenience, cost of recharging accumulators, and one thing and another, he probably wishes he had bought a gramophone!

* * *

A "Star" Player.

PROBABLY the most famous cornet-player in the world is Mr. Charles Leggett, who is again on 2 L O's programme on Sunday next, October 5th. Mr. Leggett was the Army's leading cornet-player for twenty-one years, and his long experience of recording for the gramophone gives an incomparable finish to his performance in the Wireless Orchestra.

* * *

To-Night's Items.

TO-NIGHT (Oct. 3rd) the London programme is a promising one, with some well-known 2 L O favourites, including Peter Yorke, the Syncopation Pianist. In addition we are to hear a popular Glasgow star, Mr. William McNally. He is a dulcimer virtuoso, with a great reputation at 5 S C, and to-night will be his first appearance at 2 L O's studio.

* * *

Not Good Enough.

ON a single-valve set that I was testing, I tuned-in to Birmingham the other evening, and had to wait about twenty minutes before the station's name was announced. This is not good enough, because it is no trouble to the announcer to give the call-sign or station's name occasionally, but it makes a vast difference to distant listeners.

* * *

Follow London's Lead.

JUST at this time of the year especially there are thousands of people keenly interested in picking-up far-away stations, and there is nothing more tantalising than these long anonymous transmissions. London is very good in this respect, and artfully introduces "London calling," "2 L O," or "the London station" into nearly every announcement. The local audience don't notice it, and it pleases the D X enthusiasts mightily.

* * *

A Tour Round.

WHAT a change was wrought in wireless recently when we put the clocks back to Greenwich Time! I "toured" round the stations that first "winter" time evening (on H.F. and Det.) and found them all "going strong." The only reluctant one was Manchester—a

(Continued on page 226.)

NOTES AND NEWS.

(*Continued from page 225.*)

station that is always coy with me—but after a few minutes' sleight-of-hand with the filament and reaction controls, 2 Z Y was all that could be desired.

* * *

Roping Them In.

AT one time foreign stations were a cause for rejoicing, but now they are getting so common that they are a positive nuisance. A good single-valve Unidyne will "tour" all over Europe under favourable conditions, and the two-valve sets simply rope in the Continental stations.

* * *

That Aerial "Curl."

IF your mast is one of those which are inclined to curl over a little at the top, owing to the pull of the aerial, you will be interested to know that the Rugby masts are stayed to resist a horizontal pull of 10 *tons* at the top of each mast! Two distinct aerial systems are supported by the twelve masts, at a height of 820 feet above the ground.

* * *

"T'other From Which?"

ARE you fond of the domra, or do you prefer the goosli? Personally, I must admit that I cannot distinguish t'other from which, but I enjoy hearing these ancient Russian musical instruments all the same. Their weird music, played by M. Vladimoff's Balalaika Orchestra, suggests a romantic origin; but they are even more wonderful than they sound, for they were evolved by ancient wandering tribes from Persian and Arabian sources.

* * *

Cape Town Calling.

CAPE TOWN'S new broadcasting station —which opened on September 15th, on a wave-length of 375 metres—has been modelled upon 2 L O. A Marconi 6 kw. transmitter is used, in conjunction with the latest type of microphone, such as has been fitted at Belfast and Brussels. The station is situated on a store in Adderley Street.

* * *

Broadcasting at Sea.

IT is not generally known that broadcast reception on board ship is hedged round by regulations. A separate licence is necessary, and so is a separate aerial; the ships' main aerial being exclusively reserved for official purposes. There must be no connection of any kind between the broadcast receiver and the ship's main wireless set, and the operator must not under any circumstances listen-in to broadcasting when he is on duty.

* * *

Radio Booming.

SOME idea of the spread of broadcasting can be gained by the orders for transmitting plant lately received by the Marconi Co. In addition to a station shortly to be erected in Sweden, they have recently dispatched installations to Belfast, Brussels, Cape Town, Durban, Lima, Rome, and Rio de Janeiro.

Manchester's Change.

MANCHESTER'S new studio (in the Parsonage, off Deansgate) will probably be open before the end of the year. A "Round" microphone is being installed there, but the actual transmitting will still be done at Dickinson Street, as at present.

* * *

For D X Listeners.

MAKE a note of Tuesdays and Fridays if you wish to know the best time for long-distance reception of the B.B.C. stations. On these evenings one of the provincial stations will continue transmitting for half an hour after the others have closed down for the night.

* * *

5 X X's Fate.

CHELMSFORD'S ultimate fate is still uncertain, but at present the arrangement continues whereby 5 X X gives one provincial programme per week, and for the remaining evenings relays 2 L O. Rumours about a new site in the north Midlands should be disregarded, and I am inclined to think that the original estimate of a site 35 miles north-west of London will be very near the mark.

Mr. Godfrey Isaacs, managing director, Marconi's Wireless Telegraph Co., Ltd.

The Millionth Licence.

ARE *you* the one person in a million? Just about the time these lines appear in print some perfectly ordinary person will walk into a perfectly ordinary Post Office and ask for a wireless licence—and he will, unconsciously, receive not an ordinary licence at all, but the *millionth* licence issued by the Postmaster-General. Nobody will ever know, of course, but I have a feeling that he will straightway put it into a pocket that is bulging with a copy of "P.W."!

* * *

A Phenomenal Feat.

NEW ZEALAND amateurs are favoured mortals, for the ether at the Antipodes is not yet very congested, and long-distance results are quite the rule "down under." Their latest is a phenomenal feat—a two-way conversation with "fans" in California, 6,000 miles away!

Broadcast Plays.

BROADCAST plays will have to improve if they are ever to become popular. Much has been said about the advantages of no scenery and no distractions in broadcast drama; but where the spoken word must convey the whole impression to the audience, the voice, tone, and diction, should be perfect to compensate for the lack of vision.

* * *

Hurried Speeches.

IN the plays recently broadcast by the B.B.C. these conditions have not been fulfilled. Instead of a few dramatic and telling words, building up a picture in the mind, listeners have heard hurried speeches, apparently read out of a book. And in broadcasting the failure to hear every word easily is just as annoying as sitting in a theatre where the stage is out of sight.

* * *

Air Ministry Experiments.

SECRET experiments have recently been carried out by the Air Ministry with the object of detecting the presence of aeroplanes at a distance. Very little is known of the result, except in official circles; but I hear that they were startlingly successful as regards the distance and accuracy of the position-finding.

* * *

Possibilities of Rugby.

SPEECH between New York and London telephone subscribers is one of the possibilities which the new P.O. Station at Rugby will offer. Official estimates of the hours of service, etc., are very cautious; and considering that Rugby will have 200 kw. to play about with, it just shows how extremely good the low-power results obtained by wireless amateurs have been.

* * *

Wireless in the Arctic.

THE Oxford University Expedition has returned to the Tyne after a successful survey of North East Land, which was traversed for the first time. Wireless was an important aid to the expedition, and I hope that Mr. George Binney, the leader, will tell us from 2 L O of his experiences, and of how the party listened-in to the B.B.C. stations 2,000 miles away.

* * *

Gentle Persuasion.

THE eagerly-expected broadcasting of the Zoo, which takes place to-day (Friday) at 5 p.m., will be a triumph of strategy. At first nothing would induce the hyena to laugh before the microphone. But one day a keeper discovered that he couldn't resist chuckling at the sight of a ham-bone. He begins to grin as soon as he sees the knuckle end, and if there happens to be a paper frill on it, he—well, you must listen-in to understand just how tickled he feels about it.

* * *

Arrangements for New Relay Stations.

THE B.B.C.'s remaining relay stations are being settled satisfactorily, and the Stoke-on-Trent station is rapidly nearing completion. It will be opened on October 15th, and the Dundee Station will commence operations about a month later.

ARIEL.

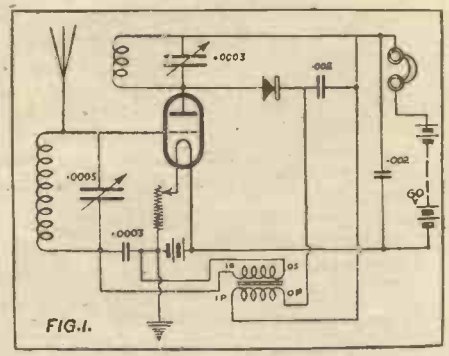
HOW TO CONSTRUCT AN EFFICIENT THREE-VALVE RECEIVER EMPLOYING DUAL AMPLIFICATION.

By E. CHATTERTON, B.Sc. (Eng.).

Results obtained on test with this set have been found to be very good indeed, and Mr. Chatterton's receiver is to be recommended to all constructors.

THE receiver about to be described has been evolved as the result of some months' research with dual amplification circuits, and as the results obtained with this circuit are extremely good, it is thought that a few notes on the design of the apparatus may be of interest.

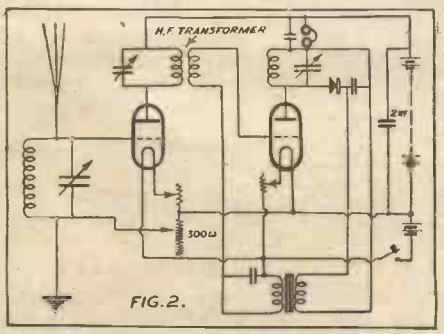
The first dual amplification circuit tried



by the writer was one employing a single valve with crystal detector, and this gave excellent results. Many circuits of this type are now well known, and most of these will give strong signals over quite long ranges, providing that reasonable care is taken in construction. A very successful circuit is that shown in Fig. 1, the anode coil being coupled with the A.T.1. to obtain reaction.

Not Very Successful.

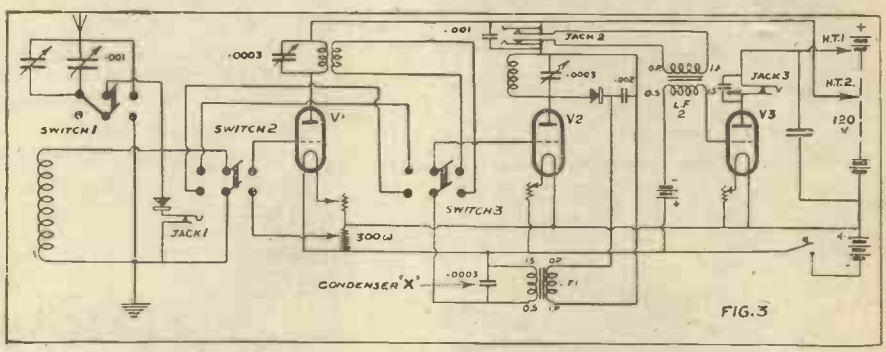
In view of the results obtained with these single-valve circuits, an effort was then made to employ two valves as dual amplifiers, still retaining the crystal detector. Many circuit arrangements were tried, including some which were reputed to have been used successfully in America, but in each case the results obtained were disappointing. Signals were extremely good on stations up to about 30 miles distant, but beyond this range results were poor.



The conclusion was therefore arrived at that the high-frequency side of a receiver in which two valves are used as dual amplifiers is seriously impaired. In addition, all the two-valve dual circuits tried showed a marked tendency towards low-frequency oscillation, and in most cases the degree of amplification had to be seriously reduced in order to obviate this tendency.

The Switching Arrangements.

The next stage in the series of experiments was to try out circuits employing one valve as a high-frequency amplifier, followed by one valve dual with crystal detector. For coupling the high-frequency and dual valves the tuned anode method was first tried, and good results were obtained in this way. When this method is employed a radio choke coil must be included in the grid circuit of the second valve, the size and construction of which require extreme care. An attempt was then made to eliminate this choke by using



transformer coupling, and the circuit shown in Fig. 2 was finally arrived at, the anode coil being coupled to the aerial.

Using this circuit all the British and the chief French stations were heard at good strength in telephones in Central London, 2 L O—2 miles away—working a medium-sized loud speaker very well. All these results were obtained using a single wire indoor aerial 30 feet long, and the gas-pipe as an earth.

The next step was to add a stage of note magnification, and this brought in all the above stations on the loud speaker, London, Glasgow, Bournemouth, and Paris coming through with remarkable strength.

The complete three-valve circuit is shown in Fig. 3, and from this the following points will be noted. First, a potentiometer is incorporated for controlling the normal operating potential on the grid of the high-frequency valve. This should be worked as near as possible to the negative end, and will be found extremely useful for controlling oscillation.

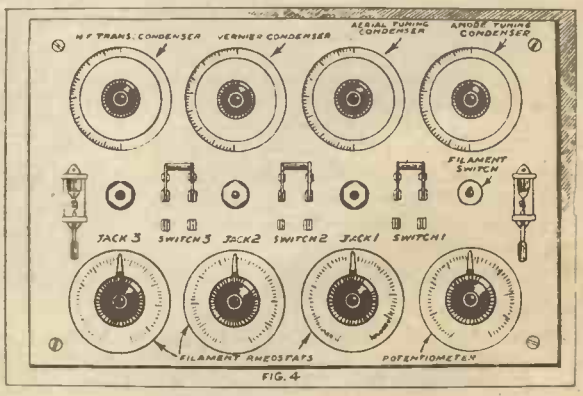
Secondly, grid cells are employed to impress a potential on the grid of the low-frequency valve, which is negative with respect to the negative end of the filament.

Using an ordinary Mullard Ora or Ediswan A.R. valve, it was found that a negative potential of about 2·5 volts, with a plate potential of about 120 volts gave best results. This plate voltage is much higher than that required for the high frequency and dual valves, which require about 60 volts, and a separate high-tension lead is, therefore, provided for these valves.

Thirdly, in order to obtain economy in working, switches and jacks are incorporated by means of which valves which are not required can be cut out. It will be seen that a separate crystal detector is included, making it possible to work with a plain crystal set, without the introduction of complicated switching arrangements.

Disposition of Components.

A front view of the receiver as constructed



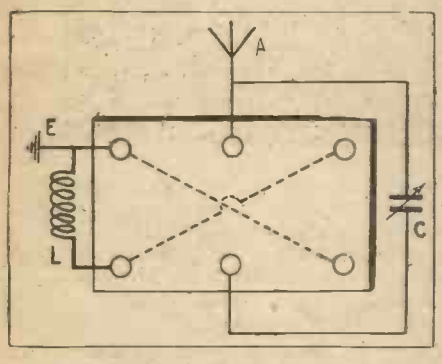
by the writer is given in Fig. 4. This is drawn to scale, the panel being 15 in. long by 10 in. wide. All terminals are carried on

(Continued on page 228).

TWO MORE TECHNICAL TIPS.

A Combined A.E. and Series Parallel Switch—A Simple Lightning Arrester.

WHEN sets are made up which are fitted with series-parallel switches in the aerial tuning circuit, it is unnecessary to provide an additional aerial-earthing switch for use during lightning. The series parallel switch normally



has a dummy contact, and this contact can be made use of as follows:

Remove the ebonite bar which joins the switch arms, so that each arm can be moved individually. Then connect up the aerial (A), earth (E), inductance coil (L), and variable condenser (C), as shown in the diagram (internal switch connections are shown dotted, and external connection of components shown as full lines).

1. When top switch arm is to left, the aerial is earthed, and no harm can be done to the set by lightning.

2. When bottom switch arm is to left, the aerial inductance and condenser are in series.

3. When both switch arms are to right, the aerial inductance and condenser are in parallel.

In cases 1 and 2 the arm which is not in use is left vertical.

If any reader has a single pole double-throw switch which he uses for earthing his aerial, but does not use a series-parallel switch on his tuning condenser, he can add the latter improvement to his set by simply using an additional single-pole double-throw switch and connecting up the two switches, as in the diagram.

A SIMPLE LIGHTNING ARRESTER.

By F. G. WHITE.

A CHEAP yet efficient lightning arrester may be constructed quite simply as shown in Fig. 1. It consists mainly of two pieces of saw-blade, A A, each about 2 in. long, softened and drilled at the ends to receive the No. 4 B.A. screws, B, which are passed right through the baseboard and fittings from the back, being provided with double nuts and washers to serve as terminals. The two distance pieces, C, and baseboard, D, should be of ebonite or vulcanised fibre, countersunk holes being provided in the latter for fixing screws.

This lightning arrester is not intended

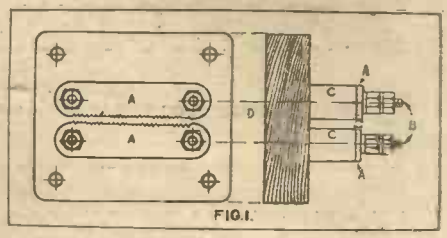


FIG.1.

to take the place of the usual knife switch, but should be connected in parallel with it, as in Fig. 2, to act as a safeguard in case the switch happens to be left in the "on" position, care being taken, when fixing, to keep the earth wire as short as possible, and to avoid sharp bends which would offer a big resistance to the passage of the high-frequency lightning discharge.

It is sometimes possible, during a thunderstorm, to watch minute sparks jumping the gaps between the teeth, but the lightning discharge is so freakish in its manifestations that no form of protection can be stated to be *absolutely* safe.

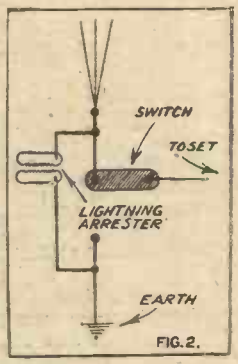


FIG.2.

AN EFFICIENT THREE-VALVE RECEIVER.

(*Continued from page* 227.)

a horizontal panel at the back of the cabinet, this panel being supported by two brackets from the front panel. The valves are also carried on the back panel, as shown in the back view in Fig. 5. This system makes for a very neat and compact receiver, but great care must be taken with regard to the arrangement of components and with wiring.

The back panel is 15 in. long by 6 in. wide, and is supported so that the distance from the face of the front panel to the back edge of the horizontal panel is 9 in., and the cabinet arranged so as to enclose everything but the back row of terminals, the coil holder, and the H.F. transformer.

Operating the Set.

When first trying out the receiver, the switching arrangements will be found extremely useful, as any trouble which may be experienced can be immediately isolated to one section of the apparatus, and in this way quickly located.

The following method is recommended when first trying out. The high-frequency valve should be switched out, and the telephone plug placed in the jack, which cuts out the low-frequency valve. We are then left with an ordinary one-valve dual and crystal circuit, and, providing that the wiring diagram has been correctly followed, no difficulty should be experienced, the circuit being extremely stable. The connections to the crystal detector should be reversed to see which way gives the best results, and the plate and filament voltages regulated so that a howl is heard in the phones as soon as the crystal contact is broken.

When the dual circuit is working properly the note magnifier should be brought into action by transferring the telephone plug to jack 3, when signals from the local

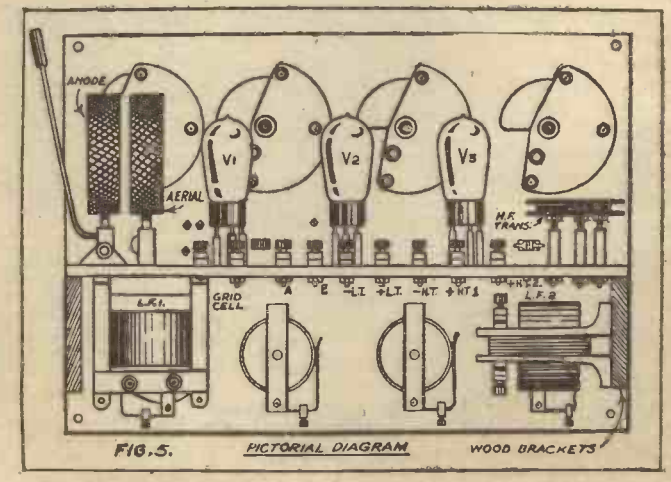


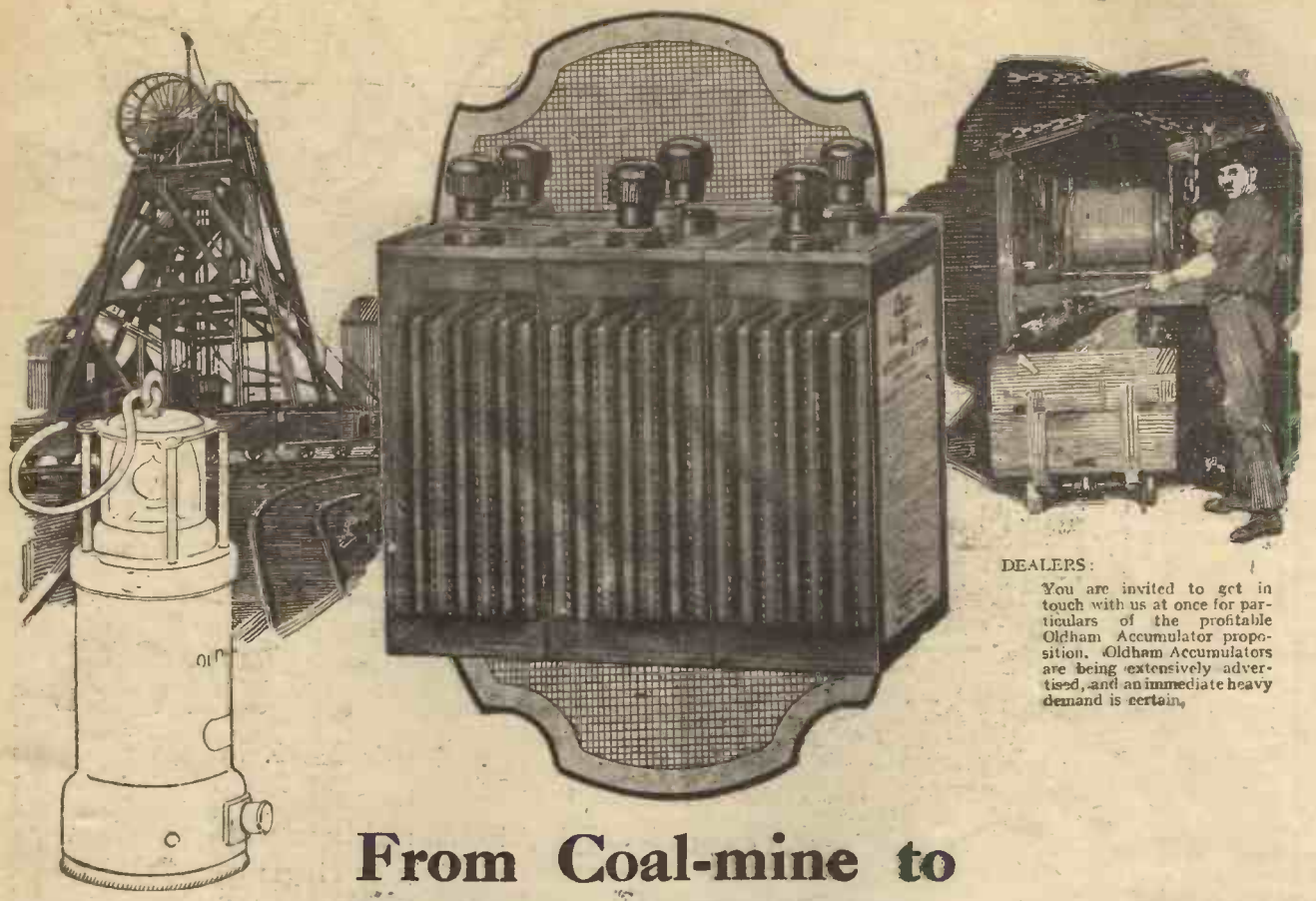
FIG.5. PICTORIAL DIAGRAM WOOD BRACKETS

broadcasting station should be received at good loud-speaker strength. The method of connecting the second low-frequency transformer which usually gives best results is indicated in the diagram, but if a howl is heard as soon as the note magnifier is switched in, the primary or secondary connections to this transformer should be reversed. If this is not effective a larger condenser should be substituted for that marked "X," which is in the grid circuit of the dual valve.

The negative potential on the grid of the low-frequency valve should be varied from 2 up to 4 volts, the high tension voltage being increased as grid bias is increased. As previously stated, with a 4-volt valve of ordinary type a negative potential of about 2·5 to 3 volts will usually be advisable, using a plate voltage of about 120.

The note magnifier should now be switched out and the high-frequency valve brought into operation by means of the switches. The connections to the high-frequency transformer should be varied to find which method gives most efficient coupling.

Any tendency to self-oscillation can be controlled by use of the potentiometer, but if the grid of the high-frequency valve is made too positive, grid current will flow which will give rise to distortion.



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You are invited to get in touch with us at once for particulars of the profitable Oldham Accumulator proposition. Oldham Accumulators are being extensively advertised, and an immediate heavy demand is certain.

From Coal-mine to Radio Receiver.

IT is difficult to imagine a more arduous test for an accumulator than the gruelling conditions in the interior of a Coal-mine. Long hours of continuous lighting and hard knocks are the inevitable lot of the Miner's Lamp. And yet for the electric lamp to supersede the old Davy Lamp, it must possess long life and be thoroughly dependable under all conditions. Failure would mean not only increased working costs, but would also create a dangerous loss of confidence on the part of the men working below.

To the miner his lamp is as precious as his eyesight. In a crisis its inability to provide light in plenty may mean the difference between life and death.

Small wonder, then, that the years spent in bringing the Oldham Miner's Lamp to perfection has resulted in the evolution of an entirely new process for the manufacture of accumulator plates. The magnitude of its success can be gauged by the fact that over 50 per cent. of the electric Miners Lamps in use to-day are of Oldham manufacture.

This same *special activation process* is now being applied to Accumulators for Wireless use. As every amateur appreciates, he expects from his accumulator a two-fold service; a constant and absolutely unvarying supply of current, and a long life between charges. This work devolves entirely upon the plate; making a better plate means, therefore, a substantial improvement in the accumulator. And Oldham Accumulators—although not previously advertised in these pages—have already obtained a tremendous reputation among wireless experts and critics who are in a position to descriminate. When you purchase your next Accumulator, therefore, it will pay you to see that it is an Oldham—most good Dealers stock them.

In spite of its greatly increased life and superior construction, it costs no more than an ordinary Accumulator.

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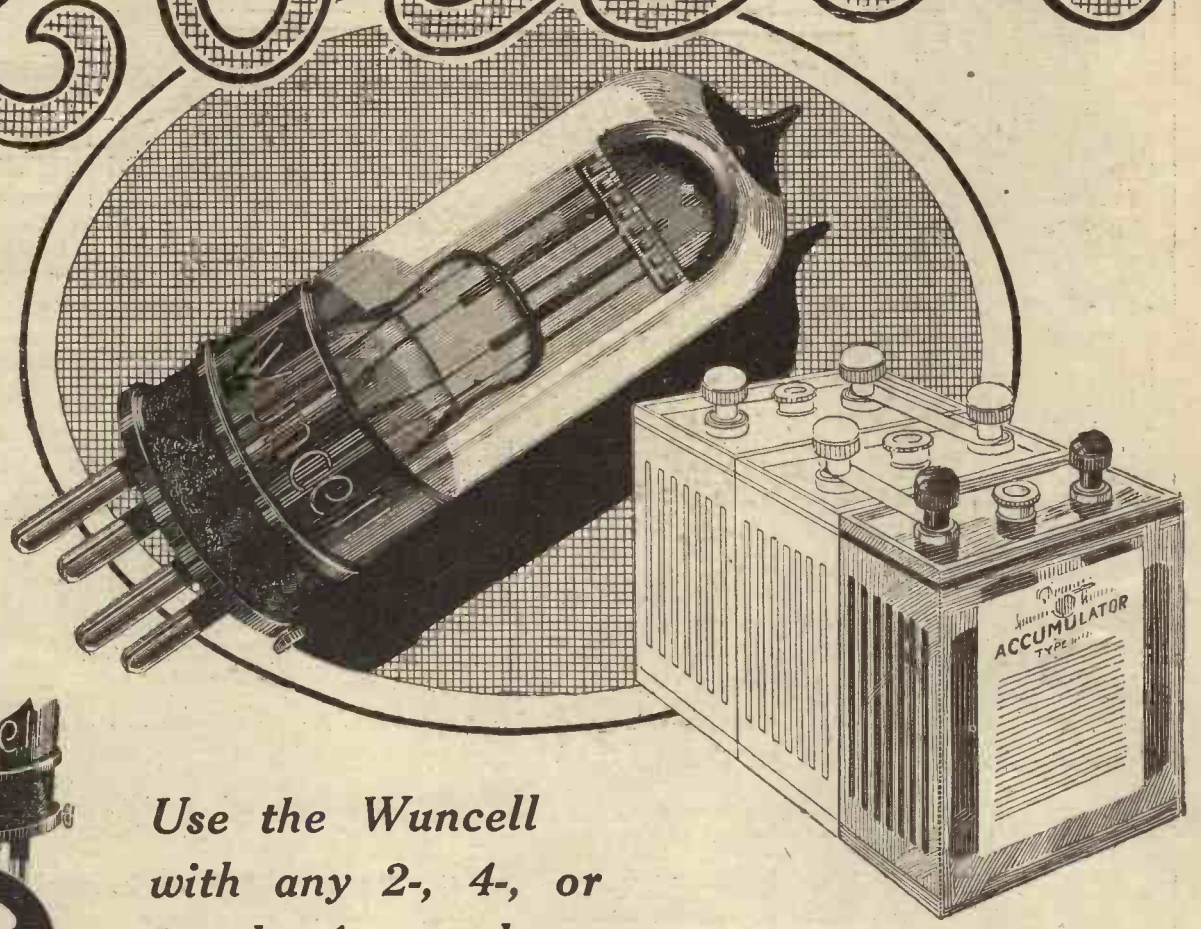


Illustration showing special Wuncell ebonite base. When milled head is screwed home it makes contact with filament leg and short circuits the resistance.

Use the Wuncell with any 2-, 4-, or 6-volt Accumulator

MOST Valve Receivers to-day use more than one Valve and when a wireless enthusiast wants to change over to Dull Emitters he has two alternatives: firstly to scrap all his existing valves and put in a complete set of Dull Emitters, or, secondly to readapt his Set so that his one new Dull Emitter will operate off the same 6-volt accumulator. The first method is prohibitive in cost and the second is troublesome.

Now, however, the new Cossor Wuncell Dull Emitter comes along with a complete solution. Concealed in its base is a special resistance which is in circuit with the filament, so that any Wuncell can be used along with ordinary bright emitter valves from the same 4- or 6-volt accumulator without alteration to Set.

When, however, the last of the bright emitter Valves, in its turn, has been replaced with a Wuncell, all the resistances can be put out of action (by means of the small milled head) and the cells of the accumulator wired up in parallel to give two volts and its capacity trebled.

This is only one of the many exclusive advantages of the Wuncell. Next time one of your Valves fail—buy a Wuncell and get better reception at a fraction of your present upkeep cost.

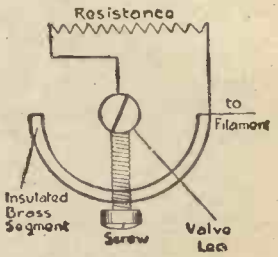
Sold in 3 types:

W 1. For Detector and L.F. use.

W 2. (With red top) for H.F. use.

W 3. (With green top) for Loud Speaker.

21/-



Theoretical diagram showing resistance attached at one end to Valve leg and at the other to insulated brass segment. When milled head is screwed home resistance is short circuited.

¶ *Large interesting Folder on the Wuncell sent free on application.*

Descriptive Folder free on application

Dull Emitter Wuncell

See our Stand at the Wireless Exhibition at the Royal Albert Hall

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

Gilbert Ad 1512

THE STORY OF SELENIUM.

NATURE'S WONDER ELEMENT.

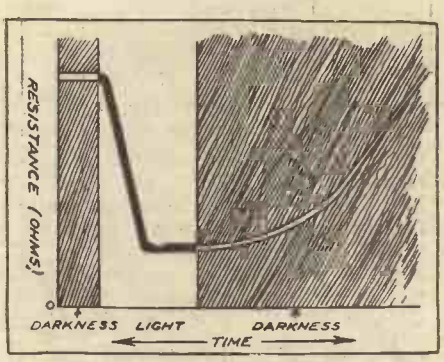
By J. F. CORRIGAN, M.Sc., F.I.C.

This very interesting article on the origin, nature, and properties of Selenium will prove useful to amateurs conducting experiments in Radio Photography or Radio Vision.

ALTHOUGH selenium is not used for the purpose of wireless rectification, it is, nevertheless, a most remarkable substance, and during the last quarter of a century it has found many uses in the realms of applied electricity.

The most remarkable thing about selenium is, of course, its well-known property of decreasing in electrical resistance when exposed to light, and it is on account of this fact that so much interest has been taken in it by radio scientists and electrical investigators generally.

A practical and workable system of television, with all its latent possibilities,



may very feasibly be perfected by the agency of selenium, and it is because of the direct possibility of this fact that the material presents such a good deal of interest to the radio experimenter.

How It Got Its Name.

It is not the purpose of this article to enter in any great detail into the various electrical uses to which selenium has been put. Rather, it is intended to give an account of the nature of the remarkable substance, and to describe a few points of general interest concerning it.

Selenium, of course, is an element; that is, it is a substance which cannot by any known means be split up into anything simpler. The circumstances under which it received its name have a certain interest about them, and are well worth a brief notice here. The name "selenium" is derived from a Greek word which signifies "the moon." Selenium was discovered during the early years of the last century by the great chemist Berzelius, and, of course, when it became finally identified as a new element, a name had to be found for it.

Looking back on the then recent discoveries, Berzelius noted that the previously discovered element had been called "tellurium," meaning "the earth." Now, in certain respects, this newly discovered element of Berzelius was found to be very like tellurium, and so what could have been happier in conception than Berzelius' choice of the name selenium with which to designate his new element, and at the same time to indicate its resemblance to tellurium?

Selenium is not a common element. In fact, in some parts of the world it is quite scarce. It is contained in certain rare minerals, such as Crookesite, Naumannite, Clausthalite, and Zorgite; but these minerals are not very often come across.

Despite the fact, however, that selenium is not a commonly occurring element, it can often be found in very small quantities in many common minerals. For instance, some varieties of native sulphur contain traces of selenium. The element is sometimes found in specimens of galena, and it exists to the extent of rather less than ·1 per cent in many kinds of pyrites.

Where It Comes From.

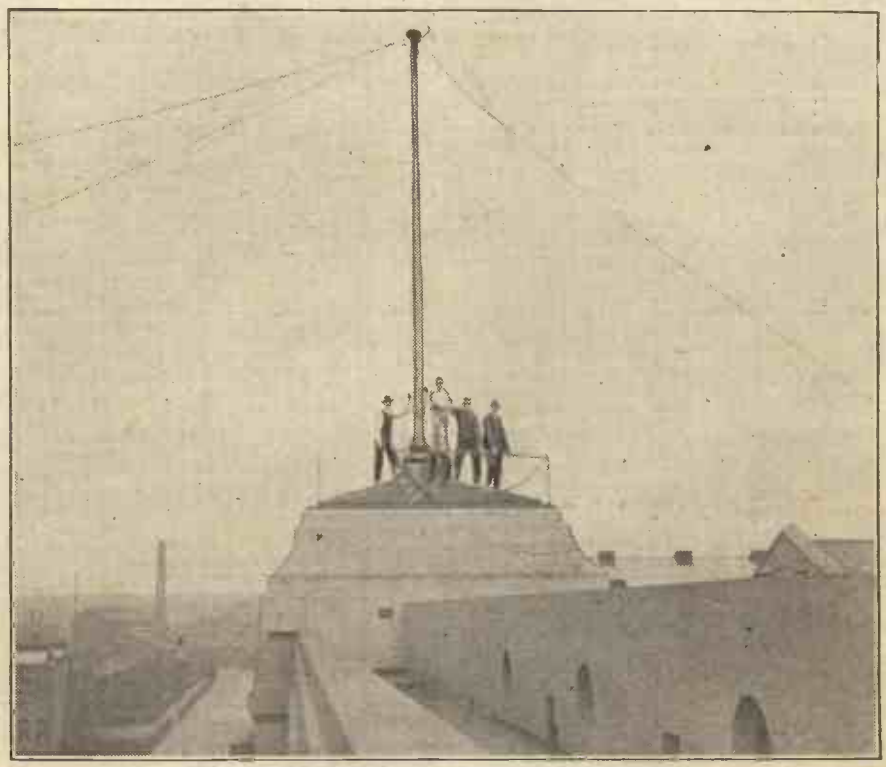
The latter mineral is the source from which most of the selenium of commerce is obtained. Iron pyrites is used in the manufacture of sulphuric acid—a very important industrial commodity—and during the process a sort of sludge or slime is deposited on the bottom of the acid tanks. This acid sludge is often very rich in selenium, which has been obtained and concentrated in it from the seleniferous pyrites, and, generally speaking, it constitutes the material which is worked up to produce commercial selenium.

In Its Pure State.

If the reader resides in the neighbourhood of an acid manufactory, or a chemical works in which sulphuric acid is made, he will probably be able to obtain some of this "chamber deposit," as it is called, for the asking. If there is a good deal of selenium in it, it will be deposited in the form of a brick-red powder on pouring the sludge into water. If, however, the acid slime only contains a small amount of selenium, the element will most likely not be deposited on pouring the material into water, and more complex methods of extraction will have to be employed. Selenium, of course, can always be obtained in a pure state from any good firm of manufacturing chemists, and many dealers in rectifying minerals stock the material.

We have already seen that selenium resembles tellurium in many ways. It is also like sulphur in some respects. One very obvious point of resemblance between selenium and sulphur can be seen in the fact that, whilst sulphur can be made to combine with oxygen and hydrogen to form the well-known sulphuric acid, H_2SO_4, selenium

(*Continued on page* 234).



Removing 5 I T's Aerial from the G.E.C.'s Flagstaff at Witton.

A DOUBLE-REFLEX RECEIVER.

From a CORRESPONDENT.

THE instrument described in the following article makes use of dual amplification on both valves, thus giving two stages of H.F. and two L.F.

The popularity of dual amplification circuits is ever increasing, and, with a little care in construction and wiring at the outset, extremely good results can be obtained.

The Fixed Condensers.

The circuit described below gives a very high degree of amplification, and is comparatively easy to handle despite the seeming multitude of controls.

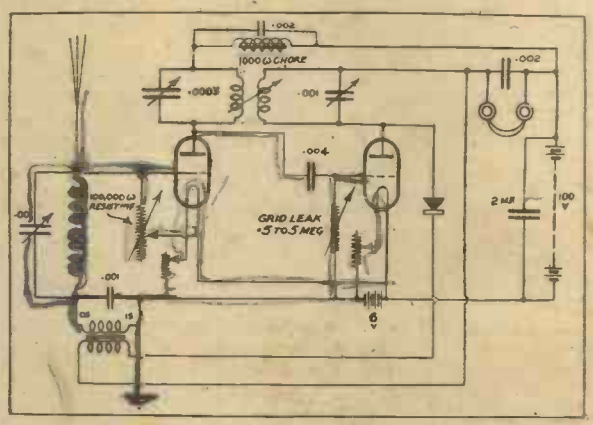
Many readers are already familiar with the principles of dual amplification, but a little explanation of the following circuit will no doubt be appreciated.

The incoming signals are impressed on the grid of the first valve, which acts as an H.F. amplifier. The high-frequency potentials are communicated to the grid of the second valve via the grid condenser and further amplified before being rectified by the crystal. The grid leak is shunted across the grid and negative of the filament accumulator to enable any excess of electrons to leak away.

The L.F. impulses are now fed back to the grid of the first valve through the L.F. transformer. The first valve now acts as an L.F. amplifier, an iron-core choke being included in the plate circuit, shunted by a fixed condenser of ·002. The object of this condenser is to by-pass the H.F. oscillations. The L.F. potentials which are induced across the ends of the choke are communicated to the grid of the second valve via the grid condenser. (This condenser should have a capacity of at least ·004, as it has to carry both currents.)

The L.F. oscillations are now further amplified and passed to the 'phones or loud speaker. The variable 100,000 ohm resistance across the grid and filament of the first valve is for stabilising the circuit should this be found necessary.

As the fixed condensers play a very important part in dual circuits, the constructor should, if possible, experiment with different values, as variations will occur with different components and lay-outs.



Some Results Obtained.

The circuit is very selective, and on an average outside aerial all B.B.C. stations have been received at good loud-speaker strength, and cutting out the local station (5 S C), three miles distance, without the aid of wave-traps of any description. Various Continental stations can be brought in at good 'phone strength, Paris being distinctly audible on the loud speaker. At 20 miles on a 3-ft. frame aerial great volume has been obtained from the loud speaker.

SELENIUM, THE WONDER ELEMENT.

(*Continued from page* 233.)

also gives a similar compound—selenic acid, H_2SeO_4, a peculiar characteristic of which lies in the fact that it is the only single acid which is able to dissolve gold.

Sulphur exists in many different forms, or *allotropic modifications*, as they are called. Selenium also exists in several different forms, but for all practical purposes the different varieties of selenium may be classified under the headings *amorphous*, *crystalline*, and *metallic* selenium.

Amorphous selenium contains many of the minor varieties of the element. Crystalline selenium is the name which is given to the well-known brick-red powder in which form the material often makes its appearance, whilst the "metallic" form of the element is the one which exhibits the remarkable effect of varying resistance according to the intensity of the light which falls upon it, and which, from the point of view of the wireless experimenter, is by far the most important.

What Selenium Can Do.

Metallic selenium is a black-looking substance which, if very finely powdered, acquires a dull brick-red colour. If any of the other varieties of selenium are heated (out of contact with air) to about 220° Centigrade, they are all converted into the metallic form of the element. When heating selenium in order to prepare the metallic variety, it is very important to carry out the process in a sealed tube, otherwise the selenium will take fire and, like sulphur, will burn with a pale-blue flame; but, unlike the latter element, will give off very disagreeable fumes.

The property of altering in electrical resistance when exposed to light which is possessed by metallic selenium has been known for about fifty years, and many have been the uses to which it has been put. The photophone, an instrument for transmitting sound over a beam of light, depends upon this peculiarity of selenium; and another effective application of this property of the element has consisted in the construction of a device for automatically controlling the illumination of buoys which are anchored far out at sea. The utilisation of selenium in the attempts at television is, therefore, only one of the recent applications of this curious element.

Its Curious Uses.

The metallic variety of selenium very quickly increases in electrical conductivity when it is exposed even to subdued daylight, and in many cases its resistance diminishes by more than half. Why it should do this is not at all clear, but it is generally supposed that the action of light upon the material brings about the formation of a variety of selenium which is of a highly conducting nature, and that when the light stimulus has ceased this very conductable form of selenium is resolved once again into the former variety. There are, of course, several objections to this theory; but, after all, it is about the most reasonable one which has been put forward, and the one which seems to give the most satisfactory explanation of the facts.

It has been found that not all kinds of light act on selenium with the same intensity. Orange and red rays give the greatest effect, whilst blue rays of light appear to produce rather the opposite results. Another peculiar fact is that non-luminous heat rays—"infra-red rays"—do not produce any electrical effect in the selenium.

Although the resistance of selenium may be very quickly diminished by exposing it to light, the return to the original resistance when the source of light has been cut off is a much more gradual process. There is a certain lag in this direction which is rather unfortunate, for if the selenium instantly returned to its original resistance after it had been exposed to light and subsequently returned to darkness, many of the practical difficulties which now beset its successful application in electrical work would be rendered non-existent. Traces of lead, platinum, silver, or gold, when admixed with the selenium, help, to a certain extent, to overcome this difficulty; but a form of selenium which reacts instantaneously and satisfactorily to variations in the intensity of light or darkness has yet to be discovered.

There are one or two other curious uses of selenium which are worth mentioning here, although they have no connection with radio science.

A minute trace of selenium, when incorporated in ordinary green glass, is able to "bleach" or neutralise the tint of the glass, and so render it more valuable. Selenium is also used in the production of purple and reddish enamels and glazes.

The "Wonder Element's" Future.

Truly, selenium has many curious uses. It possesses functions which are as yet little understood, but which are already capable of being applied in many different ways. The crowning triumph of its application would, of course, be in the realisation of practical television by its means. Just as silver nitrate was at the beginnings of the discovery of photography, in a similar manner selenium has been the material with which the experimenters in television have worked with. Surely there is a future of promise for selenium, the wonder element?

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"COSMOS" 2-VALVE SET In simple case, £11 With all accessories, £18

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THE "COSMOS" RADIOPHONE VALVE SETS which received universal approbation last season are also continued for the coming season at **REDUCED PRICES.**

COSMOS RADIO

HAVE you been to the "All-British" Wireless Exhibition at the Albert Hall? If so, no doubt you were more than interested in Stand No. H.31, where you saw the new "Cosmos" Universal Valve Sets; designed for reception from both British and Continental Broadcasting Stations.

You observed the neat manner in which the change is effected from one waveband to another; you saw how Reaction coupling on to the anode or aerial circuit is changed at will, by the movement of one lever—*a feature that is exclusive to the "Cosmos" Sets*; you noted, in all probability, how the special dual-amplification and resistance-capacity coupling gives great sensitiveness and large amplification with distortionless reproduction; you saw the double wound filament rheostats which allow for the use of either Bright or Dull Emitter Valves; and you appreciated the splendid appearance and workmanship of the various styles.

If you were unable to go to the Exhibition, ask your dealer to show you the "Cosmos" Universal Valve Sets and write for our pocket list P.P. 7117/2, or the complete Catalogue and Handbook P.P. 7117/1 (Price 6d.).

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(Proprietors: Metropolitan-Vickers Electrical Co., Ltd.),

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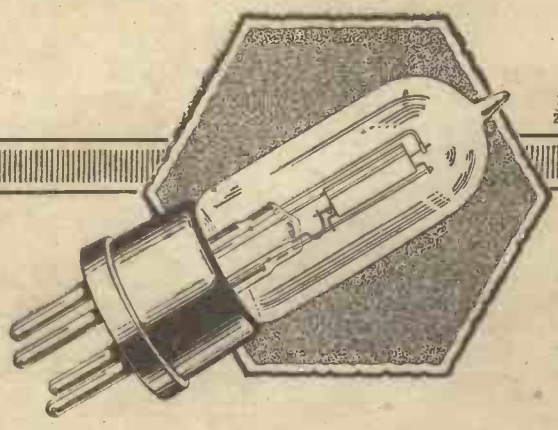

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Make your valve replacements with the "COSMOS" Type D.E.11 Dull Emitter Valve **25/-**

Get the Valve in the Purple Box!

—and ensure perfect reception. Remember that valve sets are only as good as the valves used in them.

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are the valves sold in the familiar purple box. They are the valves which bear the name "Marconi"—the valves made at the famous Osram Works. These two great names—Marconi and Osram—are your positive assurance of perfect performance.

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ROYAL ALBERT HALL
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Announcement of The M.O. Valve Co., Ltd.

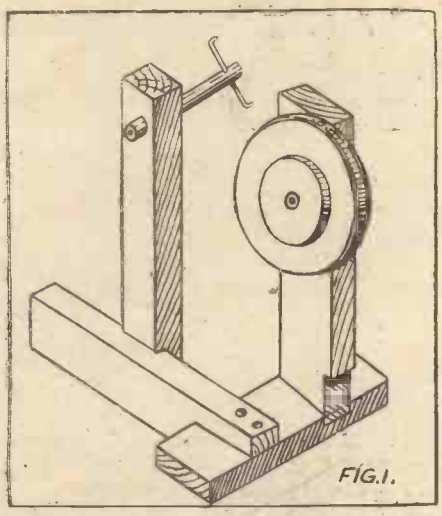
SIMPLE APPARATUS

FOR COIL WINDING.

By J. H. WOOD.

The practical advice given in this article for the winding of coils, etc., will prove very useful for those amateurs who are continually building or re-building sets and who experiment with different types of coils.

THE writer possesses a German field telephone receiver, and desired to re-wind the magnet coils for an experimental loud speaker, and, after stripping, each bobbin was filled with an equal number of turns of No. 47 enamelled copper wire, with but a single break during the winding of one bobbin, the time taken being approximately two hours.



Everything Helps.

A sewing machine, which, on test, was found to give three revolutions of its six-inch flywheel to one complete rotation of the handle, was pressed into service to drive by frictional contact the pulley of the apparatus. This pulley was made exactly four inches in diameter, so that for one complete turn of the sewing-machine handle the bobbin rotated through four and a half revolutions.

Three inches would have given an exact number of complete turns, but was an inconvenient size, since the pulley edge would not reach far enough over the sewing machine base to make good frictional contact without complicating the construction.

A narrow strip of cycle tube was stretched and held taut with gimp pins round the edge of the pulley, and, although slip was expected, actually, in practice, it was found that by keeping the pulley in fairly hard contact with the fly wheel, none occurred, hence calculations as to the number of turns on the bobbins were reliable.

A pictorial view of the apparatus is given in Fig. 1, while Figs. 2 and 3 show an elevation and side elevation of it. A piece of batten was prepared, 9 in. long, 2 in. wide, and 1 in. thick, and a groove, 1 in. wide and $\frac{1}{4}$ in. deep, made across the width 2 in. from one end, as seen in Fig. 4. Into this groove a standard or upright, 8 in. high, $2\frac{1}{2}$ in. wide, and 1 in. thick, was fitted tightly and nailed, the front edge being allowed to overhang in order to pass the sewing-machine base, Fig. 5.

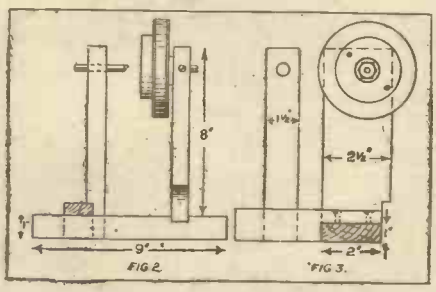
Two and a half inches from the standard a supporting bearer, notched out on the edge, as in Fig. 6, was screwed across the width of base, to enable it to stand erect, while the coil reel support, 8 in. by $1\frac{1}{2}$ in. by 1 in., similarly notched out across its width, was screwed in position as seen in the first figure. The apparatus must be rigid, hence, although the work *may* lack finish up to this point, it must at all events be strong.

The Bearings.

A piece of inch board was next planed quite flat, and a circle of 4 in. diameter was very carefully struck out, bow-sawed round, and spokeshaved to the line. A lathe was not available for use, or the work could have been turned out more accurately, and with greater ease.

Two pieces of brass sheet for bearings, each $1\frac{1}{2}$ in. by $\frac{3}{4}$ in., were drilled in the centre to take a $\frac{5}{16}$ in. diameter brass rod, two more small countersunk holes being made for fixing to the back and front of pulley. Care in fixing these plates is necessary, since any inaccuracy may lead to eccentric running, consequent jarring, and breakage of the fine wire through unequal pull.

One end of the brass rod mentioned had a nut screwed on and soldered in position, while the other was flattened by filing for about an inch of its length. See details in Fig. 7.



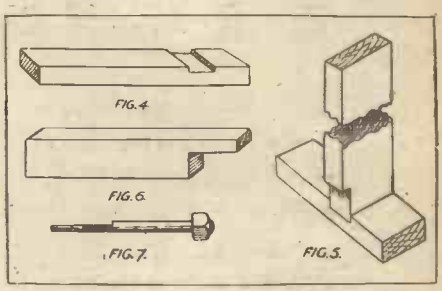
A hole was next drilled for the rod through the wood standard, $7\frac{3}{4}$ in. from the lower edge of the base, and $\frac{5}{8}$ in. from the edge, the rod inserted through the pulley's plates and into the standard, where it was held by an ordinary wood screw, with the point filed off, turned in to meet the rod flat.

Two further additions to the pulley are necessary, viz.: a circular wood disc about $2\frac{1}{2}$ in. in diameter, and sufficiently thick to clear the nut, and a strip of rubber, $11\frac{1}{2}$ in. long, stretched round the periphery and fixed as already described.

The Worst Job.

It was found that an ordinary lead pencil, scraped and filed, fitted easily into the reel upon which the fine-gauge wire was purchased, the other end of the pencil passing through a $\frac{5}{16}$ in. hole in the reel support, at the same height as the pulley centre.

To prevent the reel coming off its spindle when rotating, a piece of wire was pressed through a hole in the pencil, and bent round at the ends, to save contact between the reel and possible jagged edges, while the disc before fixing to the pulley face was smoothed over and its edges rounded.



In operation the magnet bobbin is very carefully centred and screwed to the disc on pulley face, the pulley edge brought into contact with the flywheel of sewing machine, and held there with a small cramp.

Soldering such fine wire as gauge 47 proved unexpectedly easy, and was accomplished in the following way:

The fine wire was first bared of its enamelled coating by drawing a short length of it gently once or twice between one's thumb and a piece of emery cloth. It was then dipped in flux, and wound round a cleaned piece of gauge 36, already run out of the bobbin.

A small piece of sheet copper, 3 in. by 2 in., was pointed and cleaned at one end, heated, rubbed with sal ammoniac, and tinned in soft solder, this retaining the molten solder and heat long enough to touch the connection between the two wires, when an excellent join was made.

To preserve insulation at the join, the wire was shellacked, and a small piece of very fine silk doubled over it, the winding then being proceeded with.

Speed in winding was not attempted, since, once the wire is broken, the end requires a lot of finding again, while the left forefinger was used as a guide between the wire reel and the magnet bobbin.

Actually the worst job of all was winding the fine wire round the ends of gauge 36 to make the initial and final connections—twisting a live eel into a regular helix is not in it! But then, to the amateur who says he gets New Jersey on a crystal o' nights, this would be only a tonic for jaded nerves.

BEARINGS & DISTANCES BETWEEN THE MAIN B.B. STATIONS.

Compiled by CAPTAIN W. LUKE.

RADIO amateurs, when experimenting, like to know from how great a distance their sets can pick up messages, and the following tables have been compiled, giving the distances in nautical or geographical miles and in English statute miles between all the main stations of the British Broadcasting Co.

The true bearings are also given to the nearest degree for the benefit of those experimenting in direction-finding or beam transmission.

The geographical positions used in the working are only approximate, but are sufficiently accurate for the purpose.

	Nautical miles.	Statute miles.	True Bearing.
London to—			
Aberdeen ..	343·9	395·8	N. 12° W.
Belfast ..	279·1	321·2	N. 49° W.
Birmingham	86·9	100·0	N. 48° W.
Bournemouth	80·9	93·1	S. 54° W.
Cardiff ..	137·5	158·2	S. 89° W.
Chelmsford	25·3	29·1	N. 59° E.
Glasgow ..	301·7	347·3	N. 21° W.
Manchester ..	140·4	161·6	N. 34° W.
Newcastle ..	214·7	247·1	N. 14° W.
Aberdeen to—			
Belfast ..	199·4	229·6	S. 40° W.
Birmingham	279·1	321·2	S. 1° E.
Bournemouth	384·1	442·1	S. 1° E.
Cardiff ..	342·1	393·8	S. 6° W.
Chelmsford	336·0	386·7	S. 15° E.
Glasgow ..	103·9	119·6	S. 45° W.
London ..	343·9	395·8	S. 12° E.
Manchester	220·1	253·3	S. 1° W.
Newcastle ..	130·0	139·6	S. 7° E.
Belfast to—			
Aberdeen ..	199·4	229·6	N. 40° E.
Birmingham	192·2	221·2	S. 49° E.
Bournemouth	274·7	316·2	S. 32° E.
Cardiff ..	212·7	244·8	S. 28° E.
Chelmsford	286·9	330·2	S. 53° E.
Glasgow ..	95·9	110·4	N. 36° E.
London ..	279·1	321·2	S. 49° E.
Manchester	146·8	169·0	S. 62° E.
Newcastle ..	150·6	173·3	N. 81° E.
Birmingham to—			
Aberdeen ..	279·1	321·2	N. 1° W.
Belfast ..	192·2	221·2	N. 49° W.
Bournemouth	105·0	120·9	South
Cardiff ..	77·3	89·0	S. 38° W.
Chelmsford	96·8	111·4	S. 62° E.
Glasgow ..	221·7	255·2	N. 22° W.
London ..	86·9	100·0	S. 48° E.
Manchester	60·5	69·6	N. 13° W.
Newcastle ..	150·3	173·0	S. 4° E.
Bournemouth to—			
Aberdeen ..	384·1	442·1	N. 1° W.
Belfast ..	274·7	316·2	N. 32° W.
Birmingham	105·0	120·9	North
Cardiff ..	65·4	75·2	N. 48° W.
Chelmsford	106·1	122·1	N. 56° E.
Glasgow ..	321·8	370·4	N. 16° W.
London ..	80·9	93·1	N. 54° E.
Manchester	164·6	189·5	N. 5° W.
Newcastle ..	255·2	293·7	N. 2° E.
Cardiff to—			
Aberdeen ..	342·1	393·8	N. 6° E.
Belfast ..	212·7	244·8	N. 28° W.
Birmingham	77·3	89·0	N. 38° E.
Bournemouth	65·4	75·2	S. 48° E.
Chelmsford	140·3	161·5	N. 83° E.
Glasgow ..	268·9	309·5	N. 8° W.
London ..	137·5	158·2	N. 89° E.
Cardiff to—			
Manchester	124·6	143·4	N. 16° E.
Newcastle ..	218·4	251·4	N. 15° E.
Chelmsford to—			
Aberdeen ..	336·0	386·7	N. 15° W.
Belfast ..	286·9	330·2	N. 53° W.
Birmingham	96·8	111·4	N. 62° W.
Bournemouth	106·1	122·1	N. 56° W.
Cardiff ..	140·3	161·5	S. 83° W.
Glasgow ..	301·2	346·7	N. 34° W.
London ..	25·3	29·1	S. 59° W.
Manchester ..	143·3	164·9	N. 43° W.
Newcastle ..	208·5	240·0	N. 21° W.
Glasgow to—			
Aberdeen ..	103·9	119·6	N. 45° E.
Belfast ..	95·9	110·4	S. 36° W.
Birmingham	221·7	255·2	S. 22° E.
Bournemouth	321·8	370·4	S. 16° E.
Cardiff ..	268·9	309·5	S. 8° E.
Chelmsford	301·2	346·7	S. 34° E.
London ..	301·7	347·3	S. 21° E.
Manchester	162·2	186·7	S. 26° E.
Newcastle ..	106·6	122·6	S. 59° E.
Manchester to—			
Aberdeen ..	220·1	253·3	N. 1° E.
Belfast ..	146·8	169·0	N. 62° W.
Birmingham	60·5	69·6	S. 13° E.
Bournemouth	164·6	189·5	S. 5° E.
Cardiff ..	124·6	143·4	S. 16° W.
Chelmsford	143·3	164·9	S. 43° E.
Glasgow ..	162·2	186·7	N. 26° W.
London ..	140·4	161·6	S. 34° E.
Newcastle ..	93·8	108·0	N. 14° E.
Newcastle to—			
Aberdeen ..	130·0	139·6	N. 7° W.
Belfast ..	150·6	173·3	S. 81° W.
Birmingham	150·3	173·0	S. 4° W.
Bournemouth	255·2	293·7	S. 2° W.
Cardiff ..	218·4	251·4	S. 15° W.
Chelmsford	208·5	240·0	S. 21° E.
Glasgow ..	106·6	122·6	N. 59° W.
London ..	214·7	274·1	S. 14° E.
Manchester	93·8	108·0	S. 14° W.

NOTES FROM LEEDS.

From Our Own Correspondent.

THERE are two lines from London to the Leeds-Bradford control-room in Leeds, and these, together with three lines to each transmitter and the business lines to the B.B.C. offices on the premises, terminate at the switchboard shown on the bench to the left-hand side of the photograph of the control room. By this means any line to either transmitter and any Leeds office may be plugged through to either of the London trunk lines.

The two-valve amplifier on the bench, in front of the window which looks into the studio, is used for relaying, and when local transmission is taking place the five-valve amplifier under the bench is used, making seven valves in all. Both amplifiers employ resistance capacity coupling, and that under the bench is completely enclosed in covers of sheet iron.

Next to this is a receiving four-valve receiving set which is used for controlling. Six pairs of telephones and two loud-speakers are worked by this set, which is connected to an outdoor aerial and tuned to 346 metres, the Leeds wave-length.

At Claypit Lane, Leeds, the modulated currents received from the control-room are fed direct to the transmitter, shown in the picture, but at Bradford they are first amplified by a one-valve amplifier to make up for losses on the longer land-line. At both transmitters a crystal set is used for checking.

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

A photograph of the control room at the Leeds and Bradford relay station.

"THE EFFICIENT MIND."

Free Book that Everyone Should Read.

A BOOK has been published which everyone who wishes to "get on" in life should read.

This book is entitled "The Efficient Mind," and contains a full description of the New Pelmanism, which is enabling so many people at the present time to increase their earning power, to rise to higher positions in business, and generally to improve their mental efficiency and social status.

Here are a few extracts from letters received from men and women who have taken up this famous Course :—

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"An all-round regeneration. Effort is becoming habit, the inward urge is getting a chance, and thriving wonderfully. (Lesson 2 did the trick.) Concentration is much better and interest sustained. I have changed from an easy-going, take-it-for-granted sort, to a man with a purpose and joy of achievement; and I can see that others are observing the change to my gain," writes a DOCTOR (K.30,108).

"Since taking the Course I have more than trebled my income, which is due solely to your teaching."—CLERK (L.18,150).

"Apart from the mental and physical benefits, which are very great, the Course has been a very profitable one, as I have since had two substantial additions to my salary."—CASHIER (B.19,268).

"I have increased my salary 85 per cent. since taking the Course and improved myself Intellectually and Physically. If anyone had told me they could have improved themselves as I have done, I should never have believed it."—INVOICE CLERK (B.W.175).

"I realise that the Pelman System of Mind and Memory Training is more valuable than gold, and bless the day I commenced the Course."—MACHINE WORKER (L.26,155).

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This book shows you how, by devoting a few minutes daily to a simple course of scientific Mind-Training, you can increase your Mental Efficiency, improve your Memory, widen your interests, and develop just those qualities which will enable you to succeed in life.

Just write to-day (using the coupon printed on this page) to the Pelman Institute, 97, Pelman House, Bloomsbury Street, London, W.C.1, and a copy of "The Efficient Mind" will be posted to you by return, free of all cost, with full particulars of the system that has done so much for others and the benefits of which are now obtainable by you.

"Well, dear, you were absolutely right. That course of Pelmanism was the finest thing I ever took up. I was made Manager to-day."

Why He Was Made Manager.

HE was young and ambitious. He took his work seriously. On the advice of his wife, he took up Pelmanism, spent an interesting half an hour every evening with the "Little Grey Books," and enjoyed working out the exercises. His efficiency, enthusiasm, and mental alertness attracted attention. He became confidential secretary to the Managing Director. He made several valuable suggestions which were adopted in the business. As a consequence, he was promoted over the heads of several of his seniors to the position of Manager. In the evening he returned home, treading on air, to tell his wife what this wonderful Course of mind-training had done for him.

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Name .....

Address .....

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If coupon is sent in an OPEN envelope it only needs ½d. stamp. All correspondence is confidential.

Some of the artistes who have given you pleasure when listening-in.

THERE is no lack of good dramatic fare all round the B.B.C. stations, opera, too, being capitally represented by the recent performance in the studio at 2 L O of Gounod's "Faust," under the direction of Mr. Stanton Jefferies, while comic opera, a week later, took the shape of that famous success "My Lady Molly." Much water has flowed 'neath the bridge of Time since its first stage production at Terry's Theatre in 1903, and though the poor old theatre has gone for all time, yet the play turns up as fresh as ever, without its paint and gay furbelows. But it is one that wants to be seen as well as heard, though a very adequate cast enacted it. The title-rôle was Miss Vera Lowe, who took the part made famous by Sybil Arundale, herself an ardent broadcaster in the old days, we fancy, at Marconi House, while Walter Hyde took his original part of Lionel Bland, proving that for him the years have certainly stood still.

Miss Esmé Beringer.

A Well-Used Story.

To be used for story, opera, and play is making good use of a plot, but W. W. Jacob's stories are always worthy of honour in every form. In "The Boatswain's Mate," Dame Ethel Smyth used it for her one-act opera, as a short story, and as a play it has stood the acid test of public opinion, and when broadcast recently from 2 L O, one of the best-known actresses on the stage, Miss Esmé Beringer was persuaded to take the feminine part.

Mr. Gilbert Bailey.

The eldest of a clever and famous family of writers and actresses, Miss Beringer has acted in some of the most famous plays on both sides of the world. To quote but a few, the Pinero play "The Benefit of the Doubt," "Rupert of Hentzau," "Captain Kettle," "The Night of the Party," while during the last few years she has often taken part with her sister Vera in the latter's own plays, written under the name of Henry Seton. Miss Beringer's appearance before the microphone may be regarded as another triumph for wireless.

A Famous Actor.

An equally famous "star" was captured for "Pictures from the Past" in the person of Mr. Fewlass Llewellyn. Few actors have had wider experience, for he has been in the profession for over thirty years as actor, stage-manager, producer, and playwright. He has played in nearly every town, though for the past twenty years principally in London's West End theatres—played in twenty-six of them, and in over eighty productions.

Veterans of Variety.

Old age has sometimes been termed the "unforgivable sin," but we think most listeners-in will agree that with some artistes "age cannot wither nor custom stale their infinite variety," and under such a category must come the artistes who revived the old-time variety favourites again. Under the chairmanship of Mr. Willy Rouse, we heard again dear old Dan Leno, as so wonderfully impersonated by Mr. Jaye Kaye; indeed, the writer found it hard to realise that the old Tivoli, where "The Huntsman" was heard on its first performance, was dead and gone and the clever little comedian himself with it. Ah well, as John Henry would say, still we had Mr. Charles Coborn with his international "Two Lovely Black Eyes," and Ray Wallace and Tom Costello, and altogether a jolly good "night in" instead of a "night out."

Mme. Anna Pavlova.

Terpsichorean Genius.

To look back over the last ten years or so reveals very few great dancers, and the three which do rise most readily to one's mind are foreign, Mlle. Genée, Lydia Kyasht, and Mme. Pavlova, and perhaps it is the last named that is the best known of the Russian type of dancer. Trained at the Imperial School in Petrograd, she literally danced herself into fame in a night. Over here she has given generously, not only of her own art, but has introduced the best of Russian ballets, and the first performance of "Don Quixote" was awaited with much interest, as the dancer went specially to Spain in order to get the correct detail and atmosphere.

A Popular Singer.

Though there has been a marked increase in the popularity of instrumental music, the vocalist will always be the most popular of entertainers, and one of the best singers "over the aether" is Mr. Gilbert Bailey. He has broadcast to advantage from London, Bournemouth, and Cardiff stations, and is still progressing round. In a recent interview he said that he had been often asked how he became an artiste, and, strangely enough, he admits he owed this new profession to the war. Previous to that his only experience of singing had been as a choir boy in Caius College, Cambridge, but it evidently gave him good training. In '14 he joined "Mobbs Corps," Northants Regt.; he was one of the first at the front. Being wounded in 1916, he was sent to King's Weston Hospital, Bristol, and the Commandant, Napier Miles, was an enthusiastic musician.

Mr. Fewlass Llewellyn.

Bournemouth.

As is only to be expected, one of the best classical concerts of the week was heard from Bournemouth, with the Wireless Orchestra under the capable baton of Captain Featherstone. The soloists were May Blyth, of the B.N.O.C., and Mr. Evelyn Howard Jones, the well-known London pianist.

The programme included Mozart's "Jupiter" Symphony (1st and 2nd movements), part of the great B flat minor pianoforte concerto of Tchaikowsky, and some excellent examples of Moussorgsky, Scriabin, and Glazounov, a "highbrow" night truly enough, but one that appealed none the less widely.

Miss Elsie Cochrane.

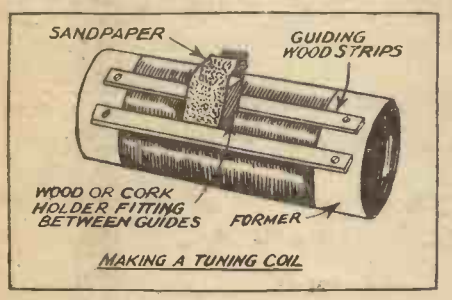
Bournemouth also heard one of the most popular sopranos last week in the person of Miss Elsie Cochrane, whose voice has been compared by a big daily to "a string of pearls, well over two octaves in length."

Constructional Notes

Conducted by Dr. J. H. T. ROBERTS, F.Inst.P.

Making a Tuning Coil.

IN making a tuning coil it is necessary to remove the insulation of the wire along the path of the slider. This, of course, can easily be done by the simple process of taking a piece of sand paper or emery paper in the fingers and simply rubbing the coil. But the result by this process is anything but neat in appearance, and the way to get a nice straight and sharply defined path for the slider, which will add greatly to the appearance of the finished coil, is illustrated in the accompanying figure. It is very simple. You merely take two small wood strips (or metal strips if these are more conveniently obtained) and secure them temporarily to the "former" in the manner shown. A small piece of wood or cork should be wrapped round with sandpaper, and the wood guides should be arranged sufficiently far apart for the scraper to slide easily between. When the path has been cleared by rubbing a few times, the wood guides may be removed. Care should be taken to brush or blow away from the paper all the loose particles of glass or emery which may have lodged in the turns of the coil.



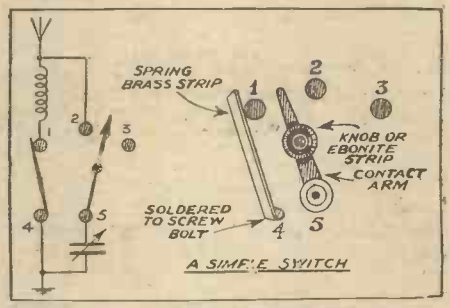
MAKING A TUNING COIL

Easily Made Crystal Holder.

The accompanying illustration hardly requires any explanation. The device consists simply of two pieces of springy brass, each secured by means of a single screw to the baseboard and bent into the shape shown, A third piece of brass, somewhat stouter, is bent twice at right angles, and drilled with a hole which easily clears the adjusting screw. A nut is then soldered in position over this hole, through which the adjusting screw is passed. Electrical connections are made to the two pieces of brass mentioned above, and the third brass strip may be secured by a single screw. The chief merits of this little design are the simplicity of its construction and the fact that the materials required are such as are usually to be found lying about the workshop.

A Simple Switch.

HERE is a sample of series-parallel switch which is very easily constructed and includes a simple method for avoiding the use of any considerable materials. It will be seen from the figure that the arrangement is very simple, the point of particular interest being the method whereby point 1 of the three-point switch is disconnected from earth when the arm rests on it. A spring connection puts point 1 in contact with point 4,

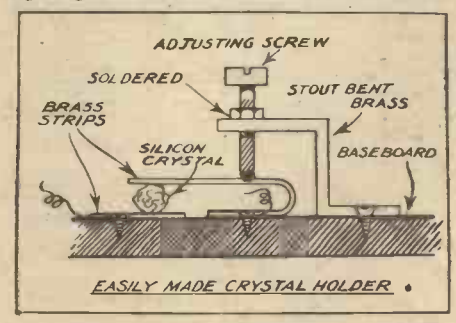


A SIMPLE SWITCH

which is to earth, until the contact-arm of the switch is moved over to point 1, when 1 is then connected to 5, and 4 is entirely disconnected. With this explanation, it will now be seen that when the switch-arm is on point 1, the condenser and coil are in series, when on point 2, they are in parallel, and when on point 3, the condenser is out of circuit. The chief details of the connection between 1 and 4 will be seen from the drawing.

Protecting Dry Cells.

A very useful and practical little hint which is sent to me for the protection of dry cells—more particularly, I imagine, the larger cells which are used for lighting the filaments of dull-emitter valves—



EASILY MADE CRYSTAL HOLDER

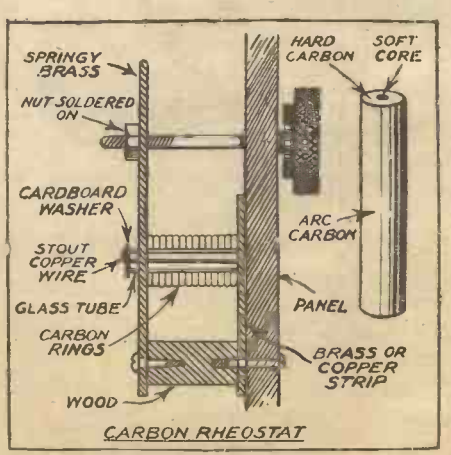
is to take a piece of the inner tube tyre of a cycle or motor-cycle, and use it as a covering for the cell. In order to make the rubber covering fit well, a piece of wood should be cut of the same size and shape as the bottom of the cell, a groove being run round the edge of this wood disc, and the rubber tube bound against the wood by means of wire laid over the tube and in the groove. The rubber tube can then be trimmed off below the wood disc by means of scissors. It is stated that a rubber cover of this kind helps to reduce evaporation from the cell, and also prevents the zinc container from coming into contact with metal parts should the paper covering be damaged.

Lettering Panels.

The various terminals on a baseboard or panel should always be carefully labelled, so as to avoid accidents as well as minor troubles. If you do not wish to go to the expense of buying properly engraved labels, you can easily make your own by writing the abbreviations for the various terminals, such as L.T., H.T., Phones. and so on, on a sheet of white paper, and neatly cutting out the strip containing the lettering. It is easier to do the writing first and the cutting afterwards. Simply stick these in position with gum, and next day give a thin coating over each with shellac varnish or celluloid varnish. The varnish will protect the label from being soiled or smudged, and will keep out moisture and so prevent it from coming off.

Carbon Rheostat.

Here is a very simple way of making your own carbon rheostat. You have probably seen the carbon rods which are used for electric arcs. Well, these generally consist of a hard carbon rod with a circular tunnel along the axis, this being filled with soft carbon in order to make the arc burn more steadily. For our present purpose, the point is that if the carbon rod is sawn, by means of a hacksaw, into a number of slices about an eighth of an inch in thickness, the soft centre of each can easily be pushed out, and a number of carbon "washers" are obtained. These can be used for making a rheostat as shown. A brass strip is used to regulate the pressure, and is secured to a wood support behind the panel at one end, and operated by means of a screw at the other. A number of the carbon washers are threaded upon a piece of glass tubing, which is itself held by a piece of stout brass or copper wire, soldered to a brass strip secured behind the panel in the manner indicated. The copper wire is to keep the glass tube from falling out, and the glass tube is simply an insulating shaft (unaffected by heat: ebonite will not do) upon which the washers may slide. The rest of the drawing is probably self-explanatory. A cardboard washer may be affixed to the bent-up end of the copper wire, so as to prevent the springy strip from making contact with it when the latter is released as far as possible. In order to get the carbon rings with true and flat surfaces, they should be rubbed on a sheet of fairly coarse sandpaper laid on a flat surface.



CARBON RHEOSTAT

Efficiency Ericsson

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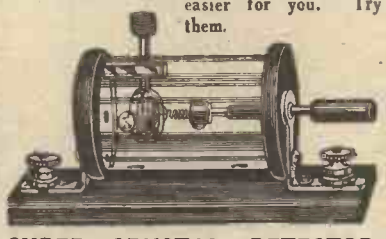

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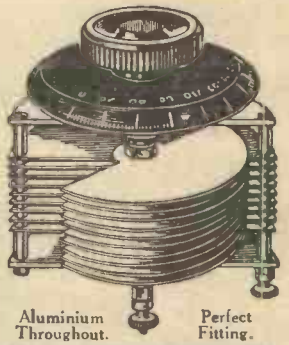

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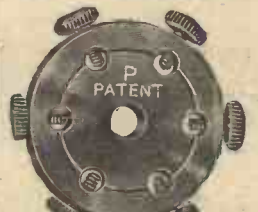

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Striking Points: Anticapacity; Positive Contact with Valve Leg; Neat appearance; Protection from burning out valves by incorrect fitting; Low Price. In the usual high standard of Gamage Quality. Price **10D.** Post 2d.

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HOW TO BUILD A FOUR-VALVE RECEIVER.

A STRAIGHTFORWARD SET FOR BROADCASTING.

By B. J. KYNASTON.

Although there is nothing very new about the circuit of this receiver, the instrument has several advantages which should appeal to the general constructor.

ALTHOUGH the broadcast receiver described in this article consists of an ordinary four-valve circuit, and cannot therefore be considered as anything new, the instrument when constructed possesses many advantages, inasmuch as

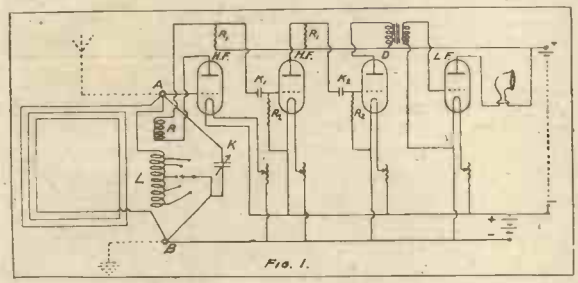


FIG. 1.

there are no external aerial or earth, and the batteries, loud speaker, valves, and frame aerial are all contained within the cabinet. The receiver has also, if carefully constructed, a good appearance, and, besides being simple to operate, is fairly portable.

If desired, an outside aerial can of course be used instead of the frame, as shown by the dotted lines in Fig. 1. The frame aerial must then be disconnected from the terminals A and B and the reaction coil R can be short-circuited, if it is found to be unnecessary.

The Panel and Lay-out.

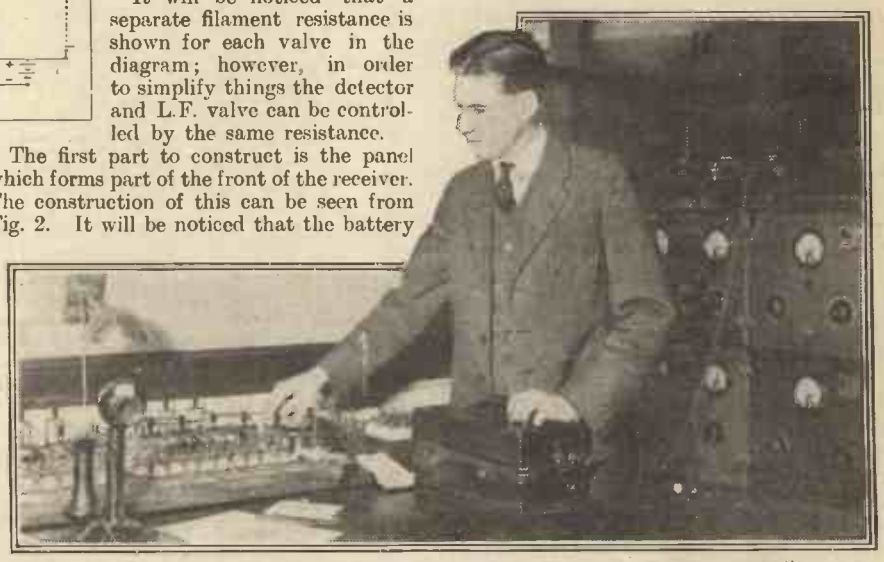
The circuit used is shown in Fig. 1, and consists of two high-frequency valves, a detector, and one note magnifier. Resistance capacity coupling is employed to couple the high-frequency valves together, and the detector and low-frequency valve are coupled by means of a transformer.

The values of the various components are as follows: The coil L consists of 60 turns of No. 20 D.C.C. wire wound on a cardboard former three inches in diameter, tappings being taken to the five studs as shown. The capacity K consists of a variable condenser of ·001 mfd., while K_1 and K_2 are fixed capacities of ·0003 or ·0004 mfd.

The anode resistances R_1 are of about 70,000 ohms, and the resistances or leaks shown as R_2 are of about 2 megohms value.

It will be noticed that a separate filament resistance is shown for each valve in the diagram; however, in order to simplify things the detector and L.F. valve can be controlled by the same resistance.

The first part to construct is the panel which forms part of the front of the receiver. The construction of this can be seen from Fig. 2. It will be noticed that the battery



The remote control switchboard in the control room of W J Z, the New York broadcasting station.

connections are made by means of flexible leads: this is necessary because both the high and low tension batteries are contained in a compartment in the bottom of the cabinet. A strip of ebonite about two inches wide is fastened to the top of the panel, and the valve sockets are mounted on this, as shown in Fig. 3. The connections to the valve sockets and other parts of the instrument are shown in Fig. 2. The reaction coil is wound on a wooden ball so that part of it revolves inside the aerial inductance. The reaction coil should consist of about 40 turns of No. 20 D.C.C. wire.

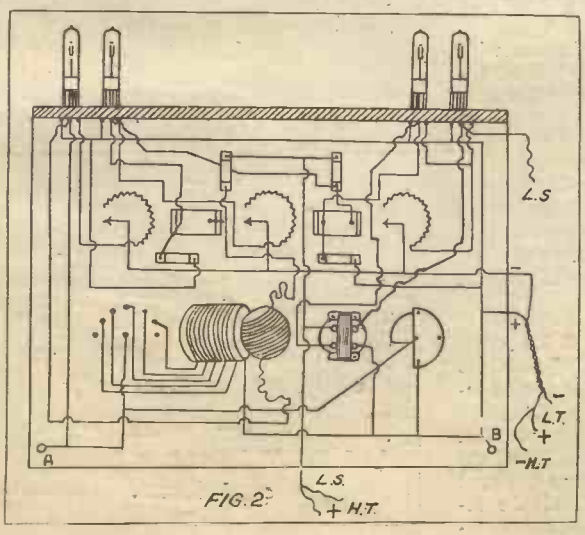


FIG. 2.

Size of Cabinet.

The cabinet should now be constructed and the panel fitted in the front. The top portion of the front is made of openwork construction with a silk panel inside. This is essential, as the loud speaker is contained behind the top of the panel, and therefore there must be no solid obstruction between the loud speaker and the room. This panel should be hinged to the ebonite so that it can be opened, as shown in Fig. 4, when access to the valves is required. As a 12-inch loud speaker is to be contained inside the cabinet, it will be necessary to make it at least 20 by 20 inches and about 12 inches deep. The ebonite and openwork panel in the front of the instrument will therefore both have to be 20 by 10 inches.

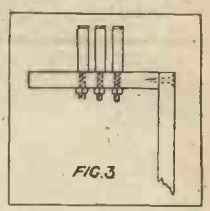


FIG. 3.

Wiring Up.

A shelf should be fitted inside the cabinet, as shown in the diagram, about 5 inches from the bottom. This shelf cannot go right to the front of the cabinet because a certain amount of space is taken up by the coils and condenser. The loud speaker is fixed to this shelf, as shown, and both high and low tension batteries are housed underneath it. If required, a drawer can easily be fitted to contain the batteries, as in Fig. 4.

After connecting up the loud speaker and filament and high-tension batteries to the flexible leads of the panel, shown in Fig. 2, the back of the cabinet can be fitted. Holes are drilled in this, as can be seen

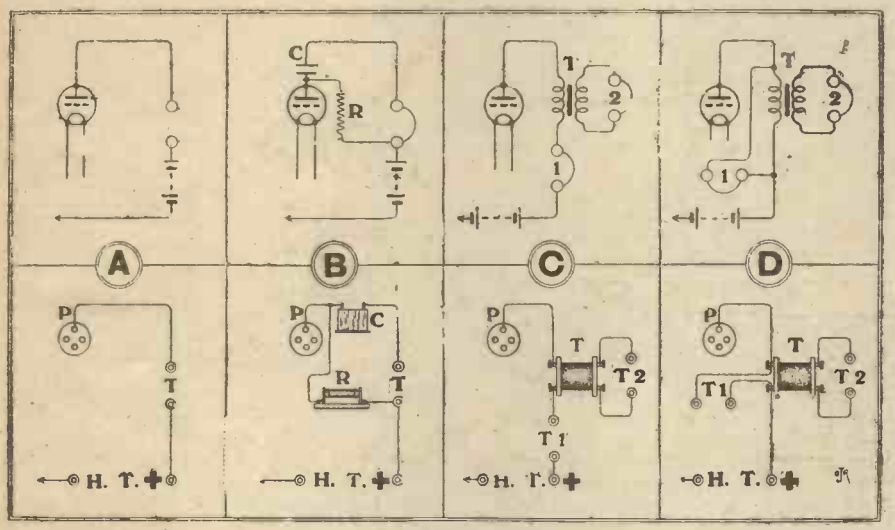
(*Continued on page* 274.)

CONCERNING TELEPHONE CONNECTIONS.

By O. J. RANKIN.

MANY amateurs are under the impression that it makes no difference how they connect their telephone tags to the receiver telephone terminals. This is a mistake where valve sets are concerned, for unless they are connected the right way round the permanent magnets soon become depolarised, with the result that the 'phones are ultimately ruined.

The positive pole of the headphones (which, of course, are connected in series) should always be connected to the positive H.T. terminal of the receiver or, in other words, to the 'phone terminal which is connected to the positive H.T. Where an enthusiast is doubtful about these connections he should lift off the panel and mark or memorise the one which is positive. The positive 'phone tag is easily distinguished by small portions of red cotton interwoven in the outside covering.



Protection Against H.T. Current.

The most usual, and certainly the best arrangement is indicated in diagram A, where the 'phones are in series with the plate of the valve and the H.T. positive. Here the positive 'phone tag would be joined to the lower 'phone terminal.

Diagram B shows a more efficient and reliable method of protecting the delicate windings of high resistance headphones. This consists of a simple filter circuit made up from a 2 mfd. Mansbridge condenser, C, and a 100,000 ohm fixed resistance, R, connected as shown. The idea is to block the steady plate current with the condenser so that it will pass through the resistance and not through the 'phones. The fluctuating currents pass through the condenser and operate the 'phone magnets in the usual way, providing the voltage of the H.T. battery is suitably increased.

Diagrams C and D show two simple methods of using high and low resistance 'phones together. Obviously, a step-down or telephone transformer, T, will be required, the input side being shown on the left in both diagrams. In diagram C, T 1 represents the high resistance 'phones and T 2 the low resistance 'phones. Alternatively, T 1 may be placed in series with the plate lead.

Fixed Condenser Experiments.

In diagram D the high resistance 'phones, T 1, are connected in parallel with the input side of the transformer, this also being connected in series with the plate and H.T. positive in the usual way. The low resistance 'phones, T 2, are connected in parallel with the output side of the transformer. Experiments should be carried out with small fixed condensers until maximum results are obtained.

SIMPLE CLIP CONNECTORS.

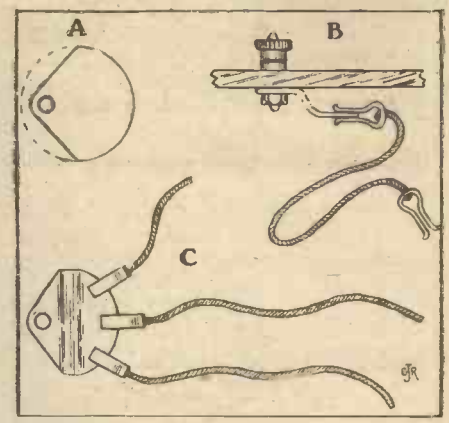
By O. J. R.

WHEN carrying out experiments with different types of circuits it is an advantage to be able to make the connections, and effect any necessary alterations, with the minimum of time and trouble. The changing over of leads is no simple matter when it necessitates perpetual soldering or the slackening and tightening of nuts, and therefore it is most convenient to adopt some kind of plug-in or clip-on connecting system which will obviate these difficulties.

Very Easily Made.

The idea outlined below will be found quite satisfactory. A number of $\frac{1}{16}$ in. sheet brass or copper discs, about $1\frac{1}{2}$ in. in diameter, are cut away and drilled as shown at A, the curved edges being nicely rounded off with a smooth file. These are then bent in step fashion and clamped or soldered permanently to the terminals of the receiver, as indicated at B, and to the terminals of condensers, transformers, and other components in use.

A selection of flexible leads, ranging from about $1\frac{1}{2}$ in. to 12 in. in length, is then arranged, as shown at B, by soldering to each end a simple spring brass clip which will make good contact with the terminal

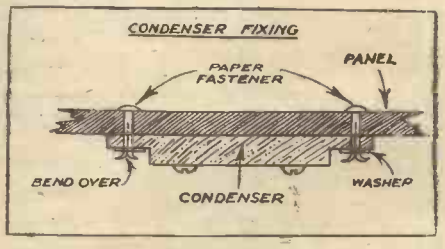


quadrant when pushed on to same in the manner indicated at B and C. If the quadrants are cut out to the given dimensions, each one will comfortably accommodate four or five clips, providing each clip is not more than $\frac{3}{16}$ in. in width.

A SIMPLE METHOD OF ATTACHING FIXED CONDENSERS.

SMALL fixed condensers of the moulded type, or others with fixing lugs, may be very easily attached to the underside of the panel by brass paper fasteners, passing through both, as depicted in sketch.

Slip a small brass washer over legs of clip, bend well over, and all will then be secure. This simple idea requires no tapping or screws, is easily detachable for inspection, and, moreover, there is no risk of breaking the rather brittle composition of which most condensers are made.

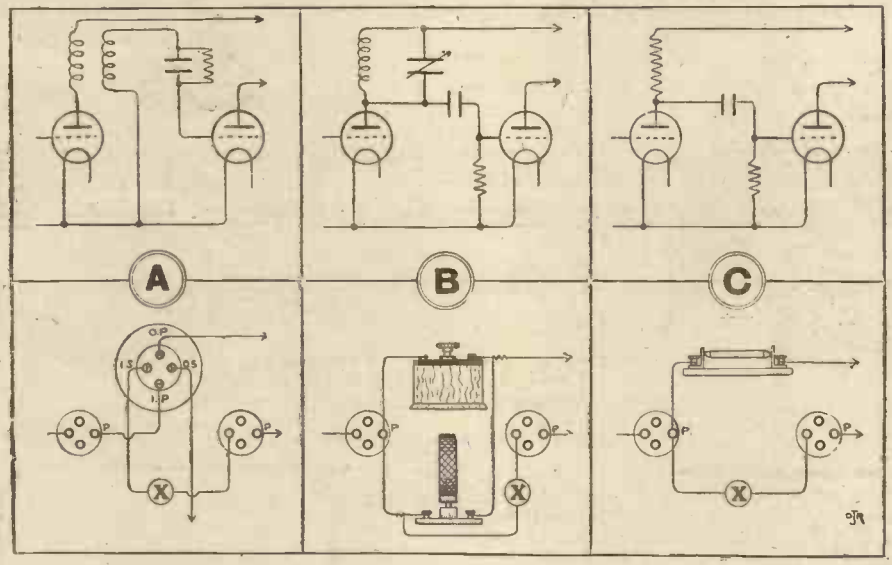


COUPLING HIGH-FREQUENCY VALVES.

By OSWALD J. RANKIN.

Practical advice on various methods of coupling an H.F. valve to a detector or another H.F. valve.

THE accompanying diagrams illustrate the three most usual methods of coupling H.F. valve to a detector valve or to another H.F. valve. In diagram A a tightly-coupled air core transformer is shown, and this may either be of the simple plug-in type, as indicated below, or it may be arranged to cover a more selective range of wave-lengths by winding a greater number of turns on a small cylindrical former and taking tappings off at intervals from both the primary and secondary windings.



A Basket-coil Transformer.

With either type it is usually necessary to connect a ·0002 mfd. variable condenser in shunt with the primary winding. A very simple loosely coupled H.F. transformer can be made from two ordinary basket coils, each wound with about 60 turns of No. 32 S.C.C. copper wire. These are arranged to slide over an insulated rod, or other support, to permit a variable degree of coupling between them. Both coils are wound in the same direction, the beginning of each winding being the "in" and the end the "out" of the primary and secondary respectively.

Tuned Anode Coupling.

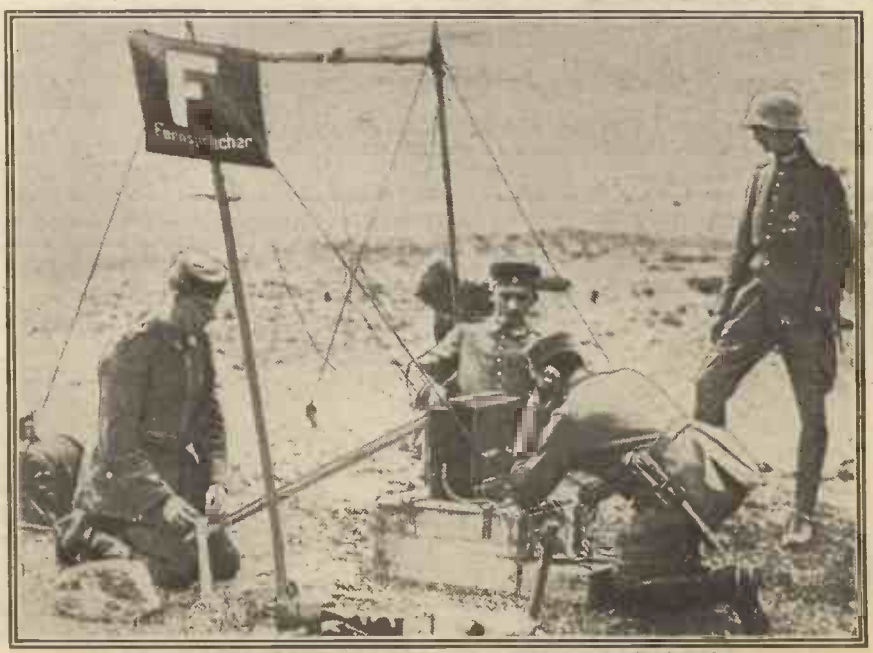
A tightly coupled plug-in H.F. transformer can be easily made from a disc of cardboard or sheet fibre, 3 in. in diameter, which is provided with four valve pins and thirteen slots. The valve pins are marked I.P., O.P., I.S., and O.S. No. 36 S.C.C. wire may be used for the winding 40 turns being wound on in basket fashion to form the primary, and 55 turns for the secondary. A few turns of coarse silk thread are wound on between the two windings. Using the tuning condenser, this transformer will tune from 200 to 350 metres. Others may be arranged as follows: 300 to 450 metres, 50 turns for primary and 65 for secondary, and 400 to 600 metres, 75 turns for primary and 90 for secondary. Alternatively, the wire may be wound round the recessed periphery of the popular ebonite disc formers now obtainable from any wireless store.

Diagram B shows the tuned anode method where a coil, in conjunction with a variable condenser of ·0003 mfd. capacity, is tuned to the same frequency as the aerial circuit. This coil may be a plug-in honeycomb unit coil as shown, a basket coil, a plain cylindrical coil, a tapped coil, or a simple slide inductance. The condenser is, in either instance, connected in shunt with the coil.

The Resistance-Capacity Method.

Diagram C shows the resistance-capacity method of coupling which is, unfortunately, only effective on wave-lengths of 1,000 metres and upwards. The value of the resistance should be somewhere in the neighbourhood of 50,000 ohms. The letter X in each of the lower diagrams marks the position of the grid condenser.

For the broadcasting wave-lengths it will be seen that either of the methods shown at A and B should be adopted, and although there is much to be said in favour of the tightly-coupled H.F. transformer, the tuned anode method is equally as efficient and probably the most simple where an enthusiast undertakes the construction of his apparatus. Now that the British broadcasting stations are keeping most of us regularly entertained, there is no actual necessity to tune to the higher wave-lengths of the foreign stations, but should this be desired then the method shown at C will admirably meet the case.



Military activities in Germany. An army wireless field station in "action."

Technical Notes

Conducted by J.H.T. Roberts, D.Sc., F.Inst.P.

Telephone as Aerial.

"SOME bright individual," as the Americans say, has discovered that if a tinplate tray be placed under the ordinary desk telephone instrument, and the metal tray connected by a wire to the aerial terminal of the receiving set, good reception can often be obtained. The telephone line acts as the real aerial, and the energy is passed to the set by the improvised condenser consisting of the telephone instrument and the metal tray.

The telephone service is not interfered with in any way, and consequently the telephone people, to quote the American account again, "have no come-back whatsoever," which means that they can have no cause for complaint, inasmuch as no tapping of wires or interfering with instruments has taken place. "A still brighter individual," we read on, has lost no time in bringing out a special form of metal tray, with terminal all complete and special high-sounding name, which works much better than the ordinary cooking dish—psychologically, at any rate.

The "P.W." Super-Crystal, the "Combination," and the "Ultra," constructed by Mr. W. E. Tuckey, 13, Buckthorne Road, Crofton Park, S.E.4.

The Loud-speaker Horn.

It is well known that the horn or trumpet of a loud speaker frequently accentuates certain tones in the reproduced sound, with the result that distortion is produced. The effect is known as resonance, and various suggestions have been made from time to time to overcome it. One well-known method is to wind electrical insulating tape around the outside of the horn here and there.

Another ingenious suggestion comes from an amateur in the south of France. He says he has found that great improvement was obtained by piercing holes through the horn, one hole at the halfway point, another at the quarter-point, and another at the eighth-point, the distances being measured along the horn from the narrow end. The idea of making holes in the horn in order to reduce the effects of resonance is not new, but I do not remember having heard of holes pierced in just these positions being exceptionally effective.

Horns have frequently been used with holes pierced more or less indiscriminately, and considerable improvement has been observed. The holes may be quite small, an eighth or a quarter of an inch in diameter.

Preserving the Filament.

In order to extend the useful life of the filament of a valve, it is a good plan to reverse the direction of the filament current occasionally. It is probably not commonly remembered that the current which enters the filament at the negative end is greater than that which leaves it at the positive end (I am speaking of the current now in terms of actual electron flow, where the "direction" is, of course, opposite to that as conventionally indicated). This is because the electron stream which enters the negative end of the filament has to provide the current which flows right through the filament, for heating purposes, and also the space current, upon which the operation of the valve depends.

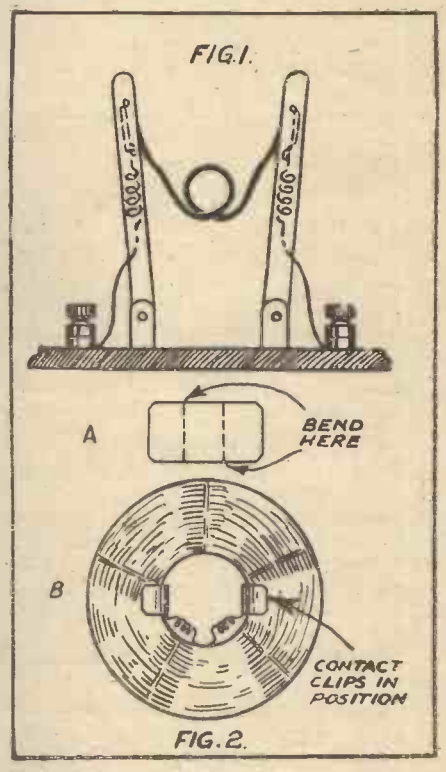
It is a simple matter to reverse the filament current in a single-valve set, and in a multi-valve set where potentiometers are employed it will only be necessary to

(Continued on page 286).

A BASKET COIL CONVERSION.

By P. G. T.

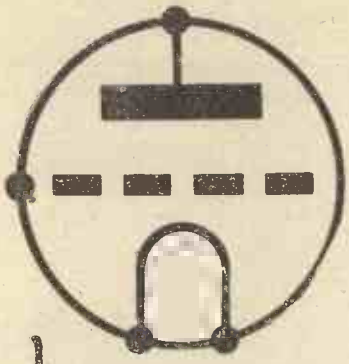
IN a basket-coil holder, with spring-loaded arms of the type represented in Fig. 1, it is not the most convenient of operations rapidly to change a coil, owing to the fact that not only have two terminal connections to be broken, but these terminals are not readily get-at-able when the coil-holder is mounted on a panel.



The Coil Clips.

To overcome these drawbacks of an otherwise excellent component, the writer connected the coil clips permanently to their respective terminals by a length of suitable gauge wire wound round a pencil to give a degree of flexibility. Thus each slip becomes electrically connected to its terminal.

The basket coil must now be adapted for use with the holder, and to do this each coil must be provided with two contacts arranged diametrically opposite on the inside of the coil. These contact pieces are simply small pieces of tin soldered to the free ends of the coil, and held securely within it by bending over and nipping with a pair of pliers. A and B (Fig. 2) show clearly how these contacts are made, and the position they occupy when mounted.



A Symbol with a Story

IT'S a symbol that has become a commonplace . . you see it in wireless articles . . two or three times in most wiring diagrams. Everybody knows that it represents a valve. Ever thought how long that symbol took to evolve? The original one didn't look like that; it was just like the picture

in the corner here. That was 30 years ago. Many years passed before the broken line was added. It indicated the grid—the *third* electrode which made broadcasting possible.

The original symbol had its beginnings in the Ediswan laboratories, where the world's first valve was made. In every Ediswan Valve you have an accumulated experience dating back to Fleming's momentous discovery.

Ediswan Valves will bring the best out of your wireless set—get some on the way home and enjoy a better programme from to-night onwards. All dealers sell them.

THE EDISON SWAN ELECTRIC CO. LTD.
QUEEN VICTORIA ST., LONDON, E.C4

EDISWAN VALVES

62-3

HOW TO OBTAIN CAPACITY MEASUREMENT OF SMALL FIXED AND VARIABLE CONDENSERS.

FROM A CORRESPONDENT.

The advice given in this short article will prove of great assistance to the experimenter, although the possession of a calibrated wave-meter is essential.

A SIMPLE inelaborate system for measuring the capacity of a condenser, whether it be fixed or variable, is often a great asset to the experimenter. It is proposed in this brief article to outline a simple method of measuring the capacity of a fixed condenser and also to outline the

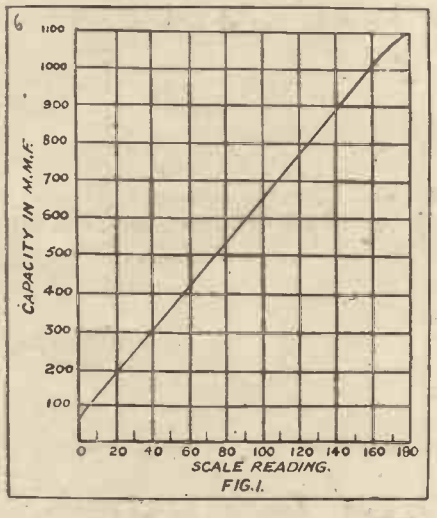


FIG. 1.

procedure when the calibration of a variable condenser is required. In the opinion of the writer, every experimenter, providing financial circumstances permit, should possess a reliable wave-meter and at least one calibrated variable condenser.

The well-known "Varicon" condenser of the Dubilier Company is supplied with a calibration curve if desired, and be it said that it is necessary to possess a condenser with the said curve before the capacity measurement of a fixed condenser, by the method to be described, can be conducted. Fig. 1 shows a typical calibration curve of a good variable condenser with a maximum capacity of 1,100 m.mfd. The ordinates represent the capacity in m.mfd. and the abscissæ the reading of the scale or dial.

Calibrating the Condenser.

Let us suppose we possess a condenser with a calibration curve, and it is desirous to plot the curve, or to find the capacity at any particular dial reading of another condenser of the same or of smaller capacity. Fig. 2. shows a three-electrode valve connected in a circuit of conventional variety. It will be seen to possess a D.P.D.T. switch across the inductance. We have two condensers, C_1 being our standard instrument with its resident curve, C_2 being a variable condenser of unknown capacity. Shown near this circuit is the diagram of a buzzer transmitting wave-meter.

We will suppose the D.P.D.T. switch to be in position 1, where it will be seen that, as this is our standard condenser, the said instrument is across the inductance. Set the standard at zero dial reading, and then tune the wave-meter until resonance is obtained—i.e. the buzzer is loudest in the telephones. Note the dial reading of the standard—in this case zero—and the capacity at this particular setting from the curve. Now change over to position 2, and tune with the unknown capacity condenser until resonance is found.

Plotting the Curve.

If the switch is thrown back into position 1, the buzzer will be heard at the same strength as that in position 2. This indicates that whichever condenser is in circuit our valve receiver is in resonance with the buzzer wave-meter.

Now, we know the capacity of our standard at any particular setting of the dial by the curve, and all that is now necessary to do is to make an observation of the scale reading of the unknown condenser, and it will be seen that, as the circuit is in resonance with either condenser, the capacity of the unknown condenser must at that particular setting be the same as that of the standard. A similar curve as that of the standard can now be plotted for the unknown condenser. Perhaps an example will facilitate the understanding of the method more clearly.

Capacity of Fixed Condensers.

Suppose the standard dial reading is 40° and the capacity at this setting is 300 m.mfd. If the dial reading of the unknown

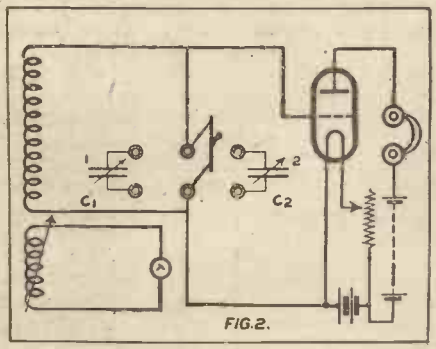


FIG. 2.

happens to be 35°, then the capacity of the unknown condenser at 35° is 300 m.mfd. Before the curve is plotted it is advantageous to sketch out the numerals, etc., on the vertical and horizontal axis, as shown in Fig. 3. It will, of course, be seen that if the maximum capacity of the unknown condenser is greater than that of the standard it cannot be measured beyond the maximum capacity of the standard. The method of procedure when a fixed condenser is in the place C_2 is as follows:

Place the switch in position 2, and tune with the condenser or variometer, as the case may be, of the wave-meter until in resonance. Now change over to position 1,

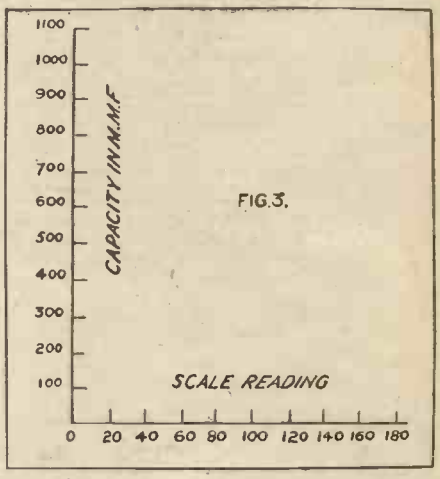


FIG. 3.

and tune with the standard condenser until resonance is again indicated. Find the capacity of the standard by the curve. It will be obvious that the capacity of the unknown fixed condenser is then the same as that of the variable standard. It is often advisable to measure the capacity of non-descript fixed condensers.

Inaccurate Capacities.

The writer purchased a condenser not long ago sold to him as possessing a capacity of ·0003 mfd. On measurement it was found to be exactly ·0000195 mfd. Quite large condensers may be calibrated by the above method, providing a large enough standard is procurable.

WAVES AND STRAYS.

BY HIGHAM BURLAC.

VII. The Autobiography of a Condenser.

THIS is a bedtime story of my own. It was conceived at the orders of a precocious radio expert of some thirteen summers, who knows all there is to know about supersonic reception. It is told, I believe, in the approved style.

"No," said the Old Condenser, "this cheap broadcasting work is not at all the sort of thing I've been used to, I assure you. Time was when I would look at nothing under the status of a high-power transoceanic station—and then only C.W., mind you. I must say I am glad my relations are ignorant of my hospitality towards these common perturbations—I can't call 'em waves—of the Great Aetheric Medium. Trombones, laddie! Base bassoons! Holy farads, they give me a pain in my positive terminal!" He discharged himself and settled down to "stand by" on 365 metres. His remarks were addressed to a sprightly young condenser which was clinging bravely to the aerial circuit and doing its utmost to handle jazz as his schoolmaster had taught him.

A Chequered Copper.

"Now, until that infernal row begins again we'll rest a bit and I will relate to you a few of the incidents in my remarkable career. Just slide yourself round to maximum and let your dielectric ease off; you'll learn the trick before long. There, that's better, as the amateur said when he disconnected the grid from the plate and the 'earth.'

"I was born in the 'boom' of 1922, in the little village of London. You have probably heard these cheap-jacks say that a condenser is assembled, not made; but don't you believe 'em. Calibration is the test. Indeed, my poor father used to say, 'Don't forget you come of calibrated stock, my boy, and that the best electrons flow in your vanes. Always remember, when you are tempted to talk to cheap microfarads with stamped-out plates and doubtful insulation, that you are a genuine Two Noughts One, by Billson, bicycle maker, of Hammersmith High Street.'

"I was calibrated at a very early age, and I flatter myself that I came through the ordeal creditably. After receiving my diploma from the National Physical Laboratory I went into retirement for a time before embarking upon my professional career. During this period I was frequently dusted by a wet-nosed boy who was very careless of my lacquer; he never divulged the fact that he once dropped me, and as a result I suffer to this day from a slant in my top plate which plays Old Harry with my fine work. You wouldn't think it to look at me, but I believe old Professor Stuggs always suspected I had a skeleton somewhere in my dielectric, because he used to—ah—rough-house me so brutally. Phew! That man's terminal twist could squeeze the aether out of a vacuum.

"It was to this Stuggs person that I was first drafted for duty. He entered the establishment like a fretful porcupine and asked for 'a pot of about 0·001 mick. Such vulgarity!' Pots, my dear fellow! Our assistant was much affected and endeavoured to purify the atmosphere by referring to me in terms of jars, but the old man bit his head off. Says he, 'Jars! *Jars!* Pah! These Admiralty corruptions of honest scientific terms! Show me this pot's curve.' My credentials were accepted, though not without another outburst, for, upon a mild recommendation of my superlative qualities by our assistant, the professor snapped, 'Lies, all lies, young man. And what do *you* know about condensers, anyway?' And he grabbed me by the collar and shoved me, without a paper overcoat, into his bag, where I spent a miserable hour in company with a spectacle case, an old number of *Comptes Rendus*, a bread-and-cheese sandwich, and an unspeakable family of cheap fixed condensers who seemed to find something extremely funny in the sight of me sitting on that loathsome sandwich.

"Uncle" Jerry, "Auntie" Ida and "Uncle" Leslie, entertaining the children from the Hull Relay Station.

On the Down Grade.

"I did myself justice with Stuggs. Yes, I will say that. His diction was coarse, but he knew his job, and I spent many a pleasant lecture evening with him and a lanternist, greatly applauded by the gaping audience. My photograph appears on page 97 of Stuggs' 'Algebra of Audio-frequency Amplification,' and in the Transactions of the Royal Society, August, 1923, I can just be seen in Plate IV. I have been twiddled by Sir Oliphant Pamphass in a fit of abstraction and Dr. Gronberg once used me as a paperweight. I owe these honours to my association with Stuggs.

"When Stuggs went to India, I was sold by auction. I was one of Lot 80, and I blush to think what a lot it was. My companions were thirty-four Hicks' hydrometers; wire, various; several porcelain cleats; a broken barometer, and 'The Last of the Mohicans'! A prophetic touch, that book! I was on the downward road, and though my spirit was not broken I began to realise that calibration does not count so much as my parents fondly imagined. How I rejoiced that my father was then deeply embedded in a five-valve set *de luxe* at Balham, and could not witness my degradation! I was purchased by an individual named Jones, who was, I found, trying to maintain a six-unit family and a five-unit valve set on the profits from his shop in Peckham.

"This shop I cannot define; it seemed to cater for every need except food, drink, and blast-furnaces. I remember, however, that, when Jones sold out, the shop was advertised as 'Tob., conf., news.' There was, too, a decided flavour of haberdashery and drysalteries about the place, and Jones repaired boots and bicycles in his kitchen. I saw Mrs. Jones only once. She poked her head into the attic where I and Jones used to pick up Nauen, and referred to us as 'clutter.' An unamiable Amazon! Jones was a real stayer, and did good work with me, despite my slanting plate. But for his all-too-discursive preoccupations—he collected stamps, preached Ruskinism, did fretwork, kept rabbits, and hazarded money on racehorses—and his unflinching support of the census, he would have made good.

"I was transferred by Amateur Jones to Percival Smith, a plumber of New Cross, who received me in part payment for repairs effected. Smith, unused to instruments of precision, was half afraid of me. Thought I should administer an electric shock.

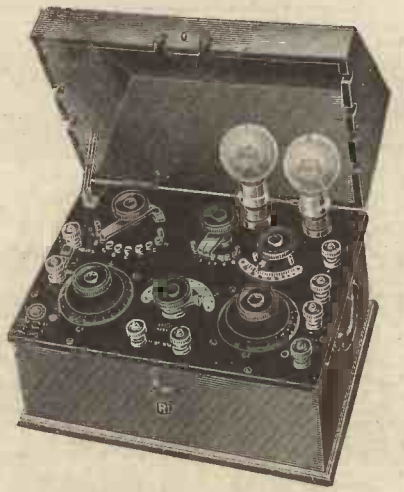
"Well, my friend, I could have shocked Percival had he possessed an understanding ear. However, I had a few months' rest in an outhouse, where I contracted ebonitis, due to damp, and ricked a terminal rather badly on a vile thing termed a box-spanner. Percival used to pick me up occasionally and inebriate me with his breath, and when he left me I was—well, slightly bucked, and used to exchange repartees with a decent young Leclanché which was polarising on a bracket above me. Gradually I degenerated by the force of environment until I felt no shame in my associations. I even bandied words with a rusty file. Once I asked a blow-lamp if he was calibrated, and was told to—er—I believe the phrase was—'come off it.'

"Last March Percival sold me to my present owner, Mr. Fred Clark, familiarly known as Nobby. This man makes the electrons boil in my vanes, for he is everlastingly twirling me round; he imagines, I believe, that the friction on my spindle will provide the energy which his sulphated accumulator fails to give his worn-out valve. A creature of straw! For ever blown about by every wind from Publishers' Alley. Conceive, if you please, the mental stability of the creature, when I tell you that within the month I have been the *pièce de résistance* in a Two-Circuit Crystal Detector, an All-Wave Reflex Concert Set, a Selective Old Folks' 2-Valve Receiver, and an All-in-One Super-selective, Non-skid, No-Battery, Self-filling, Greaseless, Pea-fed, Broadcast Cabinet Set, complete with Envelope No. 4 and photo of designer. I'm a common drudge without salary or legal remedy, laddie.

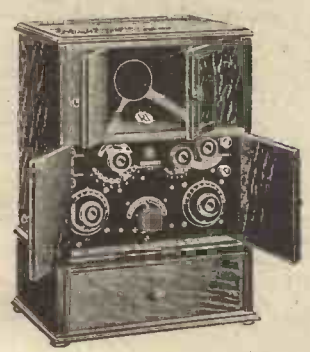
"But I live in hopes of settling down where I am and slowly accumulating enough dust to short circuit even an Augmented Orchestra. Hope I don't bore you. Here! Shift round to 4·7 quick. Big Ben's beginning."

3-Valve Portable Set **£21 15 0**
Wave-length range 300-4,000 metres.

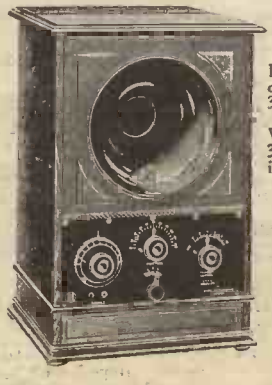
4-Valve Portable Set **£26.**
Wave-length range 300 - 4,000 metres.



2-Valve Portable Set **£14 18 6**
Wave-length range 300-4,000 metres.



4-Valve Lyrian Set complete with Loud Speaker, D.E.
Valves and batteries **£44 3 6**
Without accessories **£37 18 0**
Wave-length range 300-4,000 metres.



Lyrianette 2-Valve complete **£22 5s.**
3-Valve complete **£28 5s.**
Wave-length range 300-500 metres, can be increased by loading coils.

RI LTD.

Striding Ahead in 1924

The keenness that has been shown for the achievement of perfect radio apparatus is for thorough technical engineering rather than for commercial gain with those firms who have advanced to the forefront of the public popularity.

R.I. stands to-day for the very best wireless productions on the market. Prices may appear higher, but all R.I. purchasers know that these prices cover a skilled workmanship superior to multitudes of cheaper competitors.

Thousands of the New R.I. Transformers have already been purchased and their owners are enthusiastic over the wonderful difference they make. **You can see a giant sectional model of the NEW R.I.** at

Stands 11 and 13,

All British Wireless Exhibition.

There you will also see the other wonderful R.I. 1924 creations. The New R.I. Lyrian and Lyrianette are the only complete loudspeaker broadcasting receivers available at a popular price.

R.I. Multi Valve Sets for all wave-lengths are the highest standard wireless receivers that are made. Each component gives maximum efficiency in these neat, strong, portable valve sets, producing as a result unique radio reception.

Ask for the New R.I. catalogue.

Telephone: Regent 6214-5-6 Telegrams: "Instradio London"

Radio Instruments Ltd.

12 Hyde Street, Oxford Street W. 1.

CHANGES FOR 5XX.

How the Amateur Can Make Them.

By OSWALD J. RANKIN.

IN consequence of the opening of the new high-power broadcasting station, which works on a wave-length of 1,600 metres, many enthusiasts are asking how they may adopt their present broadcast receivers to this comparatively high wave-length without scrapping the existing tuning arrangements.

Obviously, our querists do not possess interchangeable plug-in tuners, for in such an instance it would only be necessary to plug in a suitable coil and tune in with the usual condenser. Our anxious friends are evidently the possessors of tuning coils which are more or less limited to a specific band of wave-lengths, and it is here proposed to describe two simple methods of loading such coils to cover the 1,600-metre wave-length.

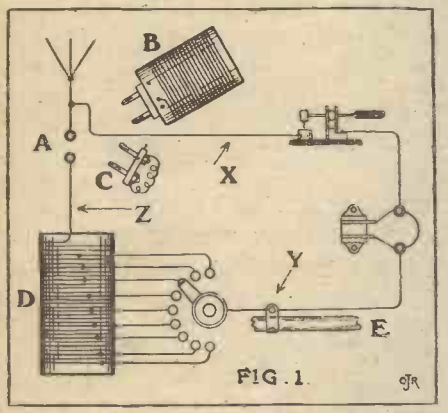


FIG. 1.

Loading the A.T.1.

The most simple and inexpensive arrangement is shown in Fig. 1, where a pair of valve sockets, A, are inserted in series with the aerial lead to form a socket for (B) a plug-in loading coil, or (C) a short-circuited plug. The existing coil, D, may be of any type commonly used, and if this

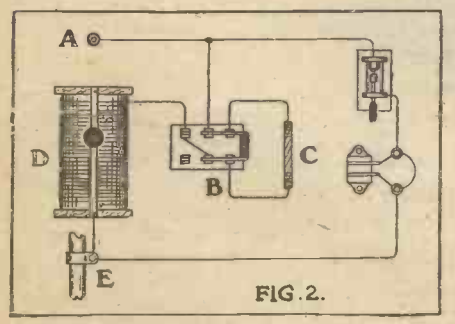


FIG. 2.

is designed to cover the broadcasting wave-lengths, then the loading coil, B, should consist of about 200 turns of No. 26 D.C.C. wire on a 3½-inch diameter former.

The design of this coil is not very important providing the correct amount of wire can be wound on the former. The arrangement shown in Fig. 1 consists of an ordinary cylindrical cardboard former mounted on a wooden disc, to which is attached the two-pin plug, made up from two-valve pins and a small piece of sheet ebonite.

Inserting a "Long Wave Switch."

The ends of the winding are preferably connected to the plugs inside the former. Should a series tuning condenser be fitted to the set, this will remain in the original position, but if a parallel condenser is used, then this should be connected between the points marked X and Y, and not between Y and Z, as formerly, so that it will now embrace both coils.

It will be seen that whenever it is desired to tune to the ordinary wave-lengths it is only necessary to remove the loading coil and replace it with the linking plug, C.

Fig. 2 shows an alternative arrangement, where the same effect is obtained by using a D.P.D.T. knife switch, B, and any suitable type of loading coil, C, preferably a basket coil of about 200 turns. The setting shown indicates that C is in series with the existing coil, D. The opposite setting cuts C out of circuit and places the aerial in direct contact with D.

Any form of aerial or tuned anode coils may be loaded in either of these two methods.

The transmitting-room of W J Z, the well-known broadcasting station at New York. This station transmits on 455 metres with a power of 500 watts.

BOOK REVIEWS.

Two Books for the Children.

THE kiddies who have had the pleasure of listening-in to the Children's Hour broadcast from 2 L O will be delighted to hear that those fascinating stories written by E. W. Lewis, and told by that equally fascinating uncle Caractacus, may now be obtained in book form, published by Hodder and Stoughton, price 3s. 6d. net.

I have just finished reading both "The Adventures of Sabo" and "More Sabo Stories," two delightful tales which, I feel sure, will appeal to boys and girls alike. These two books make an ideal present for children. They are filled with thrilling adventures of Sabo, a golliwog of whom I need say little, for he is as well known to the kiddies as Felix. Treacherous Tiffany, the cat, is also included, to say nothing of an exciting fight with Red Indians.

I must also add that this delightfully bound book has many charming coloured illustrations, contributed by that well-known artist Nadia Benois, and its large, clear printing helps even the tiniest child to understand it.

D. S.

BOOKS RECEIVED.

Ezi-Wiring Diagrams: Vol. 1. A Three-Valve Portable Receiver. 2. A Three-Valve Cabinet Receiver. 3. A Two-Valve and Crystal Reflex Receiver. Each volume 2s. each. Published by The Wireless Press.

The Amateur's Book of Wireless Circuits. By F. H. Haynes. Revised edition, 3s. 6d. net. The Wireless Press.

Mainly About Broadcasting

by The Editor

BROADCASTING is "catching" it again. Professor J. W. MacBell, an American meteorologist, has come forward with the theory that the abnormally heavy rainfall this year has been directly caused by radio waves and other electrical disturbances!

The professor believes that so long as broadcasting is regularly maintained the number of fine days will continue to diminish and that the rainfall will continue to increase in intensity. He suggests that the only way to improve the weather is to minimise the use of broadcasting and to make a general reduction in the use of electricity!

It is curious to note, however, that in the month of August, 1875, a record rainfall was recorded in France. That record still holds good, in spite of the bad August in 1924, which admittedly comes a good second. And in 1875 Hertz, Branly, Lodge and Marconi were practically unheard of in the radio world, and electrical work in general was in its infancy.

Progress Abroad.

The progress and growth of Continental broadcasting stations becomes more rapid every week. Radio Madrid, the Spanish Radio Co., which is at present operating a big broadcasting station in Spain, has recently been reorganised, and it is announced that fresh endeavours are to be made successfully to hurry along a widespread development of broadcasting in that country. The famous municipal band of Madrid will soon be regularly broadcasting concerts. A definite schedule will shortly be put in operation, and the concerts will probably be held from 10 a.m. to 12.30 p.m.

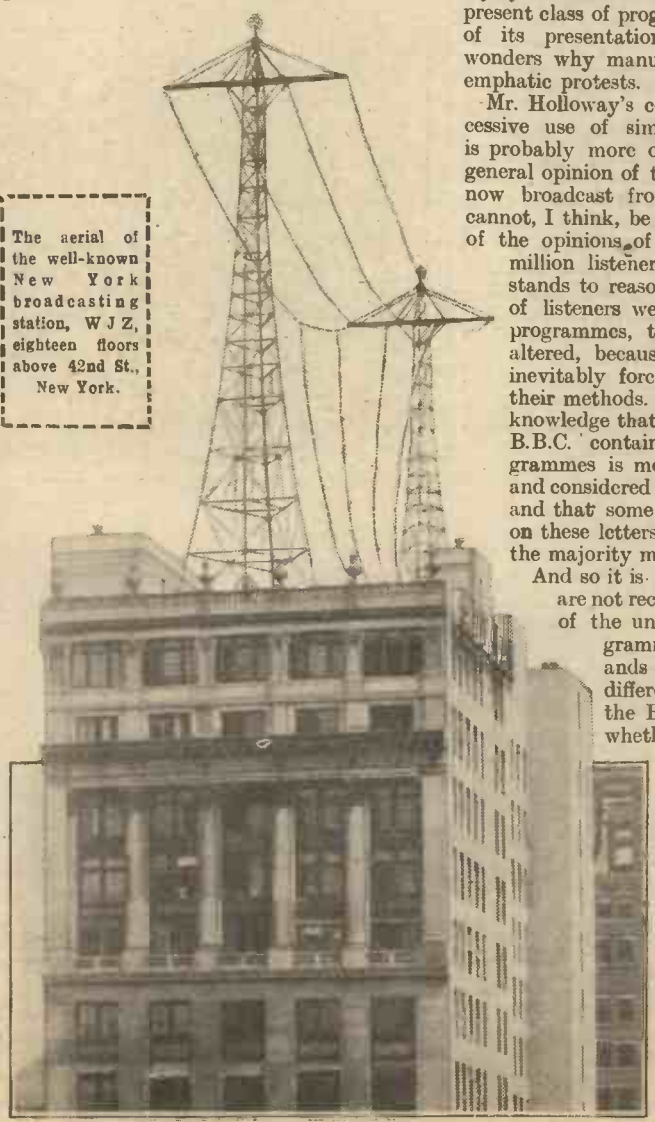
* * *

Italy is also making great strides. The high-power station at Rome, with call sign I D O, is now working on 100 to 120 metres, and two very well-known amateurs in Rome are also working on short waves; their call signs are I H T and I M T. Poldhu, with a new call sign of 2 Y M, can also be heard very frequently on a wave-length of approximately 75 metres. Another broadcasting station in Italy, I C D of Rome, will soon be broadcasting on an increased power with apparatus including a new modulating system; the wave-length will be 426 metres, while the well-known station at Köenigswusterhausen, near Berlin, has also been undergoing some radical changes. When the new transmitter is ready it will include a 50 kw. Poulsen arc transmitter, a high-frequency alternator of 50 kw., and a 20 kw. valve set.

France is also making some very interesting experiments with wired wireless. The Society of French Electricians are at present engaged on tests which may eventually lead to the connecting of the great power stations in France with each other by radio over the power transmission lines on practically the same system as was inaugurated in the United States about twelve months ago. Another interesting development in France is in connection with the broadcasting of criminals' thumb prints. The thumb print system, as most of my readers know, was invented by that well-known Frenchman, M. Bertillon, but his great work has now been followed up by another well-known French inventor, M. Belin, who has succeeded in wirelessing the thumb print of a criminal, which, together with his picture and general description, has enabled the police of other cities to obtain a very rapid means of identification.

Some Strong Views.

I receive so many letters from readers, nowadays, concerning the B.B.C.'s programme, that it is quite impossible to publish even a fraction of them in "P.W." But I received one letter the other day from a reader, Mr. Geo. E. Holloway, of 71, Sydenham Road North, Croydon, who expresses some very strong views.



The aerial of the well-known New York broadcasting station, W J Z, eighteen floors above 42nd St., New York.

Mr. Holloway complains of the excessive amount of simultaneous broadcasting in this country. He says that "with the exception of the Savoy bands, the S.B. programmes are generally composed of plays, operas and high-brow items, which have the smallest general appeal to the public."

My correspondent also says that "it was generally hoped that the high-power station 5 X X would have provided an alternative programme of popular items, but that the cost and time spent in adapting sets for the new station has been wasted in the same way as costly multi-valve sets, which were expected to provide a more varied selection of programmes, but which object has been defeated by excessive simultaneous broadcasting."

Mr. Holloway further complains that manufacturers, many of them presumably members of the B.B.C., fail to realise the injury to wireless that is being done by the present class of programme and the manner of its presentation, and Mr. Holloway wonders why manufacturers do not make emphatic protests.

Mr. Holloway's complaint about this excessive use of simultaneous broadcasting is probably more or less justified, but his general opinion of the class of programme now broadcast from the various stations cannot, I think, be taken as representative of the opinions of the three-quarters of a million listeners in this country. It stands to reason that, if the majority of listeners were dissatisfied with the programmes, they would quickly be altered, because public opinion would inevitably force the B.B.C. to change their methods. I know from personal knowledge that any letter sent to the B.B.C. containing criticisms of programmes is most carefully scrutinised and considered by a responsible official, and that some sort of a check is kept on these letters, so that the wishes of the majority may be ascertained.

And so it is obvious that the B.B.C. are not receiving sufficient evidence of the unpopularity of their programmes, or else many thousands of listeners are too indifferent or too lazy to write to the B.B.C. to let them know whether they are satisfied or not.

If the former reason is the case, then listeners have only themselves to thank; but if, as I suspect, the majority of listeners are generally satisfied, and that the B.B.C. only receive dissatisfied letters from a minority, then that minority cannot expect the B.B.C. to radically change their programmes to please them.

AN EASILY MADE POTENTIOMETER

By R. H. WATSON.

Here are concise details for the construction of a component of value to every experimenter.

THE potentiometer has several uses in a set. It is most commonly employed to control high-frequency valves, regulating the grid potential in the way shown in Fig. 1. Here, by making the grid of the high-frequency valve a little positive,

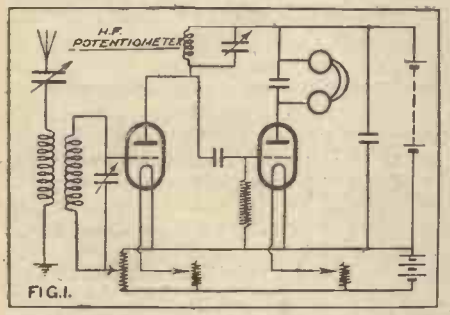


FIG.1.

we can make use of the damping effect of grid current and so prevent the valve from falling into self-oscillation. Fig. 2 shows a way in which it can be employed upon the low-frequency side of the set with great advantage. In this case a grid biasing battery X has been provided and the potentiometer is placed across it, the In Secondary (I.S.) terminal of the intervalve transformer being connected to it. By means of the potentiometer, we can obtain exactly the right amount of negative bias upon the gird to ensure that it is working.

For Dull Emitters.

The potentiometer may also be used as an auxiliary rheostat when one is working with dull emitters. When this is done, the potentiometer is used merely for rough adjustments; fine adjustments are made with the ordinary rheostat.

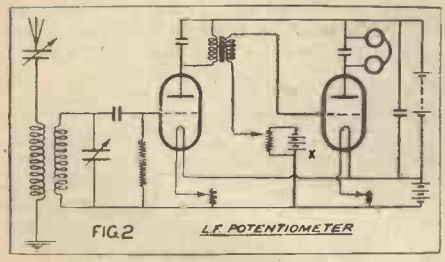


FIG.2 L.F. POTENTIOMETER

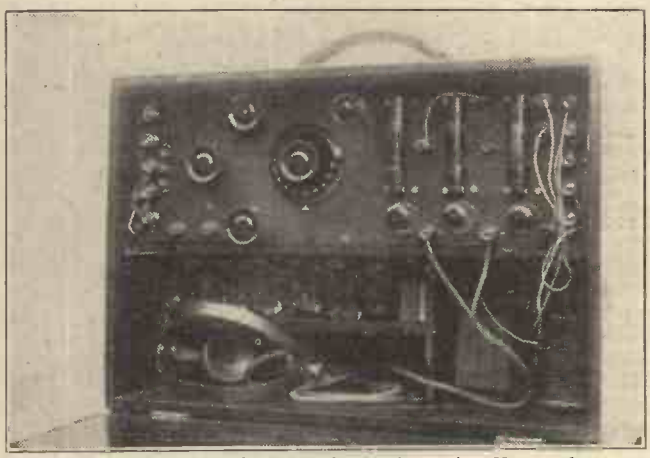
The easiest and least expensive way of constructing a 300-ohm potentiometer is to make it up on the lines of a single-slide tuning inductance in the way shown in Fig. 3. If this method is used, the total outlay will be as follows:

	s.	d.
Three terminals		6
Cardboard tube		3
Brass rod		4
Slider		4
Ebonite		3
Resistance wire	1	3
Screws		1
Total Cost	3	0

No account is taken of the wood required, since this will always be found in the workshop. The former is a stout cardboard tube 1½ inches in diameter and 6½ inches in length. Into this is inserted a wooden core made from a piece of blind roller or old curtain pole, which makes the tube thoroughly stiff and also provides an easy means of attaching it to the end pieces. If a screw is driven temporarily into the centre of each face of the wood it is easy to mount the tube in an improvised coil winder made up from Meccano parts.

Winding the Coil.

The windings consist of 1¼ ounces of No. 30 S.W.G. enamelled Eureka wire. Start half an inch from one end of the tube and wind on as evenly and as tightly as possible, with each turn touching those on either side of it. Not quite all the wire will be used, but the windings, 5½ inches in length, will


An interesting portable three-valve receiver using Myers valves.

contain sufficient wire to provide the 300-ohms resistance required. The wire which is left over will come in handy for making small fixed resistances. These can be worked out very easily if it is remembered that No. 30 Eureka wire has a resistance of approximately 5½ ohms per yard. When wound, the tube should be given a coat of shellac or enamel to bind the wire firmly in place, and this should be allowed to set quite hard.

Mounting the Former.

Now cut out a baseboard, made from ½ or ¾-inch wood 8 inches long by 3 inches wide. Upon this fix, by means of screws driven up from below, two end-pieces of ½-inch wood, each 3 inches high by 2 inches wide. These should be 6½ inches apart between their inside faces. Mount the tube between them by driving screws through the end-pieces into its wooden core. Cut out two pieces of ¼-inch ebonite 2 inches in length and ½ inch wide, drilling in each three 4.B.A. clearance holes, as shown in Fig. 4. That in the middle for the bolt, which holds the square brass rod in place, should be countersunk on the lower side, the other two on the upper side. Fix the rod to the ebonite and make a small hollow below the bolt head so that it cannot touch the wood. Then screw down the ebonite strips, reducing if necessary the height of the end-pieces until the slider makes very firm

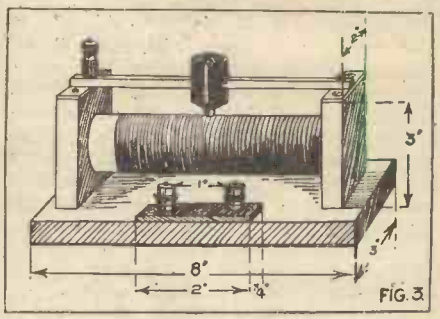


FIG.3.

contact with the turns of wire upon the tube. One end of the square rod is secured to the ebonite with a ¾-inch bolt, the other with a bolt 1¼ inches long, upon which are placed the two round nuts of a 4.B.A. terminal.

Run the slider up and down once or twice so as to mark the path which it will take along the windings. Then remove the enamel from a strip about ¼ inch wide, using fine glass-paper for the purpose.

Useful Auxiliary Rheostat.

The small ebonite block upon which the two battery terminals are mounted is made on the same lines as the strips to which the square rod is fixed. If care is taken to see that the heads of the bolts of the terminals do not touch the wood, perfect insulation will be secured.

As No. 30 resistance wire has a given capacity of rather more than ½ ampere, it is perfectly safe to use cardboard tubing for the former, since, even if the instrument is used as an auxiliary rheostat for dull emitter valves such as the M.O. D.E.3, the B.T-H.B.5 and the Ediswan A.R.06, the current passed will never be anything like this amount, and there is therefore no danger of its overheating. The resistance should not be used for the type of valve taking ·25 amp. at 2 volt however.

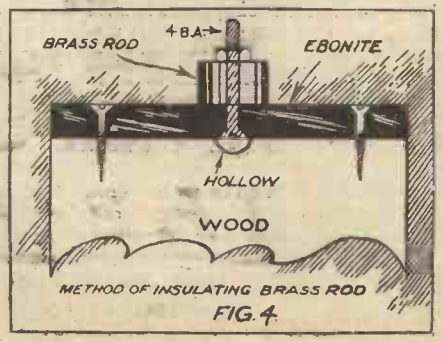


FIG.4.

THE N.A.R.M. EXHIBITION.

A RAPID REVIEW OF THE EXHIBITS.

By WARING S. SHOLL, A.M.I.E.E.

PART II.

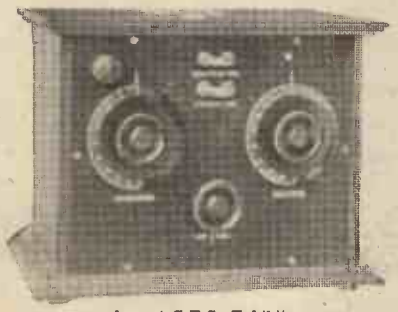
STAND No. 75.

L. McMichael Ltd., Strand, W.C.2.

One of the features of the present year has been the appearance of a number of types of L.F. transformer, and, generally speaking, they have been a promising lot.

To particularise, we may mention that the M.H. transformer has acquitted itself very well, and from personal tests we can speak of the M.H. instrument in the highest terms.

Another good line is the tapped tuning coil with



A neat G.E.C. Exhibit.

a range from 25–100 turns, covering wave-lengths of 250–1200 metres in the A type, while the B type runs up to 3,240 metres, thus covering the entire range of telephony. Coming to H.F. transformers, the plug-in pattern, which are guaranteed "matched" for several stages working, are a great assistance in handling this rather critical element in the receiving set.

Another tuning device worthy of comment is the "Reversine" coil holder: a most ingenious device which needs to be examined in detail to be appreciated.

Quick-change clip-in condensers also will find much favour with the experimenter, as also will the D.E.3 rheostat, which screws straight on to the battery terminal.

Mr. McMichael's long connection with the wireless movement has enabled him to gauge the practical man's requirements to a nicety, as these very excellent lines amply demonstrate. The well-known M.H.B.R. receivers are also here in full force and make up an exhibit that cannot fail to interest all wireless enthusiasts.

STAND No. 52.

Mullard Radio-Valve Co., Ltd., Balham, S.W.12.

Mullard valves make an attractive show, the variety of which is almost bewildering, as something like seventy-two patterns are turned out by this firm. All the old favourites are on view, from the tiny "Wecovalve" up to the Titan silica transmitter capable of dealing with 5 kw.

We find ourselves very much in agreement with the firm's belief that the bright emitter is very far from played out, even in face of the claims put forward by the sponsors of the dull emitter. On these premises Mullard's have gone "all out" on a new bright emitter known as the Mullard Master Valve, which embodies an arched filament, an oval looped grid and a hood-shaped anode designed to catch the electron stream "at the flood," to borrow a term from the immortal bard.

Two distinct types are turned out; one distinguished with a red ring for H.F. and detector work, and the other marked by a green ring for L.F. purposes.

The cap also has been improved, and is of insulating material with a view to reducing capacity.

Tests confirm the claim that the two valves possess distinct characteristics and are not merely labelled and styled as separate types.

If we are not greatly mistaken in our opinion, we predict a great measure of popularity for this new product in the coming season. The visitor will find the exhibit as a whole most interesting and instructive.

STANDS Nos. 11 and 13.

Radio Instruments Ltd., 12, Hyde Street, W.C.2.

An attractive display awaits us here, and we find ample opportunity for a prolonged stay in the inspection of a fine range of instruments, covering every requirement of both the advanced worker and the seeker after entertainment.

For the latter we note the "Lyrianette" table cabinet receiver, which is of the upright box form and is absolutely self-contained, the whole of the batteries, etc., being housed in the interior, into which the loud speaker is built.

The wave-length includes Chelmsford, thus enabling the user to receive the programmes almost anywhere on two or three valves. The new loud speaker is on show for the first time and bears evidence of the greatest care both in design and production.

That old favourite and much-parodied instrument, the R.I low-frequency transformer, has taken a fresh lease of life in the new sectionally-wound model, in which self-capacity has been reduced to the minimum.

A large sectional model enables the visitor to get an idea of the construction, and is naturally proving an object of considerable interest. The standard valve sets, from one to five valves, are among other exhibits, not overlooking a series of splendidly made coils, condensers, high-frequency units, and other components which well maintain the deserved reputation of Radio Instruments, Ltd.

STANDS Nos. 85 and 86.

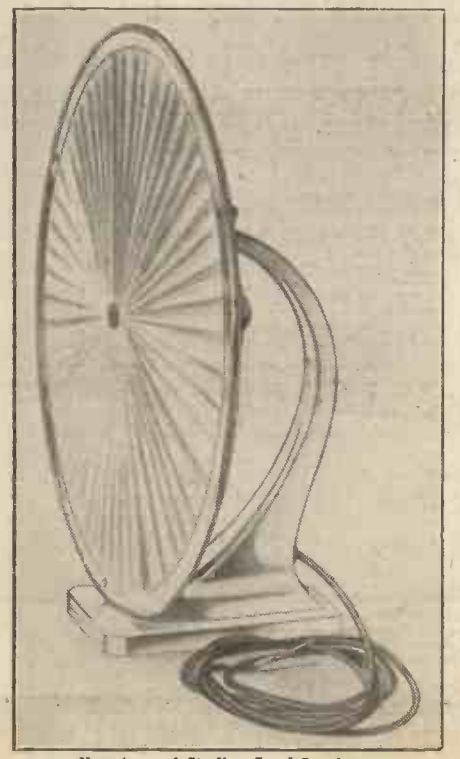
A. C. Cossor, Ltd., Highbury Grove, N.

Cossor valves need very little introduction to the experienced wireless worker who is numbered in the thousands of users of these excellent products.

The principles evolved and adopted in these valves are right both mechanically and electrically, consequently the popularity of Cossors has been a phenomenal in the bright-emitter class.

The great novelty for the coming season is the "Wuncell" dull emitter, which is being made in three types, viz., the W1, W2, and W3. The first-named is a detector or L.F. amplifier, the second is a D.E., counterpart of the well-known P2 valve for H.F. work, and is distinguished by a red top in the same way.

The W3 is a power type valve which will be placed on the market a little later on when production in quantities has been arranged for. The base of the valve contains a resistance enabling the filament to function either on a 2, 4, or 6-volt battery. The



New type of Sterling Loud-Speaker.

packing also is original and effective, giving an additional novelty to a most interesting proposition.

LOGGIA 111, STAND No. 32.

Dubilier Condenser Co., Ltd., Goldhawk Road, W.12.

Dubilier condensers are by common consent a standard, and probably find their way into more high-class receivers than any other make.

A "Gecophone" Set.

This year a slight departure is made from the existing standard type of clip in the introduction of the "610" model, which is provided with terminals for quick connection. Another new line is the double-tuning variable condenser with vernier, and still another innovation appears in the form of the "series-parallel" variable condenser, which may be introduced into the circuit, either in series or parallel, without causing a gap in the tuning range.

Low capacity has been carefully studied in the design of the "Minicap" key switch. This useful device enables a number of combinations to be produced at will without introducing capacity and its contingent troubles. The "Ducon" adapter has proved a very handy substitute for the aerial in flats or other places where the outside wire cannot be installed. The practical man will find the leaflets most useful.

LOGGIA 117.

Eagle Engineering Co., Ltd., Warwick.

Two, three, and four-valve sets are to be seen here of the American box type and styled the "Chakophone." The four-valve receiver, 1–1–2, is without reaction, the object being to go all out for quality rather than volume of sound.

The unit system comprises a series of vertical wedge-shaped panels which when assembled produce a desk type of receiver.

The component crystal receiver is of ingenious design. The variometer stator forms the body of the instrument with detector on a circular panel at the top.

STAND No. 81.

J. J. Eastick & Sons, 2, St. Dunstan's Hill, E.C.

This exhibit is in the nature of a trade display for wholesale business only.

Those interested in gadgets will find a most interesting display, among which may be noted the H.T. battery box, a line in small switches, and a particularly nice series of variometers. Valves are a special line with the firm, whose stock covers every British maker of repute.

STAND No. 71.

A. W. Gamage, Ltd., Holborn, E.C.1.

Gamages have stood for wireless ever since telegraphy became popular among amateurs, and long before telephony was anything but a dream.

We naturally find a firm with its roots so firmly struck in the industry going strong on the lines that the experimenter finds indispensable both for research and home construction.

The Bijouphone Crystal Receiver.

We can speak very highly indeed of "Permanite," one of the original "ites" which made its appearance when a crystal of any kind was hard to obtain, let alone a really good one.

Among the components we find a nice line in variable condensers, and some very useful rheostats and grid leaks of a dependable nature which may be used without any doubt as to satisfactory result.

A long experience of the amateur's needs places the firm in a favourable position to supply his wants: the excellence of the exhibit gives further proof of this by reason of its eminently practical nature.

STAND No. 64.

Gent & Co., Ltd., Leicester and London.

An old-established firm of electrical engineers and instrument makers such as Gent & Co. are naturally very much in their element in wireless. The organisation and resources of a well-equipped factory have been brought to bear with excellent results, on the

(*Continued on page* 265).

Just out!

A wonderful new system of simplified wireless construction

As the Pioneer Publishers of Wireless literature, THE WIRELESS PRESS can claim another noteworthy achievement in the publication of this splendid "EZI-WIRING" series.

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No. 3. A 2-Valve and Crystal Reflex Receiver - by W. JAMES.

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Series represents a definite and welcome innovation for the Constructor, possessing little or no technical knowledge, who wishes to build instruments of high efficiency, with minimum trouble and expense. Apart from other aids to easy wireless construction the wiring diagrams are shown in four colours—a unique feature which prevents any possibility of incorrect wiring by rendering this frequent cause of difficulty a matter of extreme simplicity. In addition, there are explanations, progressive diagrams and plates showing the Set concerned in various positions with the disposition of the components—in fact, every item is adequately dealt with which can possibly facilitate accurate, speedy and faultless construction however limited the Amateur's knowledge. There are no loose sheets. Detailed measurements are given, particulars as to the size and use of various parts, as well as full instruction on the operation of the complete Set.

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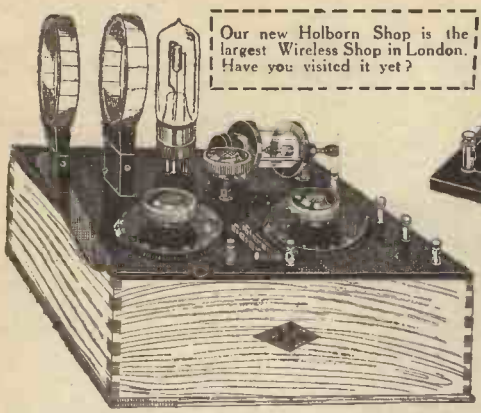


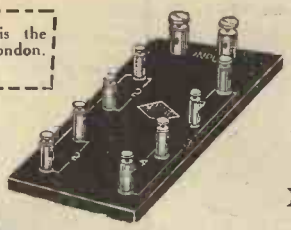
Our new Holborn Shop is the largest Wireless Shop in London. Have you visited it yet?

Build up this splendid 1-Valve Reflex Receiver.

Anyone can build up this splendid compact and efficient one-valve reflex, which gives practically the equivalent of 3 valves (1 H.F. crystal detector and 1 L.F.). The cheapest Valve Set of repute on the market. Very favourably reported on by the Editor of "P.W." Full working instructions for home assembly and every necessary component, including drilled and engraved panel, Max-Amp Transformer, two variable condensers, Mic-met Detector, Switch, etc., etc. (including Marconi royalties) £4 0s. 0d.

Cabinet 4/6 extra

Finished Instrument, aerial tested, including Marconi Royalties £5 5s. 0d.



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A solid moulded ebonite panel with all connections concealed below. To use, merely connect to the Set and insert telephones into terminals where marked. Will take up to 4 pairs of phones **4/6**

Interchangeable Plug-in Condensers.

Each condenser is of same standard size, and plugs into panel or into another one of different value. Thus, two condensers each of the value of ·0005 mfds. become ·001 mfds. Very little room taken up on the panel. Every condenser tested, guaranteed and calibrated

Price: ·001 to ·0009 mfds. 2/- each
·001 to ·001 mfds. 3/- each
Sockets 2d. per pair.

Peto-Scott Square Law Condensers.

New registered design with absolutely straight curve on actual test. Superior finish with solid ebonite and plates.

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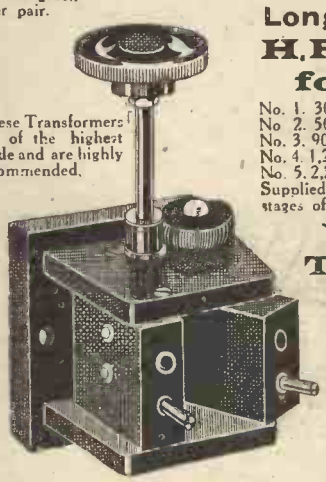

These Transformers are of the highest grade and are highly recommended.

Long-Distance H.F. Transformer.

No. 1. 300 to 600 metres 6/6
No 2. 500 to 900 metres, 7/-
No. 3. 900 to 1,500 metres, 7/-
No. 4. 1,200 to 2,300 metres, 7/-
No. 5. 2,200 to 4,800 metres, 7/-
Supplied matched for two stages of H.F. at same price.

Vernier Two Coil holder.

Improved model with fine friction drive movement. Solid ebonite, hand polished, superior finish.

10/6

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Send a postcard for a copy of our large 48-page Catalogue, a copy of the Unettes Folder and other most interesting Wireless literature—FREE.

Gilbert Ad. 1487

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The Superlamp Net Trade Price List No. 76 of Wireless Parts, Sets and Accessories contains hundreds of special Cut-price, Business-bringing, Customer-satisfying, Profit-making Lines.

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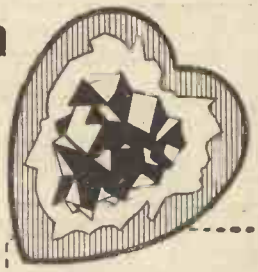
The magic of Wireless is made more wonderful by the introduction of a new crystal, "URALIUM."

Each crystal is tested and guaranteed, is consistently active, unaffected by atmosphere and gives perfect reception over the maximum range.



Uralium
NATURE'S WONDER CRYSTAL

Obtainable in boxes including silver catswhisker

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of all dealers.

Improve your Set and ensure perfect reception to-day by using "Uralium."

THE BOWER ELECTRIC LTD.,

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THE ONLY EASY WAY TO SOLDER YOUR WIRELESS SET IS TO USE

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CLEANS—TINS—AND SOLDERS IN ONE OPERATION.

NO ACIDS FLUXES FILING **1/6** MAKES SOLDERING CHILD'S PLAY

The SOLDO COMPANY, Sicilian House, Southampton Row, London, W.C.1.

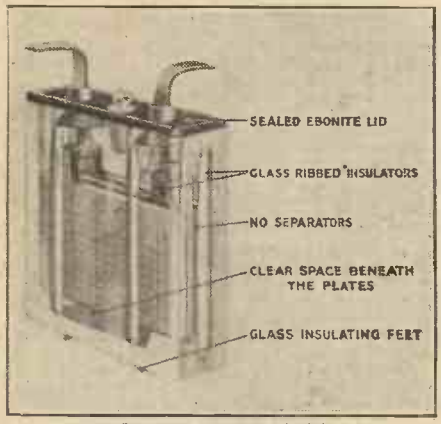
THE N.A.R.M. EXHIBITION.

(Continued from page 260.)

production of the "Tangent" and "Discol" products in the component line, and the "Radiomatic" receivers, comprising 2, 3, and 4 valves.

Taking the latter first, we find these sets of the panel type very well turned out and built on standard "straight" circuit lines. The four-valve set, 1-1-2, with last stage a power stage, is a nice-looking instrument, the detail work being very good.

"Tangent" L.F. transformers have made good as well-designed and pure-toned amplifiers, and the



A Hart Accumulator Exhibit

H.F. "Discol" transformer of the bobbin type is equally good for its special function.

The tuning coils are very robust, the winding being interlaced with cord, which adds greatly to the mechanical strength.

There is an atmosphere of quality about the exhibit which cannot fail to attract the practical man.

LOGGIA 103, STAND No. 21.

M. O. Valve Co., Ltd., Brook Green, W.6.

M. O. Valves comprise the usual types of R valves for general use, and also a number of special pattern, such as the L.S. 1, 2, and 3 for amplifying and loud-speaker work. For work specially demanding low capacity, the Q. and Q.X. types can be recommended as designed for this specific purpose.

Transmitting and rectifying valves also find a place in the range of products turned out by the firm.

Dull emitters are naturally well to the fore, the D.E.3 '06 type being a prominent feature of the exhibit.

LOGGIA 116.

The Radio Society of Great Britain and Ireland, 43, Victoria Street, S.W.1.

Here will be found the officials and records of the premier wireless society in the British Empire.

All seriously interested in wireless are invited to pay a call, meet their friends, and discuss matters of mutual interest. Country visitors are particularly invited to make a call.

STAND No. 81.

Radiax, Ltd., 4, Percy Street, W.1.

A number of handy units and components of a plug-in nature are to be found here, chiefly in connection with H.F. amplification and reaction.

The components are very well produced, and have made an excellent name for stability in operation in connection with the rather delicate proposition of multi-stage H.F. tuning.

A nice display and an eminently practical one was the impression we gathered from an all-too-short visit.

LOGGIA 132.

Radiophones, Ltd., 4a, Savoy Street, W.C.2.

While on our tour of the boxes, or "loggias," as the best people call them, we find our attention distinctly drawn to the "Listolcon" Cabinet de Luxe, a receiver of the 1-1-2, four-valve type housed in a handsome cabinet of neat and tasteful design.

The 3 T.A. set in a flat case looks a likely instrument for portable work with 3 valves, 1-1-1, the general lay-out being on practical lines.

LOGGIA 125, STAND No. 61.

Radio Communication Co., Ltd., Norfolk Street, W.C.2.

"Polar blok" units have made consistent headway since their introduction, and a detail improvement is announced in the provision of a rustless metal frame for mounting the various sections.

"Polar" gadgets are proverbially handy ideas, among which we found the Cam-Vernier knob and dial, the Cam-Vernier coil holder with its perfectly delightful motion, and another excellent tuner, the universal two-coil holder, in which the moving coil works on a bell joint almost as adjustable as a crystal detector arm.

Coming to the sets, we liked the two cabinet types very much, the one being of the Chippendale period type with 7 valves, 3-1-3, and remote control, and the other model being of the built-up bookcase form. This instrument also comprises 7 valves, this series being among the largest and most powerful in the show.

LOGGIA 119.

Rees Mace Manufacturing Co., Ltd., 50, Pall Mall, S.W.

A portable instrument in a compact mahogany case with frame aerial attached, and therefore not unsightly, as the hollow lid of the cabinet encloses the frame.

One, two, and three valve receivers are the standardised patterns, the general type being the same throughout, the dimensions only varying according to capacity of instrument. Generally speaking the set appears to be an American idea "done into English."

We learn with interest from the makers that the British manufacturer does not know very much about anode voltages and how to use them.

Our own impression is that tapped H.T. batteries with wander-plugs originated on this side of the herring-pond and not the other side.

LOGGIA 124, STANDS Nos. 54, 55 and 56.

Sterling Telephone and Electrical Co., Ltd., Tottenham Court Road, W.1.

We next pause to inspect a typical exhibit, "Sterling" in name and nature, and embracing a wide field of activity, as might be expected from so old-established a concern.

Telephones naturally make a fine display, the turn-out and finish being of a high order.

The new cabinet receivers are fine examples of both the engineer's art and the craft of the cabinet-maker.

The lines are most beautifully interpreted in the design, and a fine feature—electrically speaking—is the provision of metal panels upon which are fitted the various instruments. These panels, being matted black, are nice-looking, and naturally form an effective screen against body capacity.

The Anodion two-valve panel type set with "straight" circuit 1-1-0 is good value at £9 9s.

The Sterling interchangeable filament resistance is a really bright idea, and is much easier appreciated from actual inspection than mere description.

The "Primax" loud speaker is now being manufactured by the firm under Lumière patents.

As many of our readers are aware, the instrument is of novel appearance, a large pleated paper diaphragm taking the place of the customary horn.

STAND No. 33.

Wates Bros., Ltd., Great Queen Street, Kingsway, W.C.2

A number of really practical ideas invite our attention at this stand. The new Model 2 "Bijouphone" actually has a range from 250 to 1,650 metres, thus being capable of receiving Chelmsford—if within crystal range, of course.

A soundly-made crystal receiver with this tuning range is remarkable value at 10s. The "Wates" H.F. transformer, of the groove-wound tapped type, is a beautiful little instrument, and possesses a tiny variable condenser of its own in the base.

For the worker of moderate means, the "Supra" L.F. transformer with 5:1 ratio is good value at 12s. 6d. Mention must also be made of the dry batteries and accumulators, which have always been a speciality of the firm.

STANDS Nos 15 and 16.

Western Electric Co., Ltd., Aldwych, W.C.2.

Visitors to Wembley will probably have noticed the groups of "Western Electric" loud speakers at various points, notably over the "cave" entrance to the amusement park.

Public address and open-air loud speaker work has been a special development of this firm, and, as might be expected, we find loud speakers and the necessary amplifiers well to the fore.

The "Weconomy" sets are very compact, and, being served by dry batteries entirely, are highly suitable for use in drawing-rooms and places where the presence of acid is objectionable.

The various units of the receivers are shaped very much like card index cabinets, and in the case of multi-valve sets the different stages are stacked one above the other in most compact form.

Headphones, valves, and suitable dry batteries for operating the latter make up a most interesting exhibit.

STAND No. 82.

A. J. Stevens and Co., Wolverhampton.

Everyone knows the A.J.S. motors, and, as we might expect, the wireless goods are every bit as up-to-date as a progressive concern can make them.

The cabinet receivers are a good example of design plus adaptability, particularly in the "Unit" cabinet.

Here we have the top section, very much on the lines of a table gramophone, which contains a four-valve "straight" receiver, 1-1-2.

Under this may be placed a centre section to hold the batteries, while the base is of the nature of a plinth which houses an A.J.S. loud speaker.

When built up the whole set is indistinguishable from a solid pedestal instrument, and the finish in mahogany, light or dark oak, is a delight to the eye.

As an example of thoroughness, it may be remarked that ampere and volt meters are included in the receivers in order to maintain efficiency in the batteries. The 2, 3, and 4 desk type receivers are well made, and really good value for money.

LOGGIA 112.

C. A. Vandervell & Co., Ltd., Acton, W.3.

C. A. V. products in the form of accumulators have been known and approved for over thirty years.

With these facts in view we are not disappointed in the fine show of secondary batteries of all types suitable for both filament and anode circuits. The latest arrival comes in the form of the C. A. V. loud speaker, which now makes its debut at a purely wireless show.

The instrument is, to all external appearances, very much like the generality of other instruments.

In view of the rather extravagant claims put forward by the makers, we prefer to make a trial before giving a further opinion as to the merits, or otherwise, of the instruments.

LOGGIA 123.

National Wireless and Electric Co., Acton, W.3.

The "Gnat" crystal receiver is the trump card here, and certainly no very modest claims are made on its behalf by the producers.

A neat series of amplifiers are made to enable the set to be increased in range by the use of a H.F. unit, and the power augmented by a note magnifier.

One, two, and three valve receivers on the generally accepted lines and the usual accessories make up a well-staged exhibit.

LOGGIA 131.

The Radio Association, Sentinel House, W.C.2.

All members of the above association will be welcome at this stand, and are invited to bring their friends and all intending members.

The handbook and all information regarding the activities of the association may be obtained upon application.

A finely made two valve amplifier, by Metropolitan-Vickers Co., Ltd.

STAND 24, LOGGIA

Beard and Fitch, Ltd., 34, 36, Aylesbury Street, E.C.1.

The lines here shown are manufactured by the exhibitors under the proprietary brand of "Success."

The first of the series is the L.F. transformer, easily distinguished by its highly ornate appearance, the case being lacquered brass with a conspicuous transfer bearing the trade mark.

Another component is the anode capacity reaction unit.

A solenoid-type tapped inductance is also turned out by the firm, the switch and contact studs being neatly housed in a recessed base.

Anode coils and vernier coil-holders for fine tuning are two quite new lines, as are the aerial earthing-switch and a more advanced type of L.F. transformer.

List of "Success" components shown at the Exhibition—"Success" Standard L.F. transformer. "Success" Super-Success L.F. transformer. "Success" anode capacity reactance. "Success" tuner. "Success" Ertharea! lead-in-switch. "Success" Vernier coil-holder. Specimens of gears and worms applicable to wireless.

SHUNT H.T. SUPPLY IN RADIO RECEIVERS.

FROM A CORRESPONDENT.

For those amateurs who still utilise H.T. Batteries the information given in this article will prove of real practical value.

THE use of "series" high tension supply to the plates of valves seems to be an arrangement that is universally adopted in receiving sets, whilst the parallel or "shunt" system of H.T. supply is generally confined to transmitting circuits. The use of shunt H.T. supply to some receiving circuits is, however, quite practicable and has certain advantages over the series

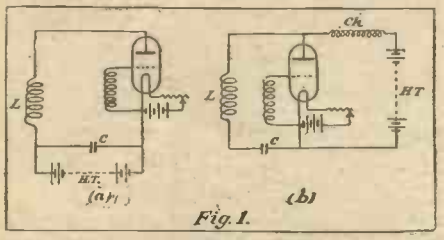


Fig. 1.

method. Before, however, describing its application to a receiver it might be well to consider the main features of the two methods.

The fundamental principles of series and shunt H.T. supply are illustrated in Fig. 1 (a) and (b), which show a valve connected in a circuit capable of producing oscillations. In the case of series H.T. supply, Fig. 1 (a), the anode of the valve is maintained at a positive potential by the current drawn from the H.T.B. *through* the inductance L; when the valve is generating oscillations the current flowing in L is made up of two components—the direct thermionic current, and the high-frequency current which is superimposed upon this.

Easier Reaction Control.

These two currents may be split up and confined to separate paths, and the method of accomplishing this is shown in Fig. 1 (b). It will be seen that the anode oscillatory circuit remains substantially the same as before, but the H.T.B. is connected through a large inductance or choke, Ck, directly across the plate and filament of the valve. Any oscillations now set up in L will be confined to that circuit, the high impedance offered by the choke to H.F. currents preventing the direct current circuit from "shorting" the oscillatory circuit, while the blocking condenser C prevents any current from the H.T.B. from passing through L.

It will thus be seen that the direct and H.F. currents have been confined to entirely separate paths and do not interact with each other.

Coming to the application of shunt H.T. supply to a receiver, a circuit to which we can most advantageously apply this principle is the well-known single-valve autodyne circuit. This circuit, converted for shunt feed, is illustrated in Fig. 2, and is in use at the writer's own station. The reaction coil is connected through a .0003 variable condenser C to the filament, while the H.T. is fed to the plate of the valve through a choke, Ck.

Since the whole of the voltage of the H.T. battery is across the condenser C, it is important that this should be well insulated, and the spacing between the fixed and movable vanes should not be too fine, otherwise dust settling on the vanes may cause intermittent leaks giving rise to irritating noises in the 'phones.

The coupling of the reaction coil may remain fixed for a considerable wave-length range, and oscillation can be controlled by adjustment of C. This has the advantage that whereas adjusting the coupling of the reaction coil alters the wave-length of the set considerably, oscillation can be weakened or strengthened by means of C with but very little alteration in wave-length.

Bypass Condensers Unnecessary.

The H.F. choke for short wave working may consist of any standard plug-in coil having about 300 turns or, alternatively, one may easily be made by winding about 300 turns of No. 38 S.S.C. on a 3-inch ebonite former. This works well up to about 1,000 metres, but for the longer waves larger chokes are to be preferred, although the set will sometimes function quite well without the choke, especially if some other impedance, such as the primary of an inter-valve transformer, happens to be in the plate circuit.

Since there is no H.F. current flowing in the D.C. circuit it is unnecessary to shunt the 'phones and inter-valve transformer primary (if any) with the usual by-pass condensers; the use of these condensers, however, may in some cases improve the quality of the signals received. The H.T. battery should, of course, always be shunted with a large condenser to smooth out any irregularities in the current.

The absence of H.F. currents in the D.C. circuit renders this part of the set entirely immune from capacity effects which sometimes cause signals to entirely disappear, as, for instance, when the 'phones are handed from one person to another. Similarly, any alteration in the impedance of the D.C. circuit such as might be caused by the switching in and out of a L.F. amplifier has little effect upon the wave-length at which the set may be oscillating or on the strength of the oscillations.

The importance of this in very weak signal work is obvious, for upon reception of a weak signal on the detector valve the L.F. amplifier can be instantly switched in with little or no retuning having to be carried out. This cannot be said of the single-valve set with series H.T. supply, where, when the 'phones are switched out of the plate circuit of the detector valve into that of the L.F. amplifier, a considerable alteration of the strength at which the set may be oscillating takes place and valuable time may be lost in re-adjusting reaction coupling.

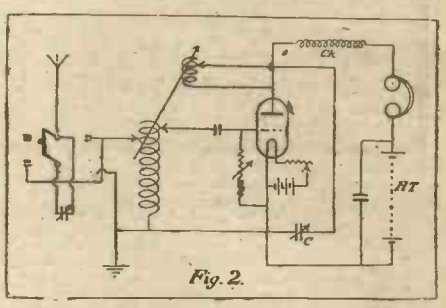


Fig. 2.

Wireless "Field Day" organised by several of the North London Radio Clubs.

The Technical Editor of "Popular Wireless" will be pleased to receive wireless sets and component parts for test. Reports will be published under this heading.

MESSRS. BEARD & FITCH, LTD., of 34-36, Aylesbury Street, London, E.C. 1, have sent us a range of their high-class wireless components for test. As a primary "try out" we made up a three-valve I.V.I. straight circuit, using a "Success" tuner in the aerial circuit, a "Success" anode capacity reactance, and a "Success" L.F. transformer.

The "Success" Anode Capacity Reactance.

The combination proved excellent, and really first-class results were obtained, both in respect of reception from B.B.C. stations, all of which were brought in—several on the loud speaker—and from the more distant Continental broadcasting stations, Königswusterhausen down to the School of P.T. being heard with remarkable clearness.

We then took out the "Success" tuner, a well-made piece of apparatus which sells at the attractive price of 21s., and tested it separately both in a simple crystal circuit and an experimental valve panel. Crystal results were good, and gave clear proof of the efficiency of the winding of the coil and the sensible-sized gauged wire.

Some sort of "dead end" switching must be employed, because on a wavemeter test, using a 75 ft. single wire aerial, we were able to tune between 200 and well over 4,000 metres, employing series parallel switching for the A.T.C. The winding of the "Success" tuner, we notice, is divided up into sections, each being well separated from the others. This is one of those little technical finishes that gives us pleasure to notice when testing and examining wireless components. It is only necessary to drill one medium-sized hole in a panel to mount the tuner, and a clearly engraved scale is provided for indication purposes.

The "Success" anode reactance we did not trouble to give an individual test, as its performance was so obviously satisfactory in the above-mentioned circuit. The anode reactance, by the way, is of approximately the same depth as the tuner—some 4½ in. or so—but is only 2 in. in diameter, the tuner being 3½ in. The anode reactance, similar to the tuner, necessitates but one-hole mounting in spite of its two controls—wave-length tuning and reaction adjustment. As a matter of fact, we consider the "double knob" method of control—that is, having the one knob "super-imposed" upon the other—is to be highly commended in certain cases, the one under review being more or less outstanding, in our opinion.

Tuning a set that embodies tuned anode coupling and reaction is always rather "tricky"—that is, at least, if it is desired to obtain optimum results—and therefore the "dual knob" tends to simplify tuning and allows one hand to make two adjustments simultaneously, leaving the other to accomplish further simultaneous knob-twisting if necessary and—if possible.

The "Success" anode reactance bears the appearance of a first-class well-finished instrument, and in view of its undoubted merits of performance we do not consider 50s. by any means an unreasonable price. After all, quality should always be given first consideration.

The "Success" L.F. transformer was given a separate test both for amplification and tone, and, as on previous occasions when we have reported on "Success" transformers in these columns, the instrument came through with flying colours. It is a nice, heavy, solid little job, and its clean-polished exterior gives no indication of the nature of its "innards." Not a wire is to be seen. A squat but neat black cylinder crowned with four neat and well-marked terminals—that is the "Success," and at 21s. we have no doubt that its selling properties are not overrated by its name.

It is claimed that a "Success" transformer can be immersed in water for long periods without causing any damage whatever to its windings. If this really is the case—and looking at it as it stands before us as we write we see no reason to doubt it—then it should stand up where others break down in this damp climate of ours!

A view of the base of a "Success" Tuner.

* * *

Messrs. Craik & Smith, well-known wireless manufacturers, inform us that owing to a rapidly increasing demand for their products they have been compelled to take over another extensive factory at 41, Allen Street, E.C. 1. This is indeed healthy news.

* * *

The Mullard Radio Valve Co. have sent us a sample of one of their Mullard Safety Discs. These they are giving away in thousands from their stand (No. 52) at the Royal Albert Hall Wireless Exhibition. These safety discs can be affixed to a valve holder in a second by means of the patent adhesive with which they are provided, and form an efficient safeguard against accidental filament destruction. Readers visiting the exhibition should certainly not miss paying a visit to the Mullard stand. "Something for nothing" is a rare possibility these days.

* * *

Two years ago a huge cylinder of wire securely riding on a large wooden baseboard, a cross between a ten-inch "spark coil" and a small mangle minus one of its rollers, represented the last word in crystal sets at the "modest" price of say £5 or so; now, well, we have the Fuller's "Sparta," for instance. The sample submitted to us for test looked very nice in its closed-up form—more like a small jewel-case than a wireless instrument. Raising the lid revealed a handsome little medley of nickeled fittings, but for a moment our impression was that the little black square marked "Chelmsford" was a plug-in coil minus its coil! Well we thought, this little set may be O.K. for 2 L O, anyway. Quickly we "wangled" the ingenious collapsible detector into position after raising the protecting crystal cover.

The "Success" L.F. Intervalve Transformer.

Our aerial is fairly lengthy, so we moved the also ingenious earth "plug terminal" to "L," fixing on the aerial and earth and 'phone leads. 2 L O did come in, and quite loudly, too. With resignation we removed the shorting clip from the load coil plugs and inserted the little black thing marked "Chelmsford" and—we heard 5 X X better than we have ever heard him before on a crystal set in London. We were only convinced at the moment that it was 5 X X for the simple reason that the signals were even louder than those of 2 L O. Yes, the "Sparta" does mark the passage of two years' progress and bristles with novel little ideas. The nice long list of instructions permanently mounted inside the lid, too, is worthy of special commendation. Readers contemplating the purchase of a crystal set would be well advised to get their dealers to show them a "Sparta"; we have no hesitation in recommending it to their notice.

* * *

It is claimed that Russell's "Chelmsford" super-crystal is manufactured specially for receiving signals from 5 X X. Two crystals in a small transparent box retail at 1s. At first sight it may appear a rather extravagant claim that one particular crystal should be more efficient for long wave-length signals; but when the varying effect of varying frequencies of alternating current on liquid rectifiers is considered, it must be admitted that there is no reason why varying frequencies should not have varying effects on rectifying crystals—that is, in respect of the quality—or should it be quantity?—of the resulting rectified current. This is as it may be; but, on test, a sample of "Chelmsford" super-crystal provided excellent results, both in tone and loudness of signals. It proved to be equally sensitive to both 5 X X and 2 L O.

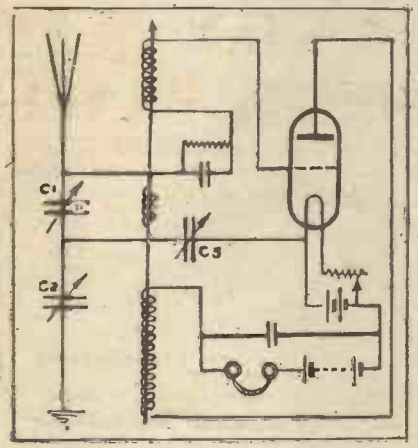
A SIMPLE SUPER CIRCUIT.

By PHILIP MASON.

Easy to Construct—Easy to Handle and Excellent Results.

THE following is a description of a single valve super-circuit which gives astonishingly good results, and is at the same time easy to construct and operate.

One of the special features of this circuit is that a coil is connected between the grid and grid condenser. This coil is coupled to the aerial coil, which is in turn coupled to the anode coil. If the coils are not coupled in this way the circuit will not function. With regard to size, the anode



coil should be the largest, the grid coil about half the size, and the aerial coil half as large as the grid coil.

The value of each of the variable condensers C1 and C2 is ·0005 mfd., and that of C3 is ·0003 mfd. C1 is the tuning condenser, and C2, C3, are used to regulate the reaction. A fixed condenser across the 'phones and H.T. battery is a considerable improvement in this circuit. A good value is ·001 mfd., though the size is not critical.

The best valve for this circuit is one of the hard Dutch type. Ordinary hard valves have been tried, but the results were unstable and not as good as with the Dutch valve. The H.T. voltage may be from 30 to 80 volts, but the best results are generally obtained at slightly below 80 volts.

Tuning-in.

The tuning of the circuit is fairly simple. Carrier waves are recognised by a faint howl. To obtain the telephony the reaction condensers are first adjusted until the howl is cut out and distorted telephony is heard. The coupling between the coils is then decreased until the distortion is cut out. Finally, the condensers are re-adjusted, when loud and clear telephony will be obtained.

One great advantage that this circuit has over other super-circuits is that it never oscillates except when a carrier wave is being received, a fact which will be appreciated by many suffering listeners.

Striking results are obtained by the writer with the above circuit. The aerial used is of the indoor type, consisting of a length of wire round the walls of a room. All the British broadcasting stations are received at very good strength, and Brussels, School of Posts, Radiola, and several other Continental broadcasting stations can be obtained regularly. The remarkable selectivity of the circuit will be appreciated when it is understood that all these stations are picked up while Birmingham (5 I T), which is only three miles away, is transmitting.

Hearing Distant Stations.

A large number of amateurs have been received, some being at considerable distances. Amateur stations as far away as Croydon (130 miles) have been heard at loud-speaker strength. Perhaps the most remarkable achievement is the reception of speech from French aeroplanes at a distance of over 500 miles.

This circuit should prove invaluable to the amateur, as it possesses the advantages of a multi-valve receiver without the expense and trouble.

HOW TO BUILD A FOUR-VALVE RECEIVER.

(Continued from page 245.)

from the diagram, and 30 feet of No. 18 D.C.C. wire is threaded in and out so as to form a large square coil having an outside measurement of about 18 by 18 inches. This coil forms the frame aerial, and each

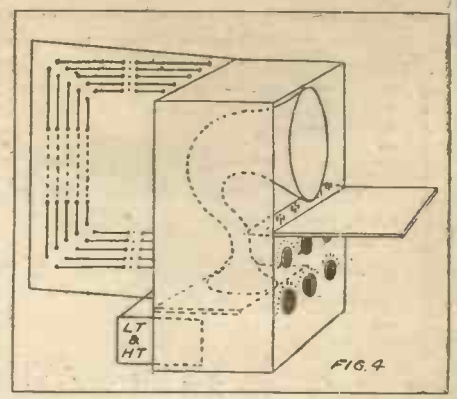


FIG. 4.

end of it must be connected to flexible leads coming from the terminals A and B, Fig. 2.

By hinging the back of the cabinet so that it can be swung through an arc of about 180°, good directional reception can be obtained.

Fig. 5 shows what the finished set should look like, but it must be understood that with a small frame aerial the range for loud-speaker reception will be only about 30–40 miles, so that for greater distances an outside aerial should be used.

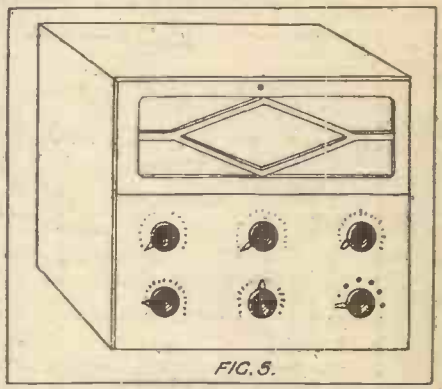


FIG. 5.

Captain Smith, of U.S.A., who broadcast a "talk" upon the sea-bed a few weeks ago.

This curiously named **All-British Exhibition** is not representative of all British Manufactures, but has been organised by a Trade Association and is restricted entirely to its own members. The use of such a title has been condemned by wireless publications of standing and repute.

BUT YOU MAY VISIT US AT THE

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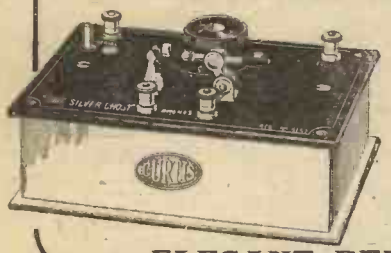
CRYSTAL RECEIVER



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For perfect reception of all British, American and Continental stations.

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3 Valves	.. ..	£9	0 0	3 Valves	.. ..	£12	0 0
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Latest models fitted in natural walnut finished Cabinet with plated Fittings

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The Radionette Models are the product of considered design, selected material .. and perfect craftsmanship which have stood the test of time.

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6×6×3/16	1/9	9×6×1/4	3/3	18×9×1/4	9 6
6×6×1/4	2/-	10½×8½×1/4	5/3	18×12×1/4	13/-
6½×5½×3/16	1/9	12×6×1/4	4/3	24×10×1/4	14/6
6½×5½×1/4	2/-	12×10×1/4	7/3	24×12×1/4	17/6
8×6×3/16	2/3	12×12×1/4	8/6		

Special Panels, similar quality and finish, Cut, Edges Ground and despatched same day 1d. per square inch, postage 6d. extra

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T1 Transformers..	30/-
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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.0001 to .0005 Fixed	1/3
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Variometer ..	10/6
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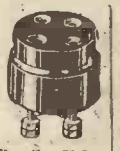

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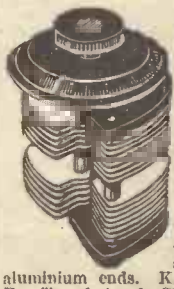

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John Blair, Esq., Rexall Pharmacy, Millom. says:— Your Condensers are a REVELATION to me as a Dealer. Sept., 1924.

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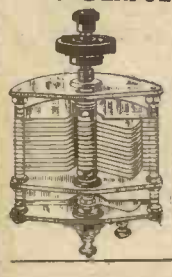

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Designed for use in H.T.-less valve circuits, such as the "Unidyne." Ratio—10-1. Turns 24,000—Spirella wound. Mounted in plated case. 20/-
POST FREE.

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6 in., complete ..	1/-
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LEAD-IN WIRE	
Heavy Rubber, 3 mm., 6 yds.	1/6
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MULTIPHONE TERMINALS.	
4-screw, round type	1/-
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BOXES (POLISHED).	
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BASKET COILS.	
6 waxed 200/3600	2/2
7 " 150/3600	2/6
5 waxless 200/2000	2/6
2 " S.T. 100	1/3
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EBONITE COIL STANDS.	
2-way, ex handles	4/6
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Also at 4/3, 4/6 ..	5/11
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BRUNET (genuine)

4000 ohms 'Phones	16/11
Do. De Luxe	17/11
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Cut to size at ½d. sq. in., ¼ sq. in., ½d.
Post 3d.

Phillips '04 DULL EMITTERS 17/11
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APOLOGY. I regret delay in delivery of Condensers, which has been unavoidable owing to being snowed under with orders.

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FOR D.E. or R. VALVES .. 2/9

SPECIAL VALUE TRANSFORMERS

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·00075	8/-	9/-	11/-
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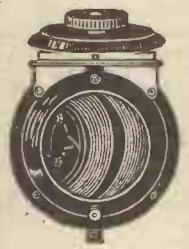

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24	1/-
26	1/1
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Ebonite Base.

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·006	1/6
·01 and ·02 ..	1/9
·05	3/3

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Midite	6d.

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Metal ·06	17/11
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With Extens. Handle	2/11 Also at 3/6, 4/-, 4/6
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Franco " "	12/6
Polar " "	11/- Etc., etc.
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Ditto, Swivel Movement	1/3
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'Phone 4 B.A:	1d.
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Plug and Socket	pr. 1d.
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Spade Screws	1d
Pin Screws	2 for 1½d.
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Ditto, ¾ in.	2 yds. 1½d.
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Battery Clips	2 a 1d.
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2,000 ohm Bobbins	1/8
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Waxed (7), 150/3,600	1/11
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Chelmsford, various,	1/6, 1/9
1 Complete with Adapter	2 3 (To use with variometer.)
Allen var. Gd. Lk.	1/3
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Ditto 4 v 80 amps.	23/-
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Ditto 6 v 80 amps.	33/6
Ditto 6 v 100 amps	41/-
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Brunet Headphones	14/6
Fixed Condensers (Ebonite)	·001 to ·0005, 10d. ·006 1/3

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D.C.C. Wire, per ½ lb.—	13 g. 9d. 20 g. 9d; 22 g. 10d. 24 g. 1/-; 26 g. 1/1 28 g. 1/3; 30 g. 1/6 Etc., etc.
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4,000 ohms .. **12/11**

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Strong Valve Template	4d.
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12 Studs
12 Nuts.
12 Washers.
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Similar to the MIC MET. **2/4**

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CALLERS' PRICES.

6×6	1/4
7×5	1/4
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9×6	2/-
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12×6	3/-
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14×10	5/6

CUT TO SIZE ½d. sq. in.
WE STOCK ¼-in. EBONITE.

"POPULAR WIRELESS."

FREE TO CALLERS. (Limited number, of course.)

SPECIAL L.F. TRANSFORMERS.

10/6 & 8/11

FRENCH METAL DULL EMITTERS ·06

3/4 Volt, L.T.
20-80 Volt, H.T. **17/11**

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Technical queries should be addressed to the Technical Queries Department, and must in all cases be accompanied by a stamped addressed envelope. Not more than three inquiries can be answered in one letter, and telephone calls or personal calls at this office cannot be dealt with. A copy of the questions must be kept as it is not always possible to reproduce the query when replying. Number the questions 1, 2, and 3, and answers will be given under each number.

The Editor desires to direct the attention of his readers to the fact that, as much of the information given in the columns of this paper is of a technical nature and concerns the most recent developments in the Radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

PATENT ADVICE FOR READERS.

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

Questions and Answers

E. J. E. (Ilford).—I wish to add a valve to my crystal set and am uncertain whether I should prefer it to act as an H.F. amplifier, L.F. amplifier, or both (i.e. dual). What are the different connections for these three purposes, keeping the crystal set intact as far as possible?

The accompanying diagram clearly shows how different alterations to a crystal set can be made. Fig. 1 is a single-slide tuning coil across which a pair of 'phones and crystal are connected to form a crystal detector, and Figs. 2, 3, and 4 show additional connections that can be made. Any form of crystal set can be adapted in this way, whether the tuning is accomplished by means of single slider, double slider, variometer, basket coils, or honeycomb coils, and whether direct or loose coupling is employed.

In Figs. 2 and 4 the I P —O P and I S—O S terminals are not marked because they vary according to the particular transformer used. The leads on both sides of the transformer should be tried and reversed until the best position is found. When the crystal set is used as a tuned-anode unit, as shown in Figs. 3 and 4, the A.T.I. should be larger than is necessary when it is functioning as an aerial coil, and it may be necessary to load the crystal set inductance with a small loading coil of 25 turns or so in order to cover the desired wave-lengths, and to bring this circuit into tune with the aerial.

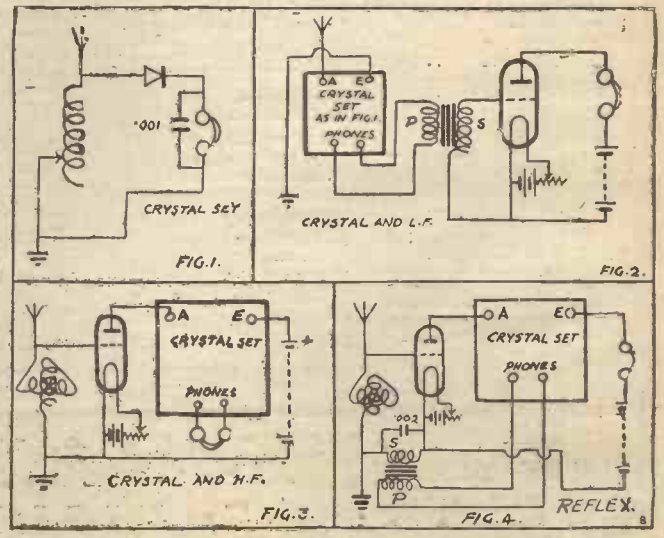
When the 'phones are disconnected and the primary of the L.F. transformer replaces them, the fixed condenser, which is normally across the 'phones, will be connected across the transformer primary; and generally this will be found to give perfectly satisfactory results. When the 'phones are disconnected and the primary of the L.F. transformer takes their place, the 'phone condenser is automatically connected across the L.F. primary. In most sets the value of the 'phone condenser is ·001 mfd., and this capacity is the one that generally gives best results when used across the L.F. primary.

* * *

J. J. R. (Withington), W. R. D. (Omagh), E. S. (Leeds), H. M. C. (Risca, Mon.), A. W. (Altrincham), J. A. L. (Selby), C. W. F. (Sidcup), W. R. A. (Caledon), B. D. P. (Tylorstown), C. R. F. (Beeston, near Nottingham), F. P. (Cheshunt), "MEMO" (Leicester), F. H. (New North Road, N.1.), E. B. (Monkseaton), V. J. R. (Alexandria), H. G. M. H. (Bury St. Edmunds), and S. V. B. (Ipswich).

In sending your queries unaccompanied by a stamped addressed envelope you disregarded the rules of the Query Department. As the questions are not of sufficient general interest to answer through these columns (or else have already been dealt with) replies can only be sent through the post. For this purpose a stamped and addressed envelope should be enclosed.

Foreign readers—whose postage stamps cannot be used for pre-payment of letters to be posted in this country—can send "Reply Coupons," which are obtainable at their local post-offices, and can be exchanged here for British stamps. The queries should be repeated, and should in all cases be numbered. Replies to each question will then be given under the appropriate numeral.



(*Continued on page* 281.)

RADIOTORIAL QUESTIONS & ANSWERS.

(*Continued from page 280*).

"TWO-CIRCUIT-CRYSTAL-SET" (Gorleston-on-Sea, near Yarmouth).—I wish to build a selective crystal set that can be loosely coupled so as to reduce interference from shipping, which is very bad in this district. I have been informed that a crystal set of this type was described in "P.W." No. 38, but I am unable to obtain this number now. Were the particulars ever reprinted, or, if not, can a summary of the main constructional details be obtained?

POPULAR WIRELESS No. 38, in which this set was fully described, is now out of print. The accompanying diagram gives sufficient particulars to enable the set to be constructed at home. You will see that the set essentially consists of an open aerial tuning circuit and a closed tuning circuit, arranged in the usual manner. The inductances are of the spider-web form, and are wound over nine nails driven into a cylindrical piece of wood, 2½ in. in diameter.

IMPORTANT NOTICE.

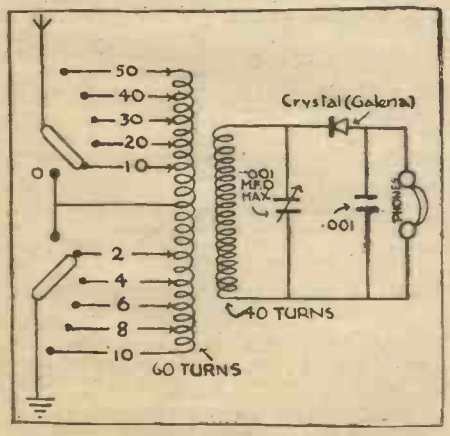
Readers are requested to note that not more than three queries can be answered in one letter addressed to the Technical Queries Department. Owing to the extraordinarily heavy pressure on this department, readers are asked only to send in questions which they find they cannot possibly solve for themselves. On no account will more than three questions be answered in one letter, and telephone calls and personal calls at this office cannot be dealt with, owing to pressure of work on the technical staff.

A stamped and addressed envelope must accompany all queries. A copy of the questions asked should be kept by the sender, as it is not always possible to reproduce the original query when replying. Number your queries 1, 2 and 3, and answers will be given to each item.

For the primary 60 turns of 24 S.W.G. should be wound on, tappings being taken from the following turns: 0, 10th, 20th, 30th, 40th, 50th, 52nd, 54th, 56th, 58th, 60th. The "tapping" point is formed by giving a single twist to the wire, thus forming a small loop about ⅛ in. in diameter. The insulation is then cleaned off, and a wire soldered to each loop and taken to its stud. For the secondary the same wire may be used, and is wound on the same size former, but only 40 turns are required, and no tappings are taken.

Having completed the winding, the coils should be given a thorough coating of shellac, when they should be left for about 24 hours to set. After this the nails should be withdrawn and the coils removed from their formers and wound with tape to prevent any tendency to unravel.

The next step is the construction of some coupling device, which must be left to the imagination of the amateur, as space does not permit of a lengthy



description here. The primary coil should, of course, be fixed, and the secondary coil mounted on a rod of some description which would then be controlled by a knob above the panel. Any good loose coupling device will be suitable for this purpose.

A two-way coil holder may be used, if desired, and the coils plugged-in in the usual manner. This would save the trouble of constructing the coupler,

(*Continued on page 282.*)

RADIOTORIAL QUESTIONS & ANSWERS.

(*Continued from page* 281.)

and is equally efficient, if there is sufficient room for the coils to be well separated. A variable condenser of ·001 mfd. should be connected across the secondary coil, and a fixed one of the same capacity across the 'phones. The maximum wave-length is in the vicinity of 800 metres, which is reduced to about 500 metres should a variable condenser of ·0005 mfd. take the place of the ·001 mfd. An extra 10 turns on the secondary would, however, compensate somewhat for this loss if the full wave-length range is desired using the ·0005 condenser. The range for really satisfactory signals is up to about 15 miles from an ordinary main broadcasting station, but it is not at all unusual to exceed this, distances of 40 miles or so being quite common, and in one case 400 miles was covered; but this was admittedly a case of freak reception.

* * *

L. W. C. (Bourne End).—I am thinking of building the two-valve H.F. and Detector Unidyne Set that was given in "P.W." Nos. 108 and 109, but am at a loss to know how to wire up, as no diagram of panel connections was given.

The panel-wiring diagram is given herewith, but you should note that no earth connection is shown from E to L.T. This has been omitted by the draughtsman.

The 'phone condenser may be connected if desired, but has been omitted in the diagram for the sake of clarity. You should also note that the H.F. transformer connections are shown on the second condenser, only *two* of the condenser connections being shown—the top right hand (fixed vanes) and the middle right hand (moving vanes).

* * *

J. F. F. (Tamworth. Staffs).—I wish to build a "straight" three-valve circuit, capable of receiving most of the B.B.C. and some Continental short-wave broadcasting stations. I understand that by employing the H.F. Det. and L.F. circuit (1-V-1) I should be able to get, probably, two or three stations on the loud speaker and the others in the headphones. I should like to use reaction controlled by a variometer, as I have two of these instruments on hand, and I hear that the variometer method is very popular in America.

The construction of a three-valve receiver of this type was fully described and illustrated in "P.W." Nos. 99, 102, and 104. Tuning and reaction are controlled by variometers, and with a good aerial-earth system the results desired by you should be obtainable.

All back numbers of "P.W." that are still in print can be obtained from The Amalgamated Press (1922), Ltd., Back Number Dept., Bear Alley, Farringdon Street, London, E.C.4, price 4d. post free.

* * *

D. W. M. (Inverness).—I have a two-valve set with tuned anode coupling and find that, having tuned in to a station, pulling out the H.F. valve makes little or no difference to the signals. Madrid is readable on the one valve, also German and French stations, whilst all the B.B.C. (other than relays) are very clear—still on one valve. Should not disconnecting the H.F. valve automatically break the circuit?

The effect is not an uncommon one, and is due to the capacity of the holder passing the H.F. impulses like a small condenser. The fact that signal strength is not much improved shows that the first valve is working inefficiently, and you will probably find that by experimenting with the tuning of its anode circuit or with the value of its coupling condenser you will be able to improve the first stage H.F. results.

R. J. A. (Banbury).—What ratio L.F. transformer is used in the different Unidyne circuits? I have seen a 10–1 transformer marked "Unidyne," but the latest articles in "P.W." that I can trace say that only 4 or 5 to 1 ratio is necessary.

Some confusion appears to remain with regard to transformers in Unidyne sets owing to the different types used at different stages of the inventor's experiments. The matter will be perfectly clear if the following facts are borne in mind.

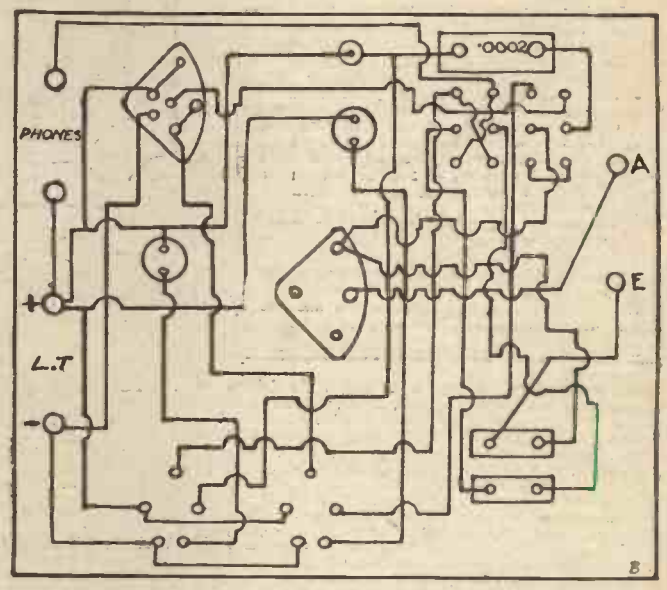
In the early experiments a 10 to 1 radio transformer was used, as described in "P.W." No. 103. Subsequently improvements were made, and the circuit was simplified, so that the necessity for this transformer completely disappeared.

When Unidyne L.F. amplification is used, the ordinary L.F. intervalve transformer is employed—viz., ratio 4 or 5 to 1.

If a detector valve only is used we recommend the simplified single-valve Unidyne described in "P.W." No. 112, in which no transformer is employed.

* * *

J. S. T. (Boveney, near Windsor).—I have built a one-valve Unidyne receiver as described in "P.W." No. 103 (May 17th, 1924), using



Ormond variable condenser (·0005), Mullard's fixed condenser (·0002), Watmel variable grid leak, Cam and Vernier two-coil holder, basket and Lissenagon coils, Formo 10–1 transformer, and Thorpe K-4 valve. All the components are in good working order, and I have wired up exactly according to diagram.

I could not get it to oscillate with a 4-volt accumulator, but with a 6-volt accumulator it oscillated readily. I find that after about a fortnight the filament burns out. Is this the fault of the valve or of the filament resistance?

In "P.W.," No. 112, a simplified one-valve Unidyne is described which does away with the transformer. Is this circuit as good as the original one?

The Unidyne one-valve receiver will oscillate very easily with a 4-volt accumulator, provided that all spacing and contacts are correctly arranged, and that suitable components are used. The causes of failure to oscillate were dealt with in "P.W.," No. 121, in reply to a question by "Unidyne" (Lowestoft), and you should also see "How to Operate Your Unidyne Receiver," in "P.W." No. 117.

You would find it advantageous to dispense with the transformer altogether, and to rewire into the straightforward and simple circuit shown in "P.W." No. 112. In this connection it cannot be emphasised too clearly that good spacing and contacts, which are important with an ordinary receiver, are vital with the Unidyne, so the simplified circuit is more likely to be successful than a more complicated circuit, especially in the hands of a beginner.

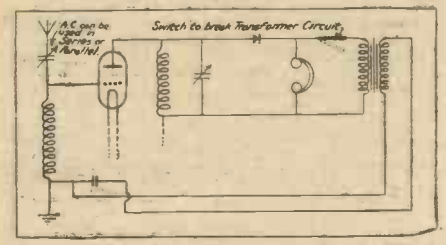
The burning out of the valve is due to keeping the filament burning too brightly, and there is no need to do this to obtain maximum signals. It will be found that a good filament resistance adds a great deal to the smooth operation of a Unidyne, and it will certainly effect a saving if the valve is kept burning as low as possible consistent with good signal strength.

Correspondence

"P.W." COMBINATION SET, SUPER CRYSTAL CIRCUIT.

The Editor, POPULAR WIRELESS.

Dear Sir,—I enclose herewith particulars by which this set can, by a few minor alterations, be turned into a crystal super. The aerial coil is used as the primary and the anode as the secondary, both coils being tuned by their respective variable condensers.



A two-way coil holder will be necessary to bring the coils close to each other. As will be seen by the diagram, the 'phones are connected across the transformers, a small S.T. switch being used to break the transformer circuit. With this circuit I have received 2 L O on a loud speaker, faintly audible at a distance of twenty feet.

Hoping this will be of interest to you and your readers.

Yours respectfully,
F. A. SHERATON.

25, St. Andrew's Road,
East Acton, London, W. 3.

THE UNIDYNE—"A GREAT SUCCESS."

The Editor, POPULAR WIRELESS.

Dear Sir,—I have just finished a one-valve Unidyne set, which is a great success. Within three seconds of switching on the valve I had Manchester loud and clear. Up to now I have pinned my faith to valve-crystal sets, but a Unidyne can compare with any crystal for purity of tone, and is well ahead in other respects. I am sure Messrs. Dowding and Rogers have every reason to be proud of their invention.

Does it matter which 'phone tag is placed in the battery terminals, seeing that there is no H.T. ?

Yours truly,
H. GRAFTON.

7, Blucher Street,
Waterloo, near Liverpool.

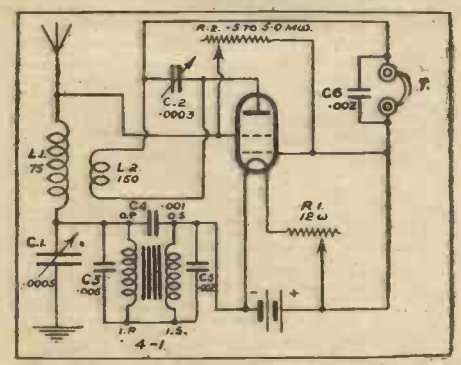
It does not matter how the 'phones are connected in a single-valve Unidyne circuit, but if more than one valve is used the plus tag should be connected to the battery positive.—TECH. ED.

A UNIDYNE "STUNT" CIRCUIT.

The Editor, POPULAR WIRELESS.

Dear Sir,—Messrs. Dowding and Rogers (in No. 110) rather discourage readers attempting to "Unidyne" any "stunt" circuits, but you may find the enclosed very rough diagram interesting. (I am no draughtsman.) (*Diagram has been redrawn!*—ED.)

It is an adaptation of the "One-Valve Loud-Speaker Circuit" published in No. 91, and I find it in some ways superior to the straight "Unidyne" circuit as published. There is no howling, volume is



greater, and tone quality equals any crystal set I have heard. Transformer is home-made from scrap wire and materials; fixed condensers are "cheap rubbish." I have only one valve (four electrode and very soft), and no previous valve experience, so cannot compare results with the H.T. circuit. I have to thank you for many good tips in your excellent journal, and

(*Continued on page* 284.)

CORRESPONDENCE.

(*Continued from page* 283.)

possibly readers who, like myself, get crystal volume from soft tetrodes bought in a hurry may care to try this. Mine is a wire-puzzle hook-up on an old board, but it answers with water-pipe earth and either outdoor or gas-bracket aerial.

Yours faithfully,
W. T. TAYLOR.

14, Parfrey Street,
Hammersmith, W. 6.

POETRY AND BROADCASTING.

The Editor, POPULAR WIRELESS.

Dear Sir,—May I be permitted to make an emphatic protest against the false, misleading theories advanced by Captain C. A. Lewis in his article on "Poetry and Broadcasting." I have seldom read anything more self-contradictory. After pleading for the broadcasting of poetry, which he describes as the "focus of thought and feeling," Captain Lewis goes on to say, and with considerable emphasis, that to be acceptable to the listener, the poetry must be rendered entirely without emotion.

Ye gods! If poetry is the focus of thought and feeling, why must it be rendered entirely without feeling? Is not emotion the very essence, the very soul and body of all good poetry? What is it but the outward verbal expression of inward emotion? Then why in the name of Shakespeare should it be rendered as if it were the multiplication table? What would Captain Lewis think if his butcher were to tell him that a sausage, to be palatable, must be made entirely without meat? What would he think if listeners were to request that the Wireless Orchestra should render the Soldiers' Chorus from "Faust" entirely on the note of B flat minor? He'd whistle and think that wits were wandering. Yet such things would be no more absurd than to declare that Hamlet slaying his uncle, and Falstaff roaring out his bar-room jokes, should utter their words in the same dead, monotonous, unemotional manner.

It is ridiculous to say that a broadcast voice sounds affected directly it becomes emotional. It does, of course, if the emotion be insincere and affected. In this respect the microphone is as merciless as the motion picture camera. It reveals every defect. But when the emotion expressed is sincere and heartfelt, it no more sounds affected than it does on the stage or the rostrum.

Of course, emotional expression, like every other good thing, can be overdone. Untrained, would-be elocutionists, in attempting to express that which is beyond their powers, will rant and rave in a manner that makes the listeners "squirm in their seats," but, wicked though it be to distort good poetry thus, it is a minor crime compared with the sacrilege of slaying it body and soul by speaking it as if it were a proposition of Euclid or quotations from the Stock Exchange.

As a protest against bad elocution, Captain Lewis's article is excellent, but to condemn all elocution because some of it is bad is neither logical nor right.

Yours sincerely,
373, Norwood Rood, CHAS. S. THOMSON.
West Norwood, S.E.27.

5 X X AND 2 L O.

The Editor, POPULAR WIRELESS.

Dear Sir,—Is it not time that the B.B.C. gave us the choice of programmes talked about when the second studio was being prepared at 2.L.O? Now that provincial "listeners in" have the choice between their own station and London, via 5 X X. Why should not Chelmsford broadcast the other stations as well, and, incidentally, introduce a friendly rivalry between them? The only thing 5 X X has done for London is to jam the most convenient Continental stations, and the simultaneous broadcasting compels those who do not care for plays without action to "close down."

Kingston-on-Thames. W. J. WINTER.

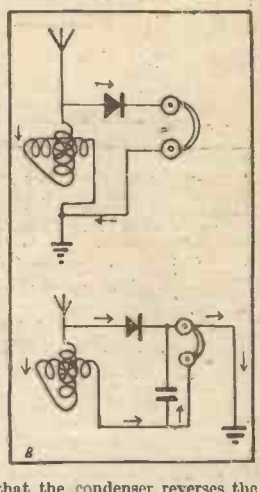
EXPERIMENTS WITH THE "P.W." ULTRA.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have been interested in Mr. Dowding's article in a recent issue on the "P.W. Ultra" set, and also in the letter from Mr. H. James (Edinburgh) on "a novel crystal circuit"—which circuit is similar to that given in Mr. Dowding's article (Fig. 6), the "earth," however, being supplied by a "counterpoise."

I have conducted a few experiments myself with a variometer set which seem to throw a little light on the situation—to me, at any rate.

I have the usual variometer circuit. Considering the diagrams by Mr. Dowding and Mr. James, it seemed to me obvious that the counterpoise resolves itself into a capacity coupling to earth. I therefore altered my connections to bring this about, and got quite good reception with a ·0005 mfd. fixed condenser, but had to increase the variometer inductance fairly considerably. I then increased the condenser to ·003 mfd. (fixed), and the inductance then came back to the normal variometer setting.



By leaving the ·003 mfd. across the phones—this made no perceptible difference to the audibility on the normal connection—I could compare the two circuits by simply putting the earth connection to either the crystal-phone or phone-variometer terminals. There was no difference, either in volume or quality. What seems to happen is that the condenser reverses the instantaneous polarity of the windings to earth, and consequently the direction of flow of the current, but the circuit is otherwise unchanged. The capacity earth mentioned by Mr. Dowding is probably considerably below the ·003 mfd. which I found necessary to produce full effectiveness at normal tuning, and the 1250 duo-lateral coil mentioned by him would possibly function by reinforcing the low capacity. But I have been unable to get any improved reception by these means. I can get Radio Paris faintly at the 12.45 concert—enough to pick up the rhythm of a dance, but not always to pick out the melody definitely—and I have tried both connections on this, and could get no difference in reception between one and the other. The same with 2 L O and 5 X X.

It would seem that the normal connections pass one-half of the wave—as rectified by the crystal—to earth through the 'phones, and the alternative method passes the one-half wave through the crystal to earth, and the other half wave (obstructed by the crystal) through the 'phones to earth, the results being identical.

Yours faithfully,
HAROLD F. G. KINDER.

Taunton, Coulsdon, Surrey.

(*Continued on page* 285.)

CORRESPONDENCE.

(*Continued from page 284.*)

THE H.F. AND DET. UNIDYNE.

The Editor, POPULAR WIRELESS.

Dear Sir,—We assembled the POPULAR WIRELESS H.F. and Det. Unidyne Receiver and have received from the address below Bournemouth, Newcastle, London, Cardiff, Aberdeen, Plymouth, and a French station.

The strength was equal to our crystal set in London when listening to Aberdeen, 500 miles away.

We built up the set exactly as described, with the exception of the coil holder, which was as used in the Det. and L.F. Unidyne set.

We are, yours faithfully,
H. E. D. and A. W. BATE.

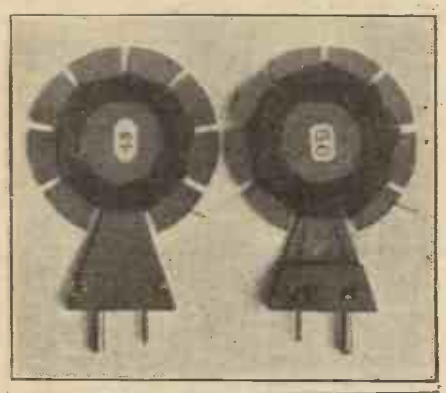
P.S.—The parts were from the Bower Electric Co., Ltd.—H. E. D. B.

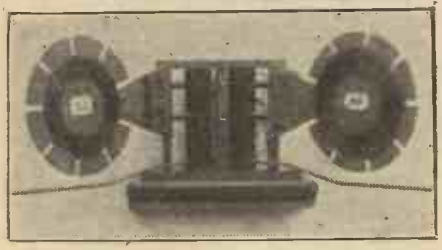
"Hargrove," Millpool, Cardynham, Bodmin, Cornwall.

A NEAT COIL HOLDER.

The Editor, POPULAR WIRELESS.

Dear Sir,—I enclose photos of a 3-coil holder I have constructed, fitted with plug-in basket coils. The holder is made of ¼ in. ebonite held together with





⅛ in. Whitworth brass screws, countersunk heads. Coil formers, ⅛ in. cardboard, waxed, 4 in. diameter, 2 in. centre, ¼ in. slots. The extended part of former is fitted with ¼ in. ebonite, valve socket, and pin. Valve sockets and pins are also used on holder.

Yours truly,
F. L. POULTER.

12, Cecil Road, Croydon.

GERMAN RECEPTION.

The Editor, POPULAR WIRELESS.

Dear Sir,—Have any of your readers received the new Zurich station on 650 metres? I get it very well every evening from 8.15 to 10.15 p.m. My set is a home-made 3-valve straight circuit, 1 H.F. det., 1 L.F. I also get the Frankfort station. May I offer to enlighten Edward Tarples in your issue of September 13th? The hymn tune is the Austrian national anthem. The word Achtung which he heard means Hallo! or Look out!

If you care to publish this letter you may do so with pleasure.

Yours faithfully,
C. GATTIKER.

Mon Désir, Boreham Wood, Herts.

CRYSTAL RESULTS EXTRAORDINARY.

The Editor, POPULAR WIRELESS.

Dear Sir,—I read in your paper dated August 30th a report from one of your readers stating that he receives five B.B.C. stations with a crystal set. My own experience may be of interest. Two months ago I constructed a simple variometer tuned crystal set. With this I am able to receive nine B.B.C. stations, i.e., Glasgow, Bournemouth, Aberdeen, Newcastle, Manchester, London, Birmingham, Cardiff, and Belfast, thus all the B.B.C. main stations. Besides Belfast, Glasgow comes in comfortably loud in the afternoon; at night the remaining seven stations come in nearly as loud as Glasgow, except Cardiff, which is very faint. Bournemouth and Aberdeen usually come in louder than Glasgow. I might also mention that several times I have heard a Continental station.

Yours faithfully,
G. H. A. Blackwood.

Lake Glen, Andersonstown, Belfast.

TECHNICAL NOTES.

(*Continued from page* 250.)

operate the potentiometers from the opposite end. In other types of multi-valve set other alterations may become necessary, but in all cases where the adjustment is not too inconvenient to be practicable, it is a good plan, as stated, to reverse the filament current, say every month or two.

Life of a Filament.

Talking about the life of a filament, it is remarkable what great improvements have now been made in the construction and robustness of the wires used for this purpose. In the Northern Electric factory at Montreal there is a testing panel aglow with peanut valves which are kept burning day and night, exactly as in a wireless set.

Periodically these valves are taken out of the life-test panel, and tested for operating efficiency in the ordinary way, then replaced in the test panel. Among them is a valve whose longevity makes him a veritable Methuselah among his fellows. For over 10,000 hours he has lived on the panel and is still as strong as the day he started in life, fourteen months ago.

Assuming that the average wireless set operates about ten or twelve hours a week, this would mean a working life for the valve in question of about 16 years. Despite his vigour, however, he may yet forfeit his patriarchal standing, for there are several promising youngsters with 5,000 hours to their credit, and to date the average life of the batch of valves on the panel is over 3,000 hours.

Simple Efficiency Test.

"A simple method of testing aerials, earths, condensers, and other wireless parts is to take advantage of the principle of reaction. It is well known that the object of using regeneration in a receiving set is to overcome the resistance of the circuit. To test various parts it is necessary to have a three-circuit tuner and a constant filament and plate supply.

"It would be preferable if one stage of L.F. were used with the secondary of a second transformer connected to a crystal detector and a micro-ammeter, but this is expensive and may be eliminated. To test a new part, say aerial or earth, against one which is at present in use, tune the set to a station, and bring it just below the oscillating point. Record the variometer setting.

"Then substitute the new part for the old one and again tune in the same station and note the variometer setting. If the second reading is higher than the first, the new part is inferior to the old one; if the second reading is lower than the first, the new part is better."

The foregoing is quoted from "Radio Digest" (U.S.A.). Experienced experimenters will see certain objections to the method, but for rough-and-ready purposes it may be useful in certain cases.

Capacity Coils.

It is a common practice to use a binding solution or varnish for coils, but the practice is objectionable and the use of a binding varnish should, if possible, be avoided. Shellac, for example, greatly increases the capacity of a coil, and the resultant losses.

(*Continued on page* 287.)

TECHNICAL NOTES.

(*Continued from page* 286.)

In most cases, with care and a reasonable amount of skill, the coil can be so wound that the use of a binding varnish becomes unnecessary.

Bus-bar Wire.

In wiring up the connections behind the panel, there is a fashion for using square-section bus-bar, and many amateurs seem to be under the impression that this is essential. Of course, any copper wire will serve the purpose, provided it is of fairly heavy gauge, so as to have a negligible resistance. Square-section wire has the advantage of offering a somewhat greater surface for a given cross-sectional area, and also it looks neat when properly manipulated. But heavy gauge (say 14) ordinary round copper wire is perfectly suitable.

A simple and useful hint for straightening copper wire is to secure one end of the length of wire to be straightened (say a foot or two) in the vice, which must be properly bolted to a heavy bench, and taking the other end of the wire in a large pair of pliers, to give two or three heavy tugs on the wire. As you do this, you will feel the wire "give," or stretch, at each tug, and on then removing it from the vice, you will find that it is dead straight. The stretching, incidentally, has the effect of hardening the copper somewhat. You will need to hold the near end of the wire close to the hinge of the pliers, and will probably have to use your whole weight in the pull before you feel the wire "flowing." Until this "flow" is felt, the wire will not be straightened.

Cement for Ebonite.

With care it should be possible to do all the necessary drillings in an ebonite panel without mishap, but sometimes a fracture may occur and it is then useful to know of a proper cement for making a repair. The following recipe, from the "Irish Radio Journal," should be of value, and appears to be easily made.

Dissolve a few pieces of shredded india-rubber in naphtha, and then add to the solution two parts by weight of best quality shellac to one part of rubber. The mixture should now be gently heated (taking great care not to ignite the inflammable naphtha) and stirred until the mixture and solution are complete. It should then be poured out on to a metal plate to cool.

When using the cement, re-melt it and apply it hot to the edges of the ebonite which it is desired to fasten together, taking care that the ebonite itself is also fairly warm. Press the edges of the ebonite well together, and hold in position until cool. Put the repaired sheet of ebonite away for at least twenty-four hours, and the result will be an almost invisible joint which will be able to withstand a fair amount of stress. As the ingredients of the cement are excellent insulators, there is no interference with the insulating properties of the ebonite.

Swinging Aerial.

All kinds of queer effects and periodic "fading" of a mysterious character are often traced to a loose aerial which sways

(*Continued on page* 288).

TECHNICAL NOTES.

(*Continued from page 287.*)

in the wind. It is therefore very desirable to have the aerial taut, and this can easily be arranged, without any danger of snapping, by using a pulley on one of the masts or supports, the tension on the aerial being maintained by a heavy weight hanging over the pulley.

Making Wood's Metal.

The name "Wood's metal" seems to be rather indefinite, but I believe it properly relates to an alloy consisting of tin, lead, cadmium, and bismuth, in the proportions respectively of one, two, one, and four by weight, the melting-point being something over 60° Centigrade. It is quite easy to make this alloy, and the metals necessary can be obtained at the chemist's, or at a wholesale or manufacturing chemist's.

Lead and tin are, of course, very cheap, but bismuth and cadmium will cost about one shilling to one-and-sixpence an ounce. When the alloy has been properly made, it will melt considerably below the boiling-point of water. The alloy may be made by simply melting down the constituent metals mentioned above in a small crucible, or even a "tin can," taking care not to heat them any more than is necessary for the melting. They should also be thoroughly stirred together when melted. If it is desired to make the alloy melt at a still lower temperature, a small quantity of mercury should be added when melting. Great care should be exercised in adding the mercury, however, as the addition of only a small quantity of mercury has a considerable influence on the melting-point of the alloy. It may be worth mentioning that "tin" means the pure metal, not the substance known as "tinplate." The latter is not really tin at all, but iron sheet tinned over on its surface.

R/R

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Advertisement of The General Electric Co., Ltd. (Manufacturers & Wholesale only), Magnet House, Kingsway, London, W.C.2.

LISSENIUM

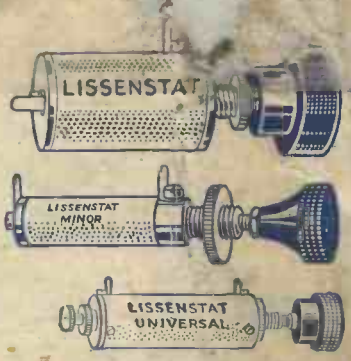
GIVE THE VALVE A CHANCE—after nightfall.

Once darkness has fallen, the conditions for distant reception are most favourable—if you are using LISSENSTAT control.

With dark nights and this control you give the fine detecting characteristics of the valve every chance to take you farther afield than ever you have been before. There is a thrill in realising that you are on to an unknown station which will make you glad you fitted **LISSENSTAT** control. With it you can critically control electron emission so as to get right on the very spot necessary for the finest detection—so essential in long-distance telephony.

All types have LISSEN ONE HOLE FIXING, OF COURSE.

RECEIVERS WHICH ARE FITTED WITH LISSENSTAT CONTROL ARE EQUIPPED FOR THE FINEST DETECTION POSSIBLE.



LISSSENTAT
(patent pending)—gives the most acute tuning possible **7/6**

LISSENSTAT MINOR
(patent pending)—is replacing many thousands of discarded and inefficient rheostats. Provides LISSENSTAT control at a popular price **3/6**

LISSENSTAT UNIVERSAL
(patent pending)—with its protective device for all emitters... ... ... **10/6**

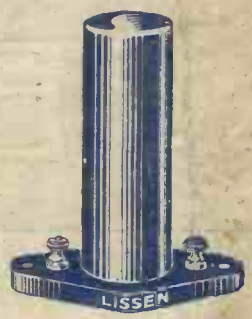
AUDIO FREQUENCY AMPLIFICATION by means of a new LISSEN CHOKE.

There are three well-known methods of audio frequency amplification, namely, the Transformer Coupling, the Resistance Capacity Coupling, and the CHOKE.

The first makes provision for an intervalve step-up in signal voltage as well as the amplification obtained by the valve, but oftentimes gives rise to serious distortion, which, however, can frequently be traced to the transformers used being resonant to particular frequencies. The transformer method is widely used, however.

The Resistance Capacity method gives pure amplification, but requires a very high H.T. voltage to make up for the volt drop through the resistance interposed. Not so widely used as it might be, but an interesting method.

THE CHOKE METHOD—USING THE NEW LISSEN L.F. CHOKE



By means of these LISSEN CHOKES a high-frequency potential is obtained between the terminals of the CHOKE, and at the same time there is comparatively a low resistance to the steady H.T. current. Distortionless amplification is obtained without the disadvantage of having to use a high H.T. supply.

Other Chokes previously on the market are spoiled because they are resonant to one or more frequencies. When one particular frequency to which a Choke may be resonant is passing through the valve, the impedance of the Choke would immediately rise, and this frequency would then be amplified out of all proportion to its natural intensity. The impedance of an ill-designed Choke is CONSTANTLY VARYING according to the frequency it is passing—it would have a natural high impedance to only a very narrow band of frequencies, and its impedance on either side of this resonant peak would be low, and when being used for amplifying telephony—where the frequency of the notes is constantly altering—would not deal evenly with the different frequencies corresponding to the various notes, and this would result in very rough reproduction.

THE SUCCESS OF THE NEW LISSEN CHOKE IS DUE TO THE ABSENCE OF ANY SUCH FAULTS. IT IS DUE, FOR ONE THING, TO THE FACT THAT WHILE ITS IMPEDANCE TO ALL AUDIBLE FREQUENCIES IS COMPARATIVELY HIGH TO EACH BAND OF FREQUENCIES, IT IS ALSO PERFECTLY CONSTANT OVER ITS WHOLE WORKING RANGE.

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8-16, Woodger Road, Goldhawk Road, Shepherd's Bush, London, W.12

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PARTS WITH A HIDDEN POWER—BUILD WITH THEM

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R/R

POPULAR WIRELESS WEEKLY, October 11th, 1924. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

A 24-PAGE BOOKLET WITH THIS ISSUE.

Popular Wireless

and Wireless Review

PRICE 3d. EVERY FRIDAY.

No. 124. Vol. VI. SCIENTIFIC ADVISER: SIR OLIVER LODGE, F.R.S., D.Sc. October 11th, 1924.

Mr. Dowding (left) and Mr. Rogers wiring up a Four-valve Unidyne Set.

SPECIAL FEATURES IN THIS ISSUE.

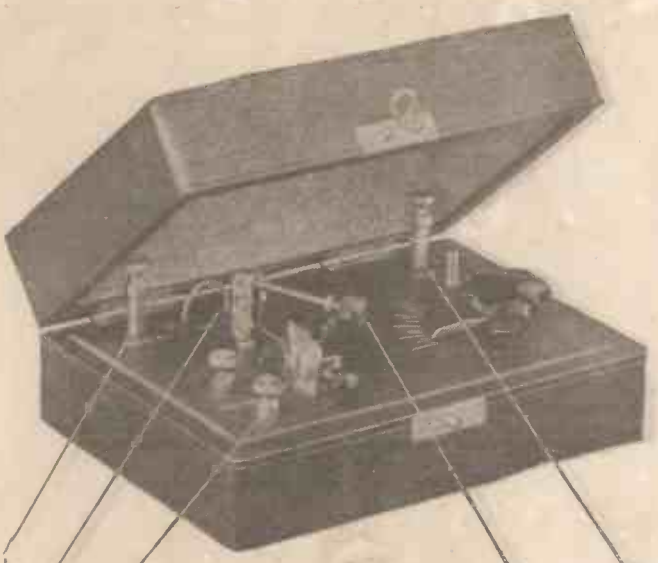
A New "Inductive Earth."
Wireless and the Police.
Secrets of the B.B.C.
Hints on Short-Wave Reception.
Some Unidyne Troubles.
Methods of Switching.

etc., etc.

THE RECEPTION OF 5XX. By Captain Eckersley.

A 24-PAGE BOOKLET, "THE POCKET FAULT-FINDER."

and many other exclusive features.



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POPULAR WIRELESS

AND WIRELESS REVIEW.

October 11th, 1924] THE RADIO WEEKLY WITH THE LARGEST CIRCULATION. [Every Friday, Price 3d.

Technical Editor: G. V. DOWDING, Grad.I.E.E. | Editor: NORMAN EDWARDS, A.M.I.R.E., F.R.G.S. | Scientific Adviser: Sir OLIVER LODGE, F.R.S.

RADIO NOTES AND NEWS OF THE WEEK.

Our Debt to Radio.

I WONDER how many lives have been saved by wireless during the short life of the magic science? In the early days I remember seeing a table giving the exact number, with the names of different ships, "Republic," "Titanic," "Volturno," etc. (There were over 500 saved on the latter alone.) Ten years ago the total became unmanageable, and had to be estimated; and the full tale of wireless life-saving in war time can never be guessed except by those who saw behind the scenes.

* * *

"Complaints and Compliments."

SO many letters are sent by readers to POPULAR WIRELESS in connection with the B.B.C. programmes, that it is quite impossible to find room for all of them in the columns of "P.W." The Editor, therefore, asks me to draw the attention of readers to a new feature entitled "Complaints and Compliments."

* * *

Send a P.C.

THIS feature will enable the representative opinions of many readers to be published in "P.W."

If you have a complaint or a compliment to make concerning the B.B.C.'s programmes, send in a postcard to the Editor, briefly outlining the nature of the complaint or the compliment you wish to make. Mark the postcard "Complaint" or "Compliment," as the case may be.

* * *

"The Birdies."

ALL sorts of statistics have been quoted to show how many people are being converted to wireless, but the most convincing demonstration that I know is to listen-in near London or one of the big cities, and to count the "birdies." There appears to be an appalling number of novices trying to get the hang of the tuning controls, and as soon as one has managed to master it, along comes another and distracts the whole neighbourhood again!

* * *

Capt. Eckersley's Leaflet.

I SUGGEST to all concerned that right now, at the commencement of the season, is the time for a *special* onslaught on the oscillators. Let us "tell the world" once again that using too much reaction spoils your own signals and other people's. If you are not quite sure what "reaction" is, send for the leaflet which Captain Eckersley wrote specially to inform you. It is called Anti Oscillation, and can be obtained from The B.B.C., 2, Savoy Hill, W.C.2.

5 X X's New Home.

THE news that 5 X X—or, at least, a similar high-power station—is to be permanently established by the B.B.C., came just at the most opportune moment of the season. I like, too, the explicit way in which the announcement stated that the site was to be "between Gloucester and King's Lynn." Leafield and Rugby are both established there or thereabouts, so the Midlands will be quite a home for harmonics soon.

WHAT THEY SAY.

"Don't think that a two-valve set with reaction on the second valve will not interfere. Without special precautions *it will.*"—Capt. Eckersley, Chief Engineer of the B.B.C.

* * *

"Now that electric waves are so easy to produce, and so absurdly easy to detect, it is amazing to think how long it took to discover them, and how many times they hinted at their existence before they were properly recognised and appreciated."—Sir Oliver Lodge, F.R.S., D.Sc., LL.D.

* * *

"The B.B.C. are having a little of their own back on those British conductors or artists who have not facilitated their listening-in activities. At their new Symphony concert season at Covent Garden the names of the four conductors are all foreign—not a British name anywhere to be seen."—"The Stage."

* * *

"The thing that was wonderful yesterday is mediocre to-day and stale to-morrow. There is neither satisfaction nor end to the labours of the broadcaster in his endeavours to give his listeners the best possible service which experience and imagination can supply."—Mr. J. C. W. Reith, Managing Director, B.B.C.

* * *

"I did not meet a single man on the Continent who looked at broadcasting as we in the B.B.C. look at it—i.e., as a public service of responsibility and importance—a trust put into our hands to help every member of the community."—Capt. C. A. Lewis, writing in "The Star."

* * *

THE WEEK'S QUERY.

What sort of results are obtained by the London amateur who has hauled a frame aerial to the top of an apple tree, joined it by a "sausage" to a basket aerial on the roof, and taken his lead-in down the chimney?

The Belfast "Line."

DESPITE the fact of its long journey over land and under the Irish Sea, the line joining Belfast with London is a good one, of which the Post Office may well be proud. After traversing the length of England there are 100 miles or more of Scotland to cross, and finally it has to go 30 or 40 miles under the sea in order to reach the Ulster capital.

* * *

Rugby's Masts.

RUGBY'S new station is making good progress, and two of the masts are now erected, whilst a third is nearing completion. Each mast will stand on porcelain blocks, the insulation of which is tested with a current of 50,000 alternations per second, at 20,000 volts.

* * *

A Correction.

AN unfortunate error crept into "Artistes of the Aether" of September 13th, and on page 97 of that issue a photograph of Mr. Tom Sherlock was published under the name "Mr. Tom Case."

Mr. Tom Case is a singer of repute who is, of course, well known to 2 Z Y's audience, and who sings under his own name. I am indebted to Mr. Tom Sherlock himself for courteously drawing attention to the error in associating his name with Mr. Tom Case.

* * *

Something Special.

I WONDER what special attraction the B.B.C. are reserving for October 27th? Something quite out of the ordinary is in the wind, but the secret is being well kept, and at the time of writing my suspicions are too faint to be called readable.

* * *

Captain Round.

CAPTAIN ROUND—the famous research engineer of the Marconi Co.—is notorious for his dislike of publicity, and on that account he became known during the War as the mysterious "Captain X—the wireless wizard." Somebody once said to him, "Would you accept a knighthood if it were offered, Round?" And he promptly replied, "No. I don't want people calling me Cir-cumference!"

* * *

More Relay Stations.

STOKE-ON-TRENT relay station will be opened on Wednesday next (October 15th) and will be followed by Dundee and Swansea, to complete the B.B.C.'s 1924 relay programme. Opening dates for the latter stations are provisionally fixed for November 12th and December 12th respectively.

* * *

Aberdeen's Celebration.

ABERDEEN station will celebrate its birthday to-night (October 10th), and an interesting programme has been arranged for the occasion. Six scenes depicting the history of the town will be broadcast, representing different periods from A.D. 570 down to the B.B.C.'s opening of 2 B D.

* * *

Improving the "Talks."

INCREASED scope and variety is going to be a feature of the talks arranged by the B.B.C. for the coming winter. Foreign affairs will be handled by the British Institute of International Affairs, and the first two talks will be given by Lord Balfour and Lord Grey of Fallodon.

(*Continued on page* 290.)

NOTES AND NEWS.

(*Continued from page 289.*)

Big Ben's Chimes.

SEVERAL readers have asked me if there is much difficulty in arranging for the sudden change-over to Big Ben's Chimes in the middle of a studio programme. It is the simplest thing in the world, as a matter of fact—just a permanent microphone in the tower and a switch at Savoy Hill to control it!

* * *

"Tremendous Interest."

OF all the provincial cities, I think Manchester is the one that has the keenest wireless population. Tremendous interest is being taken there in the Wireless Exhibition, which will be held in the Exhibition Hall, Deansgate, Manchester, from Oct. 14th to Oct. 25th.

I hear that 2 Z Y will probably be operating from the new studio before Armistice Day.

* * *

Some Novel Exhibits.

ONE of the attractions at the Manchester Exhibition will be a wireless-fitted aeroplane, lent by the Avro Company. Ford cars and railway coaches similarly equipped will also be on show, and there will be a realistic ship's cabin, fitted up with marine wireless transmitting and receiving apparatus.

* * *

A Mean Trick.

RATHER a nasty trick was recently played in America by an amateur transmitter there, who announced himself as "2 L O, the London station." Naturally enough, letters from excited Americans poured in upon the B.B.C., who had to reply as tactfully as possible, explaining that the London "Mike" was silent at the hour mentioned.

* * *

A Berlin Query.

"WHY is Berlin's wave-length sometimes given as 430 metres and sometimes as 500 metres?" writes an indignant long-distance enthusiast, who is determined to get the German capital on one valve. The answer is that Berlin has *two* stations, one transmitting on 430 metres and the other on 500 metres.

* * *

Listening for W G Y.

THE best time to listen for W G Y, the popular American station at Schenectady, is 3.30 a.m. on Saturdays. At this time W G Y is closing down ordinary programmes (it is then 10.30 p.m. in America), and finishes up by some full-power broadcasting for the benefit of D X enthusiasts.

"Fly Power."

"ONE-BILLIONTH of a fly-power" is the energy estimated to arrive on a New York 12-inch frame aerial, receiving from a station in San Francisco, 3,000 miles away.

Calculations showed that if the fly climbed up a wall it would expend as much energy as the frame aerial would receive during a period of *thirty-five years*' continuous reception.

* * *

The Hallé Concerts.

OCTOBER 16th is the date of the first Hallé Concert, to be broadcast from Manchester (and S.B. to all stations), and others will follow at fortnightly intervals.

The original Hallé Orchestra was founded by the late Sir Charles Hallé, and first appeared at the Art Treasures Exhibition in Manchester in 1857, since when it has achieved and held a world-wide reputation.

Music-hall favourites at 2 L O broadcasting an old time variety programme.

* * *

6 B M's Birthday.

BOURNEMOUTH'S birthday is being celebrated on October 17th, and a very attractive programme has been compiled, consisting of excerpts from "First Nights." When possible the original performers are appearing again, so 6 B M's audience will vividly recall their first "Popular Night," first "Symphony Concert," and other memorable programmes which will be re-enacted.

* * *

The Opening of 2 B E.

THE official opening of the Belfast station, which will be S.B. to all stations on the 24th inst., is going to be an imposing affair.

It is particularly interesting in view of Ulster's political importance, and people of all classes and shades of opinion will be eagerly listening-in to 2 B E. The speakers will include the Duke of Abercorn, Sir James Craig, Lord Gainford, the Lord Mayor of Belfast, and the Principal of Belfast University.

* * *

A Radio Lapse.

"THE condenser I used in these tests was a 'Devicon, *square-jaw*," says "Rheostat," writing in a contemporary. Evidently this is the sort of component that would stand no hanky-panky from a plug-in coil!

* * *

Too Much of a Good Thing.

A FEATURE of German broadcasting which I think the B.B.C. might copy with advantage is the continuous nature of the service. Commencing before 7 a.m., the longest break of the day is that from 8.30 to 10 a.m.: every other half-hour or so seeing one of the stations on "the air" with a weather report, time-signal, or other transmission of use or interest.

* * *

Captain Eckersley's Trip.

SPECULATION is rife regarding the object of Captain Eckersley's trip to the U.S.A. He left England on October 1st on the "Homeric" for the avowed purpose of securing experience in the latest American methods.

No doubt a number of matters in which British and American broadcasters are interested will come up for discussion. I wonder if he will visit Niagara, which the B.B.C. have promised to broadcast.

* * *

Danish Broadcasting.

DANISH Broadcasting is coming over more frequently now, but very few British listeners are successful in receiving it. Copenhagen has been sending an evening programme on Sundays, Wednesdays, and Thursdays, whilst Ryvang transmits on Tuesday and Friday evenings, and at noon on Thursdays.

* * *

Another Exhibition.

NOTTINGHAM has taken to broadcasting like a duck to water, and is already organising an Exhibition of its own, which is more that some of the "main" centres can boast. The Empress Rink, Nottingham, has been chosen as the site, and the Exhibition will last from November 3rd till November 8th.

* * *

Colour by Radio.

COLOUR by wireless is the interesting invention of Captain G. A. Taylor, who is President of the Association for Developing Wireless in Australia. His machine takes advantage of irregular contact on metal plates, upon which the picture has been etched in acid. The contact can make or break wireless signals, which thus reproduce the picture at the receiver, and so bring us nearer to the day when we shall see broadcasting, as well as hear it.

* * *

A Dublin Station?

APPARENTLY Belfast is not going to enjoy a monopoly of the Irish ether. I hear that before the end of 1924 there may be a station in Dublin, and that an ambitious scheme of relays has been proposed to cover the Irish Free State.

ARIEL.

WIRELESS AND THE POLICE.

HOW SCOTLAND YARD CAN UTILISE BROADCASTING.

AN EXCLUSIVE ARTICLE FOR "P.W."

By EX-CHIEF DETECTIVE-INSPECTOR E. HAIGH.

In this very interesting article a former chief of the Criminal Investigation Department of Scotland Yard tells how the police use wireless for the purpose of catching crooks, and how, by development, the science of broadcasting could be more fully employed by the police in this country.

WHEN the Editor of POPULAR WIRELESS asked me to write an article dealing with the application of "wireless" to police duties I at once recalled the introduction, some twenty years ago, of the telephone into the stations and offices of the Metropolitan Police Force.

A glimpse of the interior of one of Scotland Yard's "wireless vans."

In those remote days I fear that a strong form of conservatism held a high place in the opinions of the officers then serving. They believed that the internal affairs of the service had attained to a degree of perfection that could not be improved upon, forgetting, I fear, that the system had developed in every way from the original crude establishment to the position it then occupied by a process of continual evolution.

They dreaded the introduction of the telephone because they feared that some more or less excitable folk would forward unnecessary messages and that the police would be inundated with false alarms or exaggerations of small affairs into important doings.

The New State.

Happily, and in spite of such views, the telephone was installed, proved its worth, and is to-day fully utilised, having in the interim displaced the antiquated telegraphic system that preceded it and which, in its own day, had doubtless caused serious misgivings ere it, too, proved to be a tremendous step forward in the way of progress.

But those days have passed, and now at the head of the controlling powers of the police service are men who are keenly alert to take note of the march of science and to apply whenever possible new ideas and inventions that may serve to aid the enforcement of law and order in the interests of the community as a whole.

To-day it is recognised and admitted that many phases of police work have ceased to be parochial, and the council around the parish pump has had to surrender to the new circumstances. The new state has been brought about by the simple fact that lawlessness, paying no regard to district boundaries, soon discovered the value of new methods of locomotion that made it possible for a serious crime to be committed and the miscreant to be many miles away before the crime itself had been discovered, thus eluding any possibility of successful pursuit.

Helping Detectives.

The police had to meet this, and electricity was invoked. The very earliest was when a murderer, having carried out his design, fled from Slough to Paddington by the then new railway, only to find that the electric telegraph had outstripped his speed and that detectives were quietly awaiting his descent from the train at the terminus, where he was arrested.

Wireless, too, has already been similarly used, notably in the case of Crippen; the details, or at least the outstanding ones, are known to all.

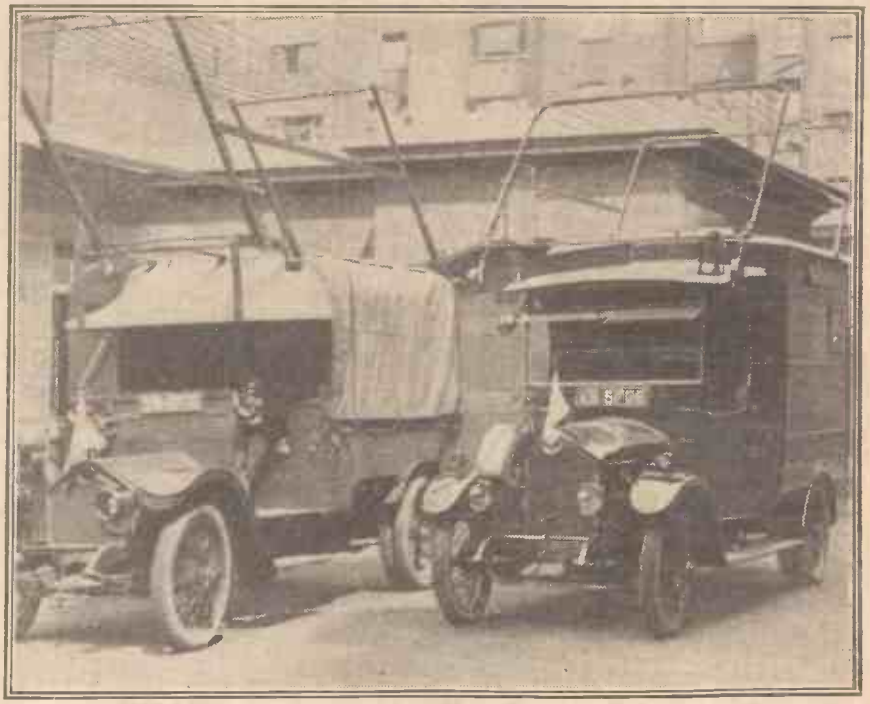
Now I propose to suggest a few ideas that I have formulated in which wirelsss may be utilised to further aid the ends of justice and make it harder still for the wrong-doer to escape the meshes of the net set for his entrapment.

Wireless at Scotland Yard.

I do not for a moment suggest that the application of my ideas will immediately cause crime to disappear and criminals to become industrious citizens. Such a millennium will, I fear, never be attained, either by administrative or legislative means; but the way to successful roguery can be made extremely difficult thereby, and so I venture to place on record the ideas I have already referred to.

There is already installed at New Scotland Yard a highly efficient wireless set, and in the force there are a number of qualified operators, and these are doubtless using

(*Continued on page* 292)



Two of the "wireless vans," showing the type of aerial employed.

AN EXPERIMENT.

(NOT TO BE REPEATED.)

By HARRY TATE.
With the Assistance of "Ariel."

NOW. that winter is coming (so 2 L O tells me), wireless enthusiasts will be renovating their sets, and perhaps with the winter the old, old story of the theatre managers' objection to broadcasting will be revived.

I was thinking of this debatable point recently when I bumped into Harry Tate outside the Alhambra, so I promptly asked him what his opinion was on the matter.

"I have decided views on the matter," he said, "and I consider that——"

What an Idea!

"Excuse me," I interrupted, "would you write your views down, so that I could publish them in 'P.W.'?"

"I haven't time to write; to-morrow I am going out of town, and, you see——"

"Papa," chimed in the little man who takes the part of Harry Tate's son in the famous sketch "Motoring," "can I go and——"

"You see," continued Mr. Tate, taking no notice of the interruption, "I shall be packing and doing all sorts of things."

"Papa!" again interrupted his agitated companion.

"Yes, my boy, what is it?" answered the famous expert, somewhat testily.

"Why—why don't you try the new dictaphone you bought off that chap who called the other day and said he was hard up?"

"That's an idea! Why, sure I will try it. You know, I bought the confounded thing to practise on before making gramophone records, and the chap was hard up. Well, if it works you will get an article; if it doesn't—well, you don't! I'll send the record to you, and you can get a typist to listen to it and type what she hears. Will that do?"

I thanked Mr. Tate for this offer, and left him, doubtful of the suggestion materialising, knowing that he did not know how to use the dictaphone. But the other day the record arrived, and, amid much excitement, I have copied every word my typist heard.

The Result.

"Ah, that's it! Now, do be a good boy, and keep quiet——No, shut up, will you?——Yes, I am going to start my scientific article on the wireless situation of to-day. 'Papa, papa——' *Will* you get *out*? I'll tell your mother! Bang!" (I presume the door banged.)

"The position as regards the opposition to broadcasting raised by the theatre managers, agents, and even by some of the professionals, is growing less in its effect, and—— 'Harry, did you post my letter to your mother?' Oh, do be quiet, my dear! I must finish this article. 'All right, Harry, I don't want a lecture, only say *yes* or *no*, that's all I ask.' Y-es, my dear.

"Where was I? Ah, yes! Less in effect than what one may anticipate. I, personally, do not agree with all the arguments advanced by the managers—ahem—er—er—and I do not agree with the arguments put forward by the B.B.C.—Atishoo! Sonny, fetch me a handkerchief. Now, where was I?—by the B.B.C. One has only to reflect and surmise the past, and its effects on the broadcasting of plays and the theatres. Take for instance 'Polly,' at the Kingsway—— 'Harry, who were you calling? Polly? Polly? Who is she?' Oh, my dear, it's the opera! 'Papa, here's your handkerchief!' Thank you, my boy.

Wireless on a New York "Taxi."

"Now I have lost myself. I don't agree with the aggressive attitude of the managers. I have read, and heard, that the box-office receipts have greatly increased whenever a play has been broadcast. I, of course, can understand and agree with the comedian who does a single turn, and depends on his jokes for that turn, then, and only then, I agree that broadcasting is dangerous, yes, *dangerous*, because the audience of wireless concerts is far too vast to be safe for a few nights. I mean it is far too big compared to a week's audience at a theatre.

"Yes? Oh, dash that 'phone! Hallo! Hallo! Yes? Oh, is that you, 'Ariel'? Yes, I have done the article. It's a good one. I laid the law down. Sure, to-night. Send it up at the office? Yes. No, I didn't make a law. I laid it down, so to speak. Why, bother it, my boy, it's the only time I can say what I really think. Here's the wife. Sure, I'll give her your regards. Good-bye. To-night? Yes. Cheerio!"

And that's that. If the reader can follow Mr. Tate's views on the vital question of broadcasting and the theatres, just as I have copied it down from the dictaphone—well, it's more than I can!

WIRELESS AND THE POLICE.

(*Continued from page* 291.)

their knowledge for the good of the service, which really means the good of all.

This wireless outfit can be used for broadcasting, but in order to make such broadcast of the greatest use there must be receivers who are able, and whose duty it is to make use of any and all information received. For general circulation of descriptions of stolen property of an important kind wireless should not be used, because it is highly desirable that the new system should not be crowded with such material, but that it should be reserved for all important circulations.

Each police station should be equipped with receiving sets, so that directly a crime of serious character occurs, the desired particulars could be distributed from the central office to all the surrounding districts simultaneously, and thereby communicated to each officer for conversion into action.

The police point duty boxes might also profitably be included in this scheme. I say profitably, because any method that secures the safety of life or property must be worth its cost.

The idea which I have dealt with, perhaps somewhat crudely, would of necessity need a little elaboration, and also some technical consideration.

So much for that. But, after all, London is not everywhere. To treat the metropolis as I have suggested would be but enlarging the principle of the parish pump. The idea I have includes the linking up of what I might call the extra metropolitan areas, districts beyond the limits of the metropolitan police area. In such a circle might be included Gravesend, Chatham, Maidstone, Sevenoaks, Reigate, Guildford, Windsor, Watford, St. Albans, Hatfield, Hertford, Epping, Chelmsford and Southend-on-Sea.

Wireless at Scotland Yard.

These points cover most of the principal exits from London for criminals escaping by road, and those leaving by rail could be picked up similarly at points easily defined.

Perhaps one could term such a system zonal, and it could be adapted and applied in the case of all large centres of population. In any case, where the whole country was to be combed, the police authorities could, of course, make use of the usual Radio broadcasting stations with great effect, because in such an instance the details for circulation would be spoken to multitudes of law-abiding "listeners-in" who, in their own interest, might be expected to help.

The Metropolitan Police have already introduced the wireless car; that is, a car in wireless communication with "The Yard." Such cars would be of untold worth in certain cases. A decade or two ago very serious riots resulted from the incessant work of professional agitators, and drafts of police were hurried from point to point to deal with riotous mobs.

A difficulty then experienced was that by the time the police arrived at the place indicated in the telegraphic order upon which they had started, the mob had disappeared, only to again commence pillage and destruction in some other district.

A frantic telegraphist at headquarters has no means of notifying the change of scene to the executive body; and much valuable time was lost before means could be devised to regain touch. Under the system by which motor transports fitted with wireless were in commission such a thing could not happen. The new events would be flung on to the cars as they happened, and the results would be of immeasurable value to the service and the community.

There is one form of crime still far too prevalent that would, I am convinced, yield quickly to wireless treatment. I refer to the thefts of motor-cars and cycles.

If on the arterial roads there could be erected boxes in wireless touch with the Yard and manned by zealous officers, what chance would a motor thief have when, long before his advent en route to his lair, the fact of his crime was known and steps taken to intercept him? A few such lessons and the number of valuable motor-cars stolen would be so small as to be almost infinitesimal.

These are but a few ways in which wireless and police could be engaged; yea, and even wed!

Britain's Best Broadcasting Sets

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(REGISTERED TRADE MARK)

NEW GECOPHONE Models for 1924/25

Crystal Sets
Single Valve Sets
Two · Valve Sets (Det. & L.F.) in Table and Cabinet Models
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Three · Valve Sets in Table and Cabinet Models
Four · Valve Cabinet Sets de Luxe
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NOW READY

In the construction of the new GECOPHONE Models it has been the aim to produce sets which combine the finest results with simplicity of operation and handsome appearance. The range of 1924/5 models has been considerably extended to meet every requirement. They embody to the fullest extent the same superlative qualities which have given the original GECOPHONE Model its unrivalled reputation.

If you desire — A Crystal or a 5-Valve Set
Long range, Maximum volume of sound
To use a Loud Speaker or Headphones
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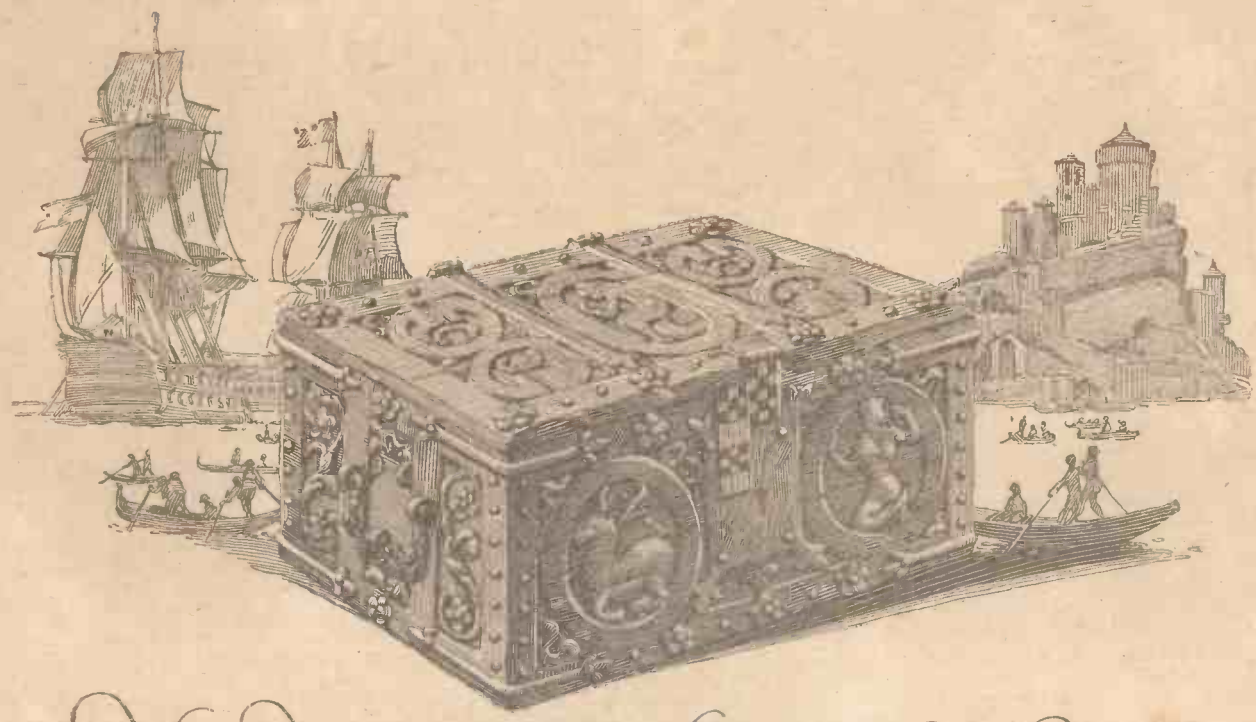
To get the best value for money

and to ensure the maximum pleasure from broadcasting

THERE IS A GECOPHONE FOR YOU

Obtainable from GECOPHONE SERVICE DEPOTS, Electrical and Wireless Dealers, Stores, &c.

Advertisement of The General Electric Co., Ltd. (Manufacturers & Wholesale only), Magnet House, Kingsway, London, W.C.2.



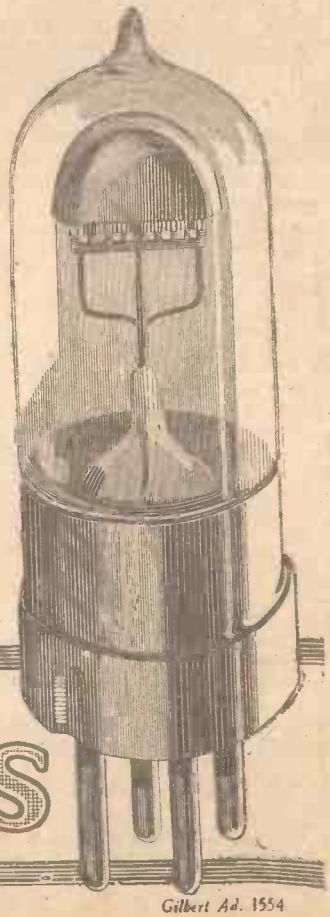
The Treasure Chest of Music
— and its Key

ASK any Cossor user what he appreciates most, and—if he is a real music lover—he will probably emphasize the exceptional purity of its reception. Why should the Cossor design be responsible for a greater mellowness of tone and the uncanny absence of microphonic noises?

Out of mere curiosity we ask you to examine critically a Cossor Valve and any ordinary valve with straight filament and tubular Anode. Look at the Grids. In the Cossor you'll see the Grid band electrically welded on to a stout support and the Grid itself wound to the well-known hood shape—*but each turn of the wire anchored in three distinct places.* There's one reason for Cossor superiority—an absolutely rigid and immovable Grid.

Now compare this with the Grid in the ordinary valve and you will find a a spiral of wire anchored once only to every turn (in some valves the spiral Grid is only supported at each end). Obviously Cossor construction permits that perfect grid control which is essential for the pure reproduction of speech.

This simple little explanation should make it quite clear *why* a Cossor Valve gives better Loud-Speaker results.



P.1 For Detector and L.F. amplification ..	12/6	P.2 (With red top). For H.F. amplification ..	12/6

Cossor Valves

Advertisement of A.C. Cossor, Ltd.—Highbury Grove, N5

Gilbert Ad. 1554

THE R.S.G.B. AND THE POST OFFICE.

BY THE EDITOR.

It has been suggested that the Radio Society of Great Britain fight a test case with the Post Office in connection with certain grievances. If this policy of "fighting" the Post Office is carried out the R.S.G.B. will be making a very undiplomatic move.

DR. W. H. ECCLES, President of the Radio Society of Great Britain, recently gave an autumn address before the R.S.G.B. The main theme of this address was a complaint against the British Post Office. I do not propose to deal at any length with Dr. Eccles' remarks, but it is interesting to note that as a result of his presidential speech there is a feeling in many quarters that the R.S.G.B. should fight a test case with the Post Office on the question of amateur transmitting licences and the rights of the amateur generally. It would seem to be the opinion of Dr. Eccles, and many others, that the Post Office are not affording wireless amateurs in this country the privileges they are entitled to.

The P.O.'s Attitude.

The chief reason for the agitation started afresh by Dr. Eccles is that, in his opinion, and in the opinion of the Radio Society of Great Britain and others, the amateur transmitter is unnecessarily tied down by red tape regulations, and that, furthermore, almost insuperable difficulties are placed in the way of the amateur desiring to take out a transmitting licence.

I have already referred in a previous issue of POPULAR WIRELESS to the stupidity of some of the regulations made by the Post Office in connection with amateur wireless transmissions.

For instance, the regulation prohibiting an amateur calling up another amateur not residing in this country is both unwarranted and without any sense or reason. But with regard to the question of granting transmitting licences to amateurs the Post Office cannot be blamed for exercising the utmost care. There are already many hundreds of amateurs holding transmitting licences who are not fully qualified to enjoy this privilege.

Every owner of a wireless set is familiar with the nature of transmissions from many amateur stations. Admittedly, many of them make better use of their privileges and carry out bona-fide experiments. But, on the other hand, there are many amateurs with transmitting sets who never seem to progress any further than making spasmodic calls of this nature: "Hallo, O.M., can you get me clearly? I will now put on another record," etc.

One cannot wonder that the Post Office authorities are chary of granting amateur wireless transmitting licences unless they are thoroughly convinced that the applicant is entitled to the privilege. Every applicant for a amateur transmitting licence should be made to pass an examination, and he should be made to state even more explicitly and more definitely the nature of the experiments he wishes to make than is the rule at present.

It has been stated that a large number of highly competent applicants for wireless transmitting licences have had their applications refused by the Post Office.

Dr. Eccles stated in his address that the Post Office refused transmitting licences to a special list approved by the Council of the Radio Society of Great Britain, and, according to one quarter, this list included applicants of the very highest qualifications. Undoubtedly in some cases the Post Office are unduly cautious, and the G.P.O. Wireless Department is, to a certain extent, influenced by unnecessary red tape; but on the whole the question of the General Post Office's attitude towards the granting of wireless transmitting licences is very sane, and a suggestion which has been made in certain quarters that the Radio Society of Great Britain should fight a test case with the Post Office can only be referred to as most undiplomatic.

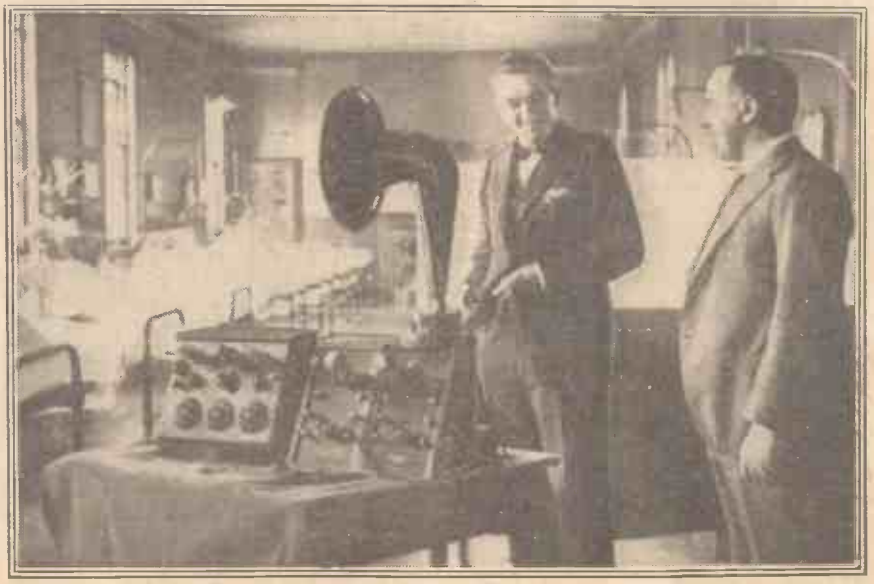
The Post Office hold all the cards. On one or two points they may be wrong at law, but if the Radio Society of Great Britain persist in arming themselves against the authorities they will but do themselves harm; and not only themselves, but other people interested in amateur wireless work. After all, the Radio Society of Great Britain has never really justified its title, and it cannot be said that this society is representative of the wireless amateur movement in this country.

A Bad Policy.

The Radio Society of Great Britain, although it has a junior section, does not encourage to the extent it should the spread of wireless among the younger generation. And yet, although its membership is but a fraction of the number of wireless licencees in this country, it appears to be seriously contemplating an action against the Post Office on the question of amateur wireless transmitting licences and other questions.

While admitting that the Radio Society of Great Britain have many legitimate grievances, the suggestion of taking a test case to court is not the best way to secure a complete understanding with the Post Office. I have no doubt that if the Radio Society of Great Britain were not influenced in certain quarters by people spoiling for a fight, and if they appointed a select committee of responsible people to meet a committee from the Post Office, many of the troubles of which the R.S.G.B. complain would doubtless be satisfactorily settled to everybody's mutual advantage. If they venture into a test case with the Post Office they will not only be acting inadvisably, but will probably live to regret such an undiplomatic course.

The Post Office have the interest of the majority of amateurs at heart. They have to consider the thousands of listeners-in, and, naturally enough, they are entitled to restrict the number of amateur transmitters if they think fit. The R.S.G.B. are not representative of the majority of amateurs, and the policy of making an enemy of the Post Office, if adopted by going to court, will inevitably react on the general amateur to his disadvantage.



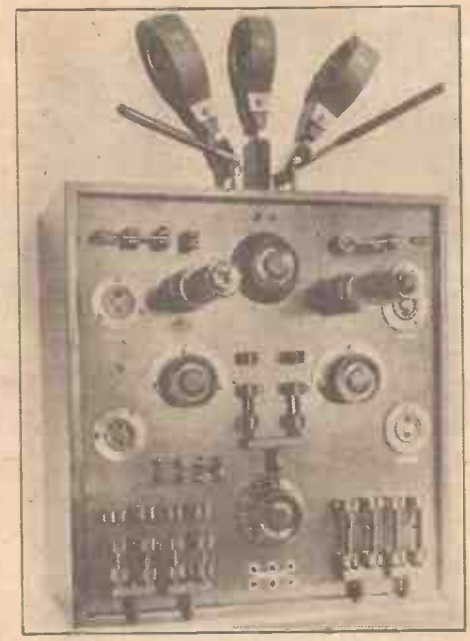
Dozens of hospitals are now fitted up with wireless sets which give infinite pleasure to the patients. Here is a typical London Hospital ward set.

HOW TO MAKE A SIMPLE COIL WINDER.

From a CORRESPONDENT.

WHEN one reads a constructional article on the subject of winding intervalve transformers, the usual instructions are either "Mount the transformer bobbin in the lathe and wind on the requisite number of turns," or else "Construct a winder as in sketch"; this latter generally consists of a crank handle turning a rod mounted between two cheeks of wood for bearings.

This all sounds very nice, but it is not every amateur who possesses a lathe, while I venture to say that still fewer possess the patience necessary to turn a crank handle,



A neat 3-coil double reaction set constructed by a reader of "P.W."

for about 10,000 revolutions. It was for this reason that the author constructed the accompanying device, with which he has successfully surmounted the difficulty of winding transformers of all types both efficiently and quickly.

Only 7s. 6d.

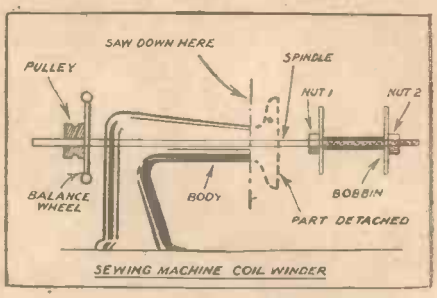
The sketch is practically self-explanatory. An old sewing machine was purchased—you can often pick up one quite cheaply from your local draper or tailor—the author's cost 7s. 6d. The machine is altered as follows. The head which normally contains the needle part of the machine was cut off with a hacksaw along the line marked in the sketch; the spindle which normally transmitted the motion of the pulley wheel to the needle was then removed, and a longer one of the same diameter was substituted.

It is of little use to give actual measurements here as the length of spindle required will vary with different types of sewing machine. However, if the length is chosen so as to allow about three inches to project all will be well. The pulley and balance wheels are generally fitted by means of a set screw to the spindle, and may thus easily be removed and transferred to the new spindle. This spindle must be threaded for about three inches of its length, so that bobbins, etc., can be easily fitted into position for winding, by means of nuts.

For Unidyne Transformers.

The winding procedure is simplicity itself; all that one has to do is to mount the bobbin on the spindle and fix it in position by means of nuts, as in the sketch, then revolve the spindle by means of the treadle or small motor, as the case may be, and allow the wire to run on until the winding is complete. This wire may be easily run off its reel by putting a length of brass rod through the hole so as to provide a rough spindle which can be held in one hand whilst the wire is guided on to the bobbin with the other.

In conclusion, the writer has wound several L.F. and telephone transformers on



the above machine, the average winding time for each one being about forty-five minutes.

The machine will be of use to those amateurs, and there will soon be many of them, who wish to wind transformers for the new Unidyne circuit.

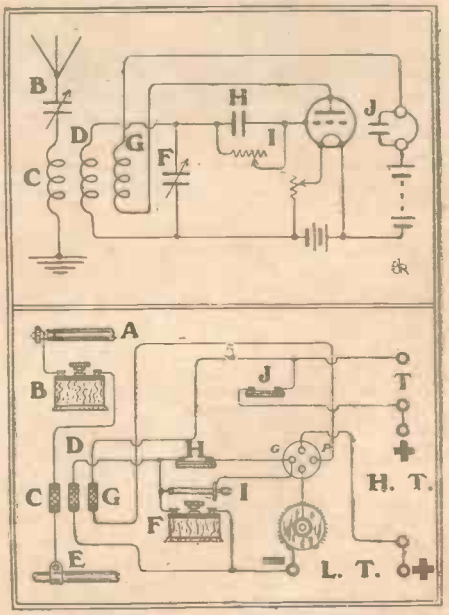
A SINGLE-VALVE REGENERATOR.

By O. J. R.

WHAT to do with a three-coil holder is a problem which sometimes confronts the young experimenter. There are, of course, many different ways in which such a device may be used, but where one's stock of components is limited the method outlined in the accompanying sketch should be of interest. This represents a simple and extremely efficient single-valve regenerative circuit employing a ·001 mfd. variable condenser, B; three honeycomb coils, C, D, and G; a ·0005 mfd. variable condenser, F; a ·00025 mfd. mica grid condenser, H; a variable grid leak, I; a ·001 mfd. telephone condenser, J; and a valve holder and rheostat.

It will be seen that the aerial tuning condenser, B, is connected in series with the primary tuning coil, C, and for the broadcasting wave-lengths, this coil should consist of a No. 75 or 100. If, however, the condenser is connected in parallel the value of the coil may be much lower, say, No. 35 or 50.

The secondary coil, D, which occupies the centre socket of the three-coil holder, may be a No. 50 or 75. This is tuned by means of the parallel condenser, F. The reaction coil, G, may be a No. 75 or 100, and this should be tried first connected one way and then the other. Tuning will be a little difficult until the operator is acquainted with the proper adjustments.



5 N O "Uncles." Left to right: Mr. Pratt (assistant-director); Mr. Odhams (station director); Col. Milligham, and Major Marsh.

READ THESE LETTERS.

The following letters are typical of the thousands received from men and women who have learnt French, Spanish or German by the new Pelman method.

MONTHS EQUAL YEARS.

I have managed, during the past few months, to obtain a better knowledge of colloquial and idiomatic French than I acquired in three years at school. **(C. 146)**

EIGHT MONTHS EQUAL EIGHT YEARS.

This is the easiest and quickest way of learning foreign languages. I was not able to study very regularly, but in the space of EIGHT MONTHS I have learnt as much Spanish as I learnt French in EIGHT YEARS at school. **(S.K. 119)**

FOUR MONTHS EQUAL FOUR YEARS.

I am delighted with the progress I have made.

I have learned more French this last FOUR MONTHS than I did before in FOUR YEARS. I enjoyed the Course thoroughly. **(W. 149)**

RESULT OF EIGHT WEEKS' STUDY.

I was invited lately to meet a Spanish lady . . . she was filled with genuine surprise and admiration at the amount I had learnt in EIGHT WEEKS. I do most of it in omnibuses and at meals. **(S.H. 219)**

FRENCH LEARNT IN SIX MONTHS.

After several years' drudgery at school I found myself with scarcely any knowledge of the French language, and certainly without any ability to use the language. I realise now that the method was wrong.

After about SIX MONTHS' study by the Pelman method I find I have practically mastered the language. **(B. 143)**

SPANISH IN SIX MONTHS.

I am very satisfied with the progress I have made. I can read and speak with ease, though it is LESS THAN SIX MONTHS since I began to study Spanish. All the lessons have interested me very much. **(S.M. 181)**

ASTONISHING PROGRESS.

I am more than satisfied with the progress I have made—I am astonished! It would have taken me AS MANY YEARS to learn by any ordinary system as much as I have learnt in SIX MONTHS by yours. **(P. 145)**

ONE THIRD THE USUAL TIME.

I have learnt more and better French in the last FOUR MONTHS than previously I had learnt in THRICE THAT PERIOD. **(M. 241)**

Further letters describing the merits of the new method will be found in the particulars which will be sent free to everyone who uses the Coupon printed on this page to-day.

THE GIFT OF TONGUES.

By

ANTHONY SOMERS.

I have discovered a remarkable method of learning Foreign Languages, a method for which I have been looking all my life. I only wish I had known of it before; what toil, what drudgery, what disappointment I should have been saved!

It has sometimes been said that the British people do not possess the "gift of tongues." Certainly I never possessed that gift. At school I was hopeless. When the subject was French or German, Latin or Greek, I was always somewhere near the bottom of my form. And yet in other subjects—English or History or Mathematics—I held my own quite well. I have now come to the conclusion—my recent experience has convinced me of this—that the reason I failed to learn languages was that the method of teaching was wrong.

Now, although I never could "get on" with Foreign Languages, I have always wanted to know them—especially French. I have wanted to read the great French authors in the original. I have wanted to read Racine and Victor Hugo and Balzac, and that great critic whom Matthew Arnold so much admired, Sainte Beuve, in French, and not merely through the medium of a characterless translation. Besides, I have wanted to spend holidays abroad without being tied to a phrase-book. And so I have often tried to find a method which would really teach me a Foreign Language. And at last I have found it.

How to Learn Languages.

Some time ago I saw an announcement entitled "A New Method of Learning French, Spanish and German." Of course, I read it, and when I saw that this method was being taught by the well-known Pelman Institute, I wrote for their illustrated book, "How to Learn Languages," and this so interested me that I enrolled for the Course in **FRENCH.** Frankly, it has amazed me. Here is the method I have wanted all my life. It is quite unlike anything I have seen or heard of before, and its simplicity and effectiveness are almost startling.

Consider, for example, this question with which the book (which, by the way, can be obtained free of charge) opens.

> "Do you think you could pick up a book of 400 pages, written in a language of which you do not know a syllable—say, Spanish or German or French—and not containing a single English word, and read it through correctly without referring to a dictionary?"

Most people will say that such a thing is impossible. Yet this is just what the Pelman method of language instruction enables one to do, and so remarkable is this method that I shall be greatly surprised if it doesn't revolutionise the normal method of teaching languages in this and other countries.

The Pelman Language Courses are based upon an original yet perfectly sound principle, and one of their most striking features is the fact that they are written entirely in the particular language (French, Spanish or German) concerned. There is not an English word in any of them. Even if you do not know the meaning of a single Foreign word you can study these Courses with ease, and read the lessons without a mistake, and without "looking-up" any words in a French-English, Spanish-English or German-English dictionary. This statement seems an incredible one, yet it is perfectly true, as you will see for yourself when you take the first lesson.

Grammatical Difficulties Overcome.

Another important fact about this new method is that it enables one to read, write, and speak French, Spanish or German without bothering one's head with complex grammatical rules, or burdening one's memory with the task of learning by heart long vocabularies of Foreign words. And yet, when the student has completed one of the Courses, he or she is able to read Foreign books and newspapers and to write and speak the particular language in question accurately and grammatically, and without that hesitation which comes when a Foreign Language is acquired through the medium of English.

The Pelman method of learning French, Spanish or German by correspondence is fully explained in three little books (one for each language), and I strongly advise those who are interested to write for a free copy of one of these books to-day.

Everyone who wishes to learn FRENCH, SPANISH or GERMAN without difficulty or drudgery should post this Coupon to-day to the Pelman Languages Institute, 97, Bloomsbury Mansions, Hart Street, London, W.C.1. A copy of the particular book desired will be forwarded by return, gratis and post-free.

COUPON

To the PELMAN LANGUAGES INSTITUTE,

97, Bloomsbury Mansions, Hart Street, London, W.C.1.

Please send me a free copy of "HOW TO LEARN FRENCH" —"HOW TO LEARN GERMAN" — "HOW TO LEARN SPANISH" (cross out two of these), together with full particulars of the New Pelman Method of learning languages.

NAME .....

ADDRESS .....

.....

Uncle Fellows calling!

A LOUD SPEAKER FOR 30/-

Hullo everybody! I know you will forgive me if I indulge in a little bit of trumpet blowing, but I simply can't help feeling a shade pleased.

To begin with the dreaded slump associated with the summer months simply didn't materialise—any more than the summer itself, and the sale of every one of my products has shown a steady crescendo. I have to thank my Production and Sales departments for this, but most of all I have to thank you.

Now I want to do something for you in return.

The Fellows Junior Loud Speaker, with its adjustable diaphragm, pleasing lines, and rich, mellow tone is too well known to need introduction. Perhaps you have coveted one. Well, there is now no need for you to deny yourself any longer. From October 1st its price is to be 30/-.

For the price of a second pair of telephones you can enable everyone to listen in at once!—another illustration of

Quality Apparatus at Low Cost.

FELLOWS WIRELESS

The Junior Loud Speaker

A remarkably efficient small loud speaker for medium sized rooms fitted with adjustable diaphragm and only

30/-

K.P.S.92.

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FIXED CONDENSERS

A CHAIN is no stronger than its weakest link, and perhaps no component so well deserves careful choice as does the fixed condenser. It may not *make* the set but it certainly can *mar* it.

THE name "ATLAS" on a fixed condenser is sure guarantee of sound dependable performance. Made with strong Bakelite casings and inserts. The carefully selected copper foil and mica sheets are held under firm pressure by countersunk brass screws and nuts. Not only is the condenser of the actual capacity named, but the capacity is kept absolutely constant. Strong soldering tags are attached, and all the metal parts are heavily nickel-plated.

Each condenser is tested to 1,000 volts prior to dispatch.

Say "ATLAS" and be safe

·0001 to ·0005	.. .. ..	2/- each
·001 to ·002	.. .. ..	2/3 „
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ATLAS

SOME UNIDYNE TROUBLES.

CANDID ADVICE TO CONSTRUCTORS.

A FAULT-FINDING GUIDE FOR THE NOVICE.

By G. V. DOWDING, Grad I.E.E.
(Technical Editor, "Popular Wireless.")

Many amateurs have reported excellent results with Unidyne sets, but also a good number of novices have built sets, attracted no doubt by the absence of H.T., and have bitterly complained that they cannot get results. Dozens of sets have been sent to the "P.W." offices, and in all cases careless or ignorant construction has accounted for the trouble. Hence this candid article, which is primarily intended for the novice building a Unidyne receiver.

I CANNOT do better than preface this article with the words of our scientific adviser, Sir Oliver Lodge, F.R.S., who, in a short "Memorandum to Those Concerned with the Unidyne," says:

"As I have reported favourably on Unidyne sets submitted to me, and as I hear of reports of difficulties found by amateurs, I think it well to make the following remarks: (1) Perfect tuning is imperative; and I think that this could be best accomplished by means of a micrometer movement on the variable condenser. The use of an independent vernier condenser brings trouble and some confusion.

"(2) I think that the sale of parts for making up the Unidyne is liable to spoil its reputation. My assistant has had two sets to test both of which were failures. The faults were dirty contacts due to the non-removal of soldering flux. He reports also that:

"'Wires carefully insulated in the first place on the ebonite panel had been brought into bare contact in numerous places on the woodwork of the base. Also wires had been run parallel to metallic rods of the coil-holder, and only $\frac{1}{16}$ of an inch away from them. In fact every mistake possible had been made (no really fundamental mistake can be easily made because the wiring diagram and the position of the parts are so carefully set out.)

Two Important Points.

"In each case considerable trouble had been taken to mount the variable condensers upside down, and the scales were not set at all—though the mounting had been done by a so-called electrical engineer.'"

I earnestly request my readers to very carefully read the foregoing words written by the greatest living wireless pioneer and his assistant, for they carry a message of the greatest of importance. Primarily, two phrases stand out: "As I have reported favourably on Unidyne sets," and "I hear reports of difficulties found by amateurs."

We, too, have heard reports of difficulties, and is it to be wondered at? Hundreds of amateurs whose previous experience of wireless work has been confined to the ubiquitous crystal have made the Unidyne their first experience of valve apparatus. Some obtained excellent results right away, and have written us congratulatory letters reporting, perhaps, most excellent results, the reception of distant continental stations, and all our own B.B.C. stations on one valve. The P.S.'s "This is my first valve set," denotes either a most commendable achievement or collosal luck. We consider that in the majority of cases it is the latter.

The Unidyne is a simplification of wireless apparatus, but not the simplification of wireless practice generally. Many possibilities of trouble in operation and maintainance are removed with the removal of the high-tension battery, but all the rules and regulations concerning the construction of a wireless receiver still exist, and in fact, are a little emphasised, inasmuch as there does not remain much to "play about with" as it were. In conventional valve circuits the existence of a high potential permits certain small liberties which cannot be taken when, such as in Unidyne circuits, it is not present.

A Comparison.

Attention to detail and a certain amount of experience is therefore essential to success. Compare the Unidyne to ordinary circuits as you would a beautifully tuned aeroplane engine to the engine of a motor lorry—liberties can be taken with the latter, both in respect of fuel and management, but not with the former.

It is here that the words of Sir Oliver Lodge's assistant become most apt: "No really fundamental mistake can be easily made——" and yet he is dealing with "failures." It is like making a cake; the ingredients can be exactly as laid down in a recipe, the mixing up of ingredients can be carried out as per the printed word, and the baking can be exactly to order, but unless the cook be experienced that cake can be a "failure"; likewise in the hands of an experienced cook the self-same recipe can produce masterpieces of gastronomic temptation! Do I need to emphasise the point further?

A Flagrant Case.

I have handled some hundred or more Unidyne sets which have been sent me as being "failures." One in particular provides an instance of how some amateurs go about things. A reader who shall be nameless and whose address shall remain as "somewhere" wrote to me and reported "nothing doing." We gave him advice. Came back that he had followed our advice in every detail and still there was "nothing doing." We gave him further advice, particularly referring him to a previous article I wrote, and which appeared in "P.W." No. 117. Once more he reported "nothing doing." As it appeared to be a most extraordinary case of absolute failure, I decided to ask him to send his set (a detector and L.F.) along to us.

Gladly he did so. The moment I saw the wiring of that receiver I spotted two most flagrant errors—they stood out in blazing relief. He had the grids connected up the wrong way round, and he had taken the grid resistance from the first valve's grid to the battery negative. We soon had that

(Continued on page 302.)

UNIDYNE TROUBLES.

FIVE IMPORTANT RULES.

(1) To ensure Successful Construction.—Use first-class components throughout and adhere strictly to the details given, particularly in respect of values. A 10 to 1 ratio L.F. transformer is useless in the Det. L.F. circuit.

Pay attention to the spacing of components and wiring. Be as careful in respect of insulation as you would be if 100 volts H.T. was to be used.

Ensure that all contacts and connections are perfectly clean and see that where such are soldered all traces of flux are removed.

(2) When a One-Valve Unidyne Fails to Work, Possible Causes.—Faulty grid resistance. Unsuitable coils. Reaction coil connections reversed. Valve pins making inefficient contact with their sockets. Grid connections reversed. Faulty grid condenser. Faulty contact or connection in wiring. Error in wiring.

(3) Inefficient Amplification on the L.F. Side.—Possible Causes. Unsuitable L.F. transformer, L.F. grid resistance of unsuitable value (instead of pencil lines an ordinary variable grid leak can be used). The POSITION of the L.F. transformer requires reversing. More L.T. required. See also (2).

(4) Failure to Obtain Efficient H.F. Amplification.—Possible Causes. "Crowding" of components. Parallel and badly spaced wiring. H.F. transformer not as per specification. H.F. transformer in too close proximity to tuning coils or L.F. transformer. See also (2) and (3).

(5) General Notes on the Operation of Unidyne Receivers.—Careful tuning is essential. Make primary adjustments of A.T.C. with reaction loosely coupled. When reaction coupling is being tightened use the vernier condenser adjustment simultaneously. Use the variable grid resistance freely when tuning-in, always making this the final adjustment. Run the filaments as low as possible—never increase their brightness above actual requirements. Use the detector filament control lightly for tuning purposes. If you are only a mile from a B.B.C. station expect to be able to cut him right out when you have mastered the tuning controls.

When tuning has been carried out on one valve only, it will be necessary to slightly retune when the L.F. stage is brought in. When an H.F. stage is brought in it may be necessary to reverse the reaction coil connections. Series A.T.C. should be used for ordinary broadcast wave-lengths, parallel for 5 X X and higher.

SOME UNIDYNE TROUBLES.

(*Continued from page* 301).

set working beautifully, and returned it to the owner. Came back, not joyful thanks, but a rather abusive letter embodying the sentiments "If YOU can't get it to work, how can WE POOR AMATEURS do so"!

A member of the "P.W." staff at work on the lathe in the "P.W." workshop, where every set is tested before being dealt with in this journal.

Words failed us and we did not reply. Came another missive later from the self-same amateur: "Splendid results—all the B.B.C. —continental—loud-speaker—thundering-in!" and a significant P.S.: "And this is my first valve set"!

Single Circuit Tuning.

What had happened to cause this reversal of feelings? We can but surmise—that amateur knew no more about tuning a valve set than he realises why a filament changes colour when it is heated. Sir Oliver Lodge says: "Perfect tuning is imperative." Of course it is. The Unidyne is the most selective "straight" valve circuit yet evolved.

With single circuit tuning and reaction directly on the A.T.I. it can cut out interfering "mush" as easily as an electron can cut through a positive grid. Five miles from 2 L O I can cut that station out completely, and bring in 5 I T, and vice versa, merely by turning the knob of the detector valve filament (Det. L.F. circuit) —when everything else is set "just so."

Tracing a Fault.

Therefore my second main point is that a set may be constructed perfectly, and be tested even by myself and marked perfect, but optimum results will not be obtained by anyone who aimlessly twiddles its controls. Before I go any farther I cannot help making mention of another "failure" I had brought to my notice. This time it was a three-valve Unidyne—H.F., det. and L.F. When it was placed before me on my testing-table, I did not regard it as an absolutely "nothing doing" set, for it was constructed by one who is by way of being "a wireless author." I connected it up to earth and aerial and a battery. Switched on the valves—2 L O, some five miles away, and in full operation failed to resolve into signals. I cut out the H.F. and still all was silence. In desperation, I cut out the L.F., and was rewarded with signals of R I order—about 100th of what is generally styled "crystal strength."

Asking Too Much.

A faulty grid leak was replaced and signals increased in strength. I was able to distinguish words. The reaction coil was reversed, and the wiring put more into order. Signals were then loud and fully up to one-valve standard. I brought the L.F. in—signals vanished! Well, to cut a long story short, I rectified most of the errors on the L.F. side—and it is surprising how many can be made, even in such a simple circuit—and brought it up to nearly two-valve standard. It would have necessitated complete reconstruction to get first-class results. I then switched in the H.F. Again signals disappeared.

Having acquired the patience of a wireless Job during my chequered career, I set to work on that section. I first of all removed the H.F. transformer from its position, which was in literally a touching proximity to the L.F. transformer, and again endeavoured to bring order to an amazing disorder of wiring. To cut another oh! so long story short, I got that three-valve set to function more or less as a three-valve set should function, but in a report sent to its owner, I advised him to scrap the whole job and start again with more care and attention to detail if he wanted a really first-class Unidyne. The owner in a letter received some weeks later announced complete satisfaction —he had followed my advice TO THE LETTER.

I have one more point I wish to drive home, and that is that one cannot expect three-valve results with a one-valve set, whether it be Unidyne or any other "straight" receiver. I have received letters from readers who express dissatisfaction because they cannot do so. This is not fair. Readers would be astonished at the number of amateurs who write to us in this vein. "My aerial is 20 feet long and 20 feet high. I can get this B.B.C. station and that B.B.C. station!" —here follows a string that would make a D.X. fiend's mouth water—"but I cannot get so-and-so"—who might be perhaps 300 miles away—"how can I improve results? My set is a one-valve Unidyne." Comment is, I think, entirely unnecessary.

Wireless Averages.

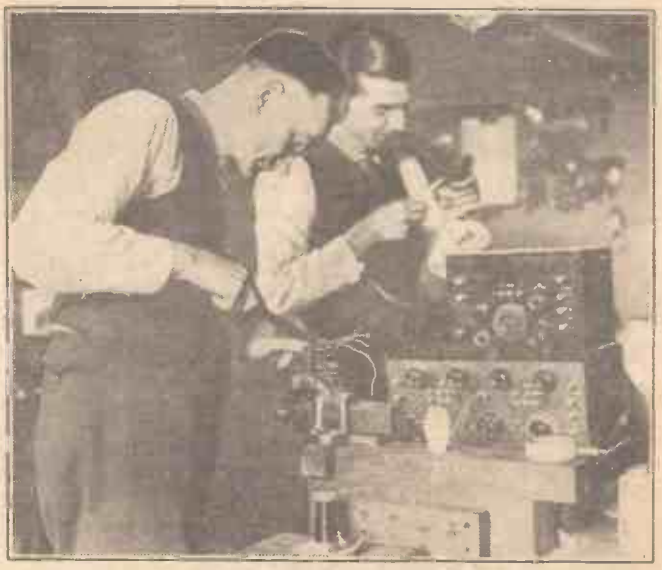
Readers must not imagine that the foregoing is by any means an exaggeration, or that the Unidyne is always the set that its owner considers should be and can be improved.

I remember one letter in which a constructor of a "P.W." Ultra crystal set expressed almost wrath because he could only receive four B.B.C. stations with clarity! Is it believable? Truth is indeed stranger than fiction.

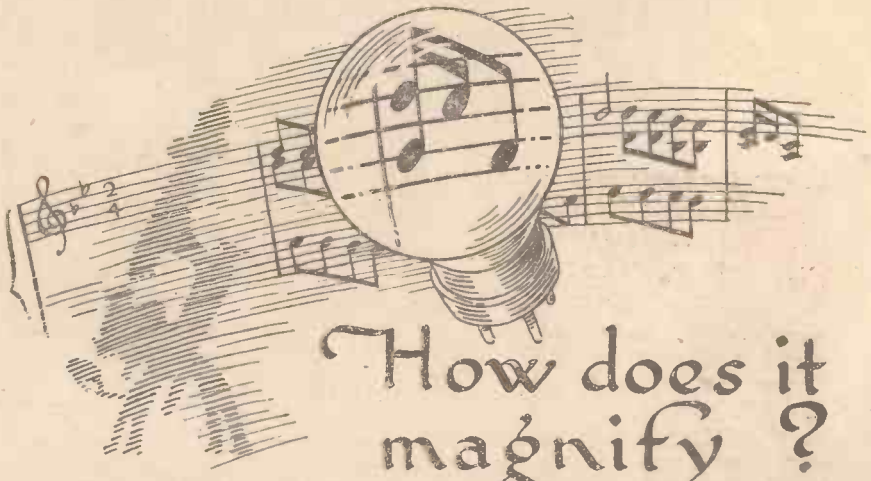
There are times when local conditions, etc., are such that enormous ranges of reception can be covered by the simplest of apparatus, but please remember that there are well-defined *averages* in wireless as in everything else in this world of ours. Apparatus constructed by an expert and operated by an expert provides one of the golden exceptions to the rule of wireless averages, and all constructors of Unidyne receivers should attempt to become experts in every sense of the word in order that the ever-increasing reputation of these special "P.W." circuits may be uniformly maintained.

Unidyne Queries.

In order that constructors may be able to grasp the main points that they have to watch in order to ensure "Unidyne success," I have drafted out a concise list. May I ask them to be kind enough to read, mark, learn and inwardly digest without accusing me of any other motive than that of endeavouring to help them over any obstacle they may encounter. Finally, I would like to add that in future all queries concerning Unidyne receivers will receive the personal attention of either Mr. Rogers or myself. Letters should be addressed to our Query department in the usual way, but marked on the envelope "Unidyne."



Two "P.W." staff men putting the finishing touches to a two and four-valve Unidyne in the workshop, which is fitted up with all the necessary tools, lathes, testers, etc. The "P.W." 24-valve set was built in this workshop, and the "P.W." Combination and other popular sets therein first saw the light of day.



How does it magnify ?

AS a matter of fact, it *doesn't* although most people think of it in that way. The wireless valve is a valve in the truest sense of the word; just as much as the throttle on an engine. It is there to regulate the supply of energy from your H.T. battery in obedience to impulses from the aerial. The energy so regulated transforms the feeble current picked up from the ether into sounds which are audible in your loud speaker.

Ediswan valves perform the delicate function of current control with a notable absence of distortion, a complete silence of operation and a marked economy in filament consumption and length of service.

Ediswan Valves will bring the best out of your wireless set—get some on the way home and enjoy better programmes from to-night onwards. All dealers sell them.

THE EDISON SWAN ELECTRIC CO. LTD.
QUEEN VICTORIA ST. LONDON. E.C.4

EDISWAN
VALVES

The first valve ever made was produced in the Ediswan laboratory

162-4

METHODS OF SWITCHING-IN WIRELESS CIRCUITS.

By P. T. BEARD.

This illustrated article, the first of a series of three, deals with a practical branch of wireless work which every constructor will find invaluable. The questions and problems relating to switching have been exhaustively dealt with by our contributor, whose first article is printed below.

PART I.

IT is never desirable to introduce elaborate switching arrangements into a wireless receiver unless they are really of use, and some constructors take a delight in introducing useless switches into every

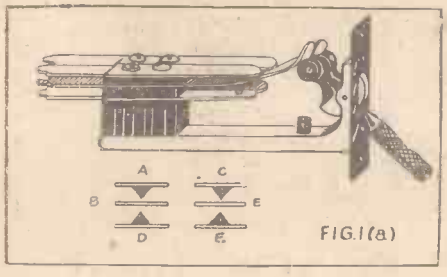
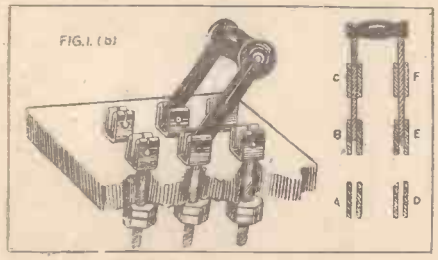


FIG. 1 (a)

possible part of the circuit, and thereby turn their receiver into a jumbled mass of leads, which makes for instability, self-oscillation due to interaction between leads, and other evils. In this article will



be given several of the more useful switching arrangements, either of which will improve any receiver.

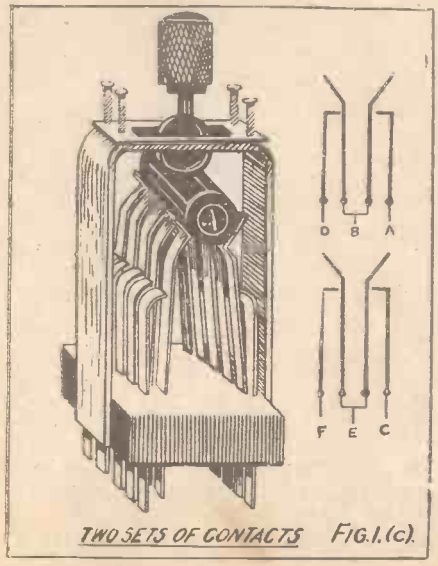
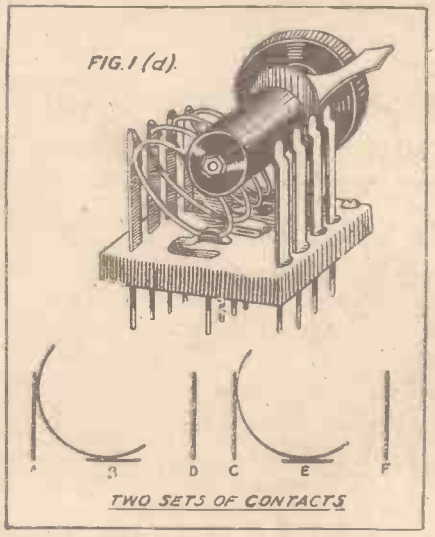


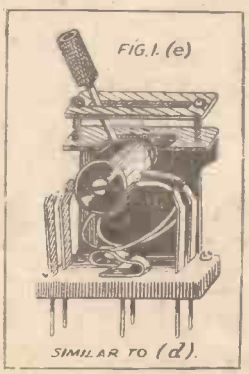
FIG. 1. (c).

The diagrams show several types of change-over switch, all of which are suitable for the circuits about to be described, with one exception. The exception is the ordinary land-line telephony type of Dewar switch as shown at Fig. 1 (*a*). This type of switch should not be used in high-frequency circuits, that is, it should not be used before a valve or crystal detector. This switch is, however, very useful for switching low-frequency amplifiers, telephones and loud speakers, etc.

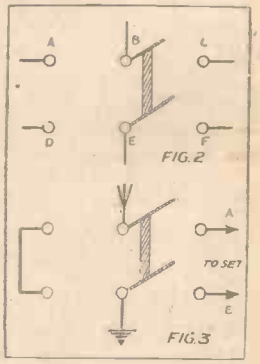
The reason for advising against the use of this switch for high-frequency circuits



is that the leaves of the switch are so close together that they act as condensers of fairly large capacity, and it is well-known that high-frequency currents pass with ease across anything which acts as a condenser. Fig. 1 (*b*) is a very useful switch of the orthodox type, which may be purchased in various sizes and on various kinds of insulating bases. The larger sizes with porcelain base are very suitable for earthing the aerial when the receiver is not in use. Fig. 1 (*c*) is a key switch of the "Burndept" pattern, and which is quite a different proposition from the Dewar switch.



The "Burndept" is constructed with ample space between its leaves, which makes it suitable for use in high-frequency circuits. Fig. 1 (*d*) is another type of novel design. It will be seen that the centre ebonite barrel carries a wire hoop which is always in contact with the centre contact on the base and also with either of the side contacts according to which way the handle is moved. Fig. 1 (*e*) is similar to (*d*), except that the movement is controlled by a handle instead of a knob.



Beneath each switch will be seen a sketch of their connections, and for wiring-up purposes the letters against each contact should be compared with those against the contacts of the diagrammatical switch shown in Fig. 2.

Fig. 2 shows how the change-over switch will be depicted in the diagrams which follow.

The Earthing Switch.

Fig. 3 shows the method of connecting an earthing switch, preferably mounted on the wall outside the window, in the aerial circuit of the receiver. For this purpose type (*b*) on a porcelain base is recommended. It will be seen that the aerial lead-in is taken to the upper arm of the switch, and the earth lead to the lower arm.

The upper right-hand contact is connected to the aerial terminal of the receiver, and the lower contact on the right-side goes to

(*Continued on page* 306.)

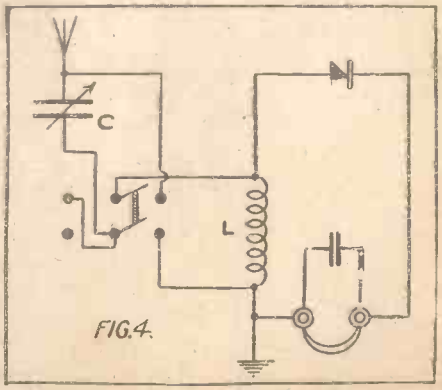
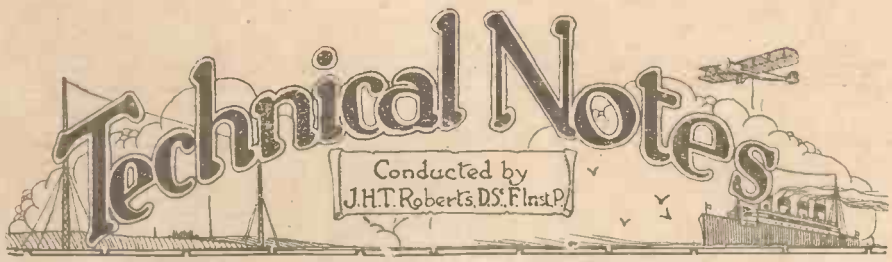


FIG. 4.



Useful Pliers.

IN wiring up a set, it is often necessary to insert a small piece of buswire into some almost inaccessible place and hold it there whilst it is soldered in position; and, in such cases, you generally find that the pliers will not reach sufficiently far, and you wonder how you can hold the piece more conveniently. A reader sends me a very simple hint for such cases. He says he uses a pair of curling-tongs for the purpose. As these are equivalent to a long and narrow pair of pliers, I can readily see how useful they would be in cases such as that mentioned above.

An Aerial Hint.

An insulator on the outside aerial obviously can only insulate so long as its surface remains dry, and for this reason insulators are usually made of material upon which the moisture collects in separate drops, rather than in a continuous film. A coating of grease or vaseline sometimes helps in this direction, although it has, on the other hand, the drawback that it collects dust which contains carbon from smoke, and this in time forms a conducting coating. A useful little trick for preventing the deposition of direct rain on the insulator, and also for protecting it to some extent from dust, is to make a cowl or shield out of a tin canister, such as is used for coffee and various other foodstuffs.

The lid should be removed altogether, and a hole drilled through the bottom of the tin large enough to enable the supporting wire to be passed through it. When the tin is in position, and placed centrally so that it is clear of the insulator, it should be soldered to the supporting wire, the hole being completely soldered up. In this way the tin forms the hood and protects the insulator.

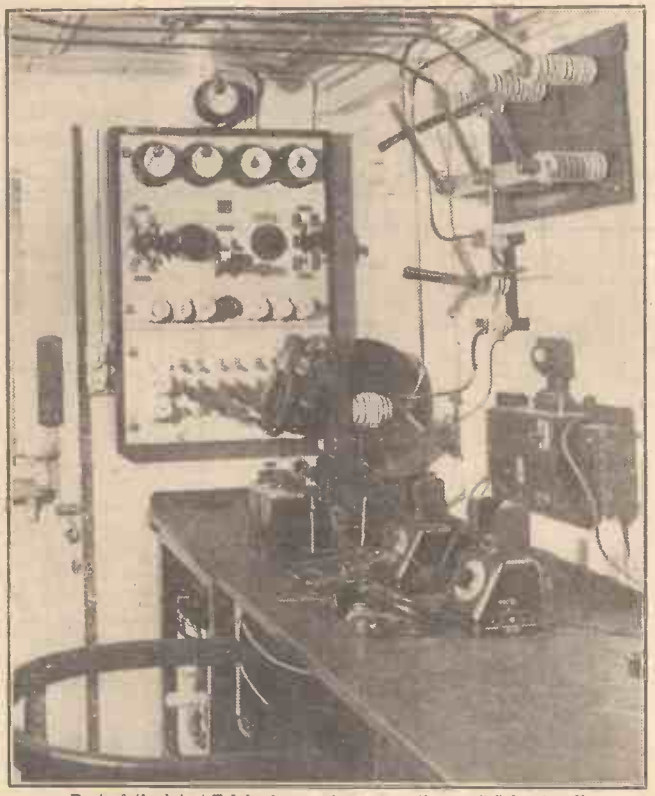
(Continued on page 354.)

A Novel Valve.

Here is a new idea for those who are given to invention in connection with valve design. A glass vessel contains the filament, the vessel being exhausted and the filament raised to incandescence in the usual way by the passage of an electric current. Outside the vessel, and in contact with the glass, is a metal plate, and the thermionic current passes through the glass from the internal filament to the external plate.

Under the heat of the filament the glass wall becomes a conductor, and so allows the current to pass. A valve on this principle, to be used as a rectifier, has recently been patented in America. I recollect considering a very similar idea to this some time ago, but I turned it down without actually trying out, as it seemed to me that if the glass were made sufficiently hot to be electrically conducting, there would be a large evolution of gas from it, sufficient to destroy the vacuum, not to mention diffusion of gas through the glass from outside, as well as difficulties due to deformation of the glass owing to its being softened with the heat.

I do not see any account of the American patent having been tried out. At any rate, here is the idea, in case it may be of interest to any readers who have the facilities for experimenting with vacuum pumps.



Part of the latest Telefunken equipment on the s.s. "Columbus."

METHODS OF SWITCHING IN WIRELESS CIRCUITS.

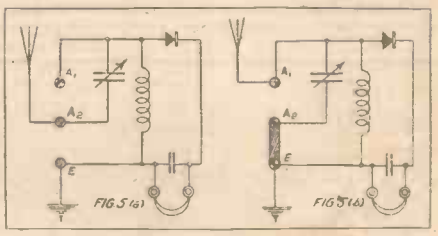
(Continued from page 305.)

the earth terminal of the set. The two contacts on the left of the switch are short-circuited, which gives a direct path from aerial to earth when the switch arm is thrown over to the left. When the switch arm is over to the right, the aerial and earth are connected to their respective terminals on the receiver, as shown.

Series Parallel Switch.

Fig. 4 shows the method of changing over the aerial tuning condenser (c) from series to parallel, and vice versa. This switch is very necessary in cases where the receiver is not used solely for the reception of British broadcasting. For these short wave-lengths the condenser should be in series with the aerial coil, but when it is required to receive on higher wave-lengths, some provision must be made for changing over the connections of the condenser to put it in parallel with the aerial coil.

Any of the switches, except type A, may be used for this purpose. The connections are as follow: The aerial terminal of the set is connected to the upper right-hand contact of the switch, and also to one side of the aerial condenser (C), the other side of



this condenser being joined to the lower arm of the switch, which is also connected to the upper left-hand contact. The upper switch arm is connected to the upper side of the aerial coil (L), and also to the crystal, or grid of the first valve. The earth side of the aerial coil is joined to the lower right-hand switch contact and the lower left-hand contact is left open.

If the circuit is traced through it will be seen that with the switch arm to the right the condenser is in parallel with the aerial coil, and when to the left it is in series. Fig. 5 shows another method of connecting the condenser in series or parallel by means of an extra aerial terminal and a shorting strap. The two aerial terminals are shown as A 1 and A 2, and the earth terminal as E. The aerial condenser is connected between A 1 and A 2, and the aerial coil is joined across A 1 and E. Connections are taken from A 1 to the crystal, or to the grid of a valve, and from E to one side of the telephones if a crystal is being used, or to low-tension negative in the case of a valve set.

It will be seen that if the aerial lead-in is connected to A 2, as shown in Fig. 5 (*a*), the aerial condenser is in series with the aerial coil. In Fig. 5 (*b*), the lead-in is joined to A 1 and a shorting-strap is connected between A 2 and E. In this case the condenser is in parallel with the aerial coil.

SECRETS OF THE B.B.C.

THE STORY OF DAN GODFREY, JUNIOR.

By "ARIEL."

Mr. Dan Godfrey, Junior, late of the Manchester B.B.C. Station, and now a leading light at 2 L O, is the subject of "Ariel's" latest investigations, and in the following article the reader may learn a few facts and fancies about a very popular member of the B.B.C. staff.

IN the year 1815 "The Times" printed a detailed report of the famous battle of Waterloo and the great victory of Wellington. Special mention was made of the heroic deeds of a drummer-boy who, it was said, "stood by the men-at-arms, and did beat drums and give encouragement to his comrades." More was destined to be heard of the drummer, for he eventually became an officer in the Guards and the conductor of the Guards' band. This was all the greater a distinction, since it was the first time the War Office had permitted a conductor to hold a commission. This drummer-boy was the first of a long line of musicians, and his name was Dan Godfrey.

A New Composition.

His son, also called "Dan," followed the same profession and became equally famous. His son, the present Sir Dan Godfrey, is still well-known to the world for his masterly power with the baton, and the citizens of Bournemouth are proud to claim him as the musical conductor of their town. Sir Dan also has a son, yet another Dan Godfrey, who is walking in his father's footsteps, and conducts the orchestra at 2 L O.

Thinking that my readers might be interested to hear more about this recent acquisition of Savoy Hill, I called on Mr. Godfrey the other day and found him playing the violin.

"You have caught me all alone," he told me. "My wife and kiddie have gone to Eastbourne for a holiday. But never mind; sit down and tell me what you think of this tune."

He played it over to me, and I replied that I thought it was very pretty, but I had never heard it before.

"Quite likely," he said. "I am busy composing a suite, and this is an air out of it."

Mr. Dan Godfrey is, of course, very fond of music. His experience has also extended to military bands, for he served a considerable number of years in the Guards, and, like his great-grandfather, he wielded his regimental baton. Later, he became municipal conductor for the town of Hastings. It can thus be seen that he is no novice.

"A Great Stunt."

"Do you know," Mr. Dan Godfrey remarked, "I listen to all the musical items broadcast from London in which I myself am not taking a part. In my opinion, broadcasting is going to do a very great deal for music. In fact, that is why I took up the matter so seriously and eventually joined the B.B.C. I think, like my father, that the only reason why music is not more appreciated in this country is that there are so few opportunities of hearing it; and that, I take it, is where broadcasting steps in."

Mr. Godfrey is also passionately fond of golf, and we recalled our golfing match at Manchester last year, when we had arranged for an expert to broadcast lessons to me, for I knew nothing about the game. We had fixed a wireless set, complete with loud speaker, on to a wheel-barrow, so that we might hear the directions as they were delivered.

"It was not a bad stunt," laughed Mr. Godfrey, "and, on the whole, I think it worked remarkably well, though it was rather unfortunate that you should have got a lesson in putting just when you had landed yourself in a very bad bunker."

Mr. Godfrey's only child is a little son named, like himself, "Dan." I suggested that it must at times be confusing, having only the one name among all the male members of the family.

"Not at all," he replied gravely. "In fact, my wife finds it a great convenience. For, whenever she loses her temper with either my son or myself, and says rather more than she meant, she can always excuse herself with, 'Well, I only said "Dan."'"

I asked Mr. Godfrey how he liked being in London. He said:

"Very much, indeed. It has many advantages over the provinces. One of them is that you can at least get a good cook in London. I remember one cook I had in Hastings; she was a most unforgetable experience. I imagine she was a person very given to religious services, for everything she sent me to eat was either a sacrifice or a burnt offering!"

Mr. Dan Godfrey is no snob, but he can boast of having dined at the same table as the Prince of Wales.

"On this occasion," he remarked, in a thoughtful voice, "I may say that I dined well, but very wisely."

I expressed myself incredulous.

"Indeed, yes," he answered regretfully. "That confounded cook had ruined my digestion!"

The Silent Cat.

In most matters, Mr. Godfrey is a very easy-going person. Even in our famous golf match my ineptitudes only gave him cause for mirth. But in musical matters he takes himself most seriously, and will allow no foolery from anybody. Any approach to an attitude of ribaldry brings down his wrath.

"That," he said, "is why, unlike the other 'uncles,' I have not got a dog. I have never succeeded in finding a dog whose views on music coincided with my own, but I have a very delightful and silent cat called John Keats. It is a striking example of the truth of that poet's famous lines, 'Heard melodies are sweet, but those unheard are sweeter.'"

"Do you not find," I asked, "that he gives vent to his suppressed musical enthusiasm on the roof at night?"

Mr. Godfrey admitted that he did.

"But still," he added, "as he confines himself to a fairly accurate rendering of the arias from 'Lucia di Lammermoor,' I don't really mind!"

Mr. Dan Godfrey, junr., conducting the Wireless Orchestra at 2 L O.

Constructional Notes

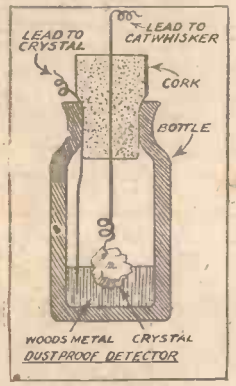
Conducted by Dr. J. H. T. ROBERTS, F.Inst.P.

Dustproof Crystal Detector.

HERE is an idea sent in to me by a reader for a device which he says he has made and used. Although not very "professional" looking on a finished set, it will serve its purpose well enough in an experimental one. It is briefly a method of finding a glass dust-cover for the crystal without the necessity of cutting a glass tube of rather large diameter, which many experimenters find somewhat troublesome in the absence of a diamond cutter.

As will be seen from the illustration, any small bottle about an inch or two in length, and with as wide a neck as possible, is used for the glass cover. Some scraps of Wood's metal are dropped into the bottle, and the latter is then very carefully heated over a spirit-flame until the metal melts.

The fragment of crystal is then dropped in in the usual way, and at the same time a wire is inserted into the molten Wood's metal, to form one of the leads to the detector. The cat-whisker is attached to a fairly stout wire passed through the cork, and may be adjusted after the cork is placed in position.



Great caution must be exercised in heating the bottom of the bottle to avoid cracking. If the fixing metal is one which melts at a lower temperature than the boiling point of water, it is better to melt the metal by immersing the end of the bottle in the hot water.

L.T. Battery Switch.

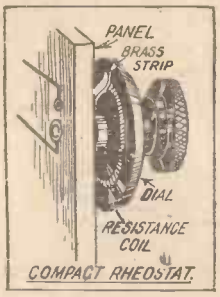
Many experimenters appear to despise the filament battery switch as being unnecessary. When they have finished using the set, they turn down all the rheostats or disconnect the battery. The first method is inconvenient, since the positions of the rheostats have to be adjusted again next time the set is used, and furthermore, if the total resistance in the rheostat is high (for example, with dull emitters), the current may not be turned entirely off, even though there is no perceptible glow in the filament.

A Good Investment.

If this is the case, there is obviously a serious drain on the battery in the next twenty-four hours. The plan of disconnecting the battery altogether from the set, although safe, is inconvenient. The filament-battery switch, however, overcomes all the objections considered above, and is a good investment.

Compact Rheostat.

One of the common complaints with regard to the ordinary wire rheostat is that it takes up too much room behind the panel. Here is a rheostat which takes up practically no room at all behind the panel, the resistance element being contained in a groove cut in the back of the dial. The dial, which must of course be sufficiently thick, is simply put in the lathe and the recessed groove cut in the back, as shown in the accompanying diagram.

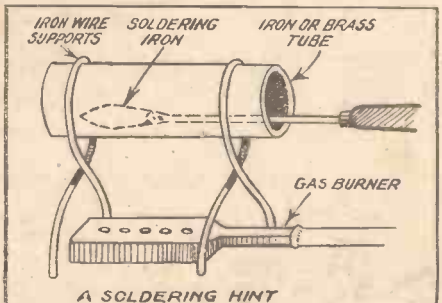


The resistance "spring" is then fitted in position, one end being connected by a copper wire to the shaft. A piece of springy copper or brass, secured to the front of the panel by a bolt, makes contact with the resistance element. The resistance element holds itself in the groove by reason of its own tension and the shape of the groove.

A Soldering Hint.

When you have a good deal of soldering to do, and you forget about the iron, you generally find that you have to remove the scale from it, file the iron and re-tin it before you can proceed with your work. I mentioned a little hint for reducing this trouble in some notes recently, and here is a picture illustrating it.

A piece of iron or brass tube is obtained, about 3 or 4 inches long, and of sufficient internal diameter to permit of the insertion of the soldering-iron easily into the tube.



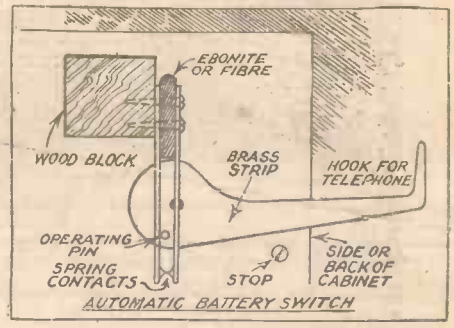
The tube is left in position in the flame, and the iron, instead of being inserted directly into the flame, is simply placed within the tube and left until it is sufficiently heated. This prevents the soldering-iron from becoming overheated, and also keeps the gases from contact with it to a large extent. In this way the troublesome scaling of the soldering-iron is much lessened.

Drilling Panels.

Generally it is a good plan to make drillings as accurate as possible, but in the case of drillings for shafts through the panel it is often a good plan to make the holes somewhat larger than the shafts. If the hole is a dead fit, or tight, the least deviation of the shaft from the true will cause sticking, and a great deal of trouble. Further, when making several holes for an instrument, it is difficult to get them exactly to register, and a little "play" makes the fitting of the instrument much easier. There is really no objection to the panel drillings being a little on the large side, as the dials, etc., cover them over when the work is completed.

Automatic Battery Switch.

I referred elsewhere to the advisability of using a filament-battery switch to cut out the battery when the set was not in use. There are several types of such switch on the market, and they can be purchased quite cheaply.



But here is one which is easily made, and which is automatic in action, if you cultivate the habit of hanging the 'phones on the hook when they are not in use. The action is similar to that of the hook-switch on an ordinary house telephone. The shape of the hook for the 'phones will be seen in the figure; this hook may be made from brass sheet, about $\frac{1}{16}$ or $\frac{1}{8}$ of an inch thick, or a piece of brass rod, bent into the required shape, may be soldered or bolted to a large brass washer to form the hook. The hook is secured to the inner surface of the side or back of the cabinet, and projects through a slot cut for the purpose. A small pin on the hook operates one prong of a switch, as shown. The prong in question must, of course, be springy and sufficiently strong to raise the hook, and so make contact with the other prong when the 'phones are lifted.

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HOW TO BUILD A TWO-VALVE "UNIDYNE" SET.

A NEW DESIGN FOR THE CONSTRUCTOR.

By WARING S. SHOLL, A.M.I.E.E.

The numerous articles by Mr. Sholl which have appeared from time to time in "P.W." have earned him the reputation of being a radio writer who never dashes into print with the description of a set until he has built it and tested it to his own high standard of satisfaction. It need hardly be said that this article is no exception to his rule, and the set dealt with by Mr. Sholl in this article is sound in all respects.

FOLLOWING on the experiments with the "Unidyne," in which standard detector and L.F. panels were used with the necessary adaptations, it was decided to build a two-valve set, detector and one stage of L.F. amplification, on the usually accepted lines favoured by the British amateur, viz., the flat panel design mounted on a mahogany cabinet.

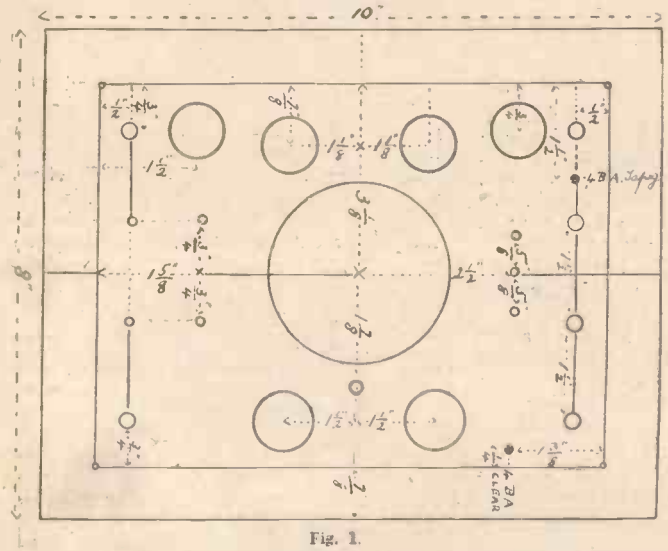


Fig. 1.

Fig. 1 gives the lay-out of the panel, which in this instance is ¼ in. thick and was specially prepared by the makers, the British Ebonite Co., of Hanwell, being first matted down and then polished up to a high state of finish resembling black marble.

The diagram should be compared with the photograph, Fig. 2, in order to check off the various components against the working dimensions and to assure their correct location on the panel.

Components Required.

A working drawing containing all dimensions is not at all easy to follow if encumbered with any descriptive matter, but taken in conjunction with a photograph, should give no trouble to the worker even of limited experience.

The dimensions are according to the following components, which are used in the construction of the instrument:

Panel, 10 in. by 8 in. by ¼ in. British Ebonite Co.
Coil holder. L.E.S. Raymond.
Valve holders. Bower Electric Co.
Valves. Thorpe K. 4. Bower Electric Co.
Grid leaks. Watmel.
Condenser, variable. "J.B." Microdenser.
Condensers, fixed. Dubilier ·0002, Edison Bell ·001.
Filament resistances. Microstat.
Switch, terminals, etc. Raymond.
L.F. transformer. H.C.W.

In order to save the polished surface of the panel the work was set out on a paper template, which was pasted at the corners to the ebonite, and all holes transferred to the panel by means of a scriber. The paper was then removed and all marks followed up with a centre-punch and drilled.

The six terminal holes are 4.B.A. tapping, the four holes for the coil-holder studs 4 B.A. clearing, the three holes for the S.P.D.T. switch 6.B.A. tapping, and the two holes shown in solid black are 4.B.A.. one tapping and one clearing, as marked. These hold the transformer in position, beneath the panel, of course.

The Cabinet.

It will be observed that the panel overhangs ⅞ in. all round, and is secured by four round-head screws, one at each corner, the holes being located at the angles of the instrument space as shown—i.e. ⅞ in. back from each outer edge of panel. The cabinet is furnished with corner blocks ½ in. square, which accommodate the holding-down screws.

In no case may the screws enter the joints or these will be forced apart and ruin the cabinet. The wood used is ⅜ in. thick, which therefore allows the panel to overlap ½ in. clear all round; the base, which is chamfered, provides an equal overhang, adding a well-balanced and attractive finish to the general lines of the instrument.

The holes for the grid leaks and filament resistances are bored ⅜ in., the latter being for one hole fixing. The valve socket ends are 4 B.A. clearance. The variable condenser requires a ⅜-in. hole for the dial shaft and a 5/16-in. clearance for the vernier knob, which is shown below, being 1⅞ in. radius from the shaft centre.

Other components may, of course, be used, but in this case the writer would advise either a larger panel or the existing panel to be mounted flush, thus giving rather more room, as the arrangement shown is about as compact as is practicable, and needs really close workmanship throughout. All holes should be tapped where shown, and every terminal screwed home and fitted with a washer and back nut.

Wiring Up.

The photograph, Fig. 3, shows the wiring which is carried out in square section wire, there being an absence of parallel wiring which, while not particularly essential in the Unidyne circuit, is recognised as sound practice generally. A diagram of the actual wiring is apt to be rather confusing unless every component is mounted in the same place, therefore the worker will do well to have diagram Fig. 7 before him, and starting from the aerial end, work methodically through to the last terminal.

In case the photograph, Fig. 2, does not reproduce too well, it may be borne in mind that the top left-hand terminal is the aerial, the lower one the earth, the top right-hand terminal the lead from the anode to 'phones, the last but one terminal the battery positive and the lowest one of all the battery negative.

No difficulty will be found in getting at the whole of the connections if all terminal shanks, etc., are brightened up and well tinned first. Have a camel-hair mop handy

(*Continued on page* 314.)

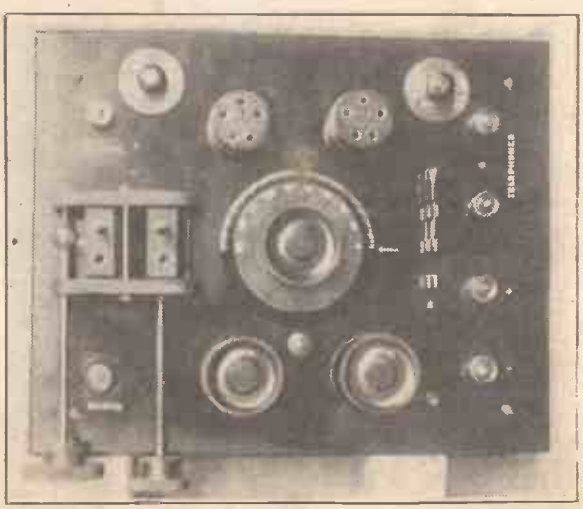


Fig. 2.

A TWO-VALVE "UNIDYNE" SET.

(*Continued from page* 313.)

and clean off any filings at once to avoid leaks. Two small shaped brackets of ½ in. by 1/16 in. brass are used to support the transformer, the lower one being seen next to the right-hand filament resistance in Fig. 3.

Fig. 4 gives a side view of the completed instrument, and at the left-hand will be

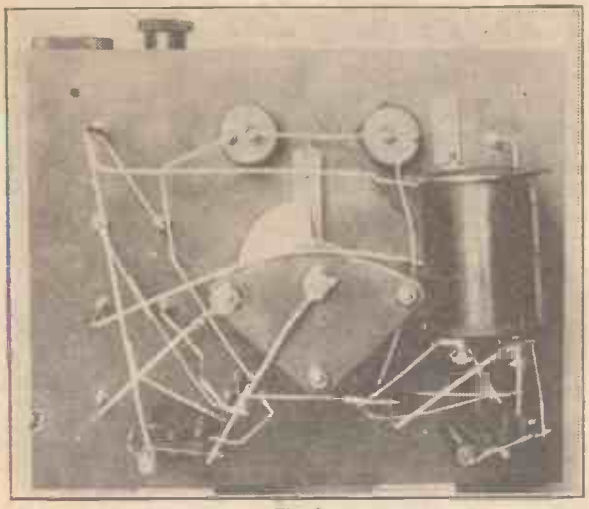


Fig. 3.

noted the grid condenser mounted vertically on the variable grid leak by means of the clips supplied with the Dubilier grid condenser. This makes a very neat fixing for this type of condenser, and may well be used for grid circuit work in any type of receiver.

The Clips.

The larger fixed condenser, viz., the ·001 mfd. between the transformer and the negative filament leg, naturally is not supplied with grid leak clips, so a connection

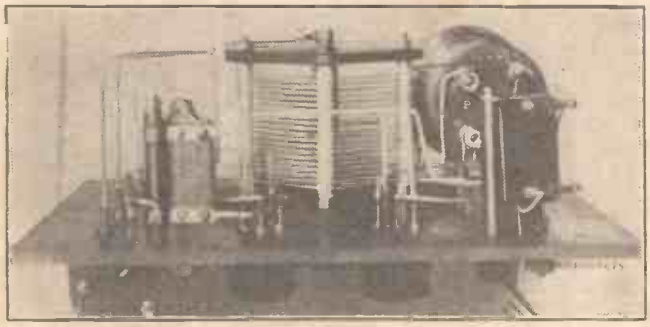


Fig. 4.

has to be soldered to the lug and a hooked end taken round the grid leak screw.

The other end is soldered to one of the screws which hold the grid leak flange to the panel, the screw being about 1 in. over all to provide an easy connection. Under no circumstances should the clips be taken off the Dubilier pattern of condenser; if this is done the contact will be severed from the inside and the condenser rendered useless.

The writer has labelled all his terminals, etc., with the transfers recently introduced for the purpose, and can highly recommend these useful labels if care be taken to attach them securely and perfectly square.

Tuning In.

The method of using a hot cloth was not found very satisfactory, but by placing a double layer of cloth, folded sharply so as to make a straight edge, over the transfer, and applying a fairly hot soldering-iron to the cloth, it was easy to make a good job of lettering the panel, which it is hoped will come out well in the reproduction of the photo, Fig. 2.

The wiring having been completed, the battery, 'phones, etc., should be connected up in the usual way, and a 75 coil placed in the A.T.I.—the right-hand holder; it would be preferable the other way about—i.e. on the left—and a 100 coil in the reaction. Turn up the filaments fairly bright, tune in roughly, and bring up the reaction coil to just short of oscillation point. The two-way switch should be in the upper position i.e. detector only.

Final Advice.

The tuning may be sharpened by turning the vernier knob in a clock-wise direction, which increases or decreases capacity by means of a most ingenious cam motion. The switch may now be thrown over to the lower position, which brings in the stage of L.F. amplification. Using a Life Tone loudspeaker on the two valves very good results are obtained from the local station, the quality of the reception being excellent.

The results from the set are most satisfactory, and with the loud speaker used gives good volume of tone. Fig. 5 gives a good general idea of the completed instrument, the finish of the panel being well illustrated in the reflected image of the coil holder which actually appears double in the photograph.

Fig. 6 gives a "close-up" of the set complete with valves and coils ready for connecting up. The woodwork has been toned down, filled, and French polished, while the brasswork, including the small screws, etc., is lacquered old gold, the whole being a typical example of the style adopted by the British maker.

In conclusion it must be emphasized that, as with all Unidyne circuits, the most innocent-looking fault will throw the whole circuit out of order. Spacing is not

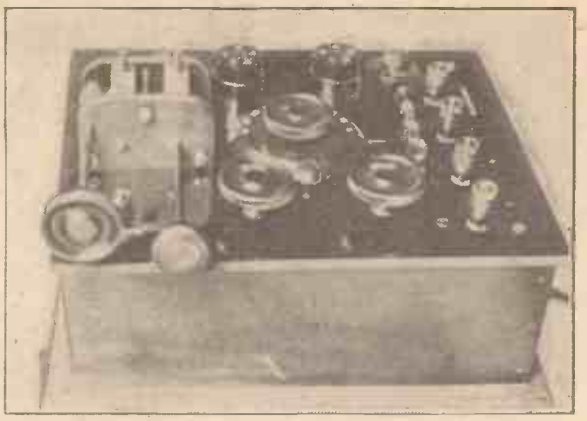


Fig. 5.

merely important, it is vital, and the components used will be subjected to a far greater test than if they were employed in the usual H.T. set.

Leaks are very important in their effect upon the circuit. Those due to bad insulation or to fluxite which is left adhering to the panel are sufficient to weaken reception

Fig. 6.

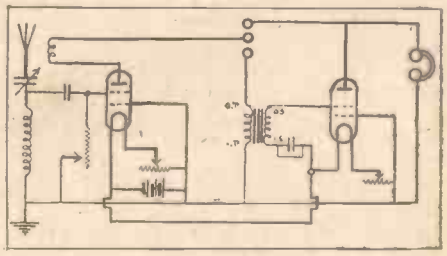


Fig. 7.

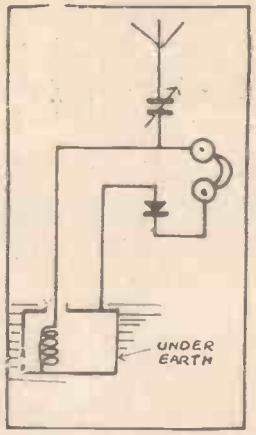
or to destroy signals altogether. Whilst grid leaks and resistances which should leak but fail to do so, will have a similar effect, and equally disappointing results.

SOME NEW EXPERIMENTS WITH AN "INDUCTIVE EARTH."

By G. V. DOWDING, Grad.I.E.E.
(*Technical Editor of "Popular Wireless."*)

The experiments with a novel "earth" described in the following article by Mr. Dowding will repay the experimenter if he copies them. Although nothing extraordinary is claimed in the way of results, the words "out of the ordinary" may be truly used.

ONE always likes to try out those little brain waves that flash across the mind from time to time, and the following is the account of one of those that struck me during a search for louder signals and yet louder signals still. Could I operate a loud speaker with signals from America using only a crystal set, I veritably believe I would still endeavour to "improve" results.



My readers will no doubt know the feeling.

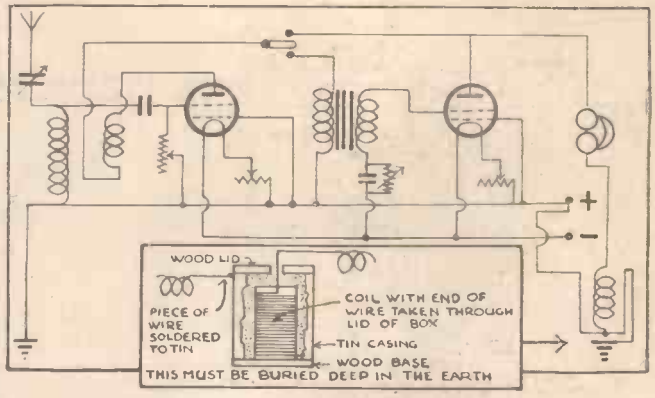
With what I will call my "inductive earth" a really noticeable increase of signals has been obtained when used in several different ways and with several different types of circuits, both crystal and valve. Before I go any further, I wish to make it clear that I do not claim that this "inductive earth" system will prove successful in every case—local conditions may have a lot to do with my own good results, but I want readers of POPULAR WIRELESS to try it out and experiment, and perhaps, all working together, we may involve something really good. I am not going to discuss the theory of the system at this stage except in very brief. The idea originated whilst I was engaged in researches mainly concerned with aerial earth efficiency, and the fact that the largest potential exists at the earthed end of the aerial made me wonder whether it would not be possible to control this in some way by direct detector connection to the set.

Getting Results.

My first experiment, therefore, was to disconnect that "end" of the detector circuit of a crystal set which goes to the earthed end of the tuning inductance and take it direct to earth by means of an additional earth lead. This is by no means an original arrangement, and, anyway, results were not promising.

The "idea" arrived when I suddenly wondered what would happen if the tuning inductance itself were buried beneath the ground. Theorists may indulge in a laugh at this point if they so desire, but my experience has led me to believe that it is as well to assume vast ignorance when experimenting, continually mentally ejaculating, "I wonder what 'that' would do," and trying it out before time is allowed to think of "it" theoretically, and perhaps "reasonably," is really a very excellent procedure for obtaining tangible results of one's "labours." I would insert a nice little moral here, were it not for the fact that I do not intend to philosophise in this article and hold up shining examples of past and present scientific endeavour. If I know my readers, and I have personally met many hundreds and received letters from many thousands, they need no spur. The correspondence columns of POPULAR WIRELESS provide an additional proof of this, and offer sterling testimony indeed of enthusiastic amateur achievements.

Well, to revert back to my subject. I next constructed a crystal receiving set of novel design. Choosing a room with French windows, so that I could obtain minimum lengths of lead to direct earth, I buried an "earth plate," which consisted of a tin biscuit box provided with a wooden base and lid. In this was placed a 75 turn coil, one end of which was connected to the interior of the tin. A lead was connected to the outside of the box, and a heavily insulated wire was taken through the lid of the "tin" to the remaining end of the 75 turn coil. The final connections were as indicated in Fig. 1. Results were excellent, 2 L O coming in louder, I think, than I have ever heard him on a simple crystal set. I was not greatly elated because, working with such a short earth lead (one could almost say with no earth connecting lead at all!), results, according to known theory, should be good.



In passing, I might mention that I believe this system may have the effect of reducing atmospheric disturbances. That I have not yet ascertained—possibly, on occasion, greater interference may be experienced; this has yet to be proved.

Progressing with the idea, however, I decided to experiment further with "inductive earths," owing to the fact that I

(*Continued on page* 318.)

Some of the "P.W." Staff. Left to right: Mr. Rogers, Mr. Edwards, Mr. Dowding, Mr. Bird, and Mr. Webb.

PHASE DIFFERENCE IN DIFFERENT KINDS OF COUPLING.

A SHORT EXPLANATION.

By SIR OLIVER LODGE, F.R.S.
(*Scientific Adviser, "Popular Wireless."*)

TWO circuits may be coupled together either magnetically, or electrostatically, or by direct conduction; the latter being much the same as electrostatic connection through a condenser. Hence either of these last may be called electric coupling, while the other may be called magnetic coupling.

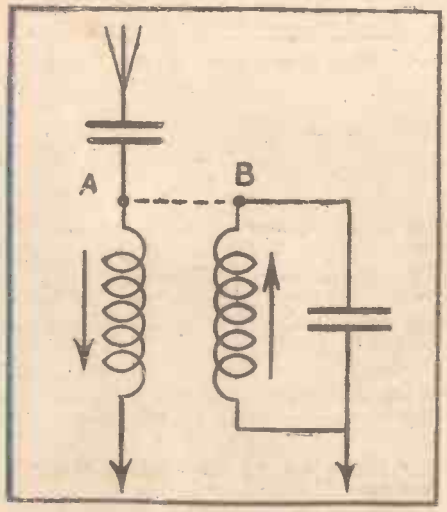
Taken separately, the different modes of coupling produce much the same effect, transmitting the oscillations from an open circuit, like an aerial, to a closed and resonating circuit. But if the two modes of coupling are combined in one apparatus, they tend to interfere and neutralise each other's effect, as may be explained thus:—

When a sinuous current is oscillating in a primary circuit, the E.M.F. induced in a secondary circuit, depending as it does not on strength but on rate of variation, will lag a quarter phase behind the inducing current, being related to it as a cosine is to a sine.

Electric Coupling Effect.

The current excited in a secondary circuit, attuned by suitable inductance to the primary, will lag another quarter phase behind the induced E.M.F., being related to it as a minus sine is to a cosine.

Consequently the current induced in an attuned circuit of negligible resistance will be exactly in opposite phase to the primary



The arrows show primary inducing and secondary induced currents in a certain phase. The potential at A is accordingly falling, while the potential at B is rising, and vice versa. Consequently, if the points A and B are connected, as shown by the dotted line, the two modes of coupling will interfere and tend to neutralise each other.

or inducing current, being related to it as a minus sine is to a sine. And the condenser in this secondary circuit, being charged and discharged by these induced currents, will be always in opposite phase to the condenser or capacity area in the primary circuit.

When the charge or potential of one is at maximum plus, the charge or potential of the other will be at maximum minus. That is the effect of magnetic coupling.

But the effect of electric coupling is different. In electric coupling the two condensers are virtually united, so that the

A recent photograph of Mr. Marconi's steam yacht, the "Elettra."

phase of potential, or charge in one, will correspond with the phase of potential or charge in the other. Both reach their maximum plus and maximum minus together.

Hence if both couplings are employed simultaneously, they tend to interfere or neutralise each other's effect. And the couplings may be so adjusted as to produce the effect zero.

The diagram may serve to illustrate this still further.

NEW EXPERIMENTS WITH AN "INDUCTIVE EARTH."

(*Continued from page 317.*)

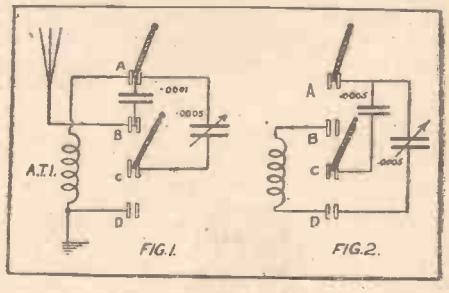
came to the conclusion, erroneously perhaps, that inductance so placed beneath the earth's surface might have some considerable electrical, or, shall we say, "reception," effect, bearing in mind the normal difference in potential which exists between the earth and atmosphere.

To this end I made another "inductive earth" on exactly the same principle as the above "earthed tuner," only I used a cocoa tin and a smaller coil of some 50 turns of 24-gauge wire wound round a small bobbin. My first experiment with this, after having buried it some 3 ft. deep in moist earth, was to connect up a two-valve "Unidyne," in the manner shown in Fig. 2. The result was a decided increase in signals strength, as was testified by two or three interested but independent witnesses. Pressure in other directions prevents me from going much further at the moment, but in the meantime I would like some of my readers to experiment with "inductive earths," and let me know if they obtain anything in the nature of interesting results. Possibly their efforts will meet with failure, but anything novel in wireless is worth trying. It is conceivable that "stunt" circuits of startling sensitivity can be involved which depend to some extent upon some such system.

A SIMPLE "THREE-CHOICE" SWITCH.

MANY receivers are designed with a multiplicity of terminals to afford choice of aerial tuning or of value of variable condensers. The simple type of switch described may, however, be used if preferred to give the same results with less expenditure of time and trouble. It consists merely of an ordinary S.P.D.T. switch with an extra arm mounted in line with the other three components.

For the alternatives of A.T.C. in parallel, series, or "constant aerial" tuning, the arrangement is as Fig. 1, where it will be seen that with the arms joining A B and



C D we have, say, ·0005 mfd. in parallel with A.T.I., with B C only joined we have ·0006 in series (the increase in maximum and minimum is of advantage here), and with C D only the "constant aerial" tuning of ·0001 in series and ·0005 in parallel.

Similarly, to combine a fixed and variable condenser to give different maximum values, as in Fig. 2, it will be seen that joining B C gives ·00025, A B ·0005, and A B, C D ·001.

The only precaution necessary is to see that the handles on the switch arms are not too long to fit down between adjacent contacts, thus the handle on arm A must be able to fit down between B and C, and that on C between A and B.

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RUNNING A PROVINCIAL BROADCASTING STATION

By BERTRAM FRYER (Station Director, the Bournemouth Broadcasting Station).

Mr. Bertram Fryer has had considerable experience of the difficulties and problems encountered by station directors and provincial B.B.C. stations, and in this article, specially written for "P.W.," he tells readers the inside story of how a station is controlled.

IT has been my good fortune to direct the running of two of the British Broadcasting Company's stations—Newcastle and Bournemouth, and in looking back on the events which seemed to have passed so extraordinarily quickly since I first joined the company, some seventeen months ago, there is certainly cause for serious thought. Giant strides have been made in broadcasting, not only from the point of view of transmission, but also from the programme point of view, both in information and entertainment.

No Light Matter.

There are others far more capable of writing about these particulars of broadcasting than I. Those who have read Captain Lewis's book, "Broadcasting from Within," have got a greater insight into these matters than I could possibly put forward. In these lines, however, I have been asked to write on the running of a provincial broadcasting station, and it is no light matter. There seems to be no beginning and no end, owing to the multitudinous points, each of which have great value and upon each of which much could be written. It would be useless to take, for instance, a day in the office, and enlarge upon each item that comes under my control, because that would only omit numbers of other items of even greater value that did not happen to come in the day in question, and all matters, of course, come under a station director's control

Mr. Bertram Fryer (right), the director of the Bournemouth Broadcasting Station.

More Talks.

There is no doubt that one of the chief features towards success in a station is organisation. Good organisation enables the director to keep his mind clear, and so allow it to be used energetically and without hindrance on any particular subject. Having achieved that, the next study is essentially the listener. It is my duty and my pleasure to create programmes that will be well received.

It is encouraging and gratifying to feel that a programme has proved successful; one should be able to hold all the reins and feel an even pressure on each, that pressure bringing the realisation that one is giving satisfaction. An extra strain on one warns one that something is wrong, and it is necessary to find out what that thing is that is wrong.

I often wonder if there can be a more interesting position than that of a station director. It is, after all, so extraordinarily human, and at the same time so business-like. Your listeners, at least so I have found it, are usually prepared to meet you half-way, and I have found that earnestness in work is received with keen appreciation by those whom you are trying to please. Naturally, just earnestness in work is not sufficient. I even now feel that I have deviated from the title of this article, and therefore I will endeavour to keep more severely to facts.

Supposing you have felt the pulse of your listeners correctly, and know how to gauge their tastes, and supply in consequence programmes fitted to bring them pleasure, there are then many points to be considered that are not necessarily connected with the entertaining side. We will take, for instance, Talks. I have listened very many times to talks, both from my own station and from other stations of the B.B.C., and I may say in the great majority of cases I have always been left with the impression that another talk or even two other talks on the same subject would have left me more satisfied.

I determined, therefore, to put into practice the system that, providing the subject was satisfactory, and providing my speaker was a good speaker, his talks should invariably number four, thus giving the listener a chance to gather more data, facts, and detail, which would have been impossible in one talk of a quarter of an hour.

No Criterion.

So far I have not received any complaints on this system, and thus I continue to keep it going. This does not mean, however, that it is necessarily satisfactory or successful. That is one of the strange things, and, if I may say so, delights of a station director's position. He always has that feeling that, although there have been no complaints, it may not have been successful. If he is a keen man he will try other things, or watch very carefully for any subtle changes that may come over the tone of the letters he receives or the criticisms that may reach him.

I inaugurated the Scholars' Half-Hour at Newcastle. This was carried on with great success by a committee of members of the educational world, and very ably guided by the chairman, the Director of Education in Newcastle, to whom I owe great thanks.

The Farmers' Corner.

Therefore I proposed doing the same in Bournemouth, and I am glad to say that it has proved successful, and here again I am indebted to the committee of educationalists and the chairman, the Director of Education. In both cases this was done with the approval of the Educational Committee in each town. The talks we have had have been varied; in fact there seems scarcely any limit to them. I shall refer again to this particular matter.

There is always, of course, to a station director, a general guidance and assistance from headquarters. Some of the papers that we read from this station are sent us from headquarters; there is always matter that strongly appeals to the listeners. Taking these papers together with the local speakers who speak in the afternoon during the afternoon concert, London guided, and it was for the station director to obtain the best that his town provided.

I am now forming a Farmers' Committee, or, I should say, *have* formed a Farmers' Committee, and intend to run a Farmers' Corner. Every Friday in the afternoons

(*Continued on page* 350)

THE RECEPTION OF 5 X X.

(FIG. 1 FOR CAPTAIN ECKERSLEY'S ARTICLE).

Each black dot represents a point where 5 X X has been heard on a crystal. This map is a copy of one kept by Captain Eckersley at the offices of the B.B.C.

THE RECEPTION OF 5 X X.

SOME GENERAL OBSERVATIONS.

By CAPTAIN P. P. ECKERSLEY, M.I.E.E.

(*Chief Engineer, the British Broadcasting Co., Ltd.*)

The following article, specially written for "Popular Wireless" by the Chief Engineer of The British Broadcasting Co., will prove of particular interest to many thousands of readers who have built crystal sets for the reception of 5 X X and who have been puzzled by one or two seemingly inexplicable characteristics of the station's transmissions.

IN all broadcast work there is a tremendous discrepancy between reports from listeners, and one can only surmise that conditions obtaining in different localities and with different apparatus make it difficult to judge results in any but a general way.

Particularly has this come to my notice in the matter of reports on 5 X X, our Chelmsford experimental station. It might interest and amuse some of my readers to hear of these differences.

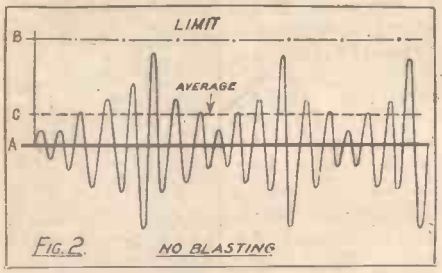


FIG. 2. NO BLASTING

In the first place, I would like to thank all those who have written in either praise or criticism to me, and I would also like to pay tribute to the enthusiasm and skill of so many who have successfully received the station—it is wonderful to think that while broadcasting has only been going a year or so, tens of thousands of people who up to that time looked upon wireless as almost witchcraft are able to-day to convert sets from 400 to 1,600 metres, adapt aerials to longer waves, and send in valuable observations to us at 2, Savoy Hill.

Explaining Contradictions.

It is, frankly, not so interesting to me to get the report of highly skilled persons, since they are in the minority (by all means let them continue to write, their reports are useful from another point of view); it is rather more interesting to know how the average person is impressed, broadcasting being for the average person.

Now let us turn to 5 X X receptions. I have a map (Fig. 1) which indicates crystal reception in the British Isles. Each black dot is a point where 5 X X has been heard on a crystal—there are not pins for every report; the map is only representative; had I put a pin for every crystal the map in parts would have been black. Of chief interest are those outlying the 100-mile radius.

5 X X has been heard in Algiers on a crystal, but someone in Hampstead is very annoyed *he* can't get it. Aberdeen and Belfast return reports, and yet there was an hotel in a remote Highland town that scrapped a multi-valve set because it couldn't hear. Poor results are reported generally from Birmingham and Glasgow, and yet outlying parts of the Midlands and the Industrial North get good results.

This leads me to my first point, and, to try and generalise and explain these contradictions, one might safely say that 5 X X *is bad in those localities at present well served by broadcasting.* Is this a "wipe out"; do the waves antagonise each other; is there some subtle reflection from harmonically tuned aerials? In my mind such high-brow ideas fail before a more human one.

Tom Jones lives 4 miles from a 1½-kw. station. He buys a set, slings up an aerial any old how, *and it works.* He is satisfied and, obviously, so are we. 5 X X opens. He expects with his set, which just gets a 1½-kw. station at 4 miles, to get 5 X X at 40 or 100 miles by just adding a loading coil. His expectations are obviously not justified, because the range of a station doesn't vary by any means directly with the power. If it takes 1 kw. to signal 10 miles, it requires a great deal more than 10 kw. to signal a hundred, because the energy is "broadcast"—the figure is nearer 100 kw. if you want the idea of the thing.

Bill Jones lives 50 miles from the nearest station, and he has erected a really fine aerial; he's had to, and he's paid a good deal of attention to detail. To him 5 X X is pure jam (not jamming), and we get a glowing report.

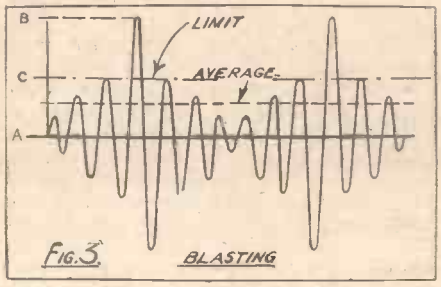


FIG. 3. BLASTING

There is another point. Every aerial has what is called a resistance. This means that when the wireless waves come along they want to set up big disturbances in an aerial, but the dead resistance of the aerial disposes of this desirable state of affairs. The greater the resistance the less the strength of signal *if no reaction is used*—if, in fact, you have a crystal set.

Why 1,600 Metres?

Now, there is another quality of an aerial which is the "useful resistance," and this is a desirable quality and increases the efficiency of an aerial. In Fig. 4 I show curves for an average aerial as used for 300–500 metre reception. It will be seen that the useful resistance falls off rapidly as the wave-length increases, and what is worse still, the dead resistance increases so that an average aerial as used for broadcast reception is far worse in some cases for 1,600-metre reception.

Why use 1,600 metres? Because it carries farther for one thing, it is not so badly jammed for another, and if we put the high-power station down on the 400-metre band, it is probable it would seriously interfere with the present service—the advantages of 1,600 metres are greater than the disadvantages.

Particularly in towns does this matter apply, where it is frequently very difficult to rig adequate aerial and earth systems, but my advice, for what it is worth, to those desiring to receive 5 X X is try and get an aerial high and long (not more than 100 feet, I'm afraid; see P.M.G.'s regulations), well away from trees, and not too near the house.

A last point before I close down. Many people have grumbled at the comparative weakness of the station and have compared it unfavourably with others on the same wave-length, using less power and working farther away. Most observers have, however, noticed that its faults in this respect are counterbalanced by its virtues in regard to purity of tone or quality.

The Only Policy.

It is fundamental in the art that you cannot get deep modulation and good quality. If you are to avoid blasting the tips of the speech or music waves, and consequently the faithfully reproduced electrical impulses are very large compared with the average value of the disturbance, we have to limit A B so that A C, the average modulation, is small, but the quality good (see Fig. 2). Allow A C to come up to the limit and let A B go miles beyond it (see Fig. 3), as certain Continental stations do, and you get a fine great signal, BUT—that's why Chelmsford may sound weak. Isn't it a saying: "Little and good?" Our policy is to aim for perfect quality and I think it is the only policy.

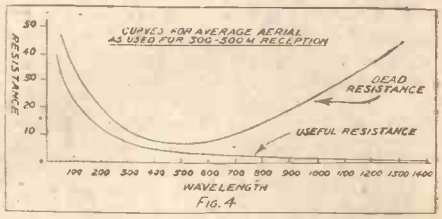


FIG. 4.

May I ask readers to remember that Chelmsford is designed for those areas which were, before its advent, badly served by broadcasting, so that the noisy minority who are well served at present would be doing a service to those less fortunate by backing up the scheme and looking to their own installations in the light of the remarks above. Once more I reiterate that the experimental 5 X X marks a great milestone on the road to the ultimate aim of a perfect broadcast scheme, and it is to be sincerely hoped that formal permission for its permanent erection will not be long forthcoming.

Artistes of the Aether

By "Ariel"

Some of the artistes who have given you pleasure when listening-in.

THE art of broadcasting is a difficult one, although apparently this is a point not always recognised. Many artistes are under the impression that so long as they sing, play, or act, in their accustomed manner, the quality and effect are the same as when their performance is given in a hall. For them might well be (mis)quoted, "Ah wad some power the giftie gie us, to hear oursel' as ithers hear us." There are many singers and players, too, that, no matter how good their work is in the hall, "over the aether" it loses in quality by reason of their lack of knowledge in the art of transmission.

Mr. Harry Burley.

When it comes to the instrumentalist, of course, the nature and character of the instrument has to be taken into consideration. The two instruments that give the best results are undoubtedly the violoncello and the flute. The broad measured tones of the former lose nothing in quality, neither do they gain so much in harshness or that mechanical "wound-up" flavour.

A Famous Flautist.

Naturally, much depends on the player, but with such artistes as Cedric Sharpe, E. B. Robinson, and Beatrice Harrison, all famous 'cellists; and Edith Penville, Frank Almgill, and Joseph Slater, amongst the flautists, there is very little to fear.

The latter artiste has broadcast on several occasions. On the concert platform he has already become famous, though but twenty-five years of age.

Miss Wynne Ajello.

He commenced playing, however, before he was twelve, and his musical career has only been interrupted by the war, in which he saw active service.

Sunday Items.

These still present many difficulties, by reason of the B.B.C.'s predilection for dogma and propaganda. Still, the musical side at 2 L O is being better directed, and the recent concerts, which engaged the services of such artistes as Sybil Maden, Frederic Collier, Kate Winter, Norman Allin, in addition to the famous violinist, Marjorie Hayward, and the 'cellist, Miss Beatrice Harrison, atoned for much. We wonder if listeners-in noted in the Five Negro Melodies, "Swing Low, Sweet Chariot," which is one of the main sources of inspiration in Dvorak's Symphony "From the New World."

The True Art of Vocalism.

After a prolonged course of concert singing, one learns to dread the vocalist who sings the notes of her song and not the words. A recent sentimental song heard "over the aether," by a well-known singer, resolved itself into utter comicality because the vocalist refused to articulate clearly.

This is possibly where operatic experience produces such good results. The singer instinctively acts, as well as sings, and the result is to carry words and notes together.

Miss Felice Hyde, the young opera star of the Carl Rosa and British National Opera Companies, is a striking example of this point. She sings before the microphone as though she were again in the rôle of her aria. Consequently there is dramatic finish as well as sympathy, and this makes her work of value. She has had a wide experience of elocution, operatic work, and of the concert platform, and, made a most captivating Delilah in Saint-Saëns' famous opera when it was performed recently.

Mr. Joseph Slater.

"One of the Best."

The success of the small orchestra when composed of picked artistes, and not merely players, was proved again on the 29th inst. when The J. H. Squire Celeste Octet broadcast again from 2 L O. Mr. Squire formed this Octet in 1913, and has had some of the finest artistes amongst his members, including James Levey, subsequently leader of the London String Quartet, and Arthur Beckwitch, of the Queen's Hall Orchestra, and now leader of the newly formed Cleveland String Quartet (U.S.A.) and at the moment on its first visit to England.

The present leader is Gordon Mayer, justly reckoned one of the finest violinists in the country.

It is hard to realise that the player is but twenty-two years of age, for he has the experience of an artiste of double this span.

Symphony Concerts.

Although these are not best suited for broadcasting, they undoubtedly give many people opportunity to hear the works which otherwise would be but names to them. The concerts at Central Hall last year proved so successful that the B.B.C. have taken Covent Garden for a series in each month, starting from December to April next. Some famous foreign conductors and artistes will be heard.

Miss Felice Hyde.

Symphony concerts have been held successfully at Bournemouth, Newcastle, Belfast (with Maurice Cole as soloist), and Aberdeen.

A Promising Singer.

Broadcasting has certainly had one good result, it has opened the door to many promising young artistes who might have had to wait and work for years before getting the opportunity to perform before an audience impossible to count. Whether this is for the good of the musical profession as a whole is, of course, open to question; but the blame for overcrowding an already overcrowded profession must be laid at the doors of the big agents, who, in their mistaken policy, have prevented what I might call the real artistes from being allowed to broadcast.

In some cases, of course, it has introduced artistes of real talent, and who in the course of time would have come just as prominently to the public ear. Under this category may be placed Miss Wynne Ajello, a clever young singer who has been heard at 2 Lo. She has given abundant proof of a sound technical training, coupled with a fresh, pure-toned voice of wide range, and this should stand her in excellent stead for her musical career.

Mr. Gordon Mayer.

A favourite singer at the provincial stations is Mr. Harry Burley. He is particularly well-known in the Leeds district, where he has done much oratorio work, and at the Bournemouth Winter Gardens, where he has appeared several times.

PRACTICAL HINTS ON SHORT WAVE RECEPTION.

FROM A CORRESPONDENT.

With Poldhu, East Pittsburg, Paris, Nauen, and hosts of amateur stations working on short wave-lengths, the amateur will find it worth his while to study these hints on short-wave reception.

THERE still seems to be a large number of amateurs who have difficulty in receiving signals on wave-lengths of 200 metres and below. The experiences of the writer may therefore be of some value to those persons who cannot get their receivers to work efficiently on the short waves.

It is not proposed to deal with the detailed construction of suitable tuning coils, etc., but rather to describe the practical principles involved.

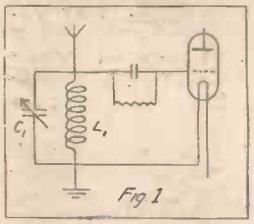


Fig 1

A standard P.M.G. aerial usually has a natural wave-length of about 170 metres. That is to say, that if the aerial is connected direct to earth, without the addition of inductance or capacity, it will have a natural frequency of oscillation corresponding to a wave-length of about 170 metres.

With a valve receiver it is necessary to have an inductance coil connected across the grid and filament of the detector valve, in order that differences of potential across the ends of this coil, set up by the passage of the H.F. currents in the aerial system, may be applied across the grid and filament.

Inductance Values.

A certain amount of inductance must therefore be included in the aerial circuit, which will, of course, increase the wave-length of that circuit. Referring to Fig. 1, if the aerial-earth system, without the addition of L1 and C1 had a natural wave-length of 170 metres, the introduction of L1 would increase the minimum wave-length of the system to, say, 185 metres. C1, the tuning condenser, would increase the wave-length to, say, 230 metres, giving a tuning range of 185 to 230 metres. The arrangement of Fig. 1 is bad, however, since the inductance of L1 must of necessity be small in value. The differences of potential applied to the detector valve are therefore small, resulting in weak signals.

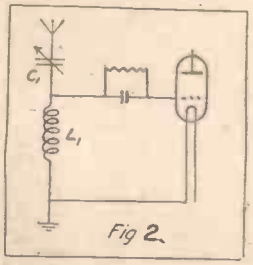


Fig 2.

This state of affairs may be improved by connected C1 in series, and, as is well known, the resultant capacity of two capacities in series, is less than either of the capacities alone. Thus, the effective capacity of the aerial system has been reduced, so that the aerial circuit may now be tuned down to, say, 100 metres. Also, for wave-lengths round about 185 metres, more inductance may now be used than when using the circuit shown in Fig. 1. This results in greater differences of potential across L1, and correspondingly louder signals.

The arrangement of Fig. 2 is, however, very far from perfect, one reason being that to receive C.W., or strong speech, a reaction coil must be provided, so that the set can be made to function either in an oscillating condition, or just off oscillation point, according to whether C.W. or speech is being received.

Two Serious Faults.

Fig. 3 shows a circuit which fulfils these requirements. The objection to this circuit, however, is that great difficulty is experienced in making the set oscillate, due to the damping of the aerial circuit.

This damping is due to the radiation from the aerial, and also to the latter's resistance, which, with an amateur's antenna system, using a water-pipe earth, or kindred arrangement, is usually high. A great deal of regeneration is therefore necessary to bring the set into oscillation. The writer has experimented considerably with this circuit, and found that the apparent secret of success lies in the correct value of the reaction coil. Various value coils were tried, and a certain value was found which made the set oscillate with the greatest ease.

If this coil was increased or decreased in value, it was impossible to make the set oscillate. In the United States, amateurs nearly always obtain reaction, not by coupling an anode coil to the aerial coil magnetically but by tuning the anode circuit with the variometer. When the plate circuit is in resonance with the aerial circuit, oscillations are set up by coupling between the aerial and plate circuits, due to the internal capacity of the valve. It would appear, therefore, that the size of coil discovered by the writer was such that when connected in the plate circuit, the latter became resonant with the aerial circuit. The internal capacity of the valve provided the necessary coupling between the circuits to produce oscillations.

Although this arrangement will oscillate readily if the right-sized reaction coil is used, it has two serious faults, which are: (*a*) In order to operate the set in a condition of maximum sensitiveness it must be kept just oscillating.

With the arrangement of Fig. 3, it was found that as C1 was increased or decreased the reaction coupling had to be greatly increased or decreased correspondingly to keep the set just oscillating. This is extremely awkward when searching round the condenser, especially as variation of reaction coupling produces the undesirable effect mentioned in *b*.

(*b*) When the reaction coupling is varied, there is a very large change in the wave-length of the aerial circuit. It will be found that if speech is being tuned-in, a slight tightening of reaction coupling results in the wave-length of the aerial circuit increasing with a bound, necessitating a decrease of C1. This will probably start the set oscillating again (see reason "a"), and the incoming speech must be retuned

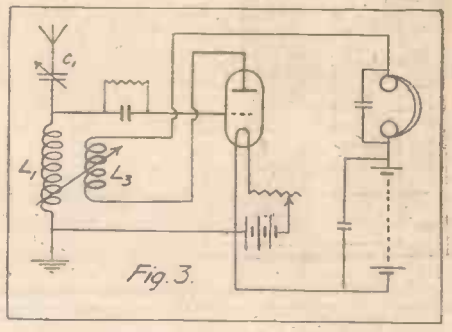


Fig. 3.

all over again. The filament rheostat of the detector valve plays an important part in getting a station tuned in well.

Yet another objection to the arrangement of Fig. 3 is that it radiates, and the radiation is much greater on the short wave-lengths than on the longer wave-lengths. Hence, considerable interference may be caused by this circuit if it is mishandled, and it is very annoying when working two-way communication with some distant station, to have the latter's reply blotted out by some enterprising local amateur.

A Practical Solution.

The real solution to the difficulty of short wave reception lies in the use of a loose-coupled aerial circuit. (See Fig. 4.) Reception of wave-lengths down to about 85 metres is easily possible with this arrangement.

It will be seen that the essential difference between the circuits of Figs. 3 and 4 is

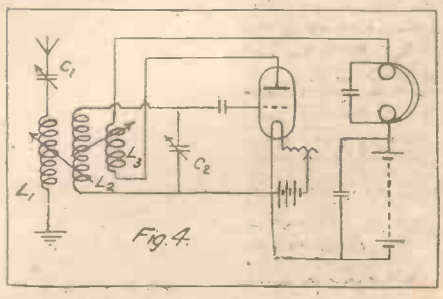


Fig. 4.

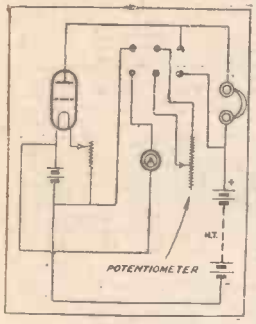
that in the latter circuit the aerial and earth are not connected to the grid and filament of the detector valve, but are connected to the coil L1, which is coupled magnetically

(*Continued on page 326*).

MEASURING SIGNAL STRENGTH.

MANY amateurs are, no doubt, unaware of any simple method of measuring signal strength. This is very useful for comparing reception of the same station at different times, and thus collecting data about fading. Here is a simple method; it is not absolutely accurate, but quite reliable for the wants of the ordinary amateur.

The materials required are a potentiometer, a double-pole double-throw knife switch, and an ammeter. These may all be incorporated in the set, or mounted on a separate panel. The potentiometer should be of a non-inductive type, and have a high resistance (about 400 ohms). Connect these up as in the diagram.



Now tune in the required signal with the switch open—i.e. with the switch arm making contact with neither side. When the maximum signal strength has been obtained, switch the potentiometer in circuit; now commence to reduce the resistance in shunt until the signal just disappears.

Next switch the ammeter and L.T. battery in, and read the ammeter. It is now comparatively simple to determine the value of the shunt by Ohm's law:

$$(R = \frac{E}{C})$$

From this, by using the formula,

$$S = \frac{R+S}{S_1},$$

in which S = signal strength, S_1 = shunt (in ohms), and R = resistance of 'phones (in ohms), we may obtain the number which represents the signal strength.

It will be obvious that this must be done in a quiet room, or the threshold of the sound is lost. In using Ohm's law, care should be taken to see that the actual current, due to discharge, is used. If preferred, a separate battery may be used for this reading.

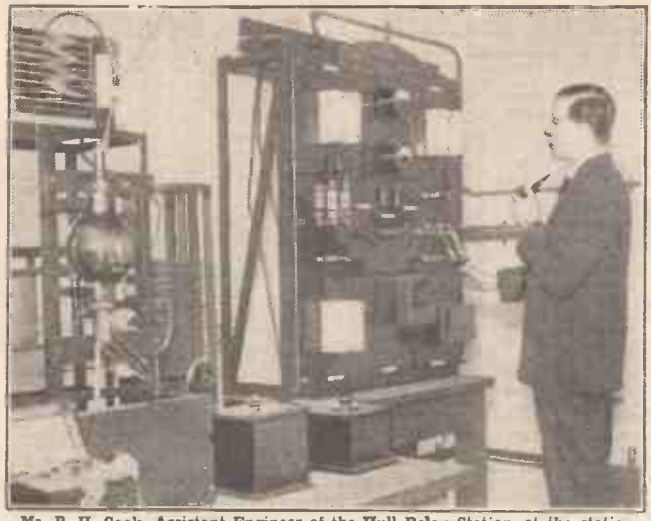
PRACTICAL HINTS ON SHORT WAVE RECEPTION.

(*Continued from page 325.*)

to another coil, L2, the ends of which are connected across the detector valve.

The coil L2 is shunted by a variable condenser, C2, which tunes the circuit to resonance with the aerial circuit. The advantages of this arrangement over the direct coupled aerial circuit are tremendous, and are as follows:

1. Since there is no initial capacity across L2, its inductance for a given wavelength may be much larger than if the aerial and earth were connected across it.



Mr. P. H. Cook, Assistant Engineer of the Hull Relay Station, at the station switchboard.

This results in its having a comparatively large number of stops, and, since L1 has only a few turns, a step-up transformer effect is produced, so that larger differences of potential are set up across L2, resulting in louder signals.

2. Since the aerial circuit is loosely coupled to the closed, or secondary, circuit, the latter has very little damping, hence quite a small reaction coil will suffice to make the set oscillate. This results in an almost entire absence of faults (a) and (b) mentioned above.

3. Due to the loose-coupling between the aerial and closed circuits, very little transfer of energy takes place when the set is oscillating, so that there is much less danger of interfering with other receiving stations.

4. The loose-coupled aerial circuit results in great selectivity. This is, of course, well known, and need not be gone into here.

With regard to the actual variable condensers and coils used. The variable condensers must be of good quality, and their losses must be low, since these losses are very important when dealing with very short wave-lengths.

Single Layer Coils.

Special attention should be paid to the method of making contact with the plates, as a condenser which works quite silently on, say, 600 metres upward, may be quite noisy on 100 metres. C1 should be fairly large, about ·0007 to ·0008 mfd. C2 should not be too large; it is best to use a condenser of about ·0003 mfd., and use several plug-in coils for the band of wavelengths desired.

For short-wave work, single layer coils are undoubtedly the most efficient, owing to their low self-capacity. Their inductance values must be accurate, as a slight variation either way will cause quite a large change in wavelength in the circuits in which they are used.

In conclusion, the writer wishes to say that the above is all the result of experimental work carried out at his station. The article is not meant to be a theoretical lecture on what should or should not be done, but is simply a detailed account of results obtained by practical experience. And, as such, it is hoped that the above information will be of use to those who are encountering the same difficulties as the writer has done, and will enable them to successfully identify and correct their faults.

The Amplifier Panel at W J Z, the well-known New York station.

BROADCASTING AND THE THEATRES.

SOME VIEWS ON RADIO DRAMA.

By C. B. COCHRAN.

Mr. C. B. Cochran has been called the King of Showmen, and certainly there is not another man alive to-day who knows more about the entertainment world. In this article, specially written for "P.W.," Mr. Cochran gives a very candid expression of his views with regard to the relationships between theatres and the B.B.C.

I HAVE been asked to give my opinion on the subject of the stage and broadcasting. On this question I have always held one view, and I still hold it. I have never changed my mind.

My views can be stated in a very few words. To my mind, broadcasting is yet another opposition to the stage, and we must deal with it as we have already dealt with its predecessors. One by one, phonographs, cinematographs, bridge, and many other indoor pastimes have made their appearance to challenge us, and we theatrical producers have had to face them, and, in fact, to see what use we could make of them.

Mr. C. B. Cochran.

But let me explain more fully what I mean. I need hardly say that for some years past I have been responsible for many plays and other productions in the London theatres. Of course, I have had, and shall probably continue to have, many failures, so far as the actual production is concerned, and on some of these I have lost large sums of money. But it is only honest to admit that in many cases the failure has been partly compensated for by the financial success derived from the by-products. To make this clearer: in the case of a musical play money is made on the publication of songs, etc.; in the case of a play, if the plot is good, we can sell rights to our greatest rival—the cinematograph. This, of course, applies rather to America than to England, but even here it is not unheard of. I see no reason why we should not extend this principle to broadcasting.

A Stone Wall.

I was approached recently on the subject of broadcasting "Little Nellie Kelly" from the New Oxford Theatre. I was quite willing to agree to this, and the B.B.C., for their part, were prepared to pay what I asked. In fact, I was quite satisfied with the bargain we had struck. But I hit a stone wall, and was forced to abandon the idea.

Theatre managers throughout the country refused to book any provincial theatres for my touring companies of "Little Nellie Kelly" unless I consented to a clause in the agreement which declares that this play should not be broadcast. I have, however, good hopes that some time in the near future this aggressive attitude may be modified.

The suggestion which has been made, that the broadcasting of my productions would prove a good advertisement for me may be true. Even so, this does not mean that I should not claim payment for broadcasting rights.

Where the Theatre Wins.

The composer, the author, the producer, and the manager—they must all live on the production. And, therefore, my view is that, if their play is broadcast, the broadcasting company should pay them for it. The argument that advertisement alone is sufficient does not hold water. People cannot live only on publicity.

To illustrate my meaning: I may discover a talented actress, and put her on the London stage. This is obviously good advertisement for her, but she needs payment all the same. And so it is with broadcasting.

It is a fact which has often struck me as remarkable that, in any walk of life, the man who shakes hands with his opponent and makes friends usually meets with more success than those who adopt an aggressive attitude. It comes to this, that anyone who would make his way in life must keep his eyes open to every possibility the world may offer him. In other words, one must have a broad mind. To maintain this independent attitude I have always refrained from joining any association formed by members of my profession, and the result is that I have always been perfectly satisfied with what I have got out of life. My failures have been my own fault.

In the meantime I can promise that, if ever I get an opportunity for co-operating with the broadcasting company, and if we can come to terms which will prove satisfactory, not only to myself but also to the author, composer, and all others interested in the production, I shall certainly make the most of it.

I have discussed the matter with many wireless enthusiasts, and they have almost all agreed that a play relayed from a theatre is far more interesting and entertaining than any of those actually performed in the broadcasting studio. It may be that the standard of the artistes employed in the theatres is higher than that of the actors who are usually available to the B.B.C. But as regards this I would prefer not to make any comment.

But my private opinion is that where the theatre has a pull over the studio is in the peculiar atmosphere it radiates. The applause, the orchestra, all those extraneous little sounds that find their way to the microphone, add to the glamour of the moment, and give the illusion that one is almost, if not quite, in the theatre itself. One should not leave too much to the imagination of the listeners, and the man who sits in a darkened room, and hears the fall of the curtain and the applause of the entranced audience, will derive more enjoyment from the performance than when he listens to the bare words of the play, broadcast from a room whence all other sounds are strictly eliminated.

No Monopoly.

As a matter of fact it does not seem to me that drama as a form of entertainment is particularly suited to broadcasting. To construct the whole action in one's mind from the words of the performers is too much of an intellectual effort. It is quite a different matter with revues and musical comedies, where the action, so far as it exists, is broken up by songs and humorous dialogues. And it is for this reason, I suppose, that the broadcasting of opera has met with such marked success, as I am told it has. The plots are generally very straightforward, and one's interest mainly rests on the music and the voices.

I do agree with the people who think that broadcasting is detrimental to the theatre box office, but theatre managers cannot have a monopoly of indoor amusements.

Earl Haig at 2LO—a recent photograph taken before the microphone.

Mainly About Broadcasting

by The Editor

THE opening of the Wireless Exhibition organised by the National Association of Radio Manufacturers at the Albert Hall, on September 27th, may also be regarded as the official opening of the winter wireless season. Readers have but to glance at the advertisements appearing in this and recent issues to realise how very healthy is the wireless trade in this country, and, judging by the large crowds which thronged to the Albert Hall on the opening day, that wireless is still the paramount hobby in Great Britain.

Great Progress.

Coinciding with the opening of the exhibition, the managing director of the British Broadcasting Company, writing in the September 26th issue of the "Electrician," announced many interesting facts concerning the progress of broadcasting in this country. And, having read Mr. Reith's article, no one in his senses can deny that broadcasting has come to stay.

According to Mr. Reith, a year ago wireless licences in this country numbered 158,171, while by the end of the year the number had risen to 580,380, and at the end of last month the figure reached 930,000, an increase which the editor of the "Electrician" rightly terms "stupendous." This increase has also resulted in stimulating the B.B.C. to greater activities.

The permanency of 5 X X can now also be taken for granted. The station will be erected on another site, and possibly within six months' time the permanent 25 kw. station will be in operation.

* * *

With this issue of POPULAR WIRELESS is given away a specially written 24-page booklet, entitled "The Pocket Fault Finder," and I think every reader of POPULAR WIRELESS will agree that here is something for nothing which is well worth having. As a rule things which are given away with periodicals are more in the nature of a compliment than a practical gift; but, in arranging for the three booklets to be given away by POPULAR WIRELESS at the opening of the winter season, I have endeavoured to provide gifts which will be of real practical value to every owner of a wireless set.

Our Free Booklets.

"The Pocket Fault Finder" has been specially compiled by the technical staff of "P.W.," and next week's booklet, entitled "Five Special Crystal Sets," will give full details for the construction of the "P.W." Ultra set and other crystal sets which have appeared from time to time in "P.W.," and which have proved enormously popular with readers.

The third and last booklet, entitled "All about the B.B.C.," has been specially written by "Ariel." It is not a technical booklet, but it contains some very interesting general information which every listener-in will, I think, appreciate. Apart from these booklets, future numbers of "P.W." will contain some very special articles, both of a constructional and a theoretical nature, and each issue will have a substantial increase in the number of pages.

* * *

Has any reader of "P.W." heard any of the Soviet stations working? I learn from one of my foreign correspondents that most of these stations are giving call signs beginning with the letter "R." For instance, R A N is Odborsk—R A P is Saratoff—R A T is Simferopol, and R A Z is Kharkof. I have no information regarding the wave-length used by these stations, but if any amateur does happen to log them, I hope he will take note of the time of transmission and wave-length used, and let me publish his observations in "P.W." for the benefit of other readers.

Mr. Beveridge, engineer-in-charge of the Edinburgh wireless station, and part of the transmitting gear.

* * *

A reader of POPULAR WIRELESS, who wishes to remain anonymous, has sent me a copy of a letter which he noticed in one of the American magazines and which he thought worth while bringing to my notice. This letter is written by a British amateur, Mr. F. A. Mayer, of Stileman's Works, Wickford, Essex, who works with the call sign 2 L Z. It is too long to reproduce in full, but there are certain extracts which I can give, and which I think 2 L Z would never have written if he knew anything about broadcasting in this country. Here is one extract from his letter:

"There is no doubt about it, you Americans are ahead of us every time with amateur radio, and I think every British "ham" will admit it; but we soon catch you up, don't we?

"5 X Z (another correspondent of the American paper) suggests that some of your circuits are quite old; admitted. Someone is always bringing out a new circuit which, when it is unscrambled, is some old stand-by. You are not the only offenders, I can assure you. What about the British radio journals? One thing, you do put out some good dope at times."

Another extract reads:

"I just must mention one thing you can do. You can put out a real live radio paper, and that is a good deal more than any of our publishers over here can do."

Radio Patriotism.

Mr. Mayer seems to be quite discontented with radio in this country, but it seems to have escaped his notice that the particular radio journal which accepted his letter for publication is at present offering as its main attraction the Unidyne articles by Mr. Dowding and Mr. Rogers, which have already been published in this journal, and, further, that one of their regular features is contributed by the editor of another well-known British wireless journal.

This American journal also makes a habit of publishing articles by Sir Oliver Lodge and Professor J. A. Fleming. True—all these articles are published in the well-known American style, and a style which probably appeals to Mr. Mayer better than the style adopted by the British wireless journals. But it is certainly amusing to reflect that this gentleman, who holds the British Amateur Transmitting licence, should prefer an American journal, which is at present engaged on boosting a series of British articles, rather than the journal which originated the boost and published the articles exclusively in this country some months ago! Whether British "hams" will admit that the Americans are ahead of us every time is doubtful, and whether they will thank Mr. Mayer for taking the liberty of suggesting that "every British 'ham' will admit it" is very, very doubtful, and I should not be surprised if he was the only British amateur in this country who was sufficiently unpatriotic to come out unblushingly in print in an American paper with such a statement.

SIDELIGHTS ON WIRELESS

A NEW SERIES FOR THE AMATEUR

GUIDING SHIPS AND AEROPLANES BY "BEAM" WIRELESS.

By G. H. DALY.

The "Beam" system, invented by Mr. Marconi and Mr. Franklin, has been described as "the most useful discovery of the twentieth century," and in this article a well-known contributor to "Popular Wireless" deals with a few of the advantages offered by the "Beam" system in connection with the guiding of ships and aeroplanes.

IT is an extremely unpleasant sensation to be up in an aeroplane when a fog comes along blotting out both earth and sky. And whether you arrive at your destination whole, and in a normal condition, depends mainly on luck. It is equally unpleasant to be on the bridge of a ship in a fog, when in crowded waters such as the English Channel—anxiously straining both eyes and ears for a sight or a sound of some near-by ship or lighthouse guarding a dangerous coastline.

In fact, fog is the greatest drawback there is to present-day transport, especially where the navigation of aircraft and shipping is concerned; and any scientific discovery which tends to counteract this evil is doubly welcome.

In this respect short wave beam wireless is likely to be one of the most useful discoveries of the 20th century, for owing to the latest research work on the subject it is now possible to guide a ship or aeroplane almost anywhere—even to the other side of the world if required.

Radio "Railway" Lines.

Nor will it now be necessary for transport to depend entirely upon the compass or sextant as hitherto, and this in itself is a great advantage, for the compass is liable to be put out of action by magnetic storms, while the sextant is useless without the sun or stars. As for finding the way by that most uncertain method known as "dead reckoning"—it is hoped that this last resource of mariners will be relegated to the scrap-heap; and it may be said that beam wireless is likely to be to ships and aircraft what the railway lines are to the trains. For the wireless beam will guide the ship or aeroplane just as the lines guide the locomotive, but without the cost of laying expensive roads, sleepers, and rails, and consequent expense of upkeep.

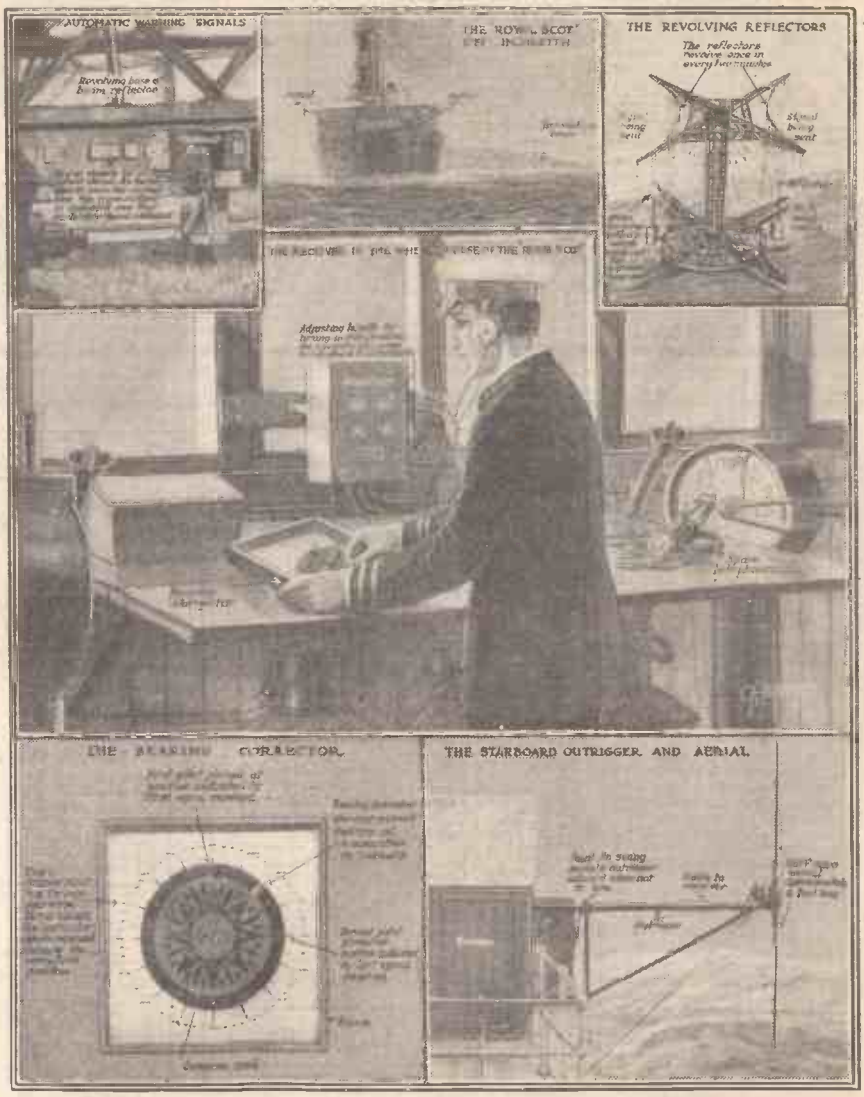
If, for instance, we desire to open an Anglo-American wireless "line" to guide vessels from England to New York, all that is necessary is to erect a beam wireless station at some convenient point such as London, and focus the beam on New York. Aircraft from the terminal aerodrome at Croydon would then follow the beam from London, while shipping from, say, Liverpool or Southampton could pick up the beam somewhere off Land's End, and both aircraft and ships—by following the beam—will be guided straight to New York.

In the case of traffic coming from New York to England it will be necessary to have another beam station erected in New York, and this beam would run parallel to, but some distance from, the other beam. In this way ships going from England to New York will follow the first beam, which is tuned, say, to 10 metres, while ships in the opposite direction would follow No. 2 beam, which is tuned to, say, 20 metres.

Thus owing to the difference in wavelength between the two beams it will be possible for any vessel to know whether it is on the "up" or the "down" line or beam—to use a railway expression. Thus the risk of collision will be reduced to a minimum.

(*Continued on page* 340.)

THE "BEAM" WIRELESS SYSTEM.



The Beam system has been successfully used for long-distance wireless communication to Australia and South America. The reflectors consist of a large number of vertical wires arranged in a parabolic curve. The message from the transmitting aerial is projected on to the reflector and sent out in a direct line. The first of the ships thus fitted is the "Royal Scot," of the London and Edinburgh Shipping Company, which, on its weekly voyages to and from London and Leith, regularly passes the rocky island of Inchkeith in the Firth of Forth. The messages are received at a distance of nine or ten miles from Inchkeith. On the base of the revolving reflector are placed in raised metal a number of Morse signals. As these dots and dashes pass the contact-box, the transmitter operates and radiates that particular signal. In the ship is a compass card with pointers attached, called the Bearing Corrector. Around the card at all points of the compass are Morse signals corresponding to those on the base of the projector. Therefore when the ship's navigator hears a certain Morse signal come through his telephones, he sets his pointer to the point of the compass indicated; then, when he again hears, he sets the second pointer in position. The Bearing indicator spaced between these two points will give him the correct bearing of the transmitter. By adjusting the tuning-in handle at the side of the receiver, he can (with a little practice) learn by the difference in the signals exactly how far he is away from the island. The aerials on the ship are placed at either end of the ship's bridge, and consist of stiff wire aerials (similar to the transmitting aerials) fixed to outriggers.

IT consists of 84 strands of fine, hard-drawn phosphor-bronze wire—a special alloy of great strength and DURABILITY. These strands are SPIRALLY-wound so that each is AIR-INSULATED. Exhaustive tests prove that it has the LOWEST OHMIC RESISTANCE yet attained. Provides 80% greater SURFACE AREA over 7/22's. Gives 50% greater efficiency over 7/22's when used for receiving; 90% greater efficiency over 7/22's when used for transmitting.

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The 'Mars' Aerial is something entirely new and quite different to other aerials—a special alloy—much finer wire—*spirally* wound. It costs 9/6—possibly more than the cost of your present aerial and crystal set combined. But pay 9/6 and fix it! Immediately you will get 50% louder, clearer reception. You will recapture the first listening-in thrill. You will cease to covet the clarity of your friend's valve set, for valve set volume will be yours!

Study the details printed in italics and you will understand why. Here is another important point: 100 feet of 'Mars' Aerial wire gives you a 120' aerial, without infringing the P.M.G.'s regulations. It's a peculiarity of the 'Mars' Aerial — exclusive to the 'Mars' Aerial. Fix your 'Mars' this week-end—it's easy to handle—flexible as string—and it gives the results—every time.

Figures for Experts.

Surface areas: 7/22's, [illegible]. The 'Mars,' 1.25. Tensile strength, 70 lbs. Weight, 9 ozs. Can be obtained in 100' to 600' lengths in multiples of 50'.

To the Trade.

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To the Public.

Please get your 'Mars' Aerial locally — leading dealers in most towns now stock. In case of difficulty send P.O. for 9/6 to us, and we will supply as quickly as possible.

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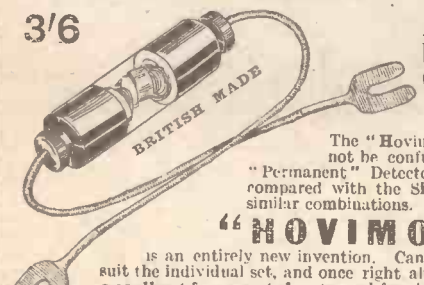
3/6



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"HOVIMO" CRYSTAL VALVE

is an entirely new invention. Can be simply adjusted to suit the individual set, and once right always right. Is equally **excellent for crystal sets** and for circuits employing crystal rectification, as well as for crystal loud speaker systems. Always producing a remarkably pure tone. Ask your dealer for it.

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As above, but Tubular Ebonite Rotor, 4/6.
All Black, Double Bottom, wound one hole fixing, 1/6 to 4/- each.
All are the best value obtainable.
Igranic and Edison Bell Variometers, 10/6, post paid.

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N and K pattern, 11/6. Dr. Nesper Adjustable, 13/6. Brown F, 25/-
All makes in stock at lowest prices possible.

LOUD SPEAKERS.—Radio Stocks' Classic, 2,000 ohms, full, clear tone, specially suitable for low power sets, £1.
Sterling's Dinkie, 30/-; Amplion Junior, 27/6; Amplion Junior de Luxe, £2 5/-. All makes in stock.

MANSBRIDGE TYPE CONDENSERS.—New, fully guaranteed, best made, with two fixing plugs. ·25, 4/-; ·05, 4/-; 1 mfd., 4/-; 2 mfd., 5/-

COIL HOLDERS.—All Ebonite, really fine, 2 way, 2/6; better finish, 2 way, plated, 3/6; ditto, 3 way, 4/6; vernier movement, 2 way, 4/6, 6/-; 3 way, 6/-, 9/6.
Many other makes in stock. State your wants; we will assist you.

BASKET COIL HOLDERS.—Best quality, with plug, 1/2 each; ditto, no plug, 9d.

VALVE HOLDERS.—Solid hand polished Ebonite, 10d. each. Special anti-capacity legless sunken socket taps to prevent valves burning out, 1/3 each (sold elsewhere at 1/9).
Another type, equally efficient, with simple fitting, showing only ¼ inch above panel, 1/3 each. Highly recommended.

COILS.—Finest Duplex Basket, waxless, suitable for any circuit and any position. Set of 5, Nos. 25 to 100, 2/-; ditto, for Chelmsford, No. 150, 1/3; No. 200, 1/6. As above, but extra large air spaces, coils ½ inch wide, sets of 5, Nos. 25 to 100, 3/-
Igranic, O'Keefe, Energo, Lissen Coils, etc., all in stock.

VALVES.—Dutch Tubular, 4/6; R. Type, 5/-; French R, 7/6. Metal Dull Emitters, finest on market for efficiency and low consumption, 17/6.
All makes in stock—Cossor, Mullard, Marconi, B.T.H., etc.—lowest list prices.

FILAMENT RHEOSTATS.—Microstats, 2/9; Lissenstats, 3/6; Ormond, 2/-; Our own Extra Special Solid Ebonite of a superior type, 2/6; for Dull Emitters, 3/-, fully guaranteed. Cheapest type, efficient and strong, 1/6 each.

CONSTRUCTOR'S SETS OF PARTS.—We specialise in quoting for complete sets of parts. No matter how small or how large your requirements we will be pleased to quote you our best terms, and also give technical advice.

CRYSTAL AND VALVE SETS.—Special prices.

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SIDELIGHTS ON WIRELESS.

(Continued from page 337).

It is also likely that the ships and aeroplanes will be able to send and receive their messages along this beam—thus avoiding wireless interference with vessels on other routes, and owing to the inexpensiveness of such a system the present rather high cost of radio telegrams can be considerably reduced.

There are also a number of other advantages connected with beam wireless. For instance, where the channel leading into a port is comparatively straight, the beam can be used for guiding the vessel in and out of the port during foggy weather. In this respect it has a great advantage over the method previously employed in some ports, where an electrified cable was laid along the bed of the channel, and the ship followed the cable into the port through the medium of a humming sound which was radiated from the cable and picked up by a receiver on the ship.

With the wireless beam no expensive cable will be required, and a ship requiring guidance into port during a fog will merely send a message to the land wireless station asking them to switch on the beam, which can be switched off when not required.

A further advantage will be the equipment of ships themselves with a low power, cheap wireless beam apparatus, which can be used for ascertaining the position of one ship with regard to another in a fog; for at present being unaware of the direction of another ship during a fog (even when one can hear its fog-horn) is one of the principal causes of collision and delay at sea to-day.

The wireless control of crewless ships and aircraft—in particular the steering of the craft from one place to another—is also greatly simplified by the wireless beam; but this subject is more of the future than of the present.

There are a number of methods for guiding ships and aircraft along these wireless beams. The most simple arrangement is to equip the vessel with an ordinary short wave wireless receiver which picks up the continuous wireless waves which constitute the wireless beam. A pair of telephones are connected to this wireless receiver and these are worn by the navigator. Thus when the ship is in the beam the continuous wave signal (which is exactly the same as the whistle of the carrier wave in telephony) is heard in the 'phones, and all the navigator has to do is to steer the vessel so that this whistle is heard continuously, and in due time the vessel will arrive at the port on which the beam is focused.

Another method is to equip the vessel with two screened wireless receivers connected to two short-wave aerials (which, by the way, are only a few feet in length).

One aerial is mounted on the port side of the vessel and the other on the starboard side.

As before, the navigator wears a pair of 'phones, but in this case the ear 'phone over his left ear is connected to the port aerial via one of the wireless receivers, while the earpiece over his right ear is connected to the starboard aerial via the other receiver. Thus if the whistle or carrier wave in the left earpiece equals the whistle in his right earpiece the navigator then knows that the ship is in the dead centre of the beam.

If, however, the whistle in the left earpiece is louder than the whistle in the right earpiece this is a sign that the ship is too much to the right hand of the beam; for the left aerial, being nearer the centre of the beam, is picking up more current than the right aerial, which is farther away from the beam centre or area of maximum signal intensity.

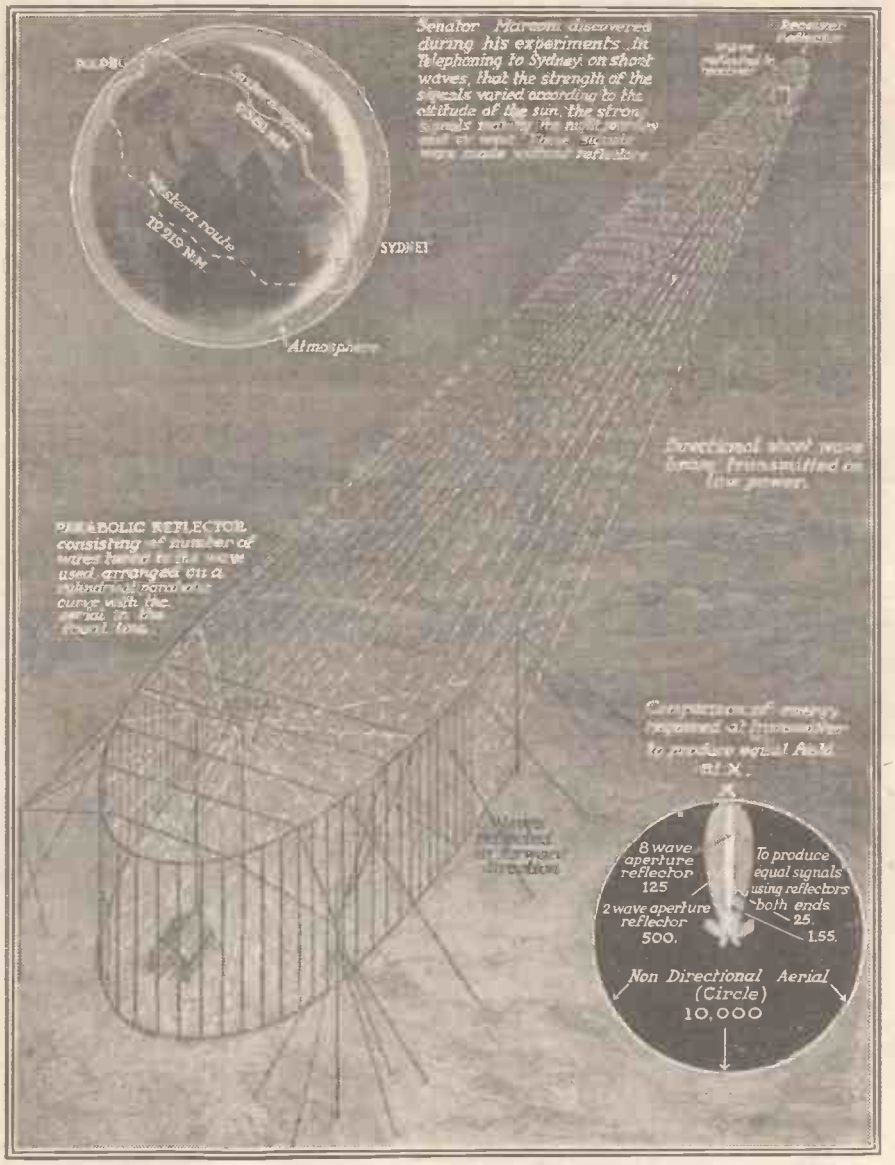
The reverse will, of course, apply if the whistle is stronger in the right earpiece.

By this method it will be possible for slow ships, such as tramps, to keep, say, to the right edge of the beam, and faster ships to the left edge, thus reducing the possibility of collision.

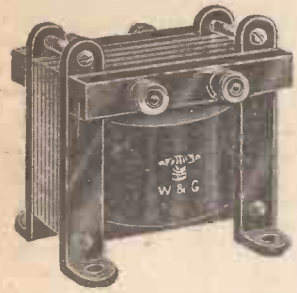
In place of the two ear telephones two electric lamps may be used.

In this case the received signal has to be amplified considerably, to operate a relay, for bringing into operation a local supply of electricity for lighting the lamps. Thus when each lamp is glowing at equal brightness the ship is in the centre of the beam, but if one lamp is less bright than the other, this shows that the ship is too much to one side—and so on.

LONG-DISTANCE SHORT-WAVE WIRELESS.



The short-wave signal tests received at Sydney from Poldhu were so successful that Mr. Marconi was tempted to try a wireless telephone test to Australia, and on May 25th intelligible speech was transmitted for the first time from England to Sydney. The total power applied was about 28 kw., the wave was 92 metres, and no reflectors were used. The result of Mr. Marconi's experiments has gone to prove that adequately designed reflectors will enormously increase the effective strength of the signals. The picture reproduced here gives a comparison of the different amount of energy required for reflected and free signals. Very high speeds of working appear to be possible only when very short waves are employed. This will give the short wave a powerful advantage over the high-powered long wave for commercial work. Another advantage is that when desired, only stations situated within a certain restricted angle of the beam are able to receive, and this condition ensures a comparative secrecy of communication. The economy of power effected by the new directional method is shown in the lower circle. Where 10,000 units of power were required without reflectors, only 125 are now necessary.



"GOLTONE" (Regd.) **LOW FREQUENCY TRANSFORMER**

Unsurpassed for silence, efficiency and reliability. Provides remarkable amplification with freedom from noise and distortion. Equally suitable with every type of valve. No make of Transformer gives better results. Price **17/6**

We can also supply at same price ratio 10 to 1 Transformers recommended with "Unidyne" High Tensionless Circuit.

W.H.M., Broughton, Lancs.—I am very pleased with the results from using W. & G. Low Frequency Transformers. I have built many sets with them, and have always found them to be free from distortion though great in volume. They give much better results than any other make I have tried.

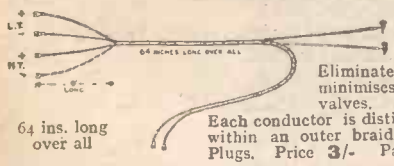
"GOLTONE" Micrometer Regulating **COIL HOLDER**

P. Patent.

High grade finish. Enables the finest possible tuning and adds considerably to the efficiency and selectivity of the Receiving Set.

Two Coil Type, as illustrated **9/-**

Three Coil Type **12/6**



64 ins. long over all

W. & G. "EASIFIX" RADIO—HIGH AND LOW TENSION ASSEMBLY.

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. Price **3/-** Packed in attractive carton.

Ward & Goldstone PENDLETON. MANCHESTER Ltd.

Address all communications to Head Office & works: **PENDLETON, MANCHESTER.**

Stocks also held at Glasgow Depot—
95, PITT STREET.

Large fully illustrated 32 pp. Radio Catalogue No. R/110 post free on request. Enclose Business Card for Trade Terms.

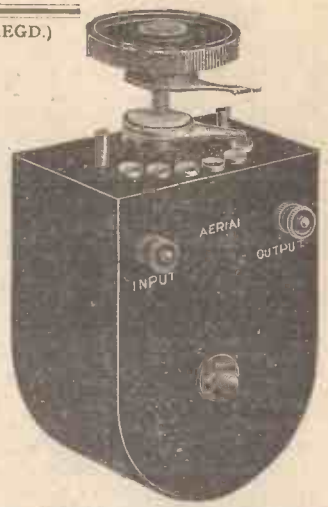
These lines are stocked by all High Class Radio and Electrical Stores.

Write direct if unobtainable.

"GOLTONE" (REGD.) WAVE TRAP

An extremely effective instrument for eliminating signal interference up to 600 metres wave-length. Can be easily attached to any set without any alteration to the actual wiring.

Price **12/6**



"SAMPSON" ACCUMULATOR CARRIER

Patent No. 214037/23.

Light, strong and exceedingly useful. The inconvenience of handling weighty cumbersome accumulators is entirely obviated. Suitable for any size accumulator. Folds flat to fit the pocket. **3/-** each. Warning. Rigorous proceedings will be taken against infringements of this patent.

RADIO WIRES of every description, including Silk, Cotton and Enamelled Wires, Aerial Wires, Leading-in wires, Telephone Receiver and Loud Speaker Cords etc. Prompt Deliveries. KEEN PRICES.

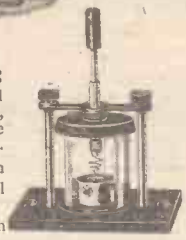
CRYSTAL DETECTOR

Improved Type Vertical Dust-proof Detector, mounted on Ebonite Base fitted with Glass Shield.

No. R4/12 .. **1/9** each

Parts only for Panel Mounting.

No. R4/10 .. **1/6** each



Each Condenser Laboratory Tested before despatch. Supplied in all standard capacities. Price **1/3** each.

VALVE RENEWALS

We repair, by our patent process (for which we have National Physical Laboratory's report of efficiency), all standard types of valves at **6/6 carriage paid, and**

GUARANTEE { **at least equal efficiency to new valves.**
to return in three days,

or refund your money without quibble.

THE ECLAT ELECTRIC MANUFACTURING CO., LTD., WIMBLEDON.

A RHEOSTAT OF QUALITY.

TYPE **B.C.**

EBONITE BOBBIN.

SUPERB FINISH.

PRICE **1/6**

ONE-HOLE FIXING.

FIRST-CLASS WORKMANSHIP.

CRAIK & SMITH,

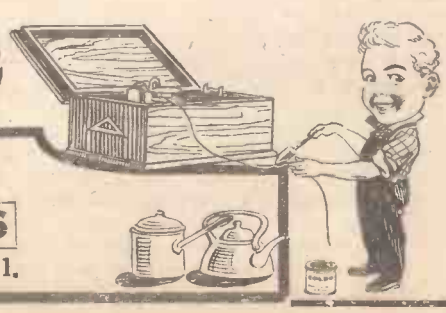
'Phone: Clerkenwell, 7346. **Allen St., London, E.C.1.**

SOLDER EXPERTS ARE AMAZED!!

Because Soldering by Ordinary Methods is Difficult

EVEN FOR THEM

SOLDO



MAKES SOLDERING CHILD'S PLAY.

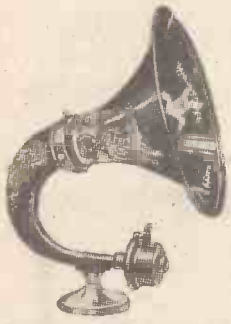
An Amateur can solder more easily with "Soldo" than an expert by old methods. CLEANS TINS AND SOLDERS IN ONE OPERATION. No Acids—No Fluxes—No Filing **1/6**

The SOLDO COMPANY, Sicilian House, Southampton Row, London, W.C.1.

The Technical Editor of "Popular Wireless" will be pleased to receive wireless sets and component parts for test. Reports will be published under this heading.

CRYSTAL SET users always welcome anything in the nature of detector improvements, for, no matter how good reception may be, there is always the feeling when listening-in that something will give that extra little bit of signal strength that seems to be available somewhere. Having tested a "Ribbonspring" cat's-whisker, as retailed at 6d. by Messrs. E. Hunt, of 27, Belgrave Road, St. John's Wood, N.W.8, up against silver and gold cat's-whisker in conjunction with a synthetic galena crystal, we have come to the conclusion that, although signal strength is not increased noticeably above that registered using the gold cat's-whisker, the "Ribbonspring" is better than a silver cat's-whisker in that respect. Where "Ribbonspring" scores, however, is that it provides a more stable contact, and this is all that the makers claim. At the price mentioned it can be recommended to our readers as well worth purchasing.

* * *



The "Dragon" Amplion is to be supplied in varying styles of Oriental decoration.

Ruben, Ltd., of 189, New King's Road, Fulham, London, S.W.6, have sent us two of their "Puratone" valves for test. One type only is supplied, and that for general purposes, requiring 4 volts L.T. and from 30-100 volts H.T. Filament consumption is ½ amp. approximately in the case of the samples submitted. They are priced at 8s. 6d., which, for an English-made valve, is remarkably cheap. An original note is struck in the design, inasmuch as a wire gauze anode is employed. It is styled a "filter anode," but we fail to see what it filters.

However, that is quite beside the point, for the "Puratone" valves on test functioned remarkably well; better, indeed, than we expected them to in view of the fact that there were noticeable several little peculiarities in the disposition of the electrodes. In the case of one valve nearly a quarter of an inch of filament protruded beyond the area enclosed by the grid and plate. One point we notice with pleasure, however, is that a very ingenious springing device is incorporated in one of the filament supports for the purpose of preventing the filament from sagging. This, perhaps, may necessitate a lengthening of the filament.

We tested both the valves in H.F., Detecting, and L.F. capacities. As detectors they are excellent—as good as any valve we have tried. As L.F. amplifiers they are very good indeed, and when grid bias up to some 3 v. is employed when they are used in a second stage, very clear distortionless magnification results. Lastly, for H.F. work, their performance was good, although grid bias was necessary even in a two-valve circuit. If all the "Puratones" Ruben's manufacture are as good as the samples submitted—and there is no reason why they should not be—then we should imagine they will find a ready market.

* * *

Messrs. N. Heywood, whose new address, it should be noted, is 27, Mooremeade Road, Twickenham, Middlesex, the proprietors of Galenel, and other well-known synthetic crystals, have sent us a pair of their new "Blue Spot" telephone receivers for test. We found them to be quite sensitive, as sensitive, in fact, as any of the more expensive types we have had brought to our notice, with, moreover, a tone quality even better than some.

The unique feature in respect of these "Blue Spots" is that they are coloured throughout, the pair sent us being provided with bright green headbands, cords, and earpieces. This is an ornamental wireless innovation well worth encouraging. They are also extremely light, and fit the head most comfortably. We strongly advise readers contemplating the purchase of telephone receivers to write to Messrs. Heywood for full particulars of their "Blue Spots," as we understand they have in stock several interesting models in various colours at very competitive prices.

* * *

The Gil-Ray Radio Campany have appointed Messrs. Victor Zeitlin, of 144, Theobald's Road, London, W.C.1, sole distributors for the United Kingdom and Ireland of their well-known Gil-Ray Crystal.

* * *

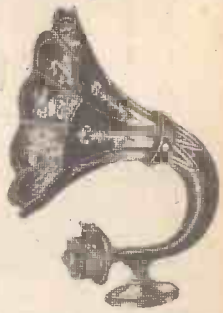
Readers who prefer to mount their valves behind the panel will be interested in the "Aermonic" valve holder which has been placed on the market by Messrs. V. R. Pleasance, of 60, Fargate, Sheffield. It is so designed that no brackets or angle pieces are necessary, two countersunk screws through the panel being all that is required in the case of each holder. Four widely spaced and easily accessible screws are provided for connecting purposes to the sockets. The valve sockets are also sunk well into the insulating material to prevent accidental filament destruction. Although it is quite a neat little fitment ample space is provided to accommodate even the more bulky "R" type of valve. In view of the growing popularity among amateurs of the American type of set with its concealed valves, the "Aermonic" valve holder should be ensured of a brisk market.

A new Amplion "Junior."

* * *

Messrs. The Bower Electric Co., of 15, Grape Street, London, W.C., have sent us a specimen of their new crystal, "Uralium," for test. This crystal is being sold subject to a most liberal guarantee of replacement, a commendable step indeed on the part of the proprietors, who appear to have considerable confidence in their new product.

We gave the sample of "Uralium" sent us a very careful test, and discovered it to be well up to the standard. We cannot with honesty say that it is better than any other yet brought to our notice, but we certainly consider it to be worthy of inclusion in the A.1. category. Slightly more stable in reflex circuits than a number of the galena types of crystal, it is yet very sensitive in straight-forward crystal circuits. "Uralium" is therefore quite a good all-round crystal detector which should not fail to give satisfaction to all its purchasers.



Another decorative Amplion "Dragon."

* * *

Messrs. C. A. Vandervell & Co., Ltd., inform us that their new but now very well-known "C.A.V." loud speaker is the subject of a very large order recently received from a French firm. This is indeed a compliment to the English trade, who must be rather tired of our large imports of foreign wireless goods, and this news should stimulate other manufacturers in respect of possible foreign markets for our own radio products. It will be remembered that the "C.A.V." loud speaker was favourably commented upon on this page some few weeks ago.

* * *

Autoveyors, Ltd., of 82-84, Victoria Street, London, have sent us samples of their new "Kentax" combination pin and fork tags. They are most ingenious little fittings, almost, but not quite, as ingenious as the well-known "Clix" Electro Links. As a matter of fact, they can be used in conjunction with "Clix" if desired. The "Kentax" are really spade terminals so made that they can be used as pin terminals when necessary. At 6d. a dozen they should achieve great popularity among amateur constructors.

* * *

We have just received two variable condensers from Jackson Brothers, makers of the famous "J.B." Condensers. The first condenser is of the square law type, of ·001 mfd. maximum and the second is of the ordinary ·0005 mfd. type. Both are exceedingly well made and in the case of the second the end plates have been improved and are of ebonite, hand-matted and polished. The square law condenser will be discussed at further length later on as we intend to use it for tuning a wavemeter which we have under construction.

HULLO EVERYBODY!!

POST PAGE No. 1.

DELIVERY. Every endeavour is made to despatch goods by return, but sometimes delays occur which are beyond our control and in which cases customers may rest assured that their orders will be executed in the very shortest period. They will therefore realise that it is not possible to have orders cancelled through above causes.

LISSEN.

Variable Grid Leak	2/6
Anode Resistance	2/6
Lissen Minor ..	3/6
Lissenstat ..	7/6
Do. Universal ..	10/6
2-way Switch ..	2/9
Series Parallel ..	3/9
T1 Transformers..	30/-
T2, 25/-; T3, 16/6; Coils : 25, 4/10; 30, 35, 40, 4/10; 50, 5/-; 60, 5/4; 75, 5/4; 100, 6/3	

POST 3d. each.

DUBILIER.

.001, .002, .003, 004, .005, .006, Fixed, 3/-	
.0001, .0002, .0003, .0004, .0005 ..	2/6
Type 577, .01 ..	7/6
Grid Leaks each	2/6
Anode Resistance 50,000; 70,000, 80,000, 100,000, on stand complete	5/6
Minicap Switch ..	8/-

POST 3d. each.

IGRANIC.

Coils : 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	
Fil. Rheostat ..	4/6
Potentiometer ..	7/-
Vernier Rheostat..	7/6
30-ohm Rheostat.	7/-

POST 3d. each.

STERLING SQUARE LAW VARIABLE CONDENSERS.

with Vernier.

.001	30/-
.0005	25/6
.0003	23/6
.00025	23/6

EDISON BELL.

.0001 to .0005 Fixed	1/3
.002 to .006 ..	2/-
.001	1/3
.0003 with Grid Leak	2/6
Variometer ..	10/6
Twin Detector ..	5/-

POST 2d. each.

GOSWELL ENGINEERING

Patent Valve Holder	1/6
2-Way Coil Stand..	9/-
(Cam Operated Vernier)	

POST 3d. each.

WEST END DEPOT FOR

POLAR; JACKSON BROS.; R.I.; BURNDEPT; GOSWELL ENG. CO.; GRAFTON ELECTRIC; SILVERTOWN; IGRANIC; LISSEN; RADIO PRESS ENVELOPES; DUBILIER; EDISON BELL; ETC.

RHEOSTATS.

Ormond	2/-
Raymond	1/6
Do. with dial.. ..	2/-
Extra value do. ..	2/6
T.C.B. 6 ohms ..	4/-
Potentiometer T.C.B.	5/-
Burndept Dual ..	7/6

POST 3d. each.

TRANSFORMERS (L.F.).

Radio Instruments ..	25/-
Igranic, Shrouded ..	21/-
Powquip, Shrouded ..	18/-
Formo, Shrouded ..	18/-
General Radio 83 ..	14/11
Brunet, Shrouded ..	11/9
Formo, Open.. ..	12/6
Powquip, 2–1 or 4–1..	14/6
Raymond	10/-
Eureka Concert Grand	30/-
Ditto, 2nd Stage ..	22/6
Silvertown	21/-

TRANSFORMERS (H.F.). POST 3d. each.

McMichael, 300/600..	7/-
Ditto 1100/2000 ..	7/-
Energo, 250/700 ..	3/11
Ditto 900/2000 ..	4/6
Raymond, 300/600 ..	2/9

Others Stocked.

H.T.C. POST 2d.

Special valve holder above panel	1/9
Ditto, for under panel	1/6

POLAR POST 6d.

.001 var. Condenser ..	10/6
.0005 " " ..	10/6
.0003 " " ..	10/6
Micrometer Condenser	5/6
Cam Vernier 2-way Coil Holder.. ..	11/-

EBONITE. Post 3d.

	3/16th in.	¼ in.
6 x 6 ..	1/6	2/-
7 x 5 ..	1/6	2/-
8 x 6 ..	2/-	3/-
9 x 6 ..	2/2	3/3
10 x 8 ..	3/-	4/2
12 x 6 ..	3/3	4/2
12 x 9 ..	4/3	5/6
12 x 12 ..	5/6	7/6
14 x 10 ..	5/6	7/6

Cut to Size, 3/16 in. at ½d. square inch.
Foreign Post extra.

WATMEL

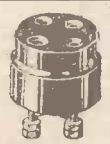
Var. Grid Leak	2/6
Anode Resistance ..	3/6

BRETWOOD (New Model)

Var. Grid Leak.. ..	3/-
Anode Resistance ..	3/-

POST 2d. EACH.

This first-class Switch Arm, with 12 Studs, 12 Nuts, 12 Washers. By Post 1/6 set.



Ebonite Valve Holder, cut from solid rod, hand-turned, 8 nuts and washers. Each, 1/3.

NICKELLED

One Hole Fixing Switch Arm, with 12 Nickel Studs, Nuts & Washer, 2/- the lot.

"RAYMOND" CRYSTAL DETECTORS. POST 6d. each.

Enclosed glass. As Sketch. Ebonite Base.

Brass	1/4, 1/6, 2/-
Nickel	1/6, 2/-
Ebonite	1/6
Perikon	2/6

(With Zincite and Bornite.)

OUR WONDERFUL MICROMETER ADJUSTMENT GLASS-ENCLOSED DETECTOR. WHY PAY MORE?

POST 6d. each. **1/11**

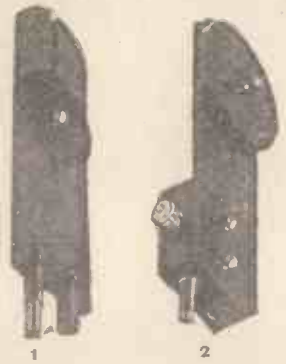
"POWQUIP" L.F. TRANSFORMERS.

BUCKS. (for Reflex. etc.)	12/6
MANCHESTER (similar to R.I.)	14/11
STANDARD	14/11
SHROUDED	18/-

POST FREE.

CHELMSFORD. POST FREE.

LOADING PLUG AND SOCKET (Ebonite top)	1/-
Tandco Coil 1300/1750 ..	2/3
Coil and Adaptor (special for use with 650 VARIOMETER)	2/9



1 2

5

7

3 6 4

LOUD SPEAKERS.

27/6	-	JUNIOR AMPLION Newest Model
42/-	-	JUNIOR DE LUXE Oak Trumpet
55/-	-	BABY STERLING Splendid Value

BASKET COILS.

6 Waxed, 200/3,600 metres..	1/11
7 Waxed, 150/3,600	2/3
5 Waxless, 200/2,000	1/11

POST 3d. set.

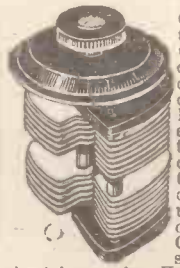
MANSBRIDGE FIXED CONDENSERS

T.C.C. (New.)

1 M.F. ..	4/6	Various others Stocked.
2 M.F. ..	5/-	
.25 ..	4/-	
.05 ..	4/-	

Delivery very slow from makers.

TWIN CONDENSER.



Composed of two equal units of .00025 or .0003 mfd. operated by one Knob and Dial, thereby enabling you to tune two circuits by one turn of the dial. Can be used in series or parallel Complete as shown with aluminium ends. Knob and dial. For Tuned Anode Circuits. 10/6.

POST FREE.

BURNDEPT

226 L.F. Transformer ..	25/-
Dual Rheostats	7/6
Crystal Detector	5/6

MICROSTAT.

For D.E. and R. Valves .. **2/9**

H.T. BATTERIES.

POST 1/- each.

Ever-ready 36 v.	8/-
Ever-ready 66 v.	13/6
Ever-ready 108 v.	22/-
B.B.C. 60 v.	10/6

Please Give Number.

No. 1.	Basket Coil Holder and Plug, 10d. .. .. 2 for 1/7
No. 2.	Basket Coil Holder and Plug, extra quality, 1/6 .. .. .. 2 for 2/8
No. 3.	Edison Bell Shaped Coil Plug, 1/2 .. .. 2 for 2/1
No. 4.	"Raymond" Shaped Coil Plug, 1/- .. 2 for 1/10
No. 5.	Coil Plug with Brass Clips, 10d. .. .. 2 for 1/6
No. 6.	Allen Variable Grid Leak, .5 to 5 meg. 1/9
No. 7.	Grid Leak and Condenser 2/9

POST FREE.

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"DE LUXE" MODEL.

—EXCLUSIVE DESIGN
—TRIANGULAR FIXED VANES
—PRESSED ALUMINIUM SPACERS
—FITS IN ANY CORNER
—TAKES UP TINIEST SPACE
—CAPACITY GUARANTEED
—EXTRA INSULATION
—NEW ONE HOLE FIXING METHOD
—TERMINAL CONNECTIONS
—STOUT VANES
—PERFECT EFFICIENCY
—WONDERFUL FOR PORTABLES, ETC.

UNSURPASSED FOR FINE TUNING.

AS SHOWN, WITH DIAL, KNOB and BUSH,

·001 - 7/3
·0005 - 5/11
·0003 - 5/4
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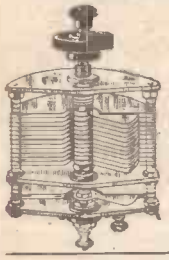
POST 6d. SET.

John Blair, Esq., Rexall Pharmacy, Millom. says:— Your Condensers are a REVELATION to me as a Dealer. Sept., 1924.

C. Walton, Esq., Andover. Tested your Condensers on Megger and got "INFINITY."



NEW MODEL with VERNIER COMPLETE with 2 KNOBS and DIAL.
Post 6d. set.

·001 - 9/3
·0005 - 7/3
·0003 - 6/9
Post 6d. set.

SQUARE LAW
·0005 - - - 7/11
·0003 - - - 7/6
·0002 - - - 7/-
Postage 6d. set.

GOSWELL INSULATED VALVE SOCKETS

SET of 4 (1 red) with Template 1/3

ONE HOLE FIXING RHEOSTAT

A1 QUALITY
POST FREE 1/9

GENUINE MICMET 6/- DETECTOR

POST 2d.

N. & K. LOUD SPEAKER

A LITTLE GEM
21/-
POST 1/-

COIL PLUGS

Single Coil Holder mounted on ebonite base and fitted with terminals .. 1/4
Ditto, swivel movement 1/8
POST FREE.

SUNDRIES

Post free

Lissen 5 point switch	4/3
Sterling Variometer	21/-
Sterling Do.(Broadcast)	12/-
Clix, with nut and insulators .. .. 6 for	2/3
Voltmeters 0-6—0-15 each	5/3
Copper Tape Aerial, 100 ft.	3/-
L.E.S. 2 way coil holder	
Micro Vernier	8/-
Miniature Fil. Res., 5 ohms	1/11
Edison Bell "A" valve holders	1/6
Lissen Aux Resistance	1/6
Lissen Choke	10/6
Tubular Dutch Detec. Valves	5/11
Phillips "R" Valves	8/11
French "R" Valves	7/11
Gamage's Permanite	1/-
Gecosite (G.E.C.) ..	1/3
Neutron (very fine) ..	1/6
Blue Tungstalite (447149)	1/6
1000 ohm Bobbins, pair.	3/6
2000 ohm Bobbins, pair.	4/-

C.R.C. "TEN-ONE" TRANSFORMER

Designed for use in H.T.-less valve circuits, such as the "Unidyne." Ratio—10-1. Turns 24,000—Spirella wound. Mounted in plated case. 20/-
POST FREE.

SUNDRIES

Post free

LEADING-IN TUBES.	
6 in., complete ..	1/-
9 in., complete ..	1/1
12 in., complete ..	1/2
LEAD-IN WIRE	
Heavy Rubber, 3 mm., 6 yds.	1/6
Heavy Rubber, 5 mm., 6 yds.	2/-
MULTIPHONE TERMINALS.	
4-screw, round type	1/-
6-screw, round type	1/3
4-screw, oblong type	1/-
BOXES (POLISHED).	
6 x 6, with ebonite	5/9
8 x 6, with ebonite (4 inches deep.)	6/11
BASKET COILS.	
6 waxed 200/3600	2/2
7 ,, 150/3600	2/6
5 waxless 200/2000	2/6
2 ,, S.T. 100	1/3
2 ,, Unidyne	1/3
EBONITE COIL STANDS.	
2-way, ex handles	4/6
3-way, ex handles	5/6
2-way, good value	3/9
3-way, good value	4/11
Also at 4/3, 4/6 ..	5/11
2-way for Basket Coils	5/6
Universal	5/11
Franco, geared 2-way	12/6
3-way	17/6
POLAR 2-way .. (Cam Vernier).	11/-

BRUNET (genuine)

4000 ohms 'Phones	16/11
Do. De Luxe	17/11
Do. Single	8/11
2000 Single	7/6

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Telephone type, Wood Screw doz.	1/-
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Double 'Phone Cords, 72 in. ..	1/11
Porcelain S.P.D.T. Switch ..	1/11
Ditto D.P.D.T. Switch ..	2/6
Battery Clips .. .. doz.	10d.
Ebonite Valve Holders	1/3 and 1/-
Lead-in Wire .. .. 10 yds.	2/6
Lead-in Wire .. .. 10 yds.	1/6
Twin Flex .. .. 12 yds.	1/11
100 ft. 7/22 Aerial Wire with four insulators	3/9
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Ditto, S.P.D.T.	1/2
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Tinned copper sq., 16 gauge, 15ft.	1/-
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Gold Whisker	4d.
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Ditto Ebonite	4/11
Ditto Ball Rotor	6/11
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Ebonite Dials	8/-
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HAVE YOU TRIED THEM? You will never use any others. POST FREE. **14/11** per pair

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MASTER VALVE

H.F. RED RING for strong high-frequency amplification and detection 12/6

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BEST BRIGHT FILAMENT VALVES EVER MADE.

MAKE SURE YOU GET THEM.

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The NEW R.I. 25/-

Beware of Imitations.

STIRLING "DINKIE" LOUD SPEAKER 30/-

MYERS VALVES.

Universal, 4 volt, ·6 amp. **12/6**

Dry Battery, 2½ volt, ·25 amp. Plate voltage 2-300 volts. **21/-**

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As light as a Feather .. 17/11

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Genuine Nesperphone, 4,000 ohms. Fitted with adjustable diaphragm, detachable receivers, double leather-covered headsprings, long flexible cords, nickel-plated parts. Very comfortably fitting to the head. LOOK FOR THE TRADE MARK. 4,000 ohms .. 12/6 Post 6d. pair.

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Guard against inferior imitations which are "cleverly" got up to deceive. Make sure of the genuine article, the original "N & K," and avoid dissatisfaction. See that the letters "N & K"—and no other—are stamped. 4,000 ohms. .12/11 6,000 ohms. .13/3 Post 6d. pair.

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	Standard	Super.	Microdenser
·001	8/6	9/6	11/6
·00075	8/-	9/-	11/-
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·0002	5/-	5/6	8/-
·0001	4/9	5/3	7/9
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B.T.H., MARCONI, MULLARD, COSSOR, EDISWAN, ETC.

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D.E.R. Type, MARCONI, D.F., ORA, EDISWAN.

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All Valves Stocked.

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On 1,600 Metres

Aerial Coil No.	Reaction
150	200

Tuned Anode 250 or 300

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Square 16 or 18 S.W.G. .. 15 ft.	1/-
Round ditto 15 ft.	10d.
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1 lb. „ 18 „	3/-
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Post Free.

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THE 4-ELECTRODE VALVE

Thorpe K4 .. .. each	17/6
6 Terminals .. .. for	10d.
2 Microstat Filament Resistances each	2/9
1 Variable Grid Leak	2/6
1 Single-Pole Double-Throw Switch 1/9 or	2/-
1 ·0005 Variable Condenser, with Vernier	7/3
1 Cam Vernier 2-way Coil Holder	9/-
Panel, 5½ in. by 1½ in. by ¼ in., drilled to hold 2 5-Pin Valve Holders for	2/-
2 5-Pin Valve Holders .. .. each	1/6
1 Fixed Condenser, ·001 .. 1/2, 2/2	3/-
1 „ „ ·0002 .. 1/2, 2/2	3/-
1 Shrouded L.F. Transformer	20/-
8 yds. No. 18 Gauge Tinned Copper Wire..	1/2

Necessary Screws, Nuts and Washers, Free if above lot purchased. Post Extra.

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FERRANTI INTERVALVE TRANS-FORMER 17/6

D.C.C. WIRE

S.W.G.	per ¼ lb.
18	9d.
20	9d.
22	10d.
24	1/-
26	1/1
28	1/3
30	1/6

Post 6d. Reel. Not sent otherwise.

POLAR MICROMETER CONDENSERS

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Don't forget that

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Imitation is the Sincerest Form of Flattery!

"RAYMOND" FIXED CONDENSERS.

Ebonite Base.

·001, ·0001 to ·0005 ..	1/2
·002 to ·004..	1/3
·006	1/6
·01 and ·02 ..	1/9
·05	3/3

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FIBRE STRIP

FOR COILS

5 lengths a **1/-**

1/10 doz.

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Ebonite D.P.D.T.	1/8
Ebonite S.P.D.T.	1/3
Min. Panel D.P.D.T.	1/–
Min. Panel S.P.D.T.	10½d.

BATTERIES 4·5

Vulco English 4·5	4d.
B.B.C Red 4·5	5d.
Eveready "London"	4½d.

H.T. BATTERIES.

Best Made 30 v.	4/6
Best Made 60 v.	7/6
Best Made 66 v.	9/–
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Ever-ready 108 v.	22/6
Siemens' "Q" 1·5	3/–
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B.B.C. 9 volts	3/–
B.B.C. 60 volts	10/–
B.B.C. 36 volts	5/6
B.B.C. 16 volts.	2/6

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Small 5 ohms	1/3
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Ormond	1/9
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Igranic, T.C.B., and all known makes.	

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Mic-Met Type	2/8
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Neutron Crystal	1/6
Hertzite (Shaw's)	8d. & 1/–
Midite	6d.

VALVES.

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Dutch "R"	5/–
Phillips "R"	7/9
French "Metal"	6/11
Phillips ·04	17/11
Metal ·06	17/11
Radion (½ amp.)	10/–

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Set of Spanners	1/4
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7-Twist (H.S.) Drills	1/4

NO POST ORDERS AT THESE PRICES.

EBONITE PARTS.

Good Coil Plugs	from 4½d.
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Basket Adapters	8½d. Also at 1/– & 1/3
2-way Coil Stands	2/6
With Extens. Handle	2/11 Also at 3/6, 4/–, 4/6
3-way	4/3, 4/6, 5/–
Goswell Cam Vernier	9/–
Franco " "	12/6
Polar " " Etc., etc.	11/–
Coin Plug on Stand	1/–
Ditto, Swivel Movement	1/3
Coil Plug and Clips	6½d.

BRASS PARTS.

W.O. or Pillar Terminals	1d.
Small Pillar	4 for 3½d.
'Phone 4 B.A.	1d.
'Phone 2 B.A., 2 for	2½d.
Valve Sockets	4 for 3d. (Above with Nut Washer)
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Plug and Socket pr.	1d.
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Spade Screws	1d
Pin Screws	2 for 1½d.
Spade Tags	5 a 1d
Spring Pillar Terminals	2½d.
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Impregnated Board, Wound D.C.C. and Clips, 200/600 metres	2/6
Very Good Value, Wound D.C.C. and Knob	1/6
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Ebonite, 200/600	3/11
Raymond Inside Winding	8/11

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Electron Aerial	1/4
Polished Boxes, 8 by 6	3/6
Tungstalite	1/–
Microstat	2/6

SUNDRIES.

'Phone Cords (6 feet)	1/5
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Similar Sets (Titles or Scales)	3d.
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Small Knobs, 2014 B.A.	2d.
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18g. Sq. Tin Copper	15 ft. 5d.
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Insulated Hooks	4 for 3d.
Rubber Lead in,	30 feet 1/3
7/22 Copper Aerial,	100 ft. 1/10½
Extra Heavy Aerial	100 ft. 2/– & 2/3
Good Valve Holders	8d.
H.T.C. in Stock	1/6, 1/9
H.F. Transformers, 300/600	2/9
Choke Coils	8/11
Empire Tape, ½ in.,	2 yds. 1d.
Ditto, ¾ in.	2 yds. 1½d.
6 in. Ebonite Anticap Handles	8d.
Battery Clips	2 a 1d.
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2,000 ohm Bobbins	1/8
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Waxless (5) 200/2,000,	set 1/8
Waxed (6), 200/3,600	set 1/8
Waxed (7), 150/3,600	1/11
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Chelmsford, various,	1/6, 1/9
1 Complete with Adapter (To use with variometer.)	2/3
Allen var. Gd. Lk.	1/3
Allen Anode Res.	1/3
Scales, 0-180, 2d., 3d.,	4d.
Dial and Knob (Ed. Bell)	1/3
Dial (Ebonite)	10d.
Accumulator 2v40amps	9/6
Ditto 4 v 40 amps	16/6
Ditto 4 v 60 amps	19/6
Ditto 4 v 80 amps	23/–
Ditto 6 v 60 amps	28/6
Ditto 6 v 80 amps	33/6
Ditto 6 v 100 amps	41/–
Intervalve Transformers	9/11
Brunet Headphones	14/6
Fixed Condensers (Ebonite) ·001 to ·0005, 10d. ·006	1/3

SUNDRIES.

Tumbler Switches (Ebonite)	1/4
Fibre Strip (for Coils)	per piece 1½d.
D.C.C. Wire, per ¼ lb.	13 g. 9d. 20 g. 9d; 22 g. 10d. 24 g. 1/–; 26 g. 1/1 28 g. 1/3; 30 g. 1/6 Etc., etc.
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2 Color Flex	yard 2½d.
Shellac	5d.
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Condenser Brushes	6d.
EASI-FIX ASSEMBLY	3/–

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BEATS ALL OTHER "ITES." **1/-**

Impossible to Advertise All the Goods Stocked.

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N and K

4,000 ohms .. **12/11**

6,000 ohms .. **13/3**

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MYERS VALVES.

12/6

Strong Valve Template	4d.
Egg Insulators	1d.
Reel ditto	1d.
Thick Rubber Lead-in	yd. 3d.
Ribbon Aerial	1/10
Panels Drilled	
Radio Press Envelopes.	
Raymond Fixed Condensers	·001, ·0001 to ·0005, 10d. ·002, ·003, ·004 1/– ·006 1/3; ·01 1/9; ·02 1/9
Six Sixty Valves	20/–
Polar Micrometer Condenser	5/6

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12 Studs, 12 Nuts, 12 Washers. THE LOT **10½d.**

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CALLERS only.

Similar to the MIC MET. **2/4**

BRASS FORMER

(DOUBLE) 23 spokes each side **3/–**

Make your own coils. CALLERS only.

EXIDE.

D.T 9 Type. 2 Volts. (Glass). (For ·06) 5/–

EBONITE 3/16-in.

CALLERS' PRICES.

6×6	1/4
7×5	1/4
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10×8	3/–
12×6	3/–
12×9	4/3
12×12	5/6
14×10	5/6

CUT TO SIZE ½d. sq. in.
WE STOCK ¼-in. EBONITE.

"POPULAR WIRELESS."

FREE TO CALLERS. (Limited number, of course.)

SPECIAL L.F. TRANSFORMERS.

10/6 & 8/11

FRENCH METAL DULL EMITTERS ·06

3/4 Volt, L.T. 20-80 Volt, H.T. **17/11**

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Technical queries should be addressed to the Technical Queries Department, and must in all cases be accompanied by a stamped addressed envelope. Not more than three enquiries can be answered in one letter, and telephone calls or personal calls at this office cannot be dealt with. A copy of the questions must be kept as it is not always possible to reproduce the query when replying. Number the questions 1, 2, and 3, and answers will be given under each number.

The Editor desires to direct the attention of his readers to the fact that, as much of the information given in the columns of this paper is of a technical nature and concerns the most recent developments in the Radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

PATENT ADVICE FOR READERS.

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

Questions and Answers

"TWO-VALVE" (Altrincham).—I have made the two-valve "Unidyne" receiver and am desirous of making the two-valve L.F. amplifier described in "P.W." No. 109. Unfortunately, no panel wiring diagram was given, so I should be glad if you could let me have one as soon as possible.

The required diagram is shown herewith. The view is from the back of the panel, the panel and the base-board being flattened out into one plane to simplify the diagram. Be careful over the connections, as so many amateurs fail because their connections are weak and dirty, more often the latter being caused by using too much flux when soldering.

* * *

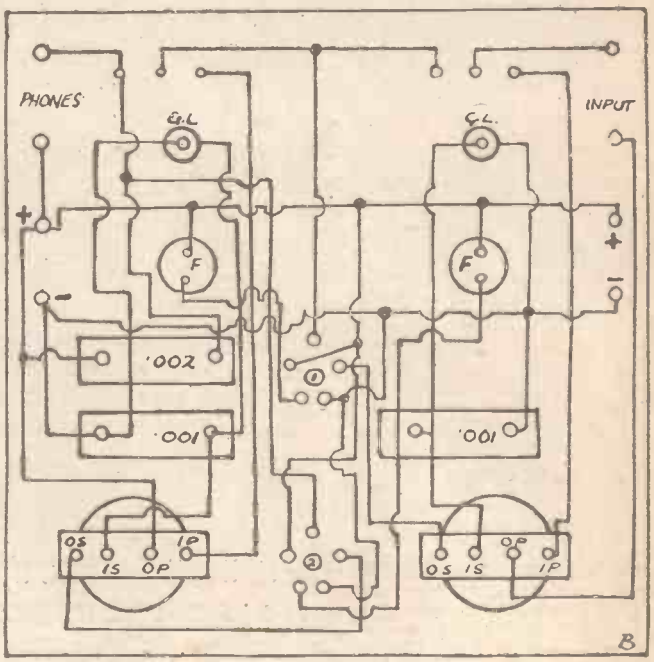
R. A. (Narenby, Lincoln).—Is it possible to fix up a crystal set to pick up the Nottingham Relay Station from here? We are approximately 30 miles from Nottingham, so if possible will you give details of the kind of set to construct?

It is impossible to estimate accurately the results obtainable, owing to the wide variations in signal strength under varying conditions. You should note, however, that the B.B.C. themselves estimate the crystal range of a relay station as being only 4 or 5 miles. No doubt this distance can be greatly exceeded under specially favourable conditions, but nevertheless it is a good guide, and we should certainly not recommend you to expect regular signals from Nottingham at a distance of 30 miles.

The type of crystal set used for long-distance working is less important than the other factors governing reception. For instance, any well-designed set will occasionally receive at very long ranges, whilst the best crystal set obtainable cannot be guaranteed to receive from a relay station over the distance separating you from Nottingham.

* * *

R. G. A. (Reading), D. S. R. (Dewsbury), also C. S. C. (Henley-on-Thames), and others.—How can I obtain full instructions for building the "P.W." Combination Set? I have destroyed all the back numbers of "P.W." dealing with this circuit, and now wish to build it for a friend.



As announced recently in the Radio Notes and News columns, the last free booklet dealing with this circuit has been given away. The stocks of the back numbers of "P.W." in which it originally appeared, and all the reprinted particulars in book form have now been exhausted; they cannot be re-issued, so we are afraid that those who failed to secure a copy during the past year will now be unable to do so.

(*Continued on page 349.*)

RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 348.)

B. M. (Radlett).—What is the easiest way of calculating (roughly) the wave-length of a coil and aerial system ?

There is no really *easy* way of calculating the wave-length of a coil and aerial system, but the following will probably be the quickest.

First calculate the coil's inductance in microhenries and add this to the inductance of the aerial, taking the capacity of the aerial in microfarads and applying the formula :

$$\text{Wave-length} = 1{,}885 \sqrt{K \text{ (mfds.)} \times L \text{ (mhys.)}}$$

As the result will only be approximate the capacity of the average aerial used for broadcast reception can be taken as ·0002, or ·0003 mfd., while the inductance will be about 15 mhys. This latter can be checked roughly by multiplying the length of the aerial in feet (plus lead-in) by 1·5, the result being in metres wave-length. Then, if we call this W and apply the formula below we shall have the inductance in mhys.

$$\frac{W}{(1885)^2} \div K \ (K = \cdot 0002).$$

This then gives us K and L for the aerial as nearly accurate as is necessary, and we can now calculate the inductance of the coil alone by means of the formula $L = \frac{9 \cdot 8 \ D^2 \ N^2 \ L \ K}{1{,}000}$, mhys., where D = diameter of coil in cms. ; N = number of turns per cm. ; L = length of coil in cms. ; K = correction factor, based on the ratio of the length of coil to the diameter. This can be found from coil tables, or else roughly calculated for the following data. The factor varies from ·96 (where the diameter is ·1 of the length) to ·2 (where the length is ·1 of the diameter). If diameter = length the factor is ·69. If L = 2D, K = ·82, and if L = 5D, K = ·92.

The answer in mhys. from the above is now added to the inductance of the aerial, and the capacity of the latter is taken and the first formula is applied, *i.e.*, $1885 \sqrt{KL}$, which gives the total wave-length of coil and aerial. Any parallel capacity across the coil can be added before the final equation is worked out.

* * *

H. J. (Orpington, Kent).—I wish to construct one or two "Unidyne" sets, and shall be glad if you can tell me what back numbers I require, and where they can be obtained.

As you do not state what type of sets you wish to make we are publishing the full list of the numbers of "P.W." in which articles on the "Unidyne" appeared. These copies can be obtained from The Amalgamated Press (1922), Ltd. (Back Number Dept.), Bear Alley, Farringdon Street, E.C.4.

The following list shows the various articles and the numbers of POPULAR WIRELESS in which they appeared.

No. of "P.W."	Subject.
101 and 102 ..	The Unidyne Principle.
103	How to Make a One-Valve Unidyne (See also No. 112.)
104	How to Make a Unidyne L.F. Amplifier.
105 and 106 ..	How to make a Unidyne Two-Valve Set (Detector and L.F.).
107 and 108 ..	How to Make a Unidyne Two-Valve Set (H.F. and Detector).
109	How to Make a Two-Valve Unidyne L.F. Amplifier.
110	How to Convert Your Set to the Unidyne Principle.
111	How to Convert H.F. and L.F. Units.
112	A Simplified One-Valve Unidyne Receiver.
113	How to Make a Three-Valve Unidyne Set (H.F., Detector, and L.F.).
114	How to Make a One-Valve Portable Unidyne Set.
115	America and the Unidyne.
116	Developing the Unidyne.
117	How to Make a Two-Valve Reflex Unidyne.
117	How to Operate your Unidyne Set.
118	Experiments with the Unidyne.
119	Construction of Two-Valve Unidyne.
120	Further details of "The Two-Valve Reflex Unidyne Circuit."
121	Possibilities of the Unidyne.

* * *

A. T. (Weymouth) has a three-valve set and wishes to know what coils to use to pick up stations other than those on the broadcast wave-lengths.

(Continued on page 350.)

RADIOTORIAL QUESTIONS & ANSWERS.

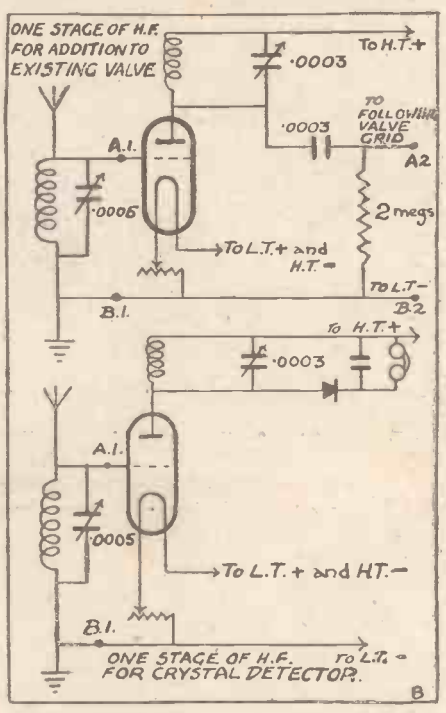
(*Continued from page* 349.)

A series of plug-in coils of from 35 to 250 turns will cover most stations—at any rate up to 5 X X, but for the sake of those readers who desire full details we would refer them to POPULAR WIRELESS No. 117 (August 23rd, 1924), page 918, where a detailed list of coils and their wave-length ranges was given.

* * *

E. P. S. (Dulwich Village, S.E.).—What are the connections for a stage of H.F. amplification to be added to an existing wireless receiver? I have a crystal set and a two-valve set (detector and L.F. amplifier), and I should like to increase the range of both these receivers by a valve amplifying at radio-frequency on the tuned-anode system. If a single H.F. valve is added to a valve detector, can another H.F. stage be placed in front of this later, so as to make the set two H.F. and detector, without material alteration to the wiring?

The diagram reproduced herewith shows, at the top, the connections for adding a tuned-anode H.F. amplifier to an existing valve set. The aerial is shown directly coupled, but, of course, loose coupling may be used, if desired, although the extra control is apt to make the tuning rather complicated. Connected as shown, a 35 coil for the aerial may be used; but if the aerial condenser is connected in series to sharpen tuning, a larger coil is necessary, about 70 turns generally giving best results.



For the anode circuit a 75 coil is used to tune to the wave-lengths of the main broadcasting stations, and the other values are as indicated.

The H.F. crystal arrangement shown in the lower part of the diagram is obviously very similar, but the 'phones and crystal are connected in series across the tuned-anode circuit. It will be seen that the filament rheostat is placed in the negative lead, but the connections should be tried in the reverse position also, as occasionally this is an improvement with valves which do not require a slight bias on the grid.

If it is desired to add a second stage of H.F. to an existing stage, the alteration is made at the points A1, B1.

The aerial circuit is disconnected at A1, B1, and another valve is connected to these points by its L.T. - lead and the output to grid, which are marked in the top of the diagram as B2 and A2 respectively. The 2 megohm leak is a good standard value for the fixed type, but for critical working a variable leak gives best results.

The value of the 'phone condenser (shown in the lower figure) is not at all critical, and generally a ·001 fixed capacity will be found quite satisfactory.

RUNNING A PROVINCIAL BROADCASTING STATION.

(*Continued from page* 321.)

for half an hour there is a talk delivered by an excellent authority purely for the benefit of the schools. There are simultaneous broadcasts from London. There are outside broadcasts locally, besides the thousand and one inquiries that have to be attended to and that are all worthy of consideration.

I mention these because a station Director actually should never be, so to speak, still, inasmuch as he may be putting out very excellent concerts and using his brains and efforts on these, but let him beware of allowing his mind to rest on these and these only. He will find in the interim that the Scholars' Half-Hour standard is not so good, or the speakers have not been quite so satisfactory.

The Children's Hour.

Therefore he will turn his attention immediately towards putting that right. He will watch that carefully until he sees it running again as it should run, and in the meantime he will then find that his evening talks are not so good. He will then switch his mind on to those and get those put right. Whilst doing that, there is something else which needs his shoulder to the wheel, so to speak, and all the time he must listen to the public, to the listeners, for they are the people for whom he is catering.

Now, there are two other points on which I could speak at length, but space forbids. One is the Children's Hour. Here the policy that I endeavour to adopt is founded upon a thought, this thought being "That the child of to-day is the man and woman of to-morrow, the voter, and supporter of the policies of the countries," and in that thought one must surely realise how carefully it requires guiding. Changes will be made, and are made gradually, very likely they are not even apparent at first, but this, to me, wants gentle and careful handling, and is a source of great interest and responsibility. The "Uncles" have a power in their hands which, if rightly used, can be of enormous help for good.

Sunday Evening "Talks."

The other point is the Sunday addresses. I am firmly convinced that these talks in the evening, or the little service that it actually is, not only brings gladness to the sick and bedridden, but is of good inasmuch as it is getting home and continues to get home to those who before may have forgotten, or possibly ignored, the religious side of life. I may say here that we are very carefully guided from headquarters, and that I personally would take little credit to myself on this account. I can only show my keenness to build this up and to make it of real value to all concerned.

On reading this through, I realise how inadequately I have expressed myself. It may show in it a little of the thought that is required through the innumerable points and branches of a programme that need attention, and if it has done that, then it has done something.

(*Continued on page* 351.)

RUNNING A PROVINCIAL BROADCASTING STATION.

(*Continued from page 350.*)

I am sure that no station director could be really successful without the co-operation of the listener, and I should like in this article to thank the Bournemouth listeners for the helpful criticisms and suggestions that they have always put forward, and for the splendid way in which they have supported the station. The listeners of the Bournemouth Station seem to have a pride in their station—at least, that is how it strikes me as I endeavour to read between the lines—and if they have that, then I can only say that I personally am grateful that I have been allowed to have the control of the station.

Correspondence

CAN YOU BEAT THIS?

The Editor, POPULAR WIRELESS.

Dear Sir,—I am writing to let you know the results I have obtained with the simplified one-valve Unidyne. I have heard a large number of stations, but have not been able to identify them all. A list of the ones whose call-sign I got follows: Manchester, Bournemouth, Newcastle (local station 1½ miles), Glasgow, Birmingham, Aberdeen, Brussels (260 metres), Hamburg (392 metres), Madrid (392 metres), Berlin I. (430metres), Stuttgart 437metres), Stockholm (440 metres), School of Posts (450 metres), Königsberg (460 metres), Frankfort-on-Main (467 metres), Berlin II. (500 metres), Hilversum (1,050 metres), Kbley (1,150 metres), Chelmsford (1,600 metres), Radio Paris (1,780 metres).

My aerial is a fairly good one, 50 feet high, long, and not screened by houses or trees.

Wishing "P.W." and the inventors of the Unidyne every success.

Yours faithfully,
G. ANDREWS.

44, Grosvenor Place,
7Newcastle-on-Tyne.

FURTHER RESULTS WITH A UNIDYNE.

The Editor, POPULAR WIRELESS.

Dear Sir,—Further to my letter which appeared in "P.W." a few weeks ago, I should like to let you know the results I have obtained with the Unidyne.

With the detector valve alone, I have received 2 Z Y, 5 S C, Radio-Paris, Madrid (Radio Iberica), and a French station which I believe is "Le Petit Parisien."

Chelmsford comes in at about the same strength as 2 L O; the latter works a small loud speaker, which is audible all over the room.

I was recently lent a new type of Dutch valve which gives excellent results.

I have found that a ·001 mfd. variable condenser gives far better results than a ·0005, but I attribute the success of my receiver to the Bretwood Variable Grid Leak.

Wishing "P.W." success.

I am,
Yours faithfully,
E. G. BARRATT.

112, Bedford Road,
Clapham, S.W.4.

SETTLING INTERFERENCE TROUBLES.

The Editor, POPULAR WIRELESS.

Dear Sir,—Could you find space in your publication for the inclusion of this letter which will, I think, be helpful to Mr. G. E. Holloway and others who are troubled with interference from their local station and from an apparent loss of range during the past few months? Until June, I was using a very well known 2-valve reflex broadcast set, and during last winter was able to receive all the B.B.C. stations on a loud speaker, but Cardiff could always be heard when listening to Bournemouth. However, when Cardiff was closed, all B.B.C. stations came in well, even in the daylight. Purity of sound, however, was not very noticeable, and in June I built a 3-valve set,

(*Continued on page 352.*)

CORRESPONDENCE.

(*Continued from page* 351.)

using 1 H.F., 1 det., and 1 L.F. valve, with intervalve reaction. Now, upon testing the set, all stations came in after it was dark, but during the daylight only Cardiff, Bournemouth, Birmingham, and, in Cardiff's closed periods, Manchester, were audible. I was using Ediswan A.R.D.E. valves with 45 volts on the plates. I had in view two objects, viz., long range and superselectivity. I increased my H.T. voltage to 70 volts, and I at once attained my first object—i.e. range. Madrid came in at loud-speaker strength, using only a frame aerial with eleven inch sides. I now aimed at obtaining selectivity, and, as I am only eight miles from Cardiff, this promised to be a rather difficult problem. The first thing which I did was to check my tuning apparatus. My condensers could not be improved upon, as they were precision instruments, with separate verniers, and a vernier was also connected across the reaction coil which, of course, gave extremely critical adjustment. Cardiff could be completely cut out when listening to Bournemouth, but jammed Manchester and Plymouth very badly. London, of course, being quite inaudible. Hitherto, I had been using the following coils—aerial 35, anode 50, reaction 50, ·0005 condenser in parallel with aerial coil. These coils gave me all stations up to 400 metres, and for stations above that wave-length, but below 530 metres, I used aerial 50, anode 75, reaction 50. I now found that this last arrangement of the coils would also give me Bournemouth, Manchester, and London, but not Cardiff, so by using these coils I can completely cut out Cardiff. In addition, I would like to emphasise the fact that a variable grid leak is a most valuable tuning asset. You may be listening to a station with the set so near to oscillation point that the music is "rough," and the speaker's voice blurred. Decrease the resistance of the leak until the music and speech becomes clear, and you will be getting the last ounce out of your set.

Another aid to selectivity and range is a T aerial. Once tried it will be found an improvement undreamt of, as it facilitates sharp tuning.

I sincerely hope that these remarks may be a help to those troubled by interference.

Wishing your paper every possible success.

I am,
Yours faithfully,
CHAS. W. NEWSOME MARTIN.

2, Glencoe Villas,
Upper Worle,
Weston-super-Mare.

KINDLY ASSISTANCE.

The Editor, POPULAR WIRELESS.

Dear Sir,—In a recent issue, you were kind enough to publish a letter headed "Interference," re the difficulties I have experienced in cutting out 2 L O and receiving other B.B.C. stations.

Within 48 hours I was surprised to receive four letters from readers of "P.W.," two in London district, one from Manchester, and another from Salisbury, volunteering in the most friendly and disinterested way to give me practical help in getting over the problem.

I am, of course, individually thanking my kindly correspondents, and also availing myself of their help.

I think this result is a tribute both to the circulation and interest taken in "P.W." by its readers, and to the fraternal spirit which wireless engenders amongst its devotees.

Yours faithfully,
GEORGE E. HOLLOWAY.

Wilbury,
71, Sydenham Road North,
Croydon.

IN PRAISE OF THE UNIDYNE.

The Editor, POPULAR WIRELESS.

Dear Sir,—Poor old Mr. High Tension. Shed a tear for the passing of an old and faithful servant. With full respect, I have read his burial service and committed his body to the deep.

My first reception on 2-valve Unidyne—detector and L.F.—2 L O a revelation, speech and music of bell-like clearness, atmospherics practically nil.

This is the first set I ever made and had no directions beyond those contained in POPULAR WIRELESS.

Distance as crow flies about 300 miles, very stormy night, with 100 ft. aerial swaying rapidly.

Found two critical factors to be grid-leak and earth, both must be of the best.

Give the inventors the thanks and congrats. of a now very radiant radio fan.

Yours truly,
J. B. TIVY.

Montgomery House,
Carlow,
Ireland.

THE CONVERSION OF A SCEPTIC.

The Editor, POPULAR WIRELESS.

Dear Sir,—As a wireless engineer of 18 years' experience in radio, please allow me to tender my congratulations to Messrs. Dowding and Rogers on their production of an H.T.-less circuit which amplifies. Certainly, I was at first sceptical regarding their claims, not so much in substance as in their method of presentation to the public via POPULAR WIRELESS. Do not think I was antagonistic to the claims. I am, as you may understand, a disciple of Sir Oliver Lodge's, and naturally considered the favourable comments given by him were merited.

However, last Wednesday I obtained the necessary components for a two-valve set from Messrs. Bower Electric, Ltd., and had the set assembled in a short time after arriving home, and can only describe the results obtained as WONDERFUL!

It is to be noted that I cannot trace reradiation from any part of the circuit or aerial when the set is oscillating beyond two to three feet, and this on an aerial which is designed for transmission, and naturally has a comparatively low resistance.

You are at liberty to use any part of this letter for publication providing my name does not appear, as I am a civil servant, and communication with the Press is forbidden, even though it be on matters conducted privately, such as this.

I am, dear sir,
Yours faithfully,
(———) A.M.I.E.E., M.I.R.E.

SHREWSBURY AND DISTRICT RADIO SOCIETY.

The Editor, POPULAR WIRELESS.

Dear Sir,—The committee of the above society have been asked by several members to arrange, during the coming session, for a lecture and demonstration illustrative of the Unidyne system of H.T.-less reception for the inception of which we are indebted to yourself and your technical staff.

I am, unfortunately, not in a position to meet the demands that have been voiced, from among the local experimenters of whom I have made enquiries in this direction. I am not sure whether the matter comes within your purview, but in my extremity I am moved to ask whether, perchance, you have any arrangements in hand for the loan of the necessary apparatus, etc., for such a demonstration. Failing this, can you put me in touch with a source from which I might obtain the necessary requirements?

No doubt you have already had much proof of the efficacy of demonstration before the local societies in such matters as this, for the increase of their popularity, etc. Speaking purely locally, this was emphasised considerably as a result of our examination of the "P.W." Super last year, which justifies me in the pursuit of satisfaction for the demand regarding the Unidyne.

Your reply will be much appreciated.

Yours faithfully,
J. C. WELLS.
Local Secretary.

The Mount, Shrewsbury.

THE "P.W." ULTRA.

The Editor, POPULAR WIRELESS.

Dear Sir,—I made up the "P.W." Ultra set for 1,600 metres, and would like to let you know the results obtained. I am 42 miles from 2 L O and 60 miles from Bournemouth, but both these stations can be heard quite well after dark. Music, however, can be heard any time when either of these stations are working. I did not include a separate loading coil for 5 X X in the box, but took the 60th and 61st turns of the main coil direct to the loading plugs. Using a 150 turn home-made basket coil, 5 X X comes in with great volume, in fact it was so good on Saturday night that I put on my T.M.C. Junior loud speaker and could hear the Savoy bands quite well. Chelmsford is about 80 miles from here. The set was made for a friend who lives in London, but I am so pleased with it that I don't think he will see it for quite a long time yet.

With reference to the "Novel Circuit" published in your excellent paper some time ago, I made this up as a three valve, using the "Novel Circuit" as detector and two L.F. amplifiers connected in the conventional manner. I found the filament current very critical, and shall fit a microstat later. I used a fixed grid leak (Dubilier 1·5 megohms), and altered the order of the condensers, using the ·0003 variable for grid and the ·0005 for aerial tuning. This I did after trial of the method shown in the circuit as published, and found it worked beter. With the ·0003 condenser I was able to get Bournemouth, Cardiff, and London, but with the ·0005 in the aerial circuit I was able to receive all the B.B.C. main stations (at loud speaker strength), also some continental stations.

Thanking you for these and other excellent circuits.

Yours faithfully,
H. E. SMITHERS.

Hursley,
Hook, Hants.

NEWCASTLE WIRELESS NOTES.

From Our Own Correspondent.

THE local station seems to be as far away as ever from getting the much-discussed new studio. Arrangements were fairly well advanced for taking over premises in Grey Street, but now I understand that there has been a hitch, and that matters have received a serious set-back.

Interest in radio matters is quickening with the advent of longer nights, and there is an optimistic feeling among wireless traders that another good winter lies ahead.

The Retirement of Mr. Crosse.

A continuous association with 5 N O has been broken with the retirement of Mr. W. A. Crosse, the director of music to the studio. Mr. Crosse has been indefatigable in his services to Newcastle station, which dates back to the opening concert in December, 1922. In addition to conducting the station orchestra, he has acted as solo pianist, solo clarinet, and as accompanist.

The cause of his retirement is severe nerve strain. As director of music he had the task of compiling programmes, and booking artistes, in addition to his orchestral work, and this sometimes necessitated eight or nine hours labour at the studio, in premises that could be only described as inadequate.

Mr. Crosse was a very well-known figure in north country musical circles before the B.B.C.'s activities commenced. For twenty years he was deputy conductor of Amers' Band. He hopes still to give an occasional solo turn at 5 N O after he has had a holiday. One hopes that he will soon be quite fit again.

The Local Society.

The Newcastle Radio Society, at their annual general meeting, decided to extend the sphere of their activities and provide a separate service for listeners-in, and to this end lectures, debates and demonstrations, in addition to the experimental programme, are being arranged. The society issue an appeal to all local experimenters and broadcast listeners to give them assistance, so that Newcastle may show a lead in amateur radio organisation.

A local society of amateur transmitters has been formed under the name of Newcastle Amateur Transmitters' Society, with Mr. H. S. Nicholls, 11, Queen Street, as hon. secretary. All interested are cordially invited to communicate with the secretary.

The Editor of "Popular Wireless" welcomes photographs of amateur sets from readers, or anything else of particular wireless interest. 10s. 6d. will be paid for each photograph used.

TECHNICAL NOTES.

(*Continued from page 306.*)

It is better to secure the "tin" to the supporting wire than to the aerial wire, as in the former case it is in a position slightly slanting downwards; whilst if attached to the aerial wire, it might collect water. Of course, if the aerial is high at one end and low at the other, it may be desirable to fasten one cowl to the supporting wire at the high end of the aerial and the other one to the aerial wire itself at the low end of the aerial. The principle to be observed, in any case, is to arrange the cowl so that the water runs off it, and not into it.

Making Holes in Glass Panels.

The following method of making holes through glass sheet was sent to me some time ago. Take some sand, moisten it slightly, and place about a teaspoonful of it about the place where the hole is to be made. Then take a lead pencil, or other round object about the size of the hole which it is desired to make, and press it into the sand, thus making a sort of mould.

Now melt some lead and pour carefully into the hole in the sand, taking care that there is no "spitting." After this, the little circle of glass is supposed to fall out, leaving a clean hole. I had one of my assistants try this, but, in the limited time he was able to give to it, he didn't seem to have much success. Perhaps, however, some of my readers with time to spare may care to see whether there is anything in the idea. If there is, I should be glad to know more about it.

Coil-Winding Hint.

When winding coils, using the conventional small-gauge cotton- or silk-covered wire, it is often a matter of some difficulty—at any rate, to beginners—to keep the wire from getting into kinks, and also to maintain a uniform tension on it. The kinking is particularly annoying, and may spoil the work altogether. In order to avoid this, it is necessary to arrange that the wire unrolls from the bobbin without twisting about its own axis.

(*Continued on page 355.*)

THE HOME DOCTOR.

TUESDAY, October 14th, is to see the publication of an important new fortnightly part work, which should find a place in every home. It is to be called "Harmsworth's Home Doctor," and will form a complete encyclopedia of good health.

It has been written by a group of general practitioners and specialists, and will be fully illustrated, mainly by photographs taken specially for the work under the supervision of physicians and surgeons. It will represent the very last word of medical knowledge, and will be of great usefulness in every home, and invaluable where there are children. The price will be 1/3 per part, and it is to be completed in about 36 parts.

TECHNICAL NOTES.

(Continued from page 354.)

A correspondent writes to "Radio News" (New York) giving a description of a very simple device which he says aids considerably in overcoming the difficulties referred to. His device consists of six bobbins, such as cotton reels, or porcelain insulators, mounted on a baseboard by means of a nail passed down the centre of each. These bobbins are free to turn easily on the nails, and are arranged in two rows, 6 inches apart, the three bobbins in each row being also 6 inches apart from one another. Calling the bobbins in the two rows 1, 2, 3, and 4, 5, 6 respectively, the wire from the spool (which is also held by means of a nail down its centre and at about six inches from numbers 1 and 4) passes around bobbin number 1, then around 4, then 2, 5, 3, 6, and finally on to the coil which is being made.

This will all be much clearer if you make a little sketch from the foregoing directions. When the wire is now drawn past all these bobbins there is just a nice tension on it to permit of proper winding, and any irregularities are straightened out as the wire passes the various bobbins. If you find that the wire pulls past too freely, one or more of the bobbins may be prevented from turning by driving the nail down until the head of the nail just locks the bobbin.

Fusible Alloys.

The references I made recently to the manufacture of fusible alloys, such as Wood's metal, have brought me a number of inquiries as to the composition of other low-melting-point alloys. In reply to all these, I would say that a very full and useful paper on the making and properties of fusible alloys is published in the Journal of the Society of Chemical Industry, XLIII, pp. 200–203, by Dr. N. F. Bugden, of the Metallurgy Department of the University of Birmingham. This contains far more information than I could possibly reproduce here, and will be found most valuable to those who are desirous of conducting experiments in the making of these different alloys.

Concentrating Electron Stream.

In a recent number of "Radio" (Berlin) is an account of an ingenious method, due to the well-known German scientist, Dr. Siegmund Loewe, for utilising the principle of the Tesla transformer for concentrating an electron stream so as to obtain an intense and comparatively pure beam of X-rays from a vacuum discharge-tube. A full description will also be found, by those interested, in German patent No. 395,822, together with diagrams showing the very ingenious constructional methods adopted in the manufacture of the discharge-tubes.

New Loud-Speaker Principles.

Since the advent of broadcasting a great deal of attention has been given to the subject of loud-speaker design, and some more or less revolutionary changes have been made from the designs formerly in vogue. A loud speaker of some novelty has been produced by the well-known German firm of Siemens & Halske, and is the result of the work of two of that company's engineers, Wagner and Luschen. It has

(Continued on page 356.)

TECHNICAL NOTES.

(*Continued from page 355.*)

been shown by mathematical analysis that for maximum efficiency the mass of the diaphragm must not exceed the mass of the air which is set in motion by it; if possible, the mass of the diaphragm should be less than this.

Owing to this theoretical condition, a search has been made for some form of diaphragm which shall be sufficiently robust to be manufactured with reasonable facility, and which shall nevertheless be as light in weight as possible. Instead of applying the varying speech-currents to the electro-magnetic field, as in the conventional type of loud speaker, the speech-currents are passed through the diaphragm itself, the latter consisting of a strip of extremely thin aluminium foil, made into a pleated or wavy formation.

This becomes thus a conductor carrying a current and placed in a magnetic field and, in accordance with well-known laws, it is deflected by the magnetic field to an extent which depends upon the strength of the current in it. It therefore vibrates in accordance with the speech-current variations. A loud speaker on this principle has been used in Germany for reproducing speech in the open air to an audience of 50,000 persons.

The same device can also be used conversely as a microphone, and is stated to be so satisfactory when used in this way that it is proposed to instal it for this purpose in all the German broadcasting stations.

Recording Possible Mars Signals.

In order to enable a more complete investigation to be made of the mysterious sounds heard when listening-in on Mars recently, Mr. C. F. Jenkins (well known for his television experiments) and Prof. David Todd, Professor of Astronomy at Amherst, and organiser of the international listening-in for Mars signals, arranged to have a permanent record of the sounds received upon a photographic film. This film was 30 feet long and 6 inches in width, and after completion it "disclosed in black on white a fairly regular arrangement of dots and dashes at one edge; whilst at the other edge, at almost evenly spaced intervals, were curiously jumbled groups, each taking the form of a crudely drawn face." The latter occur at intervals of about half an hour on the film.

Mr. Jenkins does not consider that these markings have anything to do with Mars, but at the same time he is unable to offer any satisfactory explanation of them. The films have been sent to the cipher experts of the United States Navy Department to see whether they can discover any meaning for the mysterious markings.—"Radio Digest." (N.Y.).

Removing Insulation from Wire.

When employing insulated wire it is necessary to bare an inch or two at each end. If the wire is of fairly fine gauge cotton or silk covered, this operation is readily done by means of a penknife; but with heavier wire, particularly rubber-covered cable, it is not so easy. A very handy "skinner" may be made from a strip of steel or brass about a foot long, one sixteenth inch thickness and, say, one inch broad.

This is first bent double, after the fashion of a large pair of tweezers, and the ends are then turned in again, to form teeth or jaws. Each of these jaws is then filed out to make a large V, extending across the width of the jaw, and the edges of the jaws are then sharpened by means of the file. When it is desired to strip a piece of cable, the latter is inserted between the jaws and gripped there between the angles of the two V's, and the stripping tool rotated so as to cut all round the insulation.

The stripping tool is then held firmly in one hand and the cable in the other, and the severed piece of insulation pulled away. If the insulation adheres too firmly to the wire, the work should be done in two or three operations, smaller segments of the insulation being stripped off each time.

Exide

The LONG-LIFE BATTERY

"Exide" Batteries enable you to get the very best results from your set, because they maintain uniform current over a long period of discharge.

Made up in 2-volt, 4-volt and 6-volt units, there is an "Exide" available for every type of valve.

The prices are low, and there is no better battery made.

Use an "Exide" with your set this Autumn and secure clearness in reception.

BUILT BY THE LARGEST BATTERY WORKS IN THE BRITISH EMPIRE

Exide Batteries can be obtained from your usual dealer or the nearest Exide Service Station.

Look for this sign.

450 Service Agents.

Depots at Birmingham, Bristol and Manchester.

Manufactured by

THE Chloride ELECTRICAL STORAGE COMPANY LIMITED

at CLIFTON JUNCTION, NR. MANCHESTER.

London Depot: 219/229, SHAFTESBURY AVENUE, W.C.2.

Some Types and Prices

CZ TYPE. 4-Volt Sets

TYPE	IGNITION CAPACITY Amp.-Hrs.	ACTUAL CAPACITY Amp.-Hrs.	PRICE Cells Only £ s. d.	PRICE In Crate £ s. d.
2-CZ3	60	30	1 7 0	1 14 0
2-CZ4	80	40	1 12 0	1 19 0
2-CZ5	100	50	1 17 0	2 5 0
2-CZ6	120	60	2 2 0	2 10 0

CZ TYPE. 6-Volt Sets

3-CZ3	60	30	2 0 6	2 8 9
3-CZ4	80	40	2 8 0	2 16 6
3-CZ5	100	50	2 15 6	3 4 0
3-CZ6	120	60	3 3 0	3 12 6

CX TYPE. 6-Volt Sets

3-CX5	150	75	3 18 6	4 7 9
3-CX6	180	90	4 9 0	4 19 0
3-CX7	210	105	4 19 0	5 9 3
3-CX8	240	120	5 9 0	5 19 6

HZ TYPE. 2-Volt Cell

1-HZ2	80	40	0 17 6	1 3 6
1-HZ3	120	60	1 1 0	1 8 0
1-HZ4	160	80	1 4 6	1 12 6

DTG TYPE. 2-Volt Cell

TYPE	INTERMITTENT DISCHARGE	PRICE
D T G	20 amp.-hrs.	5/- per cell

ISLAND STAND No. 5

WIRELESS EXHIBITION, MANCHESTER, OCT. 14th.

LISSENIUM

IS YOUR LEAK RESISTANCE RIGHT?—

You can put a resistance in circuit whose value will be so inaccurate and fluctuating that the leak is useless. Though some circuits and valves are not so susceptible to variable grid control as others, it is reassuring to know that one has the means to control grid potential so that the correct value is obtained for any circuit or valve, or the particular conditions under which a valve may be working. With the LISSEN VARIABLE GRID LEAK fitted, the receiver will yield the utmost sensitivity which correct grid potential under all conditions implies.

LISSEN ONE-HOLE FIXING, OF COURSE **2/6**

LISSEN VARIABLE ANODE RESISTANCE, 20,000 to 250,000 ohms, same outward appearance as LISSEN Variable Grid Leak.. .. .. **2/6**

TO SMOOTH OUT LOUD SPEAKER DISTORTION — PUT A LISSEN VARIABLE GRID LEAK ACROSS THE SECONDARY OF THE LAST TRANSFORMER, OR ACROSS THE LOUD SPEAKER ITSELF. FIRST POSITION IS BEST. THE DIFFERENCE WILL BE VERY NOTICEABLE.

PARTS THAT PULL TOGETHER.

Use LISSENAGON COILS for sharp tuning—for strong tuning.

Use LISSEN TRANSFORMERS and LISSEN CHOKE for fine tone and pleasing volume.

Use LISSEN H.F. Parts for extending range.

Use LISSEN TUNER for conveniently covering a wide wave-length.

DON'T MIX YOUR PARTS

A Receiver built with all LISSEN parts will give results which would never be possible if you used mixed parts.

LISSEN LIMITED

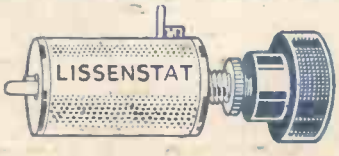
8-16, Woodger Rd., Goldhawk Rd., Shepherd's Bush, London, W.12.

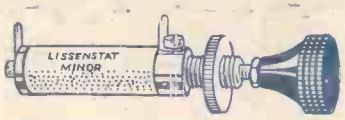
Telephones: 3380, 3381, 3382, 1072 Hammersmith.
Telegrams: "Lissenium, London."

PARTS WITH HIDDEN POWER — BUILD WITH THEM.

COAXING THE VALVE—AT NIGHT TIME

SIGNALS THAT PASS IN THE NIGHT!—You get them stronger and from farther away if you are using LISSENSTAT control. After you have tuned in as far as you can go with every other control on your receiver you can still do a great deal more—IF YOU ARE USING LISSENSTAT control. When at last you realise that you are on to an unknown station there is a thrill in the thought that it has been brought in to you by nursing the valve with the turn of a knob that stands out so simply above your panel.





The secret is in the structure of the LISSENSTAT and its composition—so critically is it possible to control electron emission of the valve that you can get right on to the very spot necessary for the finest detection of long distance telephony.

LISSENSTAT (patent ending)—gives the most acute tuning possible.. .. .. .. **7/6**

LISSENSTAT MINOR (patent pending)—is replacing many thousands of discarded and inefficient rheostats. Provides LISSENSTAT controls at a popular price **3/6**

LISSENSTAT UNIVERSAL (patent pending)—with its protective device for dull emitters **10/6**

All types have LISSEN ONE-HOLE FIXING, OF COURSE.

You can feel for fine detection—if you use LISSENSTAT Control.

USE A RADIO SWITCH

Many switches sold are undesirable for radio work—they have been designed from the purely electrical point of view, which is not good enough for radio.

LISSEN SWITCHES, on the contrary, have been designed primarily for radio, but they are useful also for other switching purposes. You just gently pull or push them, and you hear them make with a reassuring "click"—and you know they are free from capacity effect.

WHAT LISSEN 5-POINT SWITCH DOES

a. Switches off one stage of L.F. without touching the filament control—a separate switch for each stage.

b. Connects the telephones to the plate of whichever valve it is desired to use, and at the same time switches off the L.T. current from the unused valve.

c. Cuts out a stage of H.F. in the same way as it does L.F. (we do not recommend any switching in H.F. circuits where it can be avoided, but where it is decided to use a switch, this is the switch to use).

d. Will also disconnect both the H.T. and L.T. batteries, and short the aerial to earth so that the receiver can be left adjusted ready for switching instantly into commission next time. With diagram.

Price 4/-

LISSEN REVERSING SWITCH

Particularly useful when the LISSEN 5-point switch is used for cutting out one stage of H.F. When a H.F. stage is cut out, and reaction is being taken off the aerial circuit, it is necessary to reverse the reaction coil connections for each H.F. stage cut out, and this new LISSEN switch conveniently does it. Can also be used anywhere when it is necessary to reverse the connections of a battery, a coil, or a condenser, for instance. VERY USEFUL FOR COMPARATIVE TESTS. With diagram **4/-**

TWO OTHER LITTLE SWITCHES.

LISSEN 2-way switch .. .. **2/9** LISSEN Series-parallel switch .. **3/9**

All applications for Advertisement Space in POPULAR WIRELESS to be made to JOHN H. LILE, LTD., (Sole Agents), 4, Ludgate Circus, London, E.C.4. 'Phone: 1080 Central.

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R/R

POPULAR WIRELESS WEEKLY, October 18th, 1924. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

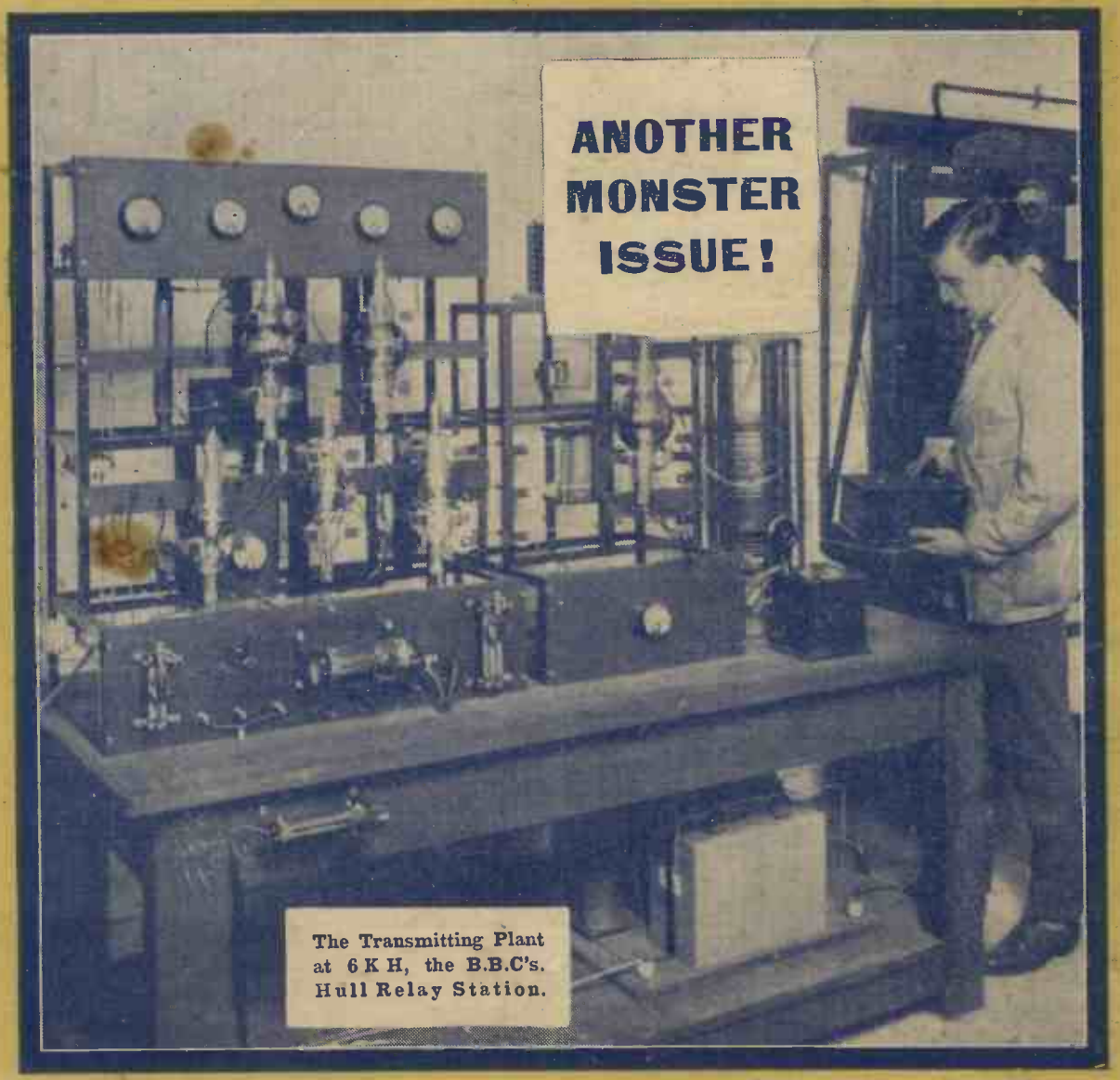
FREE BOOK ON CRYSTAL SETS THIS WEEK.

Popular Wireless

and Wireless Review

PRICE 3d. EVERY FRIDAY.

No. 125. Vol. VI. SCIENTIFIC ADVISER: SIR OLIVER LODGE, F.R.S., D.Sc. October 18th, 1924.



The Transmitting Plant at 6 K H, the B.B.C's. Hull Relay Station.

SPECIAL FEATURES IN THIS ISSUE.

The Real Thing v. Broadcast.
A Crystal Set for 5 X X.
Sidelights on Wireless.
Building a One-Valve Super.
Remote Filament Control.
Making Card Inductances.

etc., etc., etc.

And a Special

TWO-PAGE MAP OF BROADCASTING STATIONS.

The Spirit of Pioneering

THE spirit of Pioneering—that driving force which compelled such men as Cook, Livingstone, Stanley, Scott, and others to write their names boldly in the pages of our national history—has also its counterpart in industry.

There is not one invention that has not been seized upon and improved almost out of recognition because some keen-witted scientist realised that following in the beaten track meant an end to progress.

Take Wireless Valves as an example. For a considerable period it seemed obvious that the most practical design for the three components of the valve was a long, straight filament operating within a spiral Grid—the whole surrounded by a tubular Anode.

That such a design has the disadvantage of permitting a certain proportion of the electron stream to leak out of each end of the Anode without doing any work is quite apparent. Yet not until the Cossor Valve—with its arched filament and hood-shaped Grid and Anode—was placed on the market that any serious attempt was made to effect an improvement.

And the same spirit of pioneering is apparent in the clever method of packing Cossor Valves, now being introduced. In future all Cossor Valves will be sold in sealed cartons, and by means of an electrical device the dealer can demonstrate that the filament is intact *without breaking the seal*. This patented method is an exclusive Cossor feature and a definite guarantee that the valve you buy is new and unused.

¶ The new Cossor Dull Emitter—the Wuncell—is fully described in a comprehensive Folder which will be sent post free to any experimenter on receipt of a postcard. Don't invest in a Dull Emitter Valve until you have read about the Wuncell.

Cossor

Types:

P.1. For Detector and Low-Frequency use 12/6

P.2. (with red top) For H.F. use only 12/6

From all Dealers

A.C COSSOR, Ltd., HIGHBURY GROVE, LONDON, N.5.

Cossor Valves

Gilbert Ad. 1568

Pilot Panel Service

The Pilot Panel Service explained:

WHEN a man decides to build a good Receiving Set he immediately comes up against the difficulty of a suitable cabinet and the drilling and the engraving of the Panel. Cabinet-making is a skilled man's job and many a perfectly good piece of ebonite has been spoilt by a hole in the wrong position or because it has been incorrectly cut to size.

To eliminate most of the difficulties in Set-building we have instituted the PILOT Panel Service. In future ALL Sets described in all the principal Wireless Magazines, will be available in sets of parts for the Home Constructor with panels ready drilled, tapped and engraved. Two types will be placed on the market—Type A, following the author's literal specification and using his actual components, and Type B, an adaptation using Peto-Scott guaranteed components. Naturally through standardisation of components and our lower manufacturing costs due to large output, Type B will often show a large saving over Type A.

Remember that if our instructions are followed we positively guarantee that all Type B Receivers are the equal in every respect to the more Expensive Type A Sets. Our Service Dept. is available for all our customers and will test and rectify errors of construction at a nominal charge. We want all our customers to have the utmost confidence in every Set produced under the PILOT Panel Service.

Five exclusive Pilot advantages:

1. **Absolutely no previous Wireless skill required—the only tools necessary are a screwdriver and a pair of pliers.**
2. **Every Set when completed is quite the equal in efficiency of the original.**
3. **Provides a high-grade Instrument at the cost only of the components.**
4. **Success guaranteed—failure quite impossible if instructions are followed.**
5. **Every Instrument designed by a recognised expert.**

Pilot Panels

Every Wireless Receiver depends for its efficiency upon the panel. Low grade ebonite will prevent any Set from functioning properly. Every PILOT panel is manufactured from the highest grade Post Office ebonite cast accurately to size, matt finished on both sides, and with edges squarely ground. We guarantee every panel to be leak-proof and non-warping. Each panel engraved with word "PILOT," and supplied carefully packed in sealed wrapper. Standard ¼-in. thickness throughout.

All these splendid Sets now available

The Transatlantic V (a super 5-valve long distance Receiver).
The S.T. 100 (2-valve).
The 3-valve Dual Receiver.
The Puriflex (4-valve).
The All Concert-de-luxe (3-valve).
The 4-valve Family Receiver, and others.
All these Receiving Sets have been designed by prominent radio engineers and described in various issues of "Modern Wireless."

The Transatlantic V
An illustration of Type B. Note that valves are behind panel, free from risk of damage. Two stages of high frequency. amplification ensure a long range of operation.

Write to-day:

Before building a new Set, be sure you get particulars of the wide range available under the PILOT Scheme. Our literature (free on application) will show you exactly the components you need for any Set and their price. Register your name for a free copy of a large Illustrated Folder to be issued immediately.

PETO-SCOTT CO. LTD.
Registered Offices:
77, CITY ROAD, E.C.
(For all Mail Orders).

Branches:
LONDON: 62, High Holborn, W.C.1, and 230, Wood Street, Walthamstow.
CARDIFF: 94, Queen Street.
LIVERPOOL: 4, Manchester Street.
PLYMOUTH: Near Derry's Clock.

POPULAR WIRELESS

AND WIRELESS REVIEW.

October 18th, 1924] THE RADIO WEEKLY WITH THE LARGEST CIRCULATION. [Every Friday, Price 3d.

Technical Editor: G. V. DOWDING, Grad.I.E.E. | Editor: NORMAN EDWARDS, M.Inst.R.E., F.R.G.S. | Scientific Adviser: Sir OLIVER LODGE, F.R.S.

RADIO NOTES AND NEWS OF THE WEEK.

Next Week's Free Booklet.

YET another booklet will be given away with next week's POPULAR WIRELESS. It is entitled "All About the B.B.C.," and your humble servant is the author—or shall I say "the guilty party"? This is not a technical booklet; it is just a "potted" story of some of the anecdotes, stories, etc., I have collected about the B.B.C. during the last two years, and I hope you will write and tell me whether you like them.

* * *

Rome Calling.

THE Marconi broadcasting station at Rome, which has been engaged on tests for some weeks up to now, has commenced a regular broadcasting of programmes. Concerts will be given nightly between 7.30 and 9.30 (Greenwich time). Wave-length, 422 metres.

* * *

5 X X Certain.

NEWS that a permanent high power station will be erected within six months caused the winter wireless season to come in with a rush this year. Listeners who had been hovering on the brink of uncertainty immediately "fell" for the new 5 X X, which will be the backbone of the B.B.C.'s organisation, and the last word in high-power broadcasting.

* * *

A Great Effort.

CHELMSFORD has proved tremendously successful, but the proposed station to be erected in the Midlands will be on far more ambitious lines than the present 5 X X. During the time that there was no certainty regarding a site, power or wave-length, the B.B.C. were hampered by all sorts of experimental considerations; but the forthcoming installation will not suffer from these limitations, and I hear that the British super-station will embody every latest broadcasting improvement, in an effort to "tell the world."

* * *

The Smallest Loud Speaker.

ONE of the exhibits at the Radio World's Fair, New York, was the world's smallest loud speaker. This tiny instrument could easily be concealed in one hand, and when placed upon a large coin it appeared lost in comparison! Nevertheless, it worked quite well, and could be heard distinctly at a distance of ten feet.

* * *

Another Continental Station.

TO the new stations that are helping to make the European ether a happy hunting ground must now be added Zurich, which has just started broadcasting on 650 metres. Concerts are being transmitted at 8.30 p.m. daily, and it will be interesting to see if listeners in the Midlands can receive the Swiss station, which, on the coast, will be hopelessly jammed by shipping.

* * *

U.S.A. to S.A.

AFTER experimenting for eight months two wireless amateurs in Johannesburg have received broadcasting direct from Pittsburg, U.S.A. A five-valve set was in use at the time, and the baseball results were almost as clear as speech from the local station. The distance covered was about 7,200 miles.

* * *

Assisting Mariners.

THE new wireless directional station at Niton, Isle of Wight, is being completed with all possible speed, and will probably commence operations before the end of October. Other stations are contemplated, to assist navigators to find their position during foggy weather; and the excellent services rendered to shipping by similar installations at Fire Island, Nantucket, and the approaches to New York, will soon be available over the world's most crowded waterway.

* * *

The Worst Offender?

OSCILLATIONS are breaking out again very badly in the London area, and in some districts listening-in has been a nightmare for the past week or two. Brixton is bad, and Enfield has not been exactly free from trouble, but I think that the most constant and apparently deliberate offender is in the Chadwell Heath area. He generally starts operations about 8 p.m., and when in form he succeeds in absolutely spoiling reception for the rest of the evening.

* * *

A Soldier's Farewell.

WHEN General Pershing said farewell to the United States army the other day his speech was broadcast by seventeen different stations to millions of listeners. The object was to ensure that all retired soldiers who wished to hear their chief's good-bye should have a chance of listening-in to the ceremony.

* * *

The New Relays.

STOKE-ON-TRENT relay station is due to commence operations on Tuesday, October 21st, and the opening ceremony at the King's Hall will be S.B. to all stations. Three days later Belfast will be officially opened, and before Christmas Dundee and Swansea will follow suit. *Then* comes the Midland's high-power station, and the B.B.C. will be able to rest upon their laurels—perhaps!

* * *

Captain Eckersley's Tour.

WASHINGTON, Pittsburg, Philadelphia and Montreal will all be visited by Captain Eckersley during his stay in America, whither he has gone to investigate American and Canadian methods of broadcasting. In view of his unique position as chief engineer of the world's biggest broadcasting company, he is sure of a cordial welcome, for up to date a pleasing feature of broadcasting is the fact that the methods used in different countries are freely published and compared.

* * *

New Services.

THE Austrian Broadcasting Company has formally commenced its services, and elaborate musical programmes are being arranged for the winter. The

(*Continued on page 362.*)

WHAT THEY SAY.

"Broadcasting is the good fairy of the slums . . . Imagine what it must mean to East London when the Queen's Hall Orchestra floods its foul courts and dark alleys with the majestic strains of the Fifth Symphony. . . ."—Harold Begbie, writing in the "Radio Times."

* * *

". . . It is just a little misleading to suggest that multi-valve sets are responsible to a greater extent for jamming than are more simple sets. . . .

"The most serious offender is undoubtedly the man who uses a single-valve receiver with reaction on to the aerial. . . ."—Frank Phillips, A.M.I.E.E., in a letter to the "Evening News."

* * *

". . . Those who prefer a jazz band to a classical orchestra, or a learned lecture to a vocal solo, must bear in mind that the programme has been drawn to interest people of diverse tastes, and to appeal to the largest possible number of hearers. . . ."—Mr. R. F. Palmer (Uncle Rex), director of the London Station.

* * *

Tall as a village spire,
A slender fir-tree set upon the hill
Carries the news—or Chopin—at your will,
Along the fine-drawn wire.

Aerial and telephone,
Batteries, valves (so little for so much),
And half of Europe answers to your touch,
Whispers to you alone.
"Wireless at Night," from "Punch."

* * *

". . . If you are oscillating, listeners for five miles north, south, east, and west of you can hear you, and their reception is affected. This represents an area of approximately seventy-five square miles! . . . I just leave it to you now."—Uncle Jack Frost in "Wireless Yarns."

* * *

THE WEEK'S QUERY.

I want a good 3-valve set suitable for strength and distance, combined with cheapness, economy in cost of running, and freedom from interference. It must be easy to handle, and I should like all the valves to act as dual amplifiers, with switches to cut out the reflex action when desired. Also switches to use 1, 2, 3, or 4 valves, and double reaction is essential. Can you let me have the pictorial diagram by return?

NOTES AND NEWS.

(*Continued from page 361.*)

official opening of the Vienna station on October 1st was conducted on lines similar to the British ceremony, and was marked by speeches from the Burgomaster and Chancellor Seipel.

* * *

The A.B.C. ?

LONDONERS are already asking if the Austrian Broadcasting Company will call themselves the A.B.C. ? And, if so, what the French high-power station at Lyons is going to do about it ?

* * *

A Reminder.

HAVE you had your "reminder" from the Post Office ?

About a fortnight before your licence is due for renewal you will receive a printed notice from the G.P.O. jogging your memory and asking for payment at the nearest post-office.

* * *

The New Arrangements.

LICENCES are now available for twelve months, reckoning from the first day of the month of issue.

Formerly any licence taken out in either of the four quarters of the year expired at the beginning of that quarter the following year. The new arrangement has been reached by agreement between the B.B.C. and the Post Office, and it is certainly a great improvement from the listeners' point of view.

* * *

An Apology.

WE wish to inform readers of an unfortunate *faux pas* which occurred in the October 4th issue of POPULAR WIRELESS. On Page 234 there appeared a diagram of a double dual circuit, and we should like to point out that in this case the circuit is the copyright of Mr. John Scott-Taggart.

We should like to apologise to Mr. Scott-Taggart for the very unfortunate error in reproducing this circuit without acknowledgment to him. Owing to the very numerous circuits sent in to us, it sometimes happens that certain circuits are used for publication in POPULAR WIRELESS which are subject to letters copyright and letters patent.

In the case referred to above we were unaware at the time that the circuit was subject to these reservations, and we wish to take this opportunity of paying full credit to Mr. John Scott-Taggart.

* * *

5 S C's New Staff.

GLASGOW'S removal to new premises is being marked by an increase in the staff, as lately the general administrative work of the station has been steadily increasing. When 5 S C's new official has had time to settle down, Mr. Carruthers will be left free to devote himself to the programmes more completely than has been possible of late.

* * *

Australia Calling ?

A HERNE BAY amateur, Mr. R. W. Galpin, claims to have received signals from an amateur in Australia which would be the first time on record of—such a feat. Using a two-valve set, he copied the call "C Q de A 2 A D J." "The signals were weak but easily readable," he said, "despite interference from atmospherics."

* * *

5 N G's "Great Effort."

THE staff at Nottingham relay station are to be congratulated over the B.B.C.'s Zoo stunt, which was successfully broadcast from 5 N G, although at the last minute it was found that 2 L O's S.B. to "all stations" did not include the Nottingham relay in that term. The station director, Mr. E. Liveing, was determined not to disappoint his keen young audience in this way, so he arranged with his chief engineer, Mr. A. Fielder, to pick up 2 L O's broadcast direct by wireless and to re-broadcast the signals. The result was a huge success, and I am glad to add my congratulations to those which poured in to 5 N G.

* * *

Another Exhibition.

I HEAR that Radio Exhibitions and Wireless Conventions, of 46, Cannon Street, are organising a big and really representative Radio Exhibition for London. The firms which recently exhibited at the Albert Hall were all members of the National Association of Radio Manufacturers (N.A.R.M.), but the new show will be open to the entire British industry, regardless of associations.

* * *

Success Assured.

THE Exhibition will be held from November 15th to November 29th at the White City, and Mr. Arthur B. Dale, the organising director, tells me that entries are beyond his utmost expectations, and that success is already assured. The home constructor is specially catered for, and the various components and different interesting "gadgets" to be displayed will not only be an eye-opener, but, I am afraid, a pocket-opener as well.

* * *

What's in the Wind ?

I NOTICE that ever since Captain Eckersley sailed for America the B.B.C. have been concentrating on transatlantic reception, and there is evidently something in the wind in this direction. As far as the reception goes, results have been excellent on this side, and as I hear that Captain Eckersley is making good progress in America, I can't help thinking that the B.B.C. are preparing a transatlantic treat for listeners.

* * *

Twenty-One Transmitters.

ANOTHER transmitter has just been installed at Königswusterhausen (L P), and this brings the total number of sets at the German station up to twenty-one ! Included in this are a 20-kilowatt valve transmitter and two 50-kilowatt sets—one a Poulsen Arc and the other an H.F. alternator.

* * *

More Crystal Wonders.

A GRAHAMSTOWN (South Africa) correspondent, Mr. Laurence Krummeck, has sent me some very interesting particulars of good long-distance crystal reception in the Union of South Africa. On a home-made crystal set he distinctly hears Johannesburg's programmes at a distance of 500 miles ; and, as might be expected, his circuit is not some tricky affair which nobody else ever thought of, but just a good old-fashioned single-slider coil, with 'phones and crystal in series across it !

* * *

The Mystery Services.

DOZENS of people wrote to ask me about the "mystery" church services which were recently heard all over the country after the B.B.C. had closed down, and which "came over" without announcement or call-sign. All sorts of ingenious explanations were suggested, and many of my correspondents pointed out that clergymen are ardent radio enthusiasts as a class, and one of them might conceive it a duty to broadcast in this way ! But people down Cardiff way smiled ; they knew that 5 W A's aerial was the steeple of the church in question.

* * *

5 X X.

THERE is every probability that 5 X X will continue broadcasting until the new high-power station "takes the air." The site of the latter has not been decided definitely at the time of writing, but will probably be announced before these notes are in print. I shall be very surprised if it is not within five miles of Northampton.

ARIEL.

A panoramic view of the recent N.A.R.M. Wireless Exhibition held at the Albert Hall.

THE "REAL THING" *v.* BROADCAST.

THE ART OF REPRODUCTION.

By A. C. SHAW.

(*Engineer-in-Charge of 2 L O.*)

This informative article by Mr. Shaw will give the reader a good idea of the acoustic problems tackled by the B.B.C. and explains how many broadcasting difficulties have been overcome.

HAVE you ever realised when speaking over the ordinary telephone that it is not always possible to recognise who is speaking, although you may have heard the speaker's voice before, and you may know him quite well?

This simply means that the reproduction is not faithful. In time you would recognise a voice over the 'phone, but it is a doubtful point whether you could tell who was speaking on receiving a first call, even though it be your oldest friend. How does matter broadcast compare in this connection?

I have heard it said, "Oh, that is nothing like it!" meaning, of course, that the reproduction by the microphone of the studio item was bad. Is this an actual fact? Does the transmission by wireless of the human voice, the orchestra, any particular instrument, noises required in dramatic efforts, so alter the production that what is actually received bears no resemblance to that taking place in the studio? Is there any difference between a person's voice in the studio and that heard in a pair of telephones? Does the reception by wireless of the orchestra playing in the studio sound similar to that heard by ear direct? What of noises? Can you easily imagine the street scenes, the seashore or a garden scene simply by noises conveyed to you through the ether?

The Great Test.

Let us look into the matter. Take first the human voice. Imagine a person giving a lecture before the microphone. If he had previously spoken there is no doubt his voice would be recognised. If you did not recognise the voice it would not be because of bad reproduction, but because you had not heard the voice before. I remember on one occasion a talk was being given from the London station, and the speaker's daughter listened to his speech in the Control Room. She listened on headphones, and when questioned as to the likeness to her father's voice, replied that it was "absolutely dad's voice."

But this young lady knew her father's voice well, and also knew that he was talking. So the great test would appear to be, if you recognise the voice and was sure of it without previously being aware that the person was to speak and not having heard the voice "over the wireless" before. Naturally there is a vast difference between thinking you recognise a voice and being sure of it. Would it be possible for a person to say, "Why, that is So-and-so speaking," and know for a certainty that it is that person speaking?

An experience of my own shows this to be possible. I am not often before the microphone except for test purposes, but on one occasion I was required to interrupt the announcer and say about 20 words in disjointed sentences. I said sufficient to be recognised by several friends of mine who had never heard my voice by wireless before, and certainly did not know I was to speak, as I did not know myself until the evening in question. It was certainly a case of "recognised when first heard."

Perfect, Moderate, or Bad?

So it can safely be asserted that the reproduction of a speaker is always the same, that no difference would be noticed in a person's voice if he spoke to-day and again in a month's time, unless of course he was suffering from the effects of our inclement weather. So that, as far as the voice is concerned, reproduction can be regarded as almost perfect.

Do we get a faithful rendering by the microphone of selections given by an orchestra in the studio? Is the reproduction perfect, moderate, or bad?

To obtain the best results certain stringent dispositions of the orchestra are always necessary, which would seem to suggest that results are not "true to life." The dispositions are necessary, because the whole volume of sound from all the instruments should be concentrated to the face of the microphone, and as it is obviously impossible for all instruments to be at the same distance from the front of the microphone, the whole must be so arranged that the resultant effect is similar to what is heard before passing through the microphone, or technically speaking, that the "balance" of the orchestra is perfect.

There are some instruments that are far more blatant than others, and it would be a very bad rendering if these instruments were placed too near the microphone, while others less blatant were placed farther away.

At all events, the resultant effect after the necessary dispositions have been made is very good indeed, although the reproduction is not quite so good as in the case of the human voice.

Consider what is being asked of the microphone—to pass on all the different frequencies capable of being given out by musical instruments, and to carry out this duty so well that the difference between the real thing and the reproduction is hardly noticeable. There are few things in this world that will not respond to one frequency more than to another, so that when we ask a microphone to render equally well all frequencies, we are asking it to perform a hard task.

The studio at 6 K H, the B.B.C.'s Hull relay station.

B.B.C. Microphones.

The extreme range of frequencies for an ordinary piano is between 27—3,500, and if the microphone can be made so that it will not respond to any of these frequencies more than to others, then we shall be very near perfection. The present-day microphones in use by the B.B.C. are considered to be of a very high order, but even these are subject to extreme temperature changes, and this being so it can hardly be expected to maintain a non-resonant state of efficiency for ever.

Now to consider the reproduction of single instruments. There is no doubt that one can easily recognise instruments when played singly, but there is a difficulty here to overcome before perfect reproduction can be attained. Again, it is a question of frequency.

(*Continued on page* 364.)

MIDLAND WIRELESS NOTES.

By OUR OWN CORRESPONDENT.

PARTICULARLY popular programmes have been the interesting series of broadcasts which are being carried out from Cannon Hill Park, Birmingham. Here, on every Saturday evening, there is a local concert by the City of Birmingham Police Band, one of the best military bands in the country, and the installation of a microphone in the bandstand has enabled the open-air concert to be broadcast to Midland listeners-in. By arrangement with the Birmingham Watch Committee, the vocal items of the concert have been provided by the station, with the result that several of the local station artistes have appeared at the park, and also two or three, or more, B.B.C. and B.N.O.C. artistes from London. The park audiences have been very large, and on more than one occasion of such an extent that the duration of the concert has had to be curtailed in order that the park may be emptied by official closing-time.

A Radio Romance.

The 5 I T Radio Circle has still found it possible to continue its good work in regard to the supplying of listening apparatus to various of the local hospitals. The latest to benefit has been the Birmingham and Midland Ear and Throat Hospital, which now possesses a crystal set with power amplification for two loud speakers, practically the whole of which apparatus was provided by the profits on the sale of Radio Circle badges and the photographs of the various Uncles and Aunts.

The wireless sets in the various Birmingham institutions, supplied by the 5 I T Radio Circle, are maintained in working order by the services of a voluntary committee of wireless experts, of which Uncle Felix (Commander Alan Pelham, joint assistant station director at 5 I T) is chairman, who pay periodical visits to see that all is well.

Mr. Nigel Dallaway, the solo pianist at 5 I T, recently figured in one of the romances of radio which now and again are made public. Some time ago, after he had played for broadcast a Grieg study, he was asked whether he would play two other special numbers. The request came from a young woman patient at the Wolverhampton General Hospital, and a date was fixed on which he should play. His holidays intervened, but, despite this, he turned up at the studio in Birmingham at the appointed day and played two numbers from Beethoven and Chopin which went over. Midland listeners-in heard them, but few knew that those two items were really intended for an audience of one lying in a hospital bed at Wolverhampton.

About 5 X X.

There has been considerable discussion in Midland wireless circles of late concerning the merits or demerits of the suggestion that when a site for the permanent 5 X X high-power station is sought, the Midlands should be advanced as a far better position than Chelmsford.

The objection to Chelmsford, it is declared, is that its range is not an effective range on all sides, because it serves a large area of sea. Moreover, it is far more likely to be troubled by harmonics and spark transmissions than any station in the Midlands would be. The advantage of a Midland station would be that it would be practically central for the whole country, and comparatively near densely-populated areas in which the joys of crystal set use would be welcomed.

Although there has been no views on the matter expressed by the B.B.C., it is appreciated that the expense of maintaining a land-line—or, rather, an overhead line—from London to Birmingham in order that national events and the best London programmes might be broadcasted, were

A very popular "star"—Mr. Willie Rouse.

such a high-power station set up in the Midlands, would be very considerable, while the distance from London to Birmingham would result in far greater distortion than is at present the case with the thirty-mile line between London and Chelmsford.

Progress at 5 I T.

The opinion of the enthusiasts upon these probable difficulties is that the rapid advance of broadcast science will see them overcome, while it would not be too absurd to see the development of the B.B.C. programmes in the future necessitating the maintenance of companies of artistes at some of the provincial stations, and especially at a central high-power station.

Birmingham has contributed some valuable evidence to the discussion which has been waging so long upon the effect upon the prosperity of the theatres and music-halls of broadcasting. Recently, at 5 I T. a repertory company of players was formed under an old actor-manager, Mr. William Macready. Among the early radio plays produced was Ouida's ever-popular "Under Two Flags." This was put over towards the end of June, and within the next few days over a hundred appreciatory letters reached Mr. Percy Edgar, the 5 I T station director. A week ago there visited one of the Birmingham suburban theatres—and a suburb in which there was a fair number of listeners-in—a well-known travelling repertory theatrical company, and within a few days of their arrival they were inundated with letters of request for a particular play. There were five hundred odd letters, and every request was for "Under Two Flags," and the reason given was that they had heard the play over radio, and now they wished to see it staged. It played for a week to crowded houses.

THE "REAL THING" v. BROADCASTING.

(*Continued from page* 363.)

If the microphone is more sensitive to one particular note than to any other, then it is obvious that that note will be reproduced louder than others. If the microphone has been adjusted correctly in all details (this being a very delicate operation), then it will respond to all frequencies equally well, and the reproduction will be almost perfect. A piano is a very useful instrument for testing for reproduction, for it is perhaps the most difficult of all instruments to reproduce perfectly, and if, when on test, no note sounds more heavy than another, then there should not be much wrong with the reproduction of other items.

Radio "Props."

What of the reproduction of noises? They have been broadcast from time to time with considerable success, and no doubt some of you may think more noise has been put over than anything else. An announcement is not always made informing listeners what the noises are intended to represent. It is left to the imagination of the listener, which I think justifies my assertion that noises made are a very good reproduction of what they are intended to convey.

But are the noises made by an actual representation of what they are supposed to be? Is the rattle of a cup and saucer produced by these articles? I have heard it said that when the above-mentioned things were used in a studio, they sounded more like pieces of metal being thrown at a blacksmith's anvil. Therefore, the actual reproduction in this case was an absolute failure. Is it so in others?

It is in the majority of cases where noises are required, and an attempt is made to put the noise over by an exact representation. But in most cases "props" are used. It is obviously impossible to have an actual representation of what is required in every case. It would surprise many to see how studio noises are produced, and the weird contraptions used for this purpose.

I well remember how, nearly twelve months ago, the difficulty found in obtaining the requisite "works" for the operation of a lift. The first trial was carried out with the aid of a tin can with a hole in the base sliding down the rough surface of a heavily-armoured cable and falling with a crash on to some loose shackles. The result was good, but not quite the thing. No doubt the majority of listeners have heard the final result with regard to the lift, and will admit that it was not bad.

The "Noisy" Department.

In the case of noises we really have "faked" to make the reproduction as perfect as possible, for it is obviously impossible to do otherwise. Nowadays the "noisy department" of the B.B.C. is a specialist's affair, and well may it be, for the reproduction of noises made by actual representations would in a considerable number of cases be disastrous to any play requiring them.

There is another aspect of reproduction that I have not yet touched upon, and that is your receiver, and in particular your telephones.

Are they at all resonant? Do they respond to certain frequencies more than to others? If they do, then it is fairly obvious that you will have conveyed to your ears during an orchestral item some notes more loud than others.

To show exactly what is meant: the fundamental voice frequency is somewhere about 700, but also carrying with it a number of complex frequencies of a much higher frequency. The average "good" telephone has a resonant period at about 1,000, which means that transmissions which include items with frequencies varying from, say, 200 to 3,500 would not be heard as transmitted, because the higher and lower frequencies would not come out at all well.

The same thing applies to the reproduction of the voice, the fundamental frequency being received quite well, but the niceties of the voice—that is, the complex frequencies—being practically all lost. If perfect reproduction is to be obtained at the receiving end, then it is essential that all the different frequencies transmitted should be reproduced by your telephones in their correct relationship with each other, and this cannot be until we have a telephone on the market that is non-resonant.

A CRYSTAL RECEIVER FOR 5 X X.

By OSWALD J. RANKIN.

This article deals with the construction of a straightforward crystal set of low cost and proved efficiency. The set is easy to make and easy to handle.

THE receiver to be described was designed by the writer to be used on the 1,600 metre wave-length of 5 X X, with a single wire aerial about 70 ft. long and 20 ft. high. The most important considerations were: (1) that the receiver would be used on the existing aerial which was very badly screened with trees; (2) that the geographical position of this aerial was roughly 90 miles from Chelmsford, and it was not directional to that

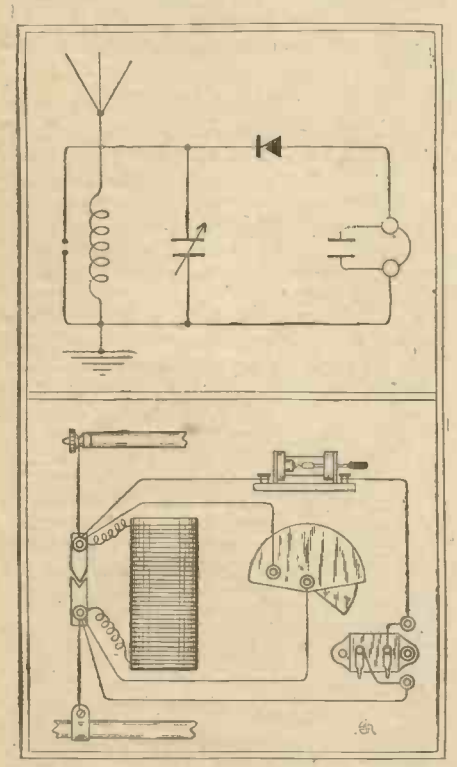


Fig. 1.

station; (3) the receiver must be cheap, compact, simple, and reliable; (4) it must operate two pairs of headphones effectively which (5) must be so arranged to permit the owner to listen-in in either room on the ground floor.

A Problem.

What a problem! And who wouldn't hesitate about tackling the job? Who wouldn't meekly suggest a stage of high-frequency valve amplification? But the prospective owner must have a crystal set or nothing, and so, after carrying out a few simple experiments it was decided to select the simple straight circuit shown in Fig. 1, where a 3 in. diameter cardboard tube is wound with 250 turns of No. 30 D.C.C. wire and shunted with a ·0005 mfd. variable condenser to effect the tuning.

The set was then built up, as shown in the accompanying photographs, and results left nothing to be desired. The receiver is now working regularly with two pairs of "N and K" headphones, suitable wiring being run round rooms, across ceilings, and even to an upstairs room, small terminal blocks being mounted on the walls so that the 'phones can be transferred from one room to another as desired.

The Panel and Cabinet.

The conditions under which this receiver is working is a testimony to its efficiency, and as there are probably many hundreds of country readers anticipating making something really good in the way of a crystal set, it is thought that a brief description of its construction will be of general interest.

Having already described the coil we will now proceed with the panel and cabinet. The panel is cut from ¼ in. matted ebonite, and is 7½ in. long by 6 in. wide. This is drilled to take four small wood screws, the aerial and earth terminals, three telephone terminals, the crystal detector, and the variable condenser bush, the approximate setting of the holes being as shown by the position of the mounted components and fittings in the photographs.

There being no room on the panel for an aerial to earth change-over switch, a simple lightning arrester is fitted between the A and E terminals on the under side of the panel, as shown. This consists of two strips of sheet brass about ½ in. wide by $\frac{1}{16}$ in. in thickness, the gap between them being shaped in any way desired, providing it is accurately equal and does not exceed $\frac{1}{16}$ in. in width.

A fixed condenser of ·002 mfd. capacity is connected across the two outer 'phone terminals, but this is not essential. The centre 'phone terminal is provided merely to form a metallic connection between the tags of the 'phones when same are connected in series, the fixed condenser (if used) being clamped to its shank under the panel.

When wiring up the panel it will indeed be difficult to make mistakes if the two diagrams are well perused beforehand. If the readers' experience in cabinet making is limited, I would suggest a simple box-like cabinet with the panel mounted on the top, rather than the sloping type of cabinet. In the present arrangement it was necessary to press the coil slightly oval in order to avoid the projecting condenser terminals from making undesirable contact with the winding, but this would not be necessary where a plain cabinet was used.

The panel is preferably inlaid and screwed to two wooden fillets secured to the inside

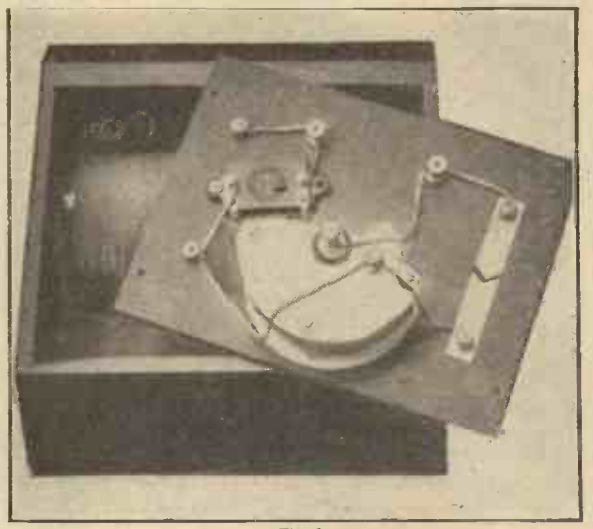


Fig. 2.

walls of the cabinet. Given dimensions of such a cabinet are often confusing, and so it is suggested that the reader should build it up in proportion with the panel, allowing a depth of about 6 in. at the back, this sloping down to 3½ in. at the front.

The Crystal.

The coil is made a tight push-in fit inside the cabinet, the tube being accurately cut after completing the winding. Having placed this in position the two fillets should

Fig. 3.

be fitted and the ends of the winding soldered to the A and E terminals. The panel may then be screwed down, after carrying out a test to ascertain if everything is O.K.

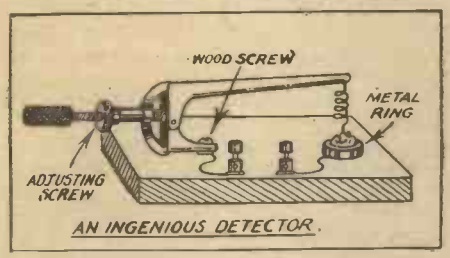
The crystal to be recommended is a good specimen of "Hertzite," with a fine gold wire tentacle, and each pair of 'phones should have a total resistance of 4,000 ohms.

Constructional Notes

Conducted by Dr. J. H. T. ROBERTS, F.Inst.P.

An Ingenious Detector.

ONE of the simplest and most ingenious forms of crystal detector which I have seen is that illustrated in the accompanying diagram. It consists essentially, as will be seen, of a discarded pair of compasses

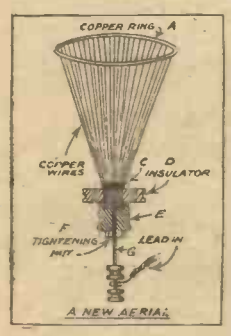


AN INGENIOUS DETECTOR.

which are provided with an adjusting screw. The latter makes an excellent vernier adjuster for the leg of the compass which carries the cat-whisker. In order to adapt the compass for the purpose, one leg should be shortened and a hole drilled through in a direction parallel to the plane of the compasses. The compasses are then secured to a suitable base-board by means of a wood screw passed through this hole. By using a single screw the compass can be rotated slightly so as to bring the cat-whisker over different parts of the crystal. For the crystal cup any small metal container may be used, or even a metal ring such as a section cut from the end of a piece of brass tube about ½ inch in diameter. The other details will easily be seen from the drawing.

A New Aerial.

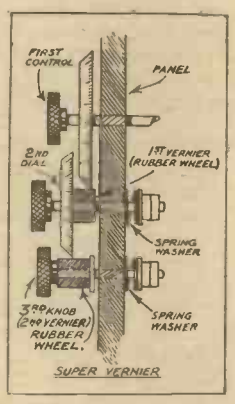
The aerial shown herewith, which is the invention of A. W. Vincent (Br. Pat. 216981), consists of 100 small-gauge copper wires, 8 inches long; leading from a holder, E, through the insulator, D, to which a bracket for fixing is connected. The wires are then spread out in conical formation, as shown, and the ends are secured to a circular copper ring, A, about 7 inches in diameter. The terminal G is fitted at the bottom of the holder E, and to this is connected a cone-shaped member, C. A small nut, F, acts to pull the cone-shaped piece C, hard down against the insulator D, and so secures the wires tightly. The leading-in wire is taken from the terminal G.



A NEW AERIAL

Super Vernier.

For fine tuning, a vernier is absolutely essential on the variometer or condenser control, and for extremely fine tuning it is sometimes desirable to employ even a second vernier on the first. The accompanying figure shows a reader's method by which this can readily be done. It amounts to a system of step-down gears, engaging frictionally. The first dial is directly attached to the condenser shaft in the usual way. The second dial is mounted with its shaft just clear of the edge of the first dial, the large dial overlaying the first dial. Beneath the second dial is a small rubber disc, which engages the edge of the first dial, so that the second knob acts as the first vernier in the ordinary way. The third knob then controls a small rubber wheel engaging with the edge of the second dial, and so acting as a second vernier on the first vernier.

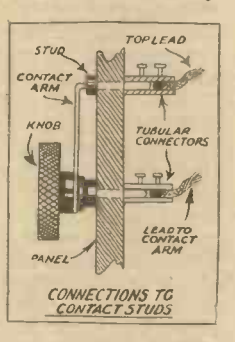


SUPER VERNIER

Connections to Contact Studs.

In soldering the connections to contact studs behind the panel, some care is necessary in order not to overheat the ebonite.

The use of solder can be obviated entirely, however, by employing studs which are either tubular or which are drilled axially and provided with a set-screw for securing the connecting wire.

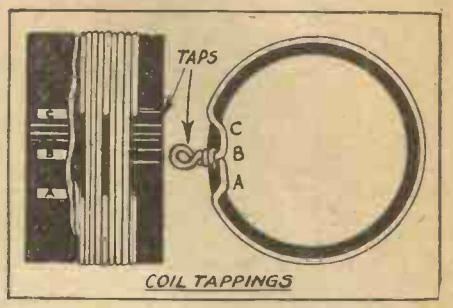


CONNECTIONS TO CONTACT STUDS

The simplest method is to use a cheesehead screw for the stud, inserted through the panel from the front, and to employ an ordinary tubular connector for securing the wire to the back end of the stud. This method, although of course not so convenient or compact as soldering, is useful in certain cases where the heat of the iron might cause damage. Further, it permits of the studs being readily removed if required.

Coil Tappings.

The figure herewith (from "Radio Digest," U.S.A.) illustrates a simple and very neat method of taking tappings from a coil. If tappings are to be taken every few turns three slots may be used, but if more frequent tappings are to be made four slots should be made, and the tappings should emerge alternately from the two middle slots. The slots may be ⅛ inch wide, and of a length which of course depends upon the length of the windings. The simplest way to make the slots is to cut along the former in the positions the slots are to take



COIL TAPPINGS

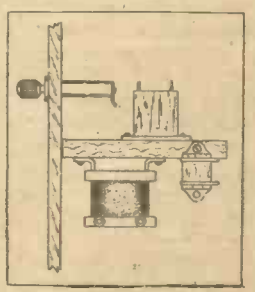
and, using a ⅛-inch drill, to drill three or four holes, breaking into each other, for the commencement of the slot. Take now three or four hack-saw blades (sufficient to make up to the width of the slot), and after inserting into the slot as already commenced, bolt them together at the two ends by means of nuts and bolts; the result will be what is equivalent to a hack-saw blade of the same width as the slot. With this simply proceed to saw along the line until the slot is made the required length, repeating the same method for the other slots.

Start the coil by putting the end of wire in through slot A, putting through 4 or 6 inches of wire so as to leave enough for the top, and then bring back out through slot B, and in through slot C, and out through slot B again. This should be done a short distance from the end of the slot, so that when the wire is put through the slot B the last time it can be put through between the other wire and the end of the slot. Pull this up tight and proceed to wind.

Wind on the amount of turns desired to the first tap and cut the wire, allowing 3 or 4 inches for the tap, and put it in through slot C, and out through slot B. This completes one tap. To start the next turns, put the end of the remaining wire through slot A and out through slot B, allowing about 2 inches for twisting, then proceed to the next tap and repeat the entire operation. The end of the coil is fastened in the same manner as the start.

A Panel Shelf.

When building a multi-valve set it is not always convenient to mount all the necessary components on the under side of the panel. Transformers, fixed condensers, etc., are then often mounted on the inside walls of the cabinet, but a much better method of procedure is to attach one or two small wooden shelves to the underside of the panel and mount the components on the faces and around the edges of same, as shown in the sketch.



Two fairly long wood screws support the shelf, their heads being neatly countersunk into the upper face of the panel. In order to avoid undue strain the heavier components, such as L.F. transformers, should be mounted as near up to the panel as possible.

SIDELIGHTS ON WIRELESS.

A NEW SERIES FOR THE AMATEUR.

THE QUANTUM THEORY CLEARLY EXPLAINED.

By SIR OLIVER LODGE, F.R.S., D.Sc., LL.D.
(*Scientific Adviser to "Popular Wireless."*)

For the amateur who wishes to obtain more than an elementary knowledge of wireless, and who is interested in theory, the following article on the Quantum theory—a theory which every serious student of wireless is bound to meet with—will provide a concise and non-technical explanation by one of the world's greatest physicists.

PEOPLE in general have not yet realised how much more important and intelligible the recently introduced physical constant, the *Quantum*, is than the mathematical method of deduction called "Relativity." Relativity in skilled hands is able to yield surprising and interesting results it is true. But then the quantum is able to yield interesting results, too, and in a more simple manner.

Professor Max Planck.

Whatever may ultimately turn out to be true about relativity considered as a philosophy, there is no doubt that the introduction of the quantum into physics represents a real though not ultimate fact. That is to say, experience shows that the fact is there; although we have at present no explanation of it. And the elucidation of the structure of the atom, to which the quantum has led, is one of the most extraordinary and illuminating and momentous discoveries in twentieth century physics.

Some Easy Examples.

By aid of the quantum we now know a large amount about what is going on in the interior of an atom, and many details about its vast store of energy.

What, then, is a quantum? It originated in a discovery by Professor Max Planck, of Berlin (beginning in the year 1900, and becoming established more and more strongly during the next twenty years), that radiated energy, in the form of light or X-rays, went about in packets or indivisible units—like cartridges, any one of which represents a store of energy, and any one of which can liberate that energy and produce an effect—but of which no fractions were possible.

Why the radiation emitted by atoms should thus be distributed in packets is not yet known, but we are pretty certain that it has something to do with the internal structure of every atom. And we are now prepared to admit that an unexpected discontinuity running through the whole of atomic science, and therefore essentially through the whole theory of matter, has been discovered.

In regions where continuity had been thought to reign—everything smooth and flowing and continuous and regular—an abrupt discontinuity has made its appearance, replacing the smoothness by a jerk, the flow by a precipitous jump, the continuity by a succession of steps; the only thing that remains being the regularity. Everything is perfectly regular and law-abiding. Not that the steps are all equal. They constitute a graduated series, but they are perfectly regular and obedient to law. They are represented by whole numbers, and not by fractions.

There is, after all, nothing foreign to our ordinary notions in this recognition of discontinuity—that is to say of units which must be taken as a whole and of which no fractions are permissible. We are familiar with it in coins of the lowest denomination. We are equally familiar with it in a staircase, instead of a slope or inclined plane; we must ascend or descend a step or several steps at a time; we only stumble if we try to take half a step.

A Strawberry and Golf Analogy.

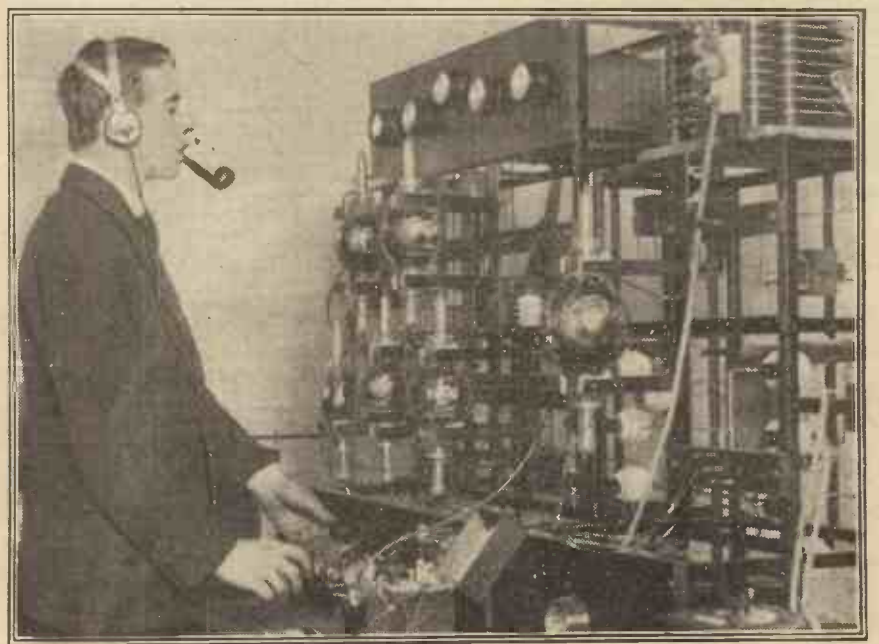
The whole elementary operation of counting involves a recognition of some obvious kind of discontinuity. We can count apples or cherries; and though it is true we can divide them, that is not the way in which they present themselves to our notice: they naturally occur in quanta. So do seeds. And this illustrates different kinds of units. We may count atoms, or we may count the electrons in an atom. So we may count strawberries, or we may count the little yellow seeds upon a strawberry. Both units can be dissected, if we want to, or know how, but both present themselves as natural units.

Again, in games, a discontinuity is familiar. In golf you either make a stroke or you don't. There is no half stroke. And what is called "giving a half" merely means cancelling an opponent's stroke at alternate holes. So again the ball is either in the hole, or not. Its path is continuous up to the end, and then it drops—or else it doesn't. It would be possible to follow the path continuously to the bottom of the hole; the discontinuity is never ultimate; but the end is discontinuous for all practical purposes, and the definiteness is satisfactory.

Quanta in Games.

In games on deck, shuffleboard and others, where something slides over chalk-marked boundaries into numbered squares, some convention has to be employed to determine whether the slider is or is not within a certain area; and there may be disputes. In bowls, also, the distances from the jack vary continuously, and may have to be carefully measured. The fall of the bails at cricket gives the required definiteness, and so does an ordinary "catch"; but "leg before" and "stumped" and "run out" are less satisfactory, for they depend on relative positions of a continuously varying and therefore less clearly determinate kind. Most games aim at quanta which can be counted. One cannot gain half a trick at whist. And the net in lawn tennis is intended to introduce an

(*Continued on page* 368.)



Mr. H. P. Cook, assistant engineer of the Hull Relay Station, tuning the transmitter.

SIDELIGHTS ON WIRELESS.

(*Continued from page* 367.)

unmistakable discontinuity, the failure of which is allowed for by an uncounted "let."

The difficulty of exact counting in many cases turns mainly upon what shall be reckoned a unit. To count the pebbles on a gravel walk would be sure to raise a question as to what constitutes a pebble. And a flight of irregular, worn-out steps are not easy to count, for the same reason. But fortunately the atoms of negative electricity are all, so far as we know, exactly alike, and therefore can be counted with accuracy.

Content with Evidence.

Whenever we come across things that can be counted, in the unseen and ultra-microscopic region of Nature, it is a sign that we are on something important and intensely interesting. Hence the electron and the quantum, however they may be ultimately analysed and resolved into entities still more fundamental, dominate modern twentieth century physics. The "quantum" itself is not to be understood as a mere vague discontinuity, like the examples employed to illustrate one of its features; it is a definite and precise natural constant capable of being measured with precision, and it is associated with the angular momentum, also called moment of momentum—a term specially applicable to and suggestive of some kind of fly-wheel—of an electron revolving inside an atom.

Why the angular momentum of a revolving electron inside an atom should have this singular discontinuous numerable quality no one has as yet succeeded in explaining. The fact, discovered by Professor Niels Bohr, of Copenhagen, has to be accepted unexplained.

But then no one has succeeded in explaining why electricity itself, instead of being continuous as used to be thought, should exist in little indivisible particles. And, indeed, it hardly occurs to most physicists that an explanation is wanted; they are usually content to accept the fact on thoroughly substantial evidence.

A Wonderful Speculation.

So it is with the world in general when people contemplate the stars. It probably does not occur to many to consider why matter should be distributed in spherical masses scattered about with immense spaces between them, instead of being aggregated into one great lump under the influence of gravitation. Certainly it is far more *interesting* to find all these myriads of separate bodies, most of them of the same order of magnitude as the sun, with smaller attendants, on the surface of which we and other discontinuous creatures can live; but only recently has it occurred to Eddington and other astronomers to speculate on the reason for this discontinuity in large scale matter, which may be said roughly to imitate in a gross manner the atomic discontinuities of every visible and microscopic speck.

Bodies may be much smaller than the sun, but then they will not be permanently hot enough to emit much light. On the other hand, if bodies are much more massive than the sun, then tend to break up. They are not stable; they easily separate into two; and any number of double and even multiple stars are known. When divided, the two components will tend gradually to separate, by reason of tidal action, in a way which is understood, though by no means obvious.

Thomson's Momentous Announcement.

So gravitation does not pull everything together, but indirectly tends to drive things apart. The earth and moon, for instance, are believed, on good evidence, to have once been a single body. But the moon, having budded off, from a now nearly filled-up scar in which the water that has accumulated is called the Pacific Ocean, has gradually receded, in an age-long spiral path; and is still very slowly receding, because of the reaction upon it of the terrestrial tides which it helps to generate. (Briefly, we may explain that the pull of the tidal wave on the moon, as the vast, low, aqueous protuberance is carried forward by the rotation of the earth, tends to accelerate the moon tangentially; and that has the effect of making it go farther away. Retardation, on the other hand, would tend to bring it nearer; for if it were stopped altogether it would merely drop in.)

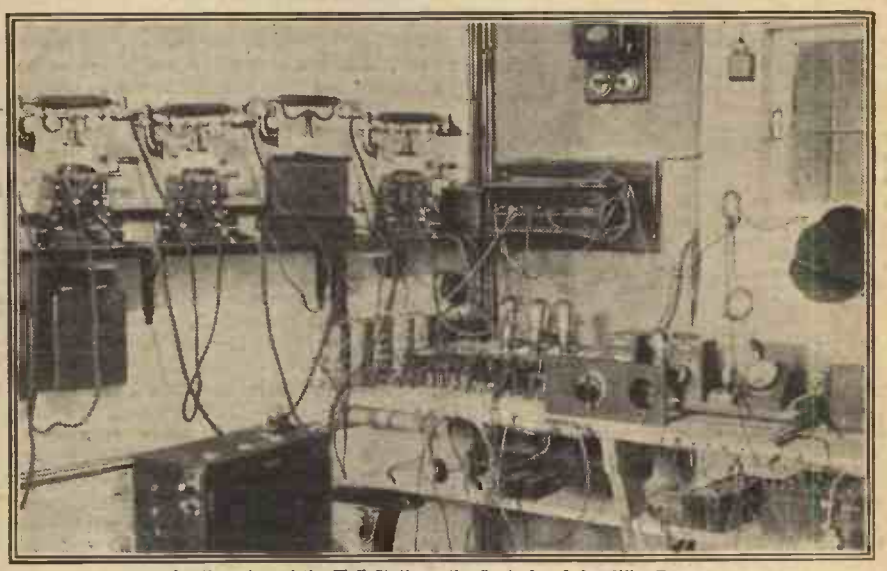
A dropping towards the centre, in the case of a revolving electron, is actually experienced, and is the chief source of emitted radiation and of bright line spectra. Conversely, absorption of radiation can be the means of removing an electron from an inner to an outer orbit, or even of flinging it away altogether. Radiation is emitted, and seems also to be absorbed, only in quanta.

All photo-electric phenomena (which are rather extraordinary) are regulated by the quantum, and without it are inexplicable. An explanation of photographic activity, and probably of retinal vision, is to be sought along these lines. The sciences, physics, chemistry, and physiology, here meet and interlock.

On September 16th, 1899, Sir J. J. Thomson, summarising in a masterly manner the results of two years previous work, announced to a joint meeting of the Physics Section of the British Association at Dover. in the presence of a contingent of the corresponding French Association, simultaneously meeting at Boulogne, his isolation or individual detection, in a Crookes' stream of cathode rays, of apparently indivisible corpuscles much smaller than the atoms of matter; or, in other words, he described his experimental realisation of the "atoms of electricity," the existence of which Faraday and Maxwell had more than half suspected, and which had been named in advance "Electrons" by Dr. Johnstone Stoney.

The discovery of these natural electric units has revolutionised the treatment of all departments of electrical science.

A few years before (in 1896), Zeeman of Amsterdam had ascertained that electrons of small mass were the particles which



Another view of the Hull Station—the Control and Amplifier Room.

radiated energy from an atom; and H. A. Lorentz, the very eminent ex-professor of physics at Leyden, had showed mathematically that assuming the radiating particles to move in an orbit which could be perturbed in a calculable manner by a magnetic field, in accordance with the theory of Larmor and himself about radiation, he was able to predict thereby many detailed phenomena concerning the observed magnetic subdivision of spectral lines and their polarisation; a set of predicted phenomena which Zeeman forthwith confirmed experimentally.

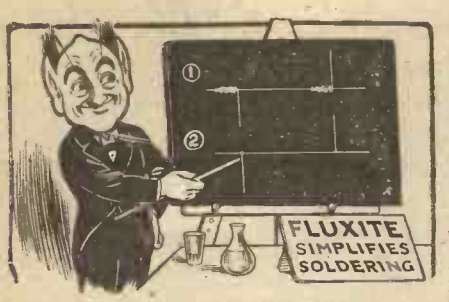
A Revolutionary Theory.

On December 14th, 1900, Professor Max Planck, professor and sometime rector of the University of Berlin, announced to the German Physical Society his revolutionary theory of black-body radiation, which carried with it the discovery of an apparently indivisible unit of radiation energy, strictly proportional to the frequency or vibration period of that radiation; and thus introduced his new universal constant—the ratio of radiation energy to radiation frequency—known as the quantum.

This incipient discovery was consolidated and extended, and made more credible, subsequently, by the finding of Einstein in

(*Continued on page* 412.)

THE GREAT DIFFERENCE



Gentlemen, with your kind attention may I present you a comparison in set wiring.

"Take No. 1. Here we have a really too flattering attempt to illustrate the kind of wiring you see in home-made sets—a ragged, plier-twisted join that looks ugly and slipshod, but still worse, a trap and a hindrance in the path of small currents. Owners of sets wired in this manner are missing the best in wireless—it is a fact—experience has proved it!

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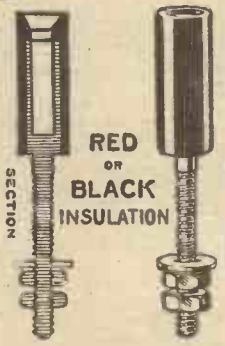

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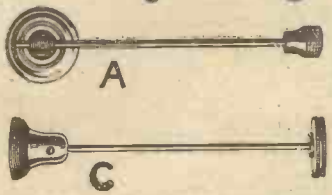

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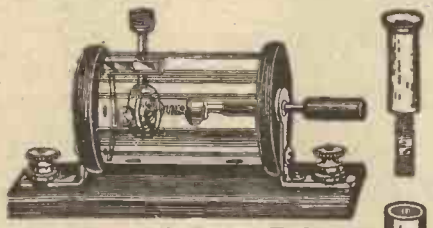

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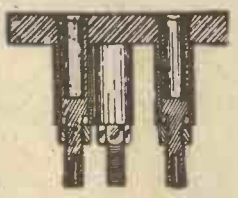

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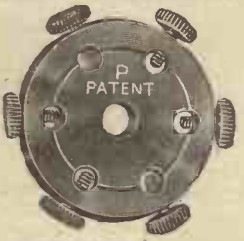

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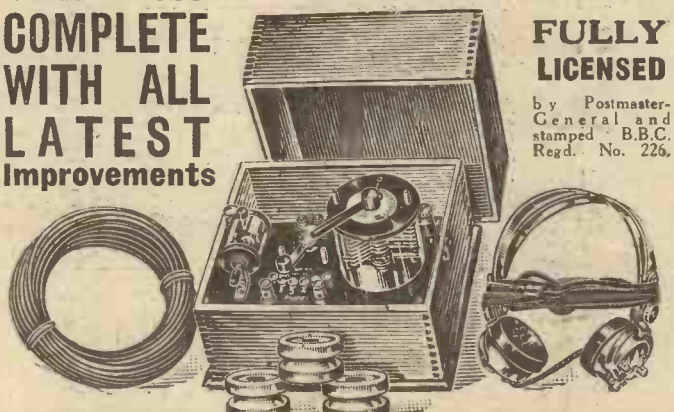

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Diam. of Trumpet 5½-in.
Over-all Height - 9-in.
Price - 25/-

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Diam. of Trumpet 10-in.
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METHODS OF SWITCHING IN WIRELESS CIRCUITS.

By P. T. BEARD.

This is the second of a series of three articles dealing with a practical branch of wireless work which every constructor will find of value.

PART II.

Tune Stand-by Switch.

WHERE much jamming from unwanted stations is experienced, and a selective circuit is required, the loose-coupled circuit shown in Fig. 6 (*a*) is usually employed. This consists of a pair of coils, L1 and L2, mounted either in a two-coil holder, or constructed to slide one within the other.

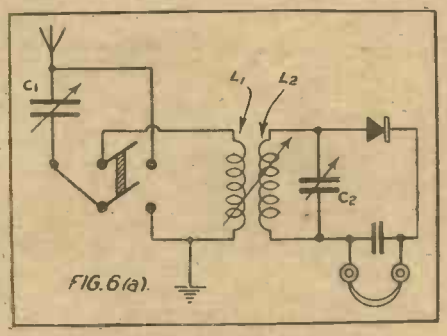


FIG. 6 (a).

The coil L1 is the aerial coil, with its condenser C1 controlled by its series-parallel switch, and coil L2, with its condenser C2, is the closed circuit coil.

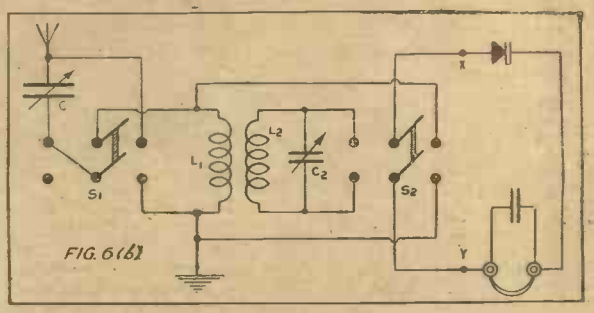


FIG. 6 (b).

It is not always an easy matter to pick up a transmitting station with this two-coil arrangement, owing to the necessity for tuning both circuits to the wave-length of the station it is desired to receive. Consequently it is an advantage to tune in the station on the aerial coil, L1, alone, and afterwards change over to bring both coils in circuit and make final adjustments on the closed circuit condenser, C2.

It is an easy matter to tune the closed circuit after the aerial circuit has been tuned separately. Fig. 6 (*b*) shows how the tune-stand-by switch (S2) is connected in the circuit. The upper contact on the right-hand side of the switch is connected to the upper side of the aerial coil, L1, the lower contact on this side being connected to the earth side of L1. The left-hand switch contacts are connected to the upper and lower ends of the closed circuit coil, L2, as shown. The upper switch arm is joined to one side of the crystal, and the lower arm to one side of the telephones.

In the case of a valve receiver the points X and Y in the diagram would be joined to grid of the valve and to low-tension negative respectively. With the switch arms over to the right, the aerial coil L1 is connected directly across the crystal and telephones, making a single circuit crystal receiver. The station required is tuned in with the aerial condenser, C1. It will be noticed that with the switch in this position the closed circuit, L2 and C2, is not in use.

With the switch arms over to the left, the closed circuit coil, L2, is joined across the crystal and telephones, and the only connection between the two coils is by magnetic induction. The station is now tuned in by adjusting the closed circuit condenser C2.

Changing-over Crystals.

It is always advisable to use two crystal detectors in case one should give out during reception. Two crystals and a simple switch enable a new crystal to be switched into circuit very quickly. Fig. 7 shows two methods of connecting the switches. Fig 7 (*a*) makes use of a simple "on" and "off" switch, and Fig. 7 (*b*) makes use of a double-pole change-over switch. In both cases the switch arm to the right brings in the right-hand crystal, and when over to the left the left-hand crystal is in circuit. In cases where two detectors of the crystal and cat's-whisker type are used, a switch is unnecessary. All that is required is to raise the cat's-whisker from the crystal which is not in use; but this, of course, would only be useful in cases where it was required to test different crystals, and not merely to have both crystals accurately set ready for use in the event of one becoming out of adjustment.

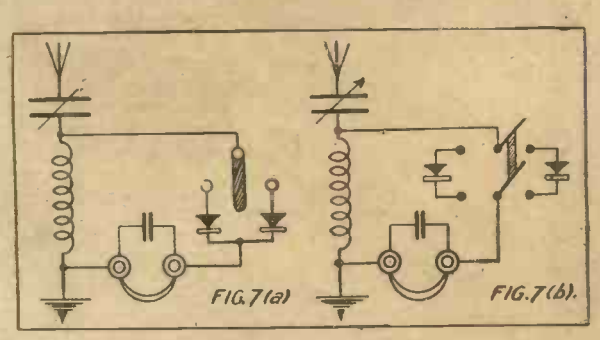


FIG. 7 (a). FIG. 7 (b).

Adding Single Valve Note Magnifier.

When a low-frequency amplifier, or note magnifier, as it is often called, is added to a crystal receiver, a double-pole change-over switch will enable the crystal alone, or the crystal plus amplifier, to be used at will. The diagram (Fig. 8) shows one method of doing this, but it will be noted that no provision is made in the change-over switch for switching off the valve filament current. This will have to be done by means of the filament resistance.

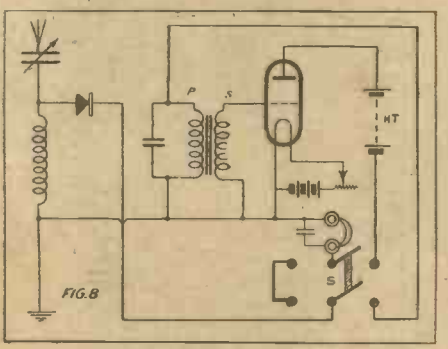


FIG. 8

Fig. 8 shows that the earth, one end of the transformer primary, one end of the secondary and low-tension negative are all connected together, while the telephones are connected between this lead and the upper centre connection of the change-over switch marked S. The two left-hand switch contacts are connected together, and a lead is taken from the crystal to the lower centre switch contact.

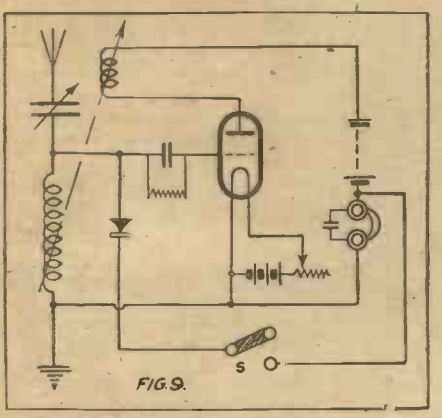


FIG. 9.

The upper and lower right-hand switch contacts are taken to high-tension negative

(*Continued on page 376.*)

Technical Notes

Conducted by J.H.T. Roberts, D.S.F. Inst.P.

Uses of Potentiometer.

THE three main uses of the potentiometer are discussed in an interesting article in the "Radio News of Canada." The position in which the potentiometer is most frequently employed is in H.F. amplifiers, where it is used to prevent oscillations by controlling the grid voltage of the H.F. valves. When used in this way, the two end terminals of the potentiometer are connected to the two terminals of the filament battery, and the slider is connected to the grid return of the H.F. valves.

A second use for the potentiometer is to vary the plate voltage of soft detector valves. This is accomplished by connecting the negative H.T. to the slider of the potentiometer, and then connecting the resistance coil of the potentiometer across the filament battery. With the potentiometer connected in this way, it is possible to vary the H.T. by 6 volts, assuming the filament battery is a 6-volt battery.

A third use for the potentiometer is to increase the resistance of the aerial, and so to reduce the radiation from regenerative circuits. When the potentiometer is used for this purpose, it is really connected as a rheostat rather than as a potentiometer, for the slider is connected to the aerial, and one of the terminals to the aerial terminal of the receiver, the other terminal of the potentiometer being idle. The resistance of the average potentiometer is from 100 to 500 ohms, about 400 ohms being a common value.

Experimenters testing apparatus on a wireless field day.

Dry Battery Connectors.

In cases where it is necessary to connect together small dry batteries, either for the anode potential, or for the grid bias, some difficulty is often experienced in finding a connector which will fit on to the brass tab which frequently forms one of the terminals of the small dry battery. A connector suitable for this purpose can, however, readily be made by taking one of the ordinary tubular or barrel connectors and making, by means of a saw-cut, two slots at opposite sides and parallel to the axis, these two slots extending one-half of the length of the connector. The plane of the saw, when making the cut, should be perpendicular to the shaft of the clamping screw at that end of the connector. With the connector altered in this way it is easy to

(*Continued on page* 415.)

METHODS OF SWITCHING IN WIRELESS.

(*Continued from page* 375.)

and to the primary winding of the transformer respectively. With the switch over to the left, the telephones are connected in the circuit between the crystal and earth,

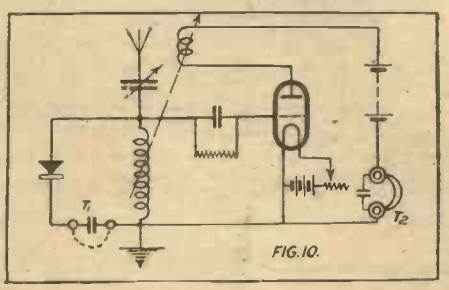


FIG. 10.

thus giving a simple crystal circuit. If the switch is thrown over to the right, the telephones are connected in circuit between high-tension negative and low-tension negative, and the crystal is connected to the primary winding of the low-frequency transformer, thus making a crystal circuit followed by a single valve amplifier.

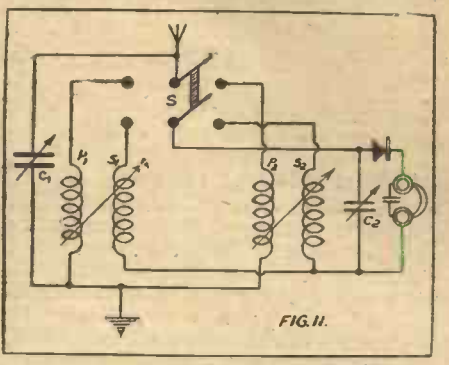


FIG. 11.

To Use Optional Crystal or Valve Detector.

To enable this to be done, it is hardly necessary to use a switch, although one could be incorporated in circuit if required, as shown in Fig. 9 at S. To use the valve as detector the switch S must be opened, but, of course, the same result would be obtained by raising the cat's-whisker from the crystal, in which case the switch could be dispensed with.

Fig. 10 shows another method of using either crystal or valve as required, but this necessitates changing over the telephones from one pair of terminals to another. With the telephones on the terminals T1, the crystal only is in circuit, and if they are connected to terminals, T2, the valve is in use as detector.

Changing Tuners.

It is often necessary to change over from long to short wave reception or vice versa, and when plug-in coils are used the operation is very simple and does not require switches. But in cases where cylindrical coils—either simple aerial coils or loose-couplers—are used, some means of changing over by switching is necessary. Fig. 11 shows a method of doing this, and in the diagram an aerial coil and a closed circuit coil are used in both tuners.

P1 and S1 are the aerial and closed circuit coil respectively of the short-wave tuner, and P2, S2 the coils of the long-wave tuner. S is the change-over switch. It will be seen that the lower ends of both primary coils are connected together and also to earth, and that the aerial is connected to the upper centre switch contact. The aerial tuning condenser, C1, is connected between the aerial and earth. The lower ends of the closed circuit coils, S1 and S2, are joined together and taken to the lower side of the detector circuit, which is shown as a crystal circuit in the diagram.

If a valve is used, this connection would be taken to negative of the low-tension battery. The upper ends of the aerial coils, P1 and P2, are taken to the upper left and right-hand switch contacts, and the upper ends of the closed circuit coils, S1 and S2, are taken to the lower left and right-hand contacts, the lower centre contact being taken to the crystal. If a valve is used, this connection would be taken to the grid leak. The variable condenser, C2, which is required across the closed circuit coil, is joined across the detector circuit as shown.

Mainly About Broadcasting

by The Editor

IN last week's issue of POPULAR WIRELESS I drew the reader's attention to a proposal recently made that the Radio Society of Great Britain should fight a test case with the Post Office on questions relating to the latter's treatment of the wireless amateur, with particular reference to the transmitting amateur.

It appears that the Post Office restrictions have become so stringent that, according to the Radio Society of Great Britain, the rights of the amateur are seriously endangered. The position, in the eyes of the Society, is so serious that the suggestion of fighting a test case has arisen as a natural result. There is no doubt, as I mentioned in last week's POPULAR WIRELESS, that the Post Office restrictions are most irritating and in many cases most uncalled for, but that does not mean that the best way to alleviate the amateur's lot is to fight a test case with the Post Office.

Does the Radio Society of Great Britain realise that, when an amateur makes application for a transmitting licence and asks permission to use more than 10 watts, the Post Office have to refer this application to the Admiralty, the War Office and the Air Force, and that in many cases the Post Office's refusal to grant a licence is due to some objection raised by one of the fighting forces ?

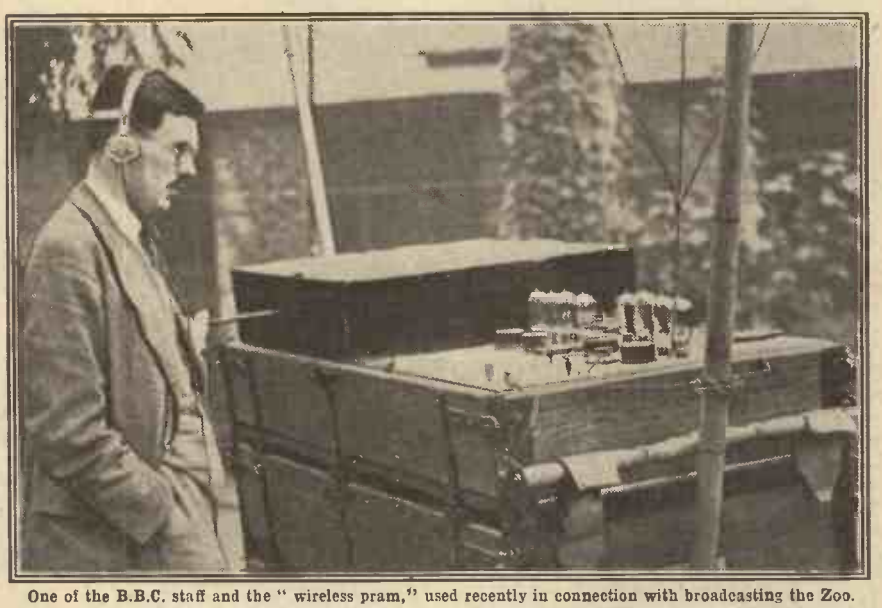
The R.S.G.B. and the P.O.

Although these official restrictions emanate from the Post Office, they are in many cases inspired by the Admiralty, the War Office, and the Air Force, and if a test case was fought the Radio Society of Great Britain would not very much improve things, because the three forces I have mentioned would have something to say in the matter, and naturally their point of view would receive most serious consideration. A much better plan would be for the Radio Society of Great Britain to strenuously fight for a round table conference with all those concerned and by hook or by crook come to some understanding, but an understanding based on friendly relations. A test case would practically mean a declaration of war.

It is a great pity that the amateur should receive such unsatisfactory treatment after the very excellent work he has accomplished. I am quite sure that the Post Office and the fighting forces realise how much they owe to the amateur transmitter and the experiments he has made in connection with short-wave work and long-distance transmissions on low power, and I am equally convinced that the authorities will do all they can to assist the R.S.G.B. in obtaining more freedom and a better status for the amateur, but test cases will not help matters at all, especially if they are subsidised from outside sources.

The R.S.G.B. stated that applications for transmitting licences are often refused, even in the cases of experts, whose applications have been proved by the R.S.G.B. Council. Furthermore, the R.S.G.B. make strong objection to the many onerous restrictions placed on the present holders of transmitting licences. I am one of the first to admit that some of these restrictions are frankly stupid, especially the restriction forbidding amateurs to call up other amateurs not residing in this country. One has many sympathies with the R.S.G.B., and one certainly appreciates their very good work.

When looking at the whole question, from the point of view of the ultimate benefit for the general amateur, it must be said that the proposed policy of fighting a test case is to be most emphatically deplored and discouraged, as it would ultimately do no good to the position of the wireless amateur in this country.



One of the B.B.C. staff and the "wireless pram," used recently in connection with broadcasting the Zoo.

Australia Heard ?

It was reported recently in the "Daily Mail" that a wireless amateur living in Herne Bay had picked up the call-sign of an Australian amateur on a two-valve set early one morning, and also that he had logged over forty American stations in the brief space of one hour.

At the time of writing these notes no confirmation of this claim has been given, but if it should prove true the success of Mr. Galpin—that is the name of the Herne Bay amateur—must be a tremendous incentive to other amateurs in this country. If Mr. Galpin did receive this Australian call it certainly constitutes a world's record which will be very hard to beat. At first sight it seems almost incredible that a two-valve set should pick up a signal from such a great distance, and, even if the signal is confirmed, one would naturally be inclined to think it a most extraordinary freak case.

But nevertheless, in these days of rapid progress it never pays to treat such incidents with scepticism or to accept them off-hand as a mere freak of nature. The feat may be repeated, and Mr. Galpin's success may be the first stage towards a regular interchange of messages between British and Australian amateurs.

I am sure every reader of POPULAR WIRELESS will eagerly await the confirmation of Mr. Galpin's reception, and, if it proves satisfactory, will extend to him their most hearty congratulations.

Broadcasting the Zoo.

Recent experiments of broadcasting the Zoo proved so very successful and so very entertaining that the B.B.C. are likely to make much greater use in the near future of their novel "wireless pram." This "wireless pram," I understand, was originally suggested to the B.B.C. by Mr. Leslie G. Mainland, the well-known "L. G. M." of the "Daily Mail" and the popular writer on Zoo topics. It is, I believe, the first wireless pram ever built, and should enable the B.B.C. to indulge in a variety of interesting stunts which will greatly enliven broadcasting this winter. This small portable transmitter can be wheeled about with comparative ease to places generally considered inaccessible to wireless transmitters, and the B.B.C. are to be congratulated on the great success of their efforts and on the very successful results they have obtained with their new "baby."

BROADCASTING FROM THE ZOO.

By "ARIEL."

THE animals and birds who are resident in the Zoological Gardens were quite surprised and mystified recently when Captain West and his staff made an unexpected visit to their estate. Not only were they mystified, but they were thoroughly annoyed with the intruders for delaying their evening repast, and I noticed that while passing the Mappin Terrace, the home of the white bears, "Sam" showed his annoyance by speaking in a very high tone to his new wife.

This was hardly to be wondered at, considering the weird appearance of Captain West's "wireless pram," which contained little "Mike," the B.B.C.'s new baby, which has been christened by Captain P. P. Eckersley 2 B.B.C.

The pram contained two bamboo poles—about 8 feet apart—the aerial being connected to a small transmitting set of 12 valves. The power of this set was 200 watts, and working on a 100 metre wavelength, the concert given by the chosen artistes was transmitted to another station in the Zoo, from whence it was relayed to 2 L O.

The Wireless Pram.

When the pram was wheeled outside the house of Mrs. Hyena, the keeper produced a bone of rather large dimension, which naturally made her laugh heartily at the prospect of a West-end dinner. The laugh proved so infectious that the engineers could not refrain from joining in too!

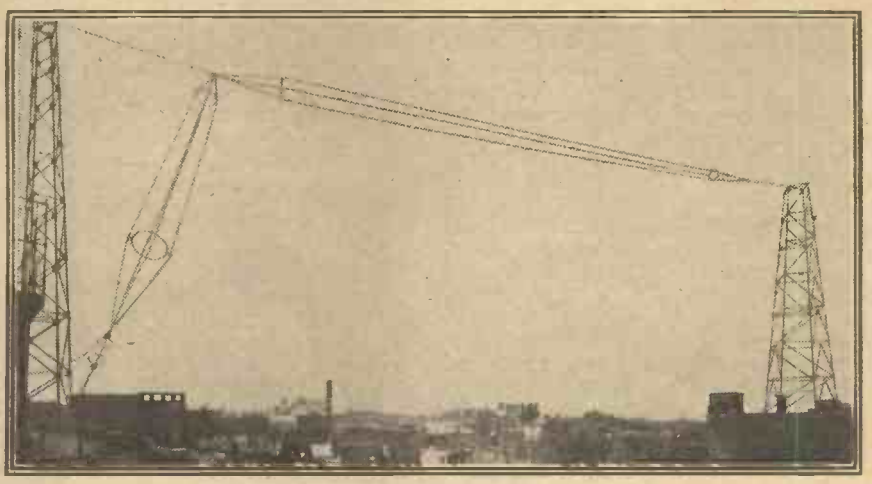
After wishing Mrs. Hyena a pleasant afternoon, the pram proceeded to the abode of the Laughing Jackasses, who did not appear to be quite so interested with the callers, but satisfied their request by exercising their vocal cords.

But probably the most exciting part of the programme was that performed by the 15-month-old baby walrus, and her colleagues—the sea-lions. I was warned by Uncle Leslie, who was responsible for this tour, that if by chance the baby's voice broke, while "Mike" was silently looking on, not only would "Mike" pass away, but also anybody who may have been at 2 L O; yet some listeners would have heard, without the aid of 'phones or loud speakers, because she can broadcast her voice over 2½ miles! In fact I was told by a friend who lives at Hampstead, that when old Mr. Walrus was alive, he was able to hear the monster's call for breakfast. My friend also stated that when Mr. Walrus's voice was audible, it was an indication to him that the wind was N.W., and that the weather was likely to be bad.

The B.B.C. have decided that when the baby walrus grows up, they will engage her as The Clerk of the Weather, and will probably consult her as to the weather forecast.

But it so happened that "Mike" was spared on this occasion because baby Walrus proclaimed her juvenile voice.

During the broadcasting of the sea-lions' concert and the baby walrus, many Press photographers had assembled themselves at the foot of the imitation mountain in the walrus pool. This, however, did not please the residents, who were at the moment entertaining "Mike," and they therefore gave chase. I noticed one photographer in a very bad plight, for he was compelled to climb the "mountain" with his camera as quickly as he possibly could, and it was not until the keeper produced a bucket of fish that he was able to descend—much to the amusement of the spectators.



The Aerial System of the Brussels Broadcasting Station.

At the conclusion of "Mike's" visit to the Zoo, she was wheeled to Uncle Leslie's little hut, where he had been broadcasting interesting stories on the lives of the animals that had graciously responded to the request of the B.B.C. in giving an afternoon's entertainment, and finally taken home to the quietude of 2, Savoy Hill.

A NOVEL FRAME AERIAL.

(From a Correspondent.)

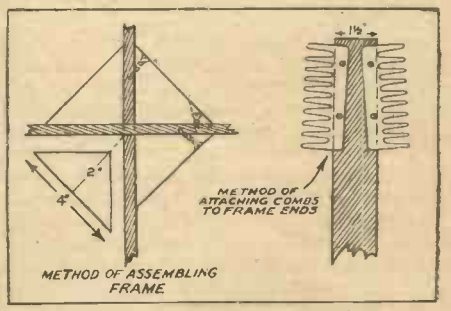
THE aerial described in this article is well worth the trouble and time spent on its construction.

It would perhaps be as well, before proceeding further, to write down a list of the materials required. They are as follows:

	£ s. d.
2 6-ft. lengths of 1½ in. × ½ in. planed wood, cost	1 0
1 1½-ft. length of 2 in. × 1½ in. planed wood, cost	4
8 2 in. × 8 in. size wood screws	4
8 ½ in. × 6 in. size wood screws	2
8 broad-toothed celluloid combs, each 4½ in. long, at 5d. each	3 4
3 lb. of 16 S.W.G. line wire at 1s. 6d. per lb.	4 6
8 insulated hooks at 1½d. each	1 0
4 yards of electric lighting flex at 4d. per yard	1 4
2 tie-clips at 3d. each	6
Total cost	12 6

The frame itself consists of two pieces of wood 6 ft. by 1½ in. by ½ in., each piece having a slot cut out in its middle ½ in. wide by ¾ in. deep, to accommodate the other. When thus fitted together, angle pieces cut from the wood 2 in. by 1½ in. are then fitted into the four corners thus formed, and held in place by the 2 in. by 8 wood screws. The eight combs are then drilled, two holes each, 2 in. apart, and fixed two on each frame arm near to the end. Next, wind on one side of your frame eight turns of the line wire equally spaced over the width of the comb teeth; this will mean that the turns will be about ½ in. apart. Then, on the other side of the frame, wind on six turns of line wire. In this winding the turns will be about ⅝ in. apart.

The line wire, it may be mentioned, is of soft copper, not tinned, and may be obtained from any electrical contractors. When the frame is wound, screw one of the insulated hooks into each arm, 2 ft. from the centre; these are to enable the frame to be suspended horizontally from the ceiling.



The remaining hooks may now be screwed into the beams supporting the ceiling of the wireless room, in positions corresponding to those of the hooks in the frame.

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DON'T BE A SLAVE OF THE MACHINE.

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It may be the customs, traditions, and conventions of your profession.

It may be the unchanging routine, the drab monotony, the mechanical regularity of your daily work and habits.

Sooner or later that is the machine which threatens all of us. The months and years roll on; the vision fades; the ambition that once fired us and drove us forward disappears. A network of Habit entangles us: the mechanism of our Business has clutched us in its cogs; our Individuality has been surrendered to Routine; we have lost our Initiative, our Freedom of Choice; we have become the slaves of a soulless machine.

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This extract from a letter received from a Pelman Student is typical of thousands of similar communications from men and women who have developed INITIATIVE, CONCENTRATION, OBSERVATION, ORIGINALITY, SELF-CONFIDENCE, JUDGMENT, DECISIVENESS, ORGANISING POWER, PERSONALITY, and other invaluable qualities of mind and character, by means of Pelmanism. And side by side with the development of these qualities have come increases of income to the extent of 50 per cent, 100 per cent, even of 200 per cent and over, and promotion to positions giving greater scope and wider possibilities.

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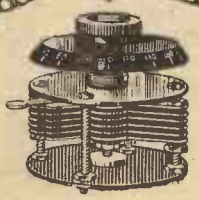

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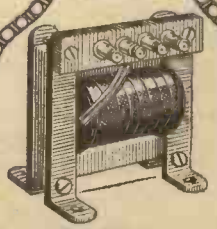

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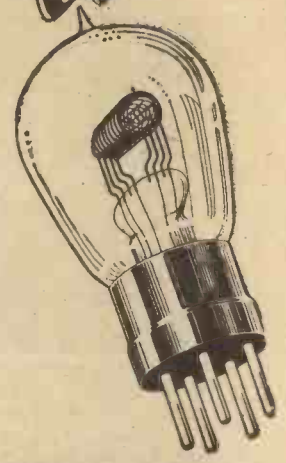

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HOW TO MAKE EFFICIENT CARD INDUCTANCES.

By R. H. COWTAN.

Basket Coils can admittedly be bought cheaply, but they can also be made cheaply. This article will clearly explain how.

THOSE who make their own parts are either experimenters or constructors.

The man with the B.B.C. licence is the man who is satisfied with the results to be secured from the sets especially made for the purpose of receiving the B.B.C. programmes; and there is but little doubt that he is well provided for. If his pocket be

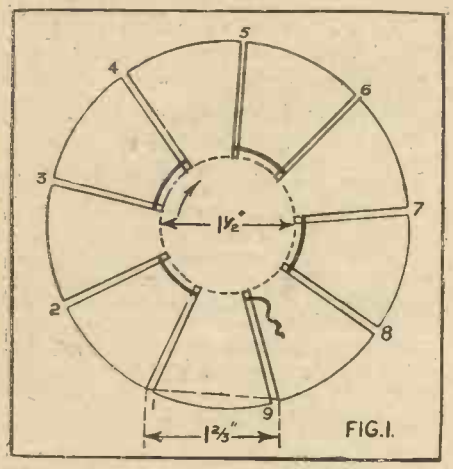


FIG. 1.

deep enough he may receive every station, transmitting on a wave-length of from 350 to 500 metres, on a loud speaker.

The constructor may be said to be the person who, desiring to secure good results from one. or all, stations, prefers the honour and satisfaction of getting his results from his own individual effort. He may buy parts and arrange them, but generally, especially if he can obtain good data, he will choose to build many of his parts.

Best for Aerial Tuning.

The experimenter pure and simple may only desire to put his experiments to certain definite objects, but I imagine, if he is anything like myself, to arrive at certain conclusions from such experiments he will build his own parts; from technical data, from experience, or from the experience of others who voice their results and views through the media of these essential journals whose aim certainly is to encourage and assist.

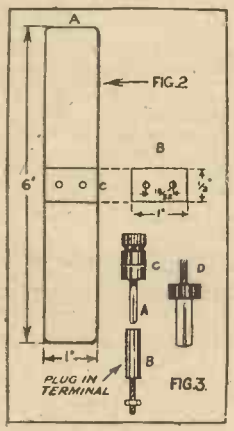


FIG. 3.

Inductances are, perhaps, the first thought of every constructor and experimenter; if of the plug-in type—and really I cannot think that for general purposes any other type fits the bill so well—there are so many reasonably priced and most efficiently working commercial coils that I would not take the responsibility of recommending any particular make.

For Larger Coils.

However, I am concerned with the making of our own. For best results we believe our experiments teach us, and very few will differ, that the basket type of coil is not easily to be beaten, particularly for the low wave-lengths. Basket coils may be bought cheaply and they may be made cheaply.

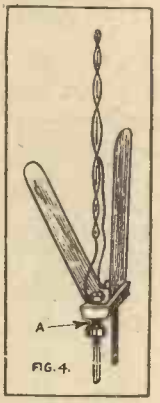


FIG. 4.

So far as actual aerial tuning is concerned, let us have small resistance and low capacity in the coils with a large, say ·001, condenser. For anode and reaction, more capacity, if we are to satisfactorily tune with smaller condensers, for ordinary purposes.

For aerial tuning my experience has proved small bell flex (10 by 36) ideal. 350 to 600 metre wave-lengths are catered for by winding 55 turns of this wire on a cardboard, or fibre, former 1½ inches centre, nine slots; the condenser (·001) being in series with the earth for wave-lengths up to about 400 metres, and in parallel beyond this. If cardboard is used for the former it should be cut in the form of a circle with a radius of 2½ inches (Fig. 1), the slots being ⅛ inch wide, and the former well shellacked and dried before winding is commenced.

Winding, of course, commences at the centre of the former, and in the case of the smaller coils, as the one we are now concerned with, the wire is wound in and out of each slot. For larger coils, say up to 150 turns, the wire should be wound through every other slot—i.e. commencing at No. 1 (Fig. 1), the wire is taken underneath and brought up through slot No. 3, down through No. 5, up through No. 7, down through No. 2, up through No. 4, and so on, until complete. Still larger coils up to 350 turns may be wound in triple spacings, so 1, 4, 7, 3, 6, 2, 5, 1, etc. In this case, however, there should be but seven slots in the former. When the necessary number of turns are wound, bore a small hole through the card former and thread the wire end through, securing with a dab of varnish.

The next process is to mount the coil and, as the writer has already suggested, if coil holders and formers are to be purchased in addition to the wire one has to spend almost as much as would purchase a good commercial coil. Therefore we must devise a cheap and satisfactory method.

The writer has solved the problem by using the following method.

First procure some cardboard, anything but the soft, spongy variety—"coated board," I think, is the correct description of the best class for our purpose. Cut a strip 6 inches long and 1 inch wide (A, Fig. 2) for each coil holder.

(Cardboard boxes favoured by dressmakers are just the thing for card formers and holders, but be careful how you remove the wife's best dress.)

These strips should be well shellacked, and while they are becoming "tacky" cut some small pieces of scrap ebonite, or gramophone record, into oblongs 1 inch long and ½ inch wide, clean up and bevel with a file and drill two holes, $\frac{1}{3}\frac{7}{2}$ inch centres to take plug and socket to fit standard coil holders (B, Fig. 2). Two similar holes must be drilled in the cardboard strip at C, and the ebonite fixed with a little shellac. Some terminals of the plug-in variety (A B, Fig. 3) should be procured; one terminal, i.e. two halves, is required for each coil mounting.

Important Incidentals.

It may be permitted to digress a little here to describe more fully these apparently little-known terminals, which, when their two halves are pulled apart, become plug and socket of standard size with threads ready cut that they may be secured by nuts to the small oblongs of ebonite we have fitted to our coil holder. First, however, the plug should be lengthened by taking the under half nut (C, Fig. 3) and screwing it on to the thread (D, Fig. 3) before the plug is fitted to the ebonite (A, Fig. 4).

The two half terminals should now be

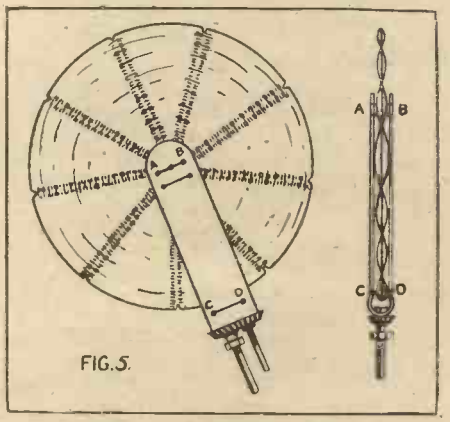


FIG. 5.

fixed with a nut in the holes drilled in our mount, and the ends of the coil fixed to plug and socket either by soldering or between nuts and washers. The card holder is now carefully bent, having been well soaked with shellac and now in a "tacky" condition, as shown in Fig. 4; and if a round

(*Continued on page* 382.)

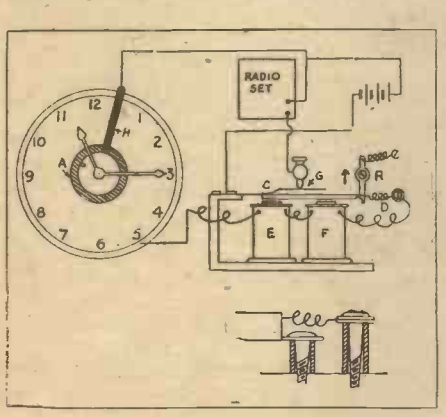
HOW TO MAKE A TIME SWITCH FOR YOUR SET.

By B. F. SHORTT.

In connection with the charging of accumulators the simple time switch described in this article will prove of value to many amateurs. An old alarm clock, an old bell, and one or two "odds and ends" are all the components needed.

AS a great number of broadcatchers have acquired the habit of listening-in at night in bed, the accumulator-charging business has made great strides lately. This is due to the fact that most people fall asleep unknowingly, and forget to switch off the filaments, if they are using a valve set. When they wake up next morning, it is to find the low-tension battery run down.

Therefore a description of a time switch, which the writer has used successfully for some time, to automatically switch off the filaments at any desired time may interest those amateur experimenters who like to dabble about with various "gadgets." A glance at the accompanying diagram will show that it is almost self-explanatory. The only apparatus needed is an alarm



clock, an old electric bell movement, and a few odds and ends that nearly every wireless enthusiast possesses. The action of the switch is as follows.

A movable cardboard disc, A, having gummed to it a piece of tinfoil shaped as shown at the shaded portion, is fitted behind the hands of the clock in such a way as to allow of its being turned round. The disc can be set so that the small projecting strip of tinfoil is opposite the hour it is required for the set to be switched off at.

A small piece of springy copper wire is attached to the hour hand so that it makes contact with the projecting strip of tinfoil when it passes over it.

When it does so, a circuit is completed through the electro-magnets, E and F. The armature, C, is attracted, and the rachet, R, slips in and holds it, thus breaking the filament circuit at G. At the same time the wire connection, D, springs clear on account of its tendency to press outward in the direction of the arrow-head. This manner of connecting is necessary, as any other method will result in the armature merely buzzing instead of breaking the filament circuit.

It will be noticed that the end of the armature is slightly bevelled in order to maintain this contact until the right moment.

On the clock, the thin strip of brass, H, serves two purposes—to make contact with the tinfoil when the disc is in any position, and also to hold it when set.

This connection must be insulated from the clock frame, while the other connection to the clock may be made at any convenient part of the metal, such as one of the legs. This device has several advantages which can be summed up as follows. It in no way interferes with the ordinary working of the clock, no separate batteries are required, the low-tension battery giving the necessary current to work the switch at the right moment, and an impulse of current lasting only a fraction of a second is used.

The method of fixing the disc and the brass strip to the clock will depend on the kind of clock which happens to come handy, but with the usual small tools the amateur should experience no difficulty in rigging up this useful piece of apparatus. All connections must be clean, including the tinfoil and also the point on the hour hand where the copper wire is attached. The rachet, R, can be cut out of a small piece of $\frac{1}{8}$ in. brass sheet. The diagram shows the manner in which it and the spring contact, D, is mounted.

HOW TO MAKE CARD INDUCTANCES.

(*Continued from page* 381.)

stick, as a piece of dowelling, is used to bend them on, the two halves will come round easily and neatly, the coil, of course, being put between the two halves. The holder should now be pressed close to the coil and sewn tight with waxed thread as shown at A B and C D, Fig. 5.

The writer prefers to shellac varnish the whole of the finished coil and holder, and readers are recommended to varnish at least the card holder. When finished, the coil and holder has a neat and workmanlike appearance, and will stand any amount of rough usage. Fig. 5 shows the coil and holder complete.

Where large coils are to be mounted, as, say, one with 350 turns, triple spaced, a round ruler, or walking stick, should be used to bend the card holder. If good compressed cardboard is used and well soaked and coated with shellac varnish, it will not crack when bending; it should be bent before it hardens, and it will wear like leather. If only soft cardboard is available it may be well soaked in molten paraffin wax and bent while hot, but this method is rather inclined to be messy and the writer prefers the former method.

The anode and reaction coils, except for very low wave-lengths, are, in the writer's opinion, best wound with 28 S.W.G. D.C.C., in preference to heavier gauge wire, unless a large variety of coils are going to be used with large capacity condensers in series.

The following is a tabulation of the coils made and regularly used by the writer with great success; in fact, most commercial coils have been compared, with little or no better results.

Readers should note that 10/36 flex is sold double, so that for coil winding the two wires must be unwound into singles. Two ounces of No. 28 D.C.C. gives just 180 turns on the card former described.

Wave-length in metres.	Aerial Coil.		.001 Condenser.		Anode. .0003.		Reaction.	
	Turns.	Size.	Series.	Parallel.	Parallel. Turns.	Size.	Turns.	Size.
Under 200	25	10/36 flex	S	–	40	10/36	45	10/36
Over 200	„	„	–	P	„	„	„	„
350–420	55	„	S	–	75	28 D.C.C.	50	28 D.C.C.
420–600	„	„	–	P	„	„	75	„
900	125	„	S	–	125	„	100	„
1050	„	„	–	P	150	„	„	„
1780	150	28 D.C.C.	–	P	200	„	100/150	„
2600	250	„	–	P	200	„	200	„

Only 18 Micro-Microfarads

25/-

Self Capacity

Yes, the lowest self-capacity of any general purpose Transformer, and all because of its unique design.

The great feature is that the primary and secondary are wound in twelve sections, the six sections of the primary being wound on the outside of the secondary.

The Radio public are beginning to appreciate how far the problem of distortion is dependent on the low self-capacity of the transformer.

No matter what kind of receiving circuit you are using, the process of transformation must guarantee an accurate magnification of every detail, and the R.I. transformer to-day is acknowledged to give the finest purity in

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Artistes of the Aether

By "Ariel"

Some of the artistes who have given you pleasure when listening-in.

IT has long been said that "humour is the salt of life," and though a bad cook may often "over-salt" a dish, yet many a bad B.B.C. programme has been saved by this "saltiness."

Miss Vera Beringer.

The query night was another success, and though I didn't aim for that five guineas, I know I spotted some of the stars. There has been, also, a marked improvement in the concert parties. We are losing the kind of song that someone—wasn't it Pett Ridge?—described as "having three verses with no meaning, and one verse with two." A new clever little sextet was found in "The Londoners."

Under the direction of Mr. Charles Harris, this clever little band of West-End artistes contrived to give a bill of clean humour, well sung songs and solos. Mr. Harris has had wide concert-hall experience himself, gaining a big repertoire. He believes, also, in giving the best of art, and has gathered round him two good vocalists in Miss Josephine Lamb (soprano) and Mr. Reginald Johnson (baritone), both of Queen's Hall, a brilliant violiniste in Miss Marjorie Bose (London Coliseum), Miss Iris Jay (Palladium), and another capable accompanist in Miss Olive Peake (Queen's Hall).

Vireless Drama.

Judging by the increase of plays in the B.B.C. programmes, it seems as if drama is appreciated, despite the natural depreciation by the loss of action and scenic effects.

Miss Dorothy Howell.

2 I.O did very well with A. Neil Lyons' Cockney study, "A Penny Bunch," because it had the services of two of the finest character - study actresses on the stage, in the persons of the Misses Esme and Vera Beringer.

Miss Esme Beringer followed up her triumph before the microphone from the week previous, while Miss Vera Beringer was a new-comer to this particular branch of histrionic art. Daughter of two famous authors and composers, Mr. and Mrs. Oscar Beringer, Miss Vera made her first appearance as a child in her mother's play "Tares," and she was the original Little Lord Fauntleroy in Mrs. Frances Hodgson Burnett's own dramatisation of her book.

Of course, the palm goes to John Henry for his opera, and with such coadjutors as Helena Millais, Gladys Newth, and Robert Chignell, to say nothing of "Blossom," the result was inevitable. 2 L O, also, later in the week, gave us an old favourite in "The Belle of Brittany," produced for broadcasting purposes and conducted by Mr. L. Stanton Jefferies.

Nature Music.

Cardiff probably forgot the weather report, but gave us fine tone pictures of the forests, the valleys, the heights and lanes. Delius, Debussy, Elgar, Beethoven, and Schubert were some of the composers whose works lent themselves to the scheme, and Miss Astra Desmond the singer. The Manchester programme obtained their "foliage" from the Russians, Tchaikowsky and Glazounov, with Vaughan Williams and Edward German as English representatives, amongst others, and delicious valses of Joyce (The English Waltz King), and Godin.

The "Londoners" Concert Party which performed recently at 2 L O.

The British Composer.

Hard and uphill has been the task of many pioneers in music to combat the prejudice against native talent. Sir Henry Wood, Sir Dan Godfrey, Isidore de Lara, Granville Bantock, all have waged war on behalf of the "home-made supply." The fate of the woman composer is harder still, and but few have achieved real and lasting fame. We can count on Dame Ethel Smyth, though to get first performance of her famous opera, "The Wreckers," she had to look to Germany, Madame Lisa Lehmann, and now for classical work a very young composer indeed in Miss Dorothy Howell, composer and pianist, too.

Mr. Anderson Nicol.

Born in Birmingham, she soon showed musical talent, and subsequently studied at the Royal Academy, under John B. McEwen, now its principal, for composition, and with Percy Waller and Tobias Matthay for piano. Her first orchestral work, "Lamia," was performed at one of the Promenade Concerts under the direction of Sir Henry Wood in 1919, at which the writer was present. I remember very distinctly the uproar of real enthusiasm which followed, and the work won the rare distinction of a repeat performance within the week.

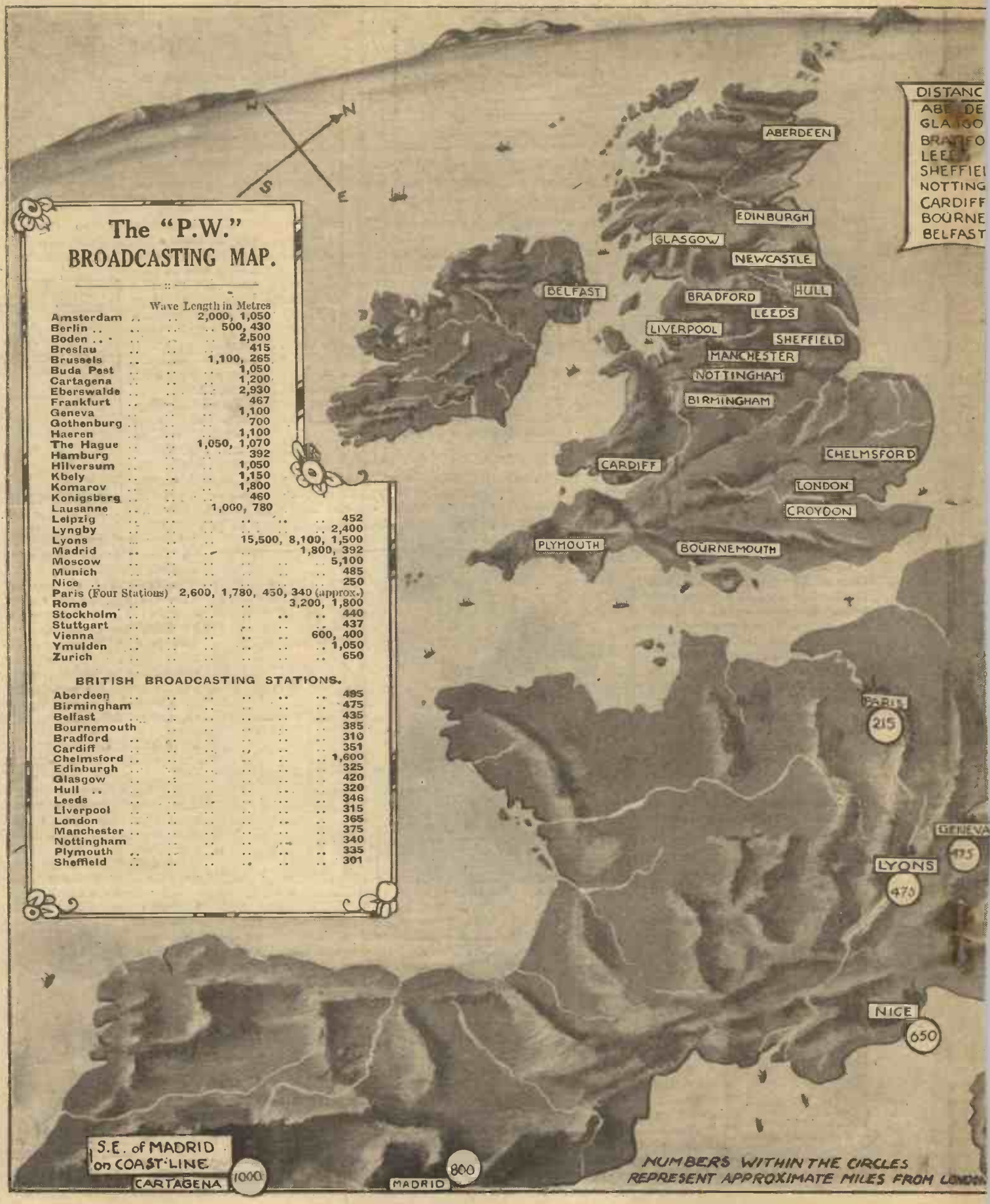
Up in the North.

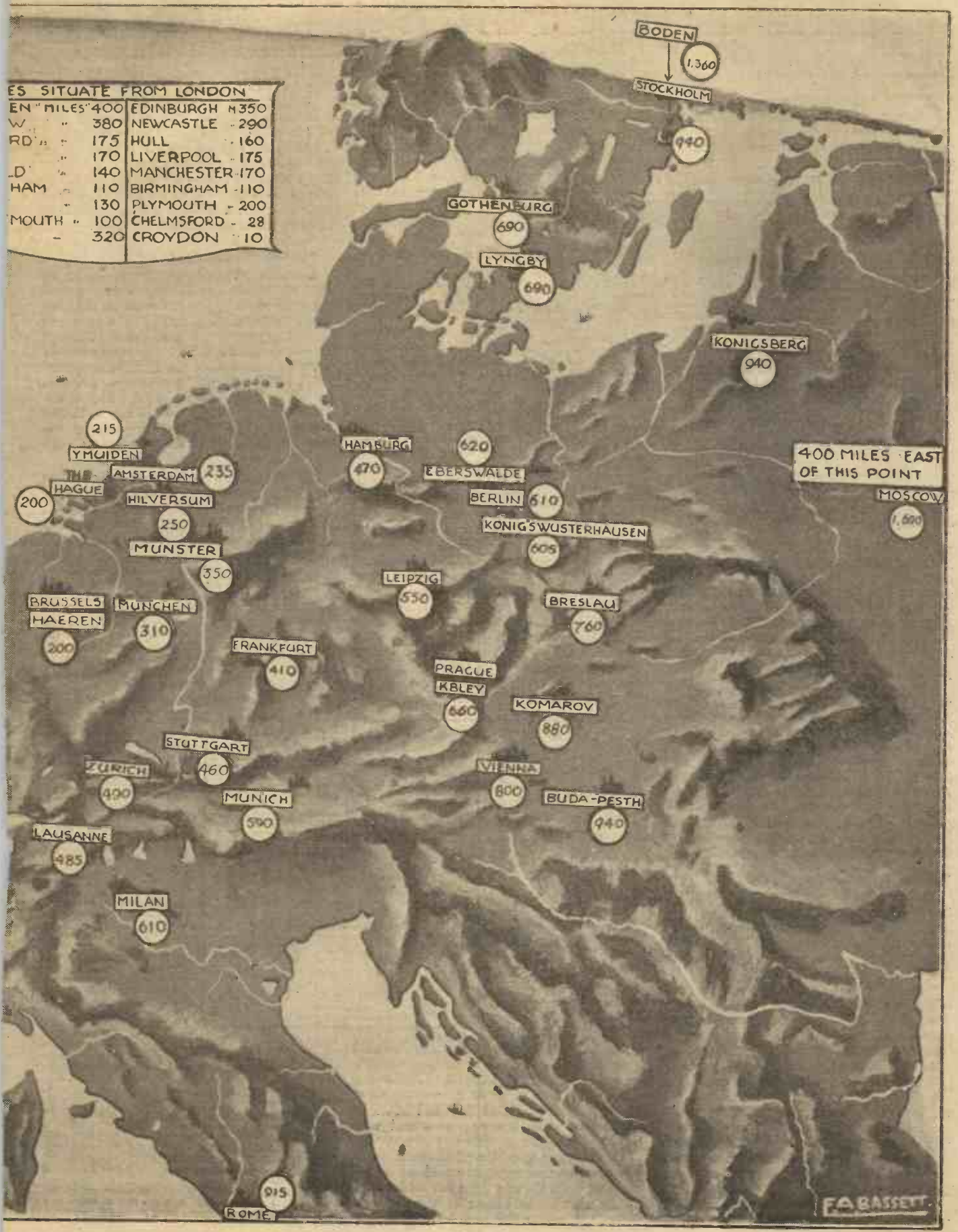
Why the northern stations should produce such excellent singers is not always easy to understand; perhaps their "weather reports" are different. One of the best heard anywhere is the Scottish tenor, Mr. Anderson Nicol. With a repertoire of over eighty works, a reputation for fine work that ranges from the Italian and German opera houses, the London Symphony concerts, oratorio societies and his tours throughout South Africa, Australia, United States, and Canada, it must be extremely difficult to make a choice of his songs.

Mr. Laurence Macaulay.

Aberdeen.

For real "high-brow" music give me Aberdeen every time. Many of the programmes are not things to be undertaken lightly, or listened to in fits and starts, but 2 B D certainly takes its work very seriously.

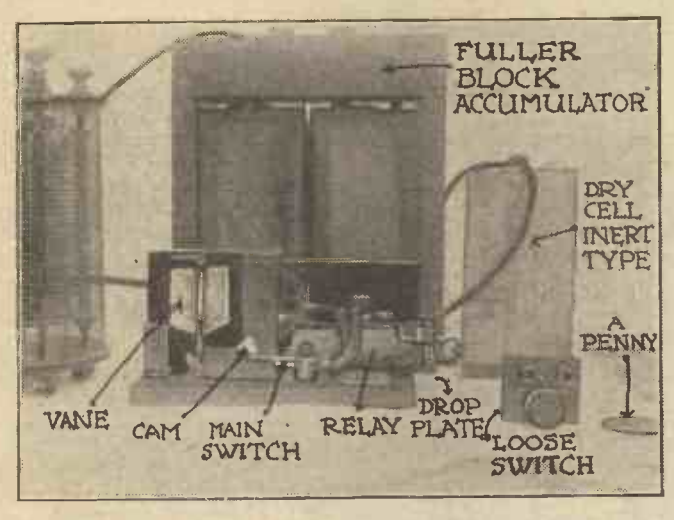

The "P.W."
BROADCASTING MAP.
Wave Length in Metres
Amsterdam 2,000, 1,050
Berlin 500, 430
Boden 2,500
Breslau 415
Brussels 1,100, 265
Buda Pest 1,050
Cartagena 1,200
Eberswalde 2,930
Frankfurt 467
Geneva 1,100
Gothenburg 700
Haeren 1,100
The Hague 1,050, 1,070
Hamburg 392
Hilversum 1,050
Kbely 1,150
Komarov 1,800
Konigsberg 460
Lausanne 1,000, 780
Leipzig 452
Lyngby 2,400
Lyons 15,500, 8,100, 1,500
Madrid 1,800, 392
Moscow 5,100
Munich 485
Nice 250
Paris (Four Stations) 2,600, 1,780, 450, 340 (approx.)
Rome 3,200, 1,800
Stockholm 440
Stuttgart 437
Vienna 600, 400
Ymulden 1,050
Zurich 650
BRITISH BROADCASTING STATIONS.
Aberdeen 495
Birmingham 475
Belfast 435
Bournemouth 385
Bradford 310
Cardiff 351
Chelmsford 1,600
Edinburgh 325
Glasgow 420
Hull 320
Leeds 346
Liverpool 315
London 365
Manchester 375
Nottingham 340
Plymouth 335
Sheffield 301
N
S
E
ABERDEEN
EDINBURGH
GLASGOW
NEWCASTLE
BELFAST
BRADFORD
HULL
LEEDS
LIVERPOOL
SHEFFIELD
MANCHESTER
NOTTINGHAM
BIRMINGHAM
CHELMSFORD
CARDIFF
LONDON
CROYDON
PLYMOUTH
BOURNEMOUTH
PARIS
215
GENEVA
LYONS
475
NICE
650
S.E. of MADRID
on COAST LINE
CARTAGENA
1000
MADRID
800
NUMBERS WITHIN THE CIRCLES
REPRESENT APPROXIMATE MILES FROM LONDON


ES SITUATE FROM LONDON
EN " MILES 400
W " 380
RD " 175
" 170
D " 140
HAM " 110
" 130
MOUTH " 100
" 320
EDINBURGH " 350
NEWCASTLE " 290
HULL " 160
LIVERPOOL " 175
MANCHESTER 170
BIRMINGHAM 110
PLYMOUTH " 200
CHELMSFORD " 28
CROYDON " 10
BODEN
1,360
STOCKHOLM
940
GOTHENBURG
690
LYNGBY
690
KONIGSBERG
940
400 MILES EAST OF THIS POINT
MOSCOW
1,600
215
YMUIDEN
AMSTERDAM
235
THE HAGUE
200
HILVERSUM
250
MUNSTER
350
HAMBURG
470
620
EBERSWALDE
BERLIN
610
KONIGSWUSTERHAUSEN
605
LEIPZIG
530
BRESLAU
760
BRUSSELS
HAEREN
200
MUNCHEN
310
FRANKFURT
410
PRAGUE
KBLEY
660
KOMAROV
880
STUTTGART
460
ZURICH
490
MUNICH
590
VIENNA
800
BUDA-PESTH
940
LAUSANNE
485
MILAN
610
915
ROME
F.A. BASSETT

REMOTE FILAMENT CONTROL.

By SEXTON O'CONNOR.

ONCE a valve set has been installed at home the demand soon arises for some method of wiring-up the various rooms of the house in such a way that the telephones or loud speaker can be quickly transferred to whatever room is for the moment being occupied. For instance, it is generally convenient to instal the actual set and batteries permanently in one room—more or less out of harm's way—and wire up, say, to the dining and sitting rooms, perhaps also to a bedroom, and in some instances to the kitchen in an optimistic effort to solve the "domestic help" problem.



Such a wiring presents very little difficulty in itself, except for the fact that it is always necessary to turn on the filament current in order to receive, and that it is highly desirable (for economical and other reasons) to turn it off again when "stocks and shares," or "local weather" comes through, or during the frequent intervals when one is requested to "stand by for five minutes, please." The careful man, if he is sufficiently energetic, will rise up and walk out to the rheostat handle on these occasions.

Reliable at Small Cost.

Frequently, however, this proves too heavy a strain after a hard day's work and a good dinner, and then the valves are kept alight until "closing-down" time, the penalty being subsequently paid on the bill for accumulator "juice."

There is, of course, the obvious solution of running the accumulator current through the length of the connecting wires and inserting a control switch in each room. This is, however, very undesirable for many reasons. In the first place it is a waste of good current, and will probably entail the use of an extra cell in order to make up for the voltage drop along the leads.

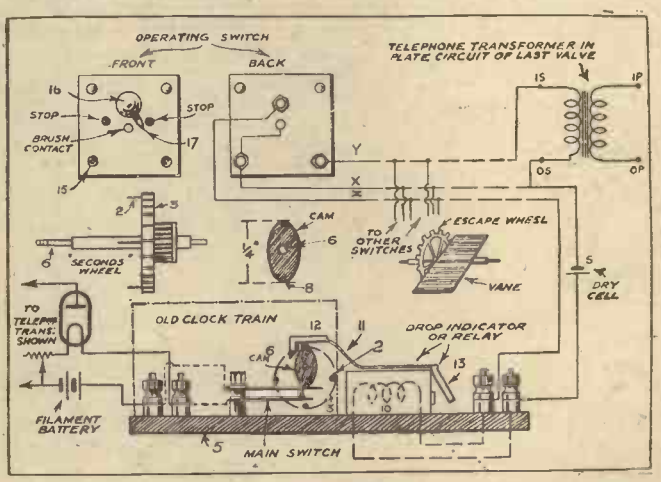
In the second place there is a distinct risk of "shorting" the accumulator, which is certainly not good for it, quite apart from the possibility of fire starting from the overheated wires.

The arrangement about to be described provides a remote control for the filament which has been proved by actual experience to be simple and reliable in action. It can be constructed at small cost, and calls for no more skill than that required to build a simple receiving set. The only tools required for the job are a drill, a saw, a soldering iron and a file, whilst the actual components are such as can be picked up at any time for a couple of shillings or so on a market stall or in a junk shop.

The principle of the idea is to arrange the main filament switch in the apparatus room, near the actual set, and to control it by means of a "brush contact" located in each room, utilising for this purpose only a momentary current derived from one extra dry cell.

The first requirement is an old alarm clock or other clock motor. Of this only the mainspring and the train of wheels down to that carrying the seconds hand are really necessary. The balance wheel and lever should be removed, if they are not already missing when the article is obtained. The real essential is some mechanism that can be wound up to make a wheel go round.

The second requirement is a drop indicator or relay such as is used to show in which room an electric bell has been ringing, or to indicate to a telephone operator what subscriber has rung up. The only essential here is that there must be an iron core, 10, and a pivoted drop-plate, 13. The actual wiring, as bought, is of no consequence, as it is invariably too fine and must be stripped off and the core re-wound with wire of 24-28 gauge.



Commencing with the clock-work train, the escape wheel must be taken off and a vane of sheet tin or copper foil soldered on to its spindle, as shown in the diagram. This is done for the purpose of damping or slowing-down the speed of rotation when in use. The escape wheel, it may be mentioned, is the last wheel of the train, and has saw-like teeth. The only other wheel that requires handling is the "seconds hand" wheel marked 3 in the diagram.

Four holes are drilled out at equal distances around its rim, and are then plugged with pins, 2, which are left projecting for about an eighth of an inch on the outer side of the wheel. The pins should preferably be of steel, and may with advantage be soldered in order to ensure a tight fit. A moderate-sized needle will do nicely for the job. The wheels are now replaced in their original order, and the clock frame is then screwed down on to a baseboard, 5.

The Relay.

A small piece of ebonite fibre shaped as an oval or "cam," as shown, is now drilled centrally so as to fit tightly on to the projecting spindle, 6. Beneath the cam are arranged two strips which are insulated from one another, and are connected to leads in circuit with the filament accumulator. These form the main filament switch. Normally the contact points at the free ends of the strips do not touch, but as the spindle, 6, turns, the long edge of the cam moves them into contact, and so lights up the valves.

All that remains to be done is to control the cam by some device which will allow the wheel, 3, to turn just one-quarter of a revolution at a time. This is effected by means of the drop indicator, or relay, 10.

Upon the end of the arm, 11, secured to the plate or armature, 13, is soldered a catch, 12, which normally falls into position to hold one of the pins, 2, on the wheel, 3. To do this the electro-magnet is first soldered on to a piece of brass which is then screwed on to the base board, 5. The brass arm, 11, can then be bent until the catch takes hold of one of the pins, 2, and prevents further rotation. As the wheel stops, the cam is adjusted and firmly fixed on its spindle so that the contact strips are pressed together, thus completing the low-tension circuit.

The next time the relay is operated the plate, 13, is attracted and "dropped," and the arm, 11, is momentarily raised to release the caught pin, 2. Immediately afterwards, the arm, 11, drops ready to catch and stop the next oncoming pin, 2, and so on. A momentary current is all that is required to pass through the relay, 10.

The clock motor does the work of actually making and breaking the circuit. One winding of the clock mainspring is sufficient to turn the juice on and off a thousand times, and a single dry cell or Leclanche cell will outlast many re-windings of the clock.

In wiring-up, three wires are led from the apparatus room to convenient places as required throughout the house, a switch panel being placed in each room. The local switch is a very simple affair, being merely 1½ in. square ebonite, ¼ in. thick. It comprises sockets, 15, to take the loud speaker or telephone leads, X, Y, from the secondary of the 'phone transformer, as shown, and a knob, 16, connected electrically at the back of the panel to the third lead, Z.

The knob carries a metal finger, 17, moving between two end "stop" screws, and brushing over an intermediate screw, which is connected at the back of the panel to one of the leads, X. When the knob is turned from one stop to the other, it momentarily completes a circuit through the dry cell, S, to the electro-magnet, 10. This is sufficient to raise the catch, 12, and allow the clock motor to make or break the circuit of the accumulator.

No disadvantage can arise from using one of the main leads for the pilot circuit, nor is there any objection to running three wires in parallel as these only carry low-frequency currents, which are practically immune from "capacity losses."

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MOUNTED VALVE SOCKETS.
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FILAMENT RHEOSTATS.
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2 or 5 ohms resistance, 3/- each;
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WAVES AND STRAYS.

THE MOOR THE MERRIER.

By HIGHAM BURLAC.

Here is another whimsical article from the pen of a very popular contributor to "P.W."

ALL too-long ago—it seems—because the world and wireless were too much with me, I fled to Yorkshire and flung my suitcase into the raftered guest-chamber of an inn set on a moor. On the way north I slept till we had left Huntingdon behind, because I knew the aerials in the backyards would have thinned out by that time. The food at luncheon was wireless. But it was not hairless. There was no wireless set at my inn, though there was a peat fire burning there which they said had burned for over a century. Li—— Oh, well, of such pleasant fictions are Love, Life and Letters composed—specially letters from crystal-users.

The Lonely Valve.

In fact, I felt that I had found oblivion, and with howls of derision growing ever fainter, the "beam" system, the message from Mars, the echoes of Hyperprism, Captain Eckersley's views, Imperial wireless and the range of 5 X X, all receded to the horizon, where they coalesced into a black dot, which exploded with the noise of a crowing cock, and I awoke to a sparkling, rain-washed world of sky and heather.

Presently I went out across the moors and sat me down to smoke. The heather ran in all directions to a skyline as severe and unbroken as a razor's edge; not a tree, not a bush or projection of any kind broke the smoothness of the moor's purple carpet, save a cow near by, who looked as if she must have been dropped from an airship, for she seemed as out of place there as a salmon in a hop-garden.

This lady and I shared a solitude like unto that experienced by the itinerant sword-swallower when the time comes for his passing the hat. And no hint or suggestion of wireless; I was alone with the unspoiled peat-bog and a slightly spoiled cow.

"Now, the Little People of the Heather, as the wise Roger of Lindisfarne saith, 'were wont to make honey'" I began to myself—as Madonnas are said to croon to their babes—and was exactly 186,200 miles away from wireless when I saw *IT*. Now, I do not expect you to believe me, but, if you please, we will take it for granted for the sake of the yarn. Not a yard distant, all four legs in the air—no, not another cow! Do you think I am writing about a ranch? Again!—all four legs in the air—was a real honest-to-goodness, *thermionic valve*.

A Sudden Shock.

It is related that Livingstone, when deep within the intricacies of what he fondly imagined was virgin African jungle, came upon a modern silver fork. It stuck in his gizzard and he was so desperate that he dashed out of camp and wildly discovered a new waterfall, just to show 'em the sort of man he was. So you can imagine my feelings when I lamped that twelve-and-sixpenny electron-bottle. I looked suspiciously at Lady Shorthorn, but she selected another cud, with a nonchalant air—*she* wore the nonchalant air, not the cud—and began to chew it like a Cincinnati stenographer chews gum—anti-clockwise.

What the Ancient Thought.

I picked up the wretched thing—the valve, not the cud. It was not much weathered and the filament was intact. I am not going to make my Editor use his blue pencil by putting down the name of the maker of that valve, but—it was the best on the market. I know that because

Mr. Rogers (left) and Mr. Dowding (at switchboard) in a corner of the "P.W." workshop.

I am a student of advertisements. Well, there it was. I felt like a lover of Nature when he sees the relics of a Cockney picnic-party in his favourite sylvan nook, and I removed myself from the unhallowed spot. Ma Shorthorn must have sensed my anguish, for she arose in sections and ambled off, seeking self-expression in a fictitious milking-time.

Back at my inn, I slunk on to a seat in the smoky taproom and comradioed with an ancient bogman with white whiskers round its rim. A quart of ale lubricated his vocal machinery and he uttered. He said:

"Wunnerful thing—this wireless!"

Yea, though we take the wings of a third-class ticket and fly to the uttermost parts of the moor, wireless is either with us or tarries not far behind us. Over the bar was an elegant engraving of the "Marriage of Queen Victoria and Prince Albert." I thought, "What a ripping frame aerial a crinoline would make." To the ancient I grunted:

"Y-yes! What do you know of it?"

"Nowt! But there were a young man here coom six months, wi' one of these machines what you carry with you, like it were a booket. Wunnerful warm, he were. Said he were gawn to pitch out on bog an' hear t' moosic. Coom back all doompy an' owerset, he done. Reckon t'bog sooked oop t'music. Arl alone, her were, 'ceptin' for that there box affair'n his'n. Reet mad, he were an' arl, a mutterin' an' a maumblin'——"

A Wunnerful Thing.

"Ah!" I said. "You will no doubt recall that the genial Don Francisco de Quevado Villegas, in his Second Vision, says, 'Mean souls do naturally breed sad thoughts.' What a rotter he must have been to bring his lash-up into this unsullied——"

"Dawn't naw'm. Happen he coom fra' Bradford. But this mun, what ahm telling, he shooted off fast, pretty near as he coom. Mad he were. Wunnerful thing—this wireless. Ah!"

Then I saw it all. (1) He went mad because, having brought a portable set to the moors, he found no tree whereon to hang his aerial, or (2) the bog took him while he was tuning it, and only the spare valve escaped.

"Well," I reflected, "that's some consolation. The immemorial bog rejects and defeats the modern innovator. I can go back and brood on the immortality of the "Little People of the Heather." So I brooded for three weeks, during which time, I can guarantee, the peat-fire never went out.

Sic Transit.

One evening, shortly after my return to London, Quilby dropped in and asked me to return a valve I had borrowed from him. "You slipped it into the pocket of your raincoat," he said.

And, b'gosh, I had never taken it out, either. It had fallen out, when I spread the coat out upon the Moor, for the heather was wet. *Sic transit*, another fine theory.

TECHNICAL QUERIES.

Readers are requested to turn to the Radiotorial page and read the important announcement concerning the P.W. Free Technical Queries Service.

THEATRELAND AND BROADCASTING.

WHAT THE "STARS" THINK.

By "ARIEL."

NOW that the autumn season is in full swing, it may interest readers to know what many eminent artistes think about that much-discussed problem, broadcasting and the stage.

When Television Comes!

It will be remembered that about this time last year, I interviewed Mme. Pavlova on a subject which seems very alien to her profession, and which she had never before discussed with any journalist. She told me that the music of some of her ballets had already been broadcast, and, she believed, very much enjoyed. But when I spoke to her (in my very bad French) of the possibility of television, and asked her how this would affect the future of dancing, she did not seem to be very much impressed. She replied that it was too far off to be taken seriously, and, in any case, the transmission by such a means of a complete ballet would be very difficult to accomplish with any measure of success.

Remembering this, I went round to Covent Garden last week, where I found Mme. Pavlova rehearsing. I reminded her of my previous visit, and was agreeably surprised to find that she had not forgotten it. She smiled at me, and remarked humorously, "I see you have not yet discovered television!"

Broadcasting Better Music.

I asked Mme. Pavlova if she had any intention of broadcasting the music of her ballets again next season. She answered that she had not thought of doing so. "But," she continued, "one never knows these days what may happen next. It is possible that I may. I do not disapprove of broadcasting—I think it is a very wonderful discovery. Surely, it must do a lot to keep happy the very poor people?"

"What effect do you think it has upon the theatres?" I inquired.

"It is difficult for me to say," she replied. "Of course, as far as I am concerned, if it has any effect, it is a good one. People only get the music of my ballets, and they may want to know what the dancing is like. In the other branches of dramatic art much will depend on how the programmes are handled. As long as the play is not spoilt by being transmitted, there is no reason why the theatre should suffer. As far as I can see, it is only necessary for the managers and the broadcasting company to come to some amiable agreement."

From Covent Garden I made my way to the Adelphi Theatre to see Mr. Owen Nares. I put the same debatable question to him, and he told me that on most points he was in agreement with the other eminent people of his profession.

"I think it would be a good idea," he said, "if the broadcasting company were to appoint a committee which would represent the interests of both parties concerned. It might consist, for instance, of three or four theatrical managers and producers, possibly an electrical engineer, and some members of the programme staff of the B.B.C. The committee would decide what shows were suitable for broadcasting, and the terms in each case. For, like Mr. Cochran, I think that broadcasting rights should be paid for by the B.B.C.; but this, of course, is a small point, and I understand that the B.B.C. are perfectly willing to pay for what they have."

Fortified by these sound judgments, I took a taxi round to the Palladium, to find out what Miss Nellie Wallace thought of the matter. She was sure, I knew, to offer some original solution of the problem.

The Staff at the Hull Station—Mr. Bulov, Mr. Lyne, Mr. Carver, Mr. Howie, and Mr. Page (Station Director).

A Good Intention.

I sought her out between two acts of the revue, and was fortunate in securing a few minutes' talk with this most comical of comediennes. She had apparently scored yet another success, judging by the roars of applause that followed her to her dressing-room. I protest that I had no intention of being anything but serious with Miss Wallace, but it is utterly impossible to keep one's countenance when talking to her.

"Good evening, Miss Wallace," I said, boldly taking the plunge, "what is your opinion of the effects on broadcasting on the theatres?"

"Indeed," she replied with great solemnity, "I have not yet had an opportunity to consider at any length this weighty and momentous question. Perhaps *you* could enlighten me."

I replied that it was her opinion I needed, and that my own would hardly carry sufficient weight. But as she continued to look entirely vague, I asked her whether she had ever listened-in.

"Yes, of course I have," she replied with dignity, "and it is my intention at the earliest possible opportunity to invest in a wireless set. Provided I can purchase it on the convenient system of my friend, Mr. Drage, for he supplies the insurance policy free. Payment? Oh, dear no! he doesn't want any payment—Mr. Everyman!"

The Only Terms!

I tried to point out that if she did not pay up her instalments the set would be confiscated.

"Oh, dear no, Mr. Everyman! As you are a Scotchman, and naturally rather close, let me hasten to add that we will make you a present of it if you cannot pay. And these," continued Miss Wallace with an arch look, "are the only terms I could possibly consider at the moment."

"Would you like to have the 'Whirl of the World' broadcast?" I inquired.

"I dunno," she replied indifferently.

"But if it were broadcast," I insisted, "do you think you would draw such large audiences to the theatre?"

"Oh, yes, probably larger! They have only to hear Billy's celebrated top notes, and they will come round in shoals!"

"Then," I interrupted, "your opinion is that it would have a good effect on the theatre?"

"My good man," said Miss Wallace with some irritation, hastily donning a jumper, "if you think you have come round here to get anything serious, you are vastly mistaken. Go along, like a good boy, and sit in the front row and watch my next scene. It will be a welcome relief from your brain-splitting problem!"

I wandered rather disconsolately out of the theatre, and the first person I ran into was Mr. Talbot O'Farrell, the famous Irish entertainer. I told him how I had been trying to get serious views upon what I considered a very important question. "Some will not be serious," I complained, "and the rest cannot see that any problem exists."

"But you have gone to the wrong people," he said. "We artistes are the most easy-going people under the sun. We will do anything we are asked to do, and we leave it to the managers to decide the momentous questions connected with the theatre. If they tell us that broadcasting is opposed to our interests, well and good, but if somebody else asks us to broadcast, we are equally willing to comply. If you want a considered judgment, go to some of the managers and producers who take these things to heart."

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WIRELESS PRESS

The Technical Editor of "Popular Wireless" will be pleased to receive wireless sets and component parts for test. Reports will be published under this heading.

A VERY compact and ingenious crystal set, which involves a method of tuning that will be new to many amateurs, has been placed on the market by Lissen Ltd.

It consists of a one-piece moulded baseboard, measuring only 4½ by 3 inches, on which are mounted all the necessary detector fittings, and a socket to take any Lissenagon plug-in coil. The inductance value of the coil is then varied by two metal vanes, which are arranged to slide across the faces of the coil, and controlled by a knob mounted on the same shaft.

On the instrument tested tuning was found to be rather flat, although this was not so noticeable as might have been expected from the extreme simplicity of the set. It is only supplied complete with the appropriate Lissenagon coil or coils to cover the wave-lengths desired.

* * *

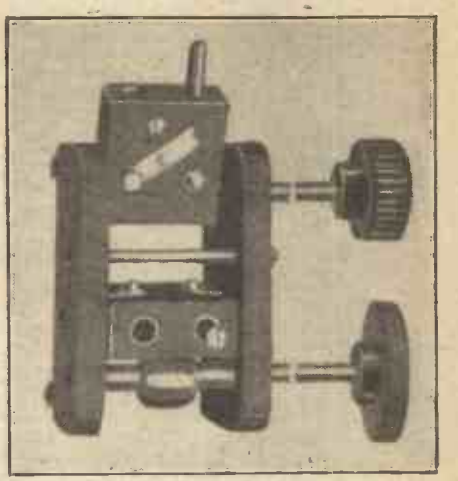
Amateurs who have experienced the peculiar and elusive fault developed by moisture in L.F. transformers, will be interested in the "Eureka Concert Grand Intervalve Transformers," one of which has been submitted for test by the Portable Utilities Co., Ltd. Enclosed in a cylindrical steel case (mounted on four feet, and carrying its four terminals on an end plate covering a sealed interior), the design is such that dampness cannot penetrate to the windings of the instrument, and this covering also serves to effectively screen the magnetic field. The total weight is not excessive, the instrument turning the scale at about a pound and a quarter.

The "Uncle Tom" crystal set.

A comparative test was made by using the Eureka as the first L.F. transformer in a dual and L.F. circuit, in place of another make of transformer which had been selected for that position. Results with the "Concert Grand Eureka" were excellent. In the amplification of weak signals, its performance was equal to the transformer which it replaced, and in the reproduction of very strong signals it was, if anything, slightly superior. Those who prefer an actual circuit comparison to a laboratory test, will agree that the first stage of a dual and L.F. circuit affords a good test of an L.F. transformer. In this position the Eureka Concert Grand was found to function admirably.

The "Murray" valve holder, which is

(*Continued on page* 400.)



This coil holder, by Goswell Engineering Co., is fitted with a reaction reversing switch.

APPARATUS TESTED.

(*Continued from page* 398.)

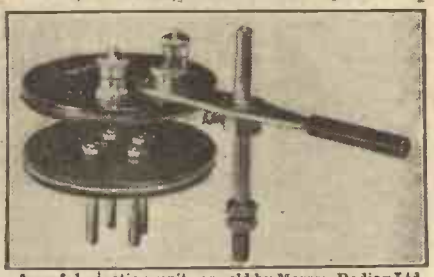
shortly to come on the market at 1/3, is one of the most interesting little "gadgets" it has been our pleasure to review. The advantages claimed for it are that no template, nuts, or soldering are required for mounting it on a panel, while it projects from the latter's surface but a matter of ¼ in. or so. When in position no brass is visible, and it is impossible to burn out a valve through an accidental contact between the plate and filament points. We have carefully examined the sample sent us, and cannot find any reasons why it should not prove as satisfactory in use as the makers claim. It certainly forms an advance over the use of ugly projecting sockets and even over the usual type of valve holder, which is not a very handsome fitment at the best of times. Prospective constructors would be well advised to ask their dealers to let them examine a "Murray" valve holder.

* * *

If it is not too early to do so we predict that the "Uncle Tom" crystal set, which is photographically illustrated on page 398, will be in great demand as a Christmas present this year. It is a speciality of Messrs. J. P. Gowland, of 18, Ellison Place, Newcastle-on-Tyne, and sells at 17/6. We recently had a sample of this interesting novelty submitted to us for test, and discovered it gave results quite equal to those of any medium-priced receiver of conventional design. It is made of a good quality coloured china which is, of course, an excellent insulator. As will be guessed, the hat forms the tuning coil, while the crystal detector can be clearly located. The "Uncle Tom" is a very suitable ornament for a wireless "den," but it functions really well as a receiver, and should prove popular.

* * *

Messrs. Eric J. Lever, of 38, Clerkenwell Green, London, have sent us a range of handy little terminal gadgets, among which are terminals with engraved heads indicating "aerial," "earth," etc. "Trix" Quick Grip



A useful reaction unit, as sold by Messrs. Radiax Ltd.

Terminals, and "Lico" terminal clips, which sell at 2d., 4d., and 9d. each respectively. All are items of distinct utility and should appeal to amateurs desirous of employing neat and adaptable connecting points.

* * *

A very interesting piece of apparatus has reached us in the shape of a "Helicoid" aerial, a speciality of the Bristol Motor Co., which retails at 12s. 6d. It consists of a copper spring, normally 3 ft. long and 1 in. in diameter, but it can be stretched to well over five times this length. Such is the springy nature of the hardened copper that, after having been stretched in this manner, it returns to its original shape and length. It is provided with eyes at each end, so that it can be fixed to hooks. It certainly provided us with an interesting hour's experimenting. In the ordinary way, the makers recommend that it should be suspended between a pole on the roof of a house and a lead-in point, and, erected in a similar manner, quite good results are obtainable. We did not discover that it equalled our ordinary twin aerial, but then we have ample space at our disposal. As an outdoor aerial for people with limited garden-space, it should prove quite useful. As an indoor aerial, pulled out to some 16 ft. and stretched in the form of a V across a room, with a lead to the set from the apex, excellent results are obtained, results far better than those obtained with a straight wire running around the room. We tried it as a frame aerial, and in this capacity, both ends being connected to the set, louder signals were obtainable than with a large 4 ft. frame of conventional type. It was decidedly interesting to note the increase of signal strength that followed when the "Helicoid"

A new "Gecophone" Two-valve receiver.

frame was enlarged by stretching, although, as may be imagined, it was necessary to alter the tuning simultaneously.

RADIOTORIAL.

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The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All contributions to be addressed to The Editor, POPULAR WIRELESS AND WIRELESS REVIEW, The Fleetway House, Farringdon Street, London, E.C.4. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

Technical queries should be addressed to the Technical Queries Department, and must in all cases be accompanied by a stamped addressed envelope. Not more than two enquiries can be answered in one letter, and telephone calls or personal calls at this office cannot be dealt with. A copy of the questions must be kept as it is not always possible to reproduce the query when replying. Number the questions 1 and 2, and answers will be given under each number.

The Editor desires to direct the attention of his readers to the fact that, as much of the information given in the columns of this paper is of a technical nature and concerns the most recent developments in the Radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

PATENT ADVICE FOR READERS.

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

Questions and Answers

"SINGLE-VALVE SINGLE-BATTERY SET." (Turnham Green).—What are the parts required to build a one-valve "Unidyne" receiver?

The following is a complete list of the parts required:

1 two-way coil holder, 1 variable condenser (·0005), 1 grid condenser (·0003), 1 variable grid leak (·5 to 5 megohms), 1 five-pin, four-electrode valve, 1 4-volt, or 6-volt accumulator, 1 filament resistance, 2 Lissenagon coils (75 A.T.I., and 100 for reaction), and 'phones. A pictorial diagram of the connections was given in Radiotorial last week (No. 122).

* * *

S. R. (no address) inquires whether a patent tuner now on the market is suitable for the Unidyne 2-valve set.

The tuner is quite efficient, but we do not like to guarantee that you will obtain good results in the Unidyne with it, as it does not appear to have any provision for reaction coupling. We should therefore recommend you to keep to the specification given in the articles describing the set, though we wish it to be understood that we are not in any way belittling the particular instrument that you mention.

We find that in Unidyne sets even the smallest deviation from the methods of tuning and reaction sometimes results in apparently the most disproportionate variation in results, and so in order to be able to guarantee that the Unidyne will operate successfully provided care is taken in its handling and construction, we advise readers to keep to the directions given. Those who desire to experiment with other components, etc., will find it very interesting, but the average reader and listener should keep to the instructions as nearly as possible.

* * *

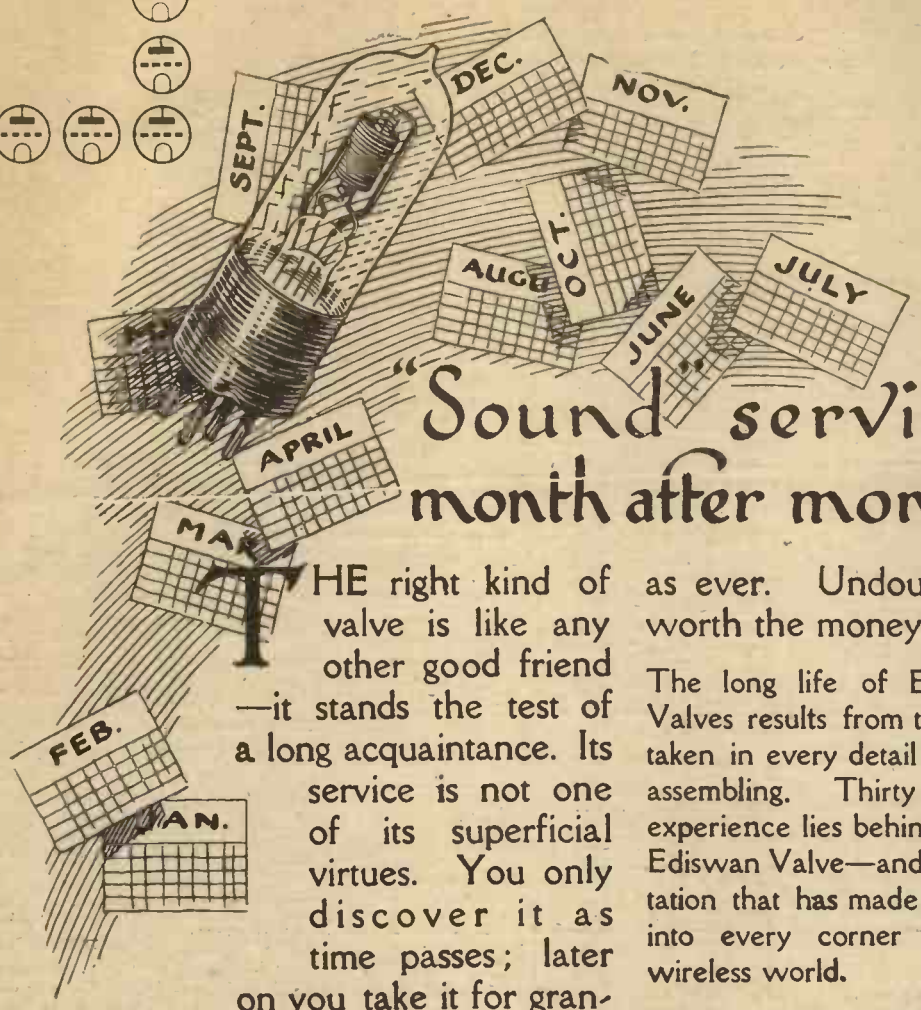
T. H. L. (Brighton).—With regard to the diagram of the Unidyne Reflex Circuit published in POPULAR WIRELESS of September 13th on page 83, Fig. 2, the L.T. positive does not seem to be connected correctly. Should not the grid leak be connected to it?

Yes; unfortunately the connections from the L.T. positive lead were omitted by the draughtsman. The L.T. positive should be connected to one side of the grid leak and also to both the filament rheostats.

* * *

L. W. S. (E.13)—With reference to your publication of a booklet on how to build a valve set using the "P.W." circuit, I shall feel obliged if you could let me have a copy of same, or, if this is not possible, perhaps you could let me know the size of the two basket coils, and whether D.E.R. valves are suitable for this circuit?

(*Continued on page* 408.)



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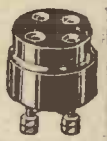

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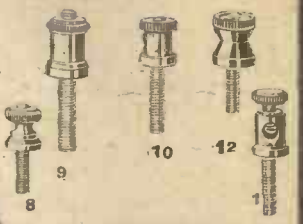
Post 3d. each.



TERMINALS WITH NUT & WASHER

No. 8	per dozen	1/-
No. 9	"	1/3
No. 10	"	1/1
No. 12	"	1/8
No. 13	"	1/1

POST FREE
All 4 B.A.

BATTERIES (H.T.) EVER-READY

60v. - 13/6
180v. - 22/6
POST FREE

FIBRE STRIP FOR COILS

3 FEET Lengths
1 inch wide.
12 feet 1/-
Post Free.

GOSWELL ENGINEERING

Patent Valve Holder
1/6
2-Way Cam Vernier Coil Stand
9/-
3-Way Cam Vernier Coil Stand
12/6
3-Way Ordinary
7/6
ALL POST FREE

EBONITE CUT TO SIZE (Highgrade)

3/16 in. ½d. per sq. inch
¼ in. ¾d. per sq. inch

RIGHT OPPOSITE DALY'S GALLERY DOOR

K. RAYMOND

27, LISLE STREET, LEICESTER SQUARE, W.C.2

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HOURS OF BUSINESS:
DAILY - 9 to 7.45
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'Phone: GERRARD 4637.

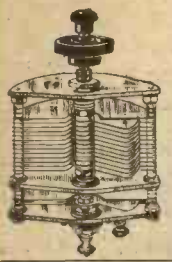
TWO PAGES MORE OVERLEAF

ALL OUR CONDENSERS HAVE BEEN TESTED AND RECOMMENDED BY LEADING JOURNALS UNSOLICITED. BRITISH MADE *SPECIALLY ADAPTED FOR* ALL LEADING CIRCUITS

NEW MODEL

WITH VERNIER		WITHOUT VERNIER	
·001	9/3	·001	6/6
·0005	7/3	·0005	5/6
·0003	6/9	·0003	5/-
2 Knobs 1 Dial		·0002	4/8
		Vernier, ·00005	3/9
		With the knob & dial	

Post 6d. Set. Post 6d. Set.



SQUARE LAW

Complete with Knob and Dial

		With Vernier
·0005	7/11	11/6
·0003	7/6	10/6
·0002	7/-	9/6

Postage 3d. Set.

RAYMOND'S VARIABLE CONDENSERS

—Exclusive design
—Triangular fixed vanes
—Pressed aluminium spacers
—Fits in any corner
—Takes up tiniest space
—Capacity guaranteed
—Extra insulation
—New one hole fixing method
—Terminal connections
—Stout vanes
—Perfect efficiency
—Wonderful for Portables

UNSURPASSED FOR FINE TUNING

'DE LUXE' MODEL

AS SHOWN, WITH DIAL, KNOB AND BUSH.

·001 - 7/3
·0005 - 5/11
·0003 - 5/4
·0002 - 4/11

POST 6d. SET.

John Blair, Esq., Rexall Pharmacy, Millom. says:— Your Condensers are a REVELATION to me as a Dealer. Sept., 1924.

C. Walton, Esq., Andover. Tested your Condensers on Megger and got "INFINITY"

9/- TWIN CONDENSER

POST FREE.

Composed of two equal units of .00025 or .0003 mfd., operated by one Knob and Dial, thereby enabling you to tune two circuits by one turn of the dial. Can be used in series or parallel. Complete as shown with aluminium ends. Knob and dial. For Tuned Anode Circuits.

MANSBRIDGE FIXED CONDENSERS

T.C.C. (New.)

1 M.F.	4/6	Various others Stocked.
2 M.F.	5/-	
·25	4/-	
·05	4/6	

Delivery very slow from makers.

"RAYMOND" FIXED CONDENSERS.

Ebonite Base. ·001, ·0001 to

·0005	1/2
·002 to ·004	1/3
·006	1/6
·01 and ·02	1/9
·05	3/3

POST FREE.

W Kennard, Sig.-Telegraphist, H.M.S. Leamington, 2nd July, 1924. The Condensers are splendid, and superior to any I have ever seen. Please find repeat order. W. Hale, Esq., 3, Gaye St., Walsall, 30th April, 1924. The last 4 Condensers gave every possible satisfaction—highest quality at extremely low prices. Kindly despatch enclosed further order. E. Shepherd, Esq., 23, Warden Street, Dunedin, 12th May, 1924 Everything came to hand in splendid condition, the quality far exceeding my expectations.

The set used by **Miss Evelyn Laye** in her dressing-room at Daly's is made of Raymond parts.

LOUD SPEAKERS

30/-	STERLING "DINKIE"	
27/6	JUNIOR AMPLION	Newest Model
42/-	JUNIOR DE LUXE	Oak Trumpet
55/-	BABY STERLING	Splendid Value

VARIOMETERS

RAYMOND 8/11

Post 3d. each

FALLON
IGRANIC
EDISON-BELL

Post free 10/-

ENERGO

H.F. Plug-in Transformers Post, 2d. each.

No. 1. 150-450	3/6
No. 2. 250-700	3/11
No. 3. 450-1200	4/3
No. 4. 900-2000	4/6
No. 5. 1600-3000	4/9
No. 6. 2200-5000	4/11

BRUNET (genuine)

4000 ohm Double	16/6
4000 ohm Single	8/3
2000 ohm Single	7/6

POST FREE.

From S. H. COULTER, Esq., 55, Court Road, Barry Dock. 30/9/24.

Condenser to hand this a.m. No wonder you are snowed under with orders! IT IS AN EXCELLENT COMPONENT. Please find repeat order.

JACKSON BROS.

"J.B." VARIABLE CONDENSERS

	Standard	Super.	Microdenser
·001	8/6	9/6	11/6
·00075	8/-	9/-	11/-
·005	7/-	8/-	10/-
·0003	5/9	6/9	8/9
·00025	5/9	6/9	8/9
·0002	5/-	5/6	8/-
·0001	4/9	5/3	7/9
Vernier	4/-	4/6	

Post 3d. set.

HIGH GRADE EBONITE

POST PRICES	3/16 in.	¼ in.
6 x 6	1/6	2/-
7 x 5	1/6	2/-
8 x 6	2/-	3/-
9 x 6	2/2	3/3
10 x 8	3/-	4/2
12 x 6	3/3	4/2
12 x 9	4/3	5/6
12 x 12	5/6	7/6
14 x 10	5/6	7/6

Cut to Size, 3/16 in. at ½d. square inch. Foreign Post extra.

D.C.C. WIRE POST PRICES

16	D.C.C.	½ lb. - 2/-	20	D.C.C.	¼ lb. - 1/3
16	,,	1 lb. - 3/8	22	,,	¼ lb. - 1/4
18	,,	½ lb. - 2/3	24	,,	¼ lb. - 1/6
18	,,	1 lb. - 3/9	26	,,	¼ lb. - 1/8
		28 D.C.C. ¼ lb. - 1/10			

CALLERS' PRICES ELSEWHERE

FRENCH THOMSON-HOUSTON

4000 ohm 'Phones
100 pairs at 12/11
POST 6d.

SUNDRIES

Post free

Screw Spade Terminals doz.	1/-
Pin Screw Terminals .. doz.	10d.
Spade Tags .. .. doz.	5d.
Empire Tape, ½ in. .. 12 yds	9d.
Insulating Sleeving .. 6 yds.	2/-
Ebonite Knobs, 1½ in. 2 B.A...	6d.
Moulded Knobs 1½ in. 2 for	8d.
Ditto 1 in. 2 B.A. .. 2 for	8d.
Ebonite ex-handles 6 in. ..	9d.
D.C.C., I.R.C. Bell Wire 10 yds.	1/-
Double 'Phone Cords, 72 in. ..	1/11
Porcelain S.P.D.T. Switch ..	1/11
Ditto D.P.D.T. Switch ..	2/6
Battery Clips .. .. doz.	10d.
Ebonite Valve Holders	1/3 and 1/-
Lead-in Wire 4 M/M .. 10 yds.	2/6
Lead-in Wire .. .. 10 yds.	1/6
Twin Flex .. .. 12 yds.	1/11
100 ft. 7/22 Aerial Wire with four Insulators	3/6
Nugraving Titles or Scales ..	8d.
"R.I." Choke Coil	10/-
Nickel Panel Switches, D.P.D.T.	1/5
Ditto, S.P.D.T.	1/2
Insulating Sleeving 3 yds. ..	1/4
Tinned copper sq., 16 gauge, 15ft.	1/-
Spearpoint Whisker, gold ..	4d.
Gold Whisker	4d.
Set of 5 (one gold)	6d.
Variometer (250/650) ..	3/3 and 2/6
Ditto Ebonite	4/11
Ditto Ball Rotor	6/11
Burndept Detector	5/6
Screw Wander Plugs .. pair	6d.
Skinderviken Button. Alumin.	5/-
Seven Twist Drills (H.S.) ..	1/11
Taps 0, 2, 4, 6 B.A. .. set	2/-
Sorbo Ear Pads .. pair	1/9
Neutron Crystal	1/6
Blue Tungstalite	1/6
Gecosite (G.E.C.)	1/3
Tumbler Switches (Ebonite) ..	1/9
Valve Sockets, Plain (nut and washer) doz.	1/-
Sets of Spanners	2/-

RIGHT OPPOSITE DALY'S GALLERY DOOR

'Phone: GERRARD 4637.

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POST PAGES CONTINUED

SEE OVERLEAF **EXTRA POSTAGE ON FOREIGN ORDERS.** SEE OVERLEAF

The CREAM of the WORLD'S HEADPHONES

4,000 ohms.

STERLING 4,000 ohms NEW MODEL 25/-
BROWN'S (Featherweight) 25/-
B.T.H. (Wonderful Tone) .. 25/-
BRANDES (Matched Tone) 25/-
GENERAL RADIO 20/-

TELEFUNKEN 4,000 ohms HEADPHONES

As light as a Feather .. 17/11

Dr. NESPER HEADPHONES

Genuine Nesperphone, 4,000 ohms. Fitted with adjustable diaphragm, detachable receivers, double leather-covered headsprings, long flexible cords, nickel-plated parts. Very comfortably fitting to the head.
LOOK FOR THE TRADE MARK.
4,000 ohms .. 12/6
Post 6d. pair.

GENUINE "N & K" HEADPHONES

Guard against inferior imitations which are "cleverly" got up to deceive. Make sure of the genuine article, the original "N & K," and avoid dissatisfaction. See that the letters "N & K"—and no other—are stamped.
4,000 ohms .. 12/11
6,000 ohms .. 13/3
Post 6d. pair.

BEWARE OF "PATTERN" OFFERED CHEAPLY

ACCUMULATORS

MADE BY WELL-KNOWN FIRM FOR ME.

2 v. 40 amps. 9/6. By post 10/6
4 v. 40 amps. 16/6. By post 17/6
4 v. 60 amps. 19/6. By post 20/6
4 v. 80 amps. 23/6. By post 24/6
6 v. 60 amps. 27/6. By post 29/-
6 v. 80 amps. 33/-. By post 34/6
6 v. 105 amps. 38/6. By post 40/6

UNIVERSAL (FRANCO)

Basket Coil Stand, 2-way

POST FREE 5/9

FRANCO, 2-way (plug-in) 12/6
Ditto 3-way 17/6
The only GEARED COILHOLDER on the market.

CHELMSFORD (5XX)

D.C.C. Basket Coil, complete with adapter, specially made to use with 650 variometer, 2/6. By post 2/9
LOADING PLUG and Socket .. 9d.
D.C.C. COIL for 5 X X, 1/6. By post 1/9

BRASS FORMER

TO MAKE YOUR OWN COILS

DOUBLE, 23 spokes each side.
POST FREE 3/11

POST PRICE TINNED COPPER

18 Round ¼ lb. 2/6
20 Round, ¼ lb. 2/6
16 Square, 12 ft. .. 10d.
18 Square, 12 ft. .. 9d.

GUIDE FOR CHELMSFORD

On 1,600 Metres

Aerial	Reaction
Coil No. 150	200
Tuned Anode	250 or 300

"SUCCESS" L.F. TRANSFORMER

21/-

"MURRAY"

(Prov. Pat.)

VALVE HOLDERS

High finish. Absolutely Safe. Low Capacity.
EASILY FIXED.
Exceptionally neat appearance
1/3 POST FREE.

RADIO PRESS TRANSFERS 6d.

By Post 8d.

POST PRICES
VARIOMETER 250/600
2/6
Ditto with fixing clips
3/-
EBONITE BALL ROTOR
6/11
ALL KINDS STOCKED
at 2/11 3/6 3/9 4/- 4/6
Leave the selection to me and you won't be disappointed

VALVES

Cossor P.1 and P.2 12/6
Mullard L.F. & H.F. 12/6
Mullard D. ra 21/-
B.T.H. R.4 - - - 12/6
B.T.H. R.5 ·06 - - 25/-
Ediswan A.R. - - 12/6
Ediswan A.R.D.E. 21/-
Ediswan A.R. ·06 25/-
Marconi R. and R.5 12/6
Marconi D.E.R. - 21 -
Marconi D.E.3 - 25/-
POST FREE

French "R" - - 6/11
Phillips "R" - - 7/6
French ·06 - - - 15/11
Post 6d. each

ALL VALVES ON POST SENT AT PURCHASER'S RISK.

MYERS VALVES

UNIVERSAL DULL EMITTER
12/6 21/-
POST FREE

PHILLIPS D.E. VALVES

·04 Type 1·5 to 1·8 each 17/6
Post 6d. each.

THORPE K4 VALVES

(5-pin) for UNIDYNE 17/6
THORPE K 1 .. .. 10/-
POST FREE
5-Pin Valve-holder - - 1/6

"OOJAH" GRAPHITE

Pile Rheostat for D.E. or R Valves 4/-

N. & K. LOUD SPEAKER

A LITTLE GEM
21/-
POST 1/-

RADIO PRESS ENVELOPES

No. 1 at 1/6
2, 3, 4 at 2/6

COIL STANDS

Ebonite 2-way with Extension Handles Nickel Fittings
3/3
By Post 3/9

Ditto 3-way
4/9
By Post 5/3

CAM-VERNIER
(2-way)
POST FREE 7/6

POLAR (2-way)
11/-

GOSWELL
(see elsewhere)

"R.I."
NEW MODEL
IN SEALED BOX
Don't Buy Otherwise
Post 25/- Free

NEW LISSEN LINES

5 Point Switch - 4/-
Auxiliary Res. - - 1/3
Lissen Choke - 10/-
Post Free

RIGHT OPPOSITE
DALY'S
GALLERY DOOR

'Phone: GERRARD 4637.

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THIS PAGE IS FOR CALLERS ONLY

ALL POST ORDERS FROM THE OTHER THREE PAGES

OPEN WEEKDAYS 9 to 7.45 SUNDAYS 10 to 1

Prices subject to alteration without notice. Every endeavour made to keep large stocks; but am not responsible for manufacturers' non-deliveries.

NO POST ORDERS FROM THIS PAGE.

SWITCHES ON

Porcelain D.P.D.T.	1/7½
Porcelain S.P.D.T.	1/3
Ebonite D.P.D.T.	1/8
Ebonite S.P.D.T.	1/3
Min. Panel D.P.D.T.	1/-
Min. Panel S.P.D.T.	10½d.

BATTERIES 4·5

Vulco English 4·5	4d.

H.T. BATTERIES.

Best Made 30 v.	4/6
Best Made 60 v.	7/6
Best Made 66 v.	9/-
Ever-ready 66 v.	13/6
Ever-ready 108 v.	22/6
Siemens' "Q" 1·5	3/-
Ever-ready ditto	1/9
B.B.C. 9 volts	3/-
B.B.C. 60 volts	9/6
B.B.C. 36 volts	5/6
B.B.C. 16 volts	2/6

RHEOSTATS.

Small 5 ohms	1/3
One Hole Fixing	1/3
Ormond	1/9
Ebonite Former	1/6
Ditto and Dial	1/10

Igranic, T.C.B., and all known makes.

CRYSTAL DETECTORS, &c.

Enclosed Brass, Large	1/3
Ditto, Nickel or Brass, Large	1/6
Small Brass	9½d.
Ebonite, Enclosed	1/-
Mic. Met Type	2/8
Burndept	5/-
Easi-Fix Cups	1d. & 1½d.
Gold Spearpoint	3d.
Neutron Crystal	1/6
Hertzite (Shaw's)	8d. & 1/-
Midite	6d.

VALVES.

Dutch Detector	4/9
Dutch "R"	5/-
Phillips "R"	7/6
French "Metal"	6/11

TOOLS.

Set of Spanners	1/4
Taps, 0, 2, 4, 6 B.A. set	2/-
Small Soldering Irons	8½d.
7-Twist (H.S.) Drills	1/4

MURRAY VALVE HOLDER (Patent) 1/3

Legless Valve Holder, Solid Ebonite .. 1/-

EBONITE PARTS.

Good Coil Plugs from	4½d.
Edison Bell Shaped	1/-
Raymond ditto	10½d.
Basket Adapters	8½d.
Also at 1/- & 1/3	
2-way Coil Stands	2/6
With Extens. Handle	2/11
Also at 3/6, 4/-, 4/6	
3-way	4 3, 4/6, 5/-
Goswell Cam Vernier	9/-
Franco " "	12/6
Polar " "	11/-
Etc., etc.	
Coil Plug on Stand	1/-
Ditto, Swivel Movement	1/3
Coil Plug and Clips	6½d.

BRASS PARTS.

W.O. or Pillar Terminals	1d.
Small Pillar	4 for 3½d.
'Phone 4 B.A.	1d.
'Phone 2 B.A., 2 for	2½d.
Valve Sockets	4 for 3d.
(Above with Nut Washer)	
Valve Pins and Nuts, 2 a	1d.
Stop Pins and Nuts 2 a	1d.
Plug and Socket	pr. 1d.
Spring Washers	4 a 1d.
Spade Screws	1d
Pin Screws	2 for 1½d.
Spade Tags	5 a 1d
Spring Pillar Terminals	2½d.
Nuts, 2, 4, 5, 6 B.A. doz.	2d.
Washers (Brass)	12 a 1d.

VARIOMETERS.

Impregnated Board, Wound D.C.C. and Clips, 200/600 metres	2/6
Very Good Value, Wound D.C.C. and Knob	1/6
Ebonite D.S. Wound, with Ball Rotor and Knob, 200/700 metres	5/11
Ebonite, 200/600	3/11
Rayniond Inside Winding	8/11

SUNDRIES.

'Phone Cords (6 feet)	1/5
Nugraving	7½d.
Similar Sets (Titles or Scales)	3d.
Good Knobs	1½d.
Small Knobs, 2014 B.A.	2d.
Studs, Nuts and Washers doz.	4½d.
Switch Arms 8d. to	1/-
Copper Foil ft.	2½d.
18g. Sq. Tin Copper 15 ft.	5d.
16g. Sq. Tin Copper 12 feet	5d.
Round Tin Copper, various Sizes.	
Insulated Staples 5 a	1d.
Insulated Hooks 4 for	3d.
Rubber Lead in, 30 feet	1/3
7/22 Copper Aerial, 100 ft.	1/10½
Extra Heavy Aerial 100 ft.	2/- & 2/3
Good Valve Holders	8d.
H.T.C. in Stock	1/6, 1/9
H.F. Transformers, 300/600	2/9
Empire Tape, ½ in., 2 yds.	1d.
Ditto, ¾ in. 2 yds.	1½d.
6 in. Ebonite Anticap Handles	8d.
Battery Clips 2 a	1d.
Skinderviken Buttons (Aluminium)	4/6
Connecticut Switches	1/4
1,000 ohm Bobbins	1/3
2,000 ohm Bobbins	1/8
Sorbo Rubber Ear Caps pr.	1/4
Adhesive Tape Roll	2½d.
Basket Coils	
Waxless ST100 (2)	1/-
Waxless (5) 200/2,000. set	1/8
Waxed (6), 200/3,600 set	1/8
Waxed (7), 150/3,600	1/11
Chelmsford No. 8 Tandeo	1/- 1/6
Chelmsford, D.C.C	1/3
1 Complete with Adapter (To use with variometer.)	2/3
Allen var. Gd. Lk.	1/3
Allen Anode Res.	1/3
Scales, 0-180, 2d., 3d.,	4d.
Dial and Knob (Ed. Bell)	1/3
Dial (Ebonite)	10d.
Brunet Headphones	14/6
Twin Flex 4 yds.	6d.
D.C.C. Bell Wire, 10 yds. (Indiarubber covered)	5d.
Sleeving yd.	4d.
Wander Plugs pr.	3d.
Coloured Plugs each (All screw pattern)	1½d.
Electron Aerial	1/3½
Polished Boxes, 8 by 6	3/6

SUNDRIES.

Tungstalite	1/-
Microstat	2/6
Tumbler Switches (Ebonite)	1/4
Fibre Strip (for Coils) 3 feet	2½d.
D.C.C. Wire, per ¼ lb.—	
13 g. 9d. 20 g.	9d
22 g. 10d. 24 g.	1/-
26 g. 1/1 28 g.	1/3
30 g. 1/6 Etc., etc.	
Solder per stick	2d.
2 Color Flex yard	2½d.
Shellac	5d.
Battery Box	4/6
(with clips for 36 v.)	
Nickel Pillar Terminals	2d.
Nickel Contact Studs 2 for	1½d.
Nickel Switch Arm (one hole fixing)	1/-
Loading Coil and plug	8d.
Gamages Permanite	1/-
Condenser Brushes	6d.

SHAW'S HERTZITE.

BEATS ALL OTHER "ITES." **1/-**

Impossible to Advertise All the Goods Stocked.

'Ware Imitations.

N and K

4,000 ohms .. **12/11**

GENUINE STAMPED.

MYERS VALVES.

UNIVERSAL.	D.E.
12/6	**21/-**

Strong Valve Template	4d.
Egg Insulators	1d.
Reel ditto	1d.
Thick Rubber Lead-in per yd.	2d., 3d.
Ribbon Aerial 100 ft.	1/10
Panels Drilled	
Radio Press Envelopes.	
Raymond Fixed Condensers ·001, ·0001 to ·0005,	10d.
·002, ·003, ·004	1/-
·006 1/3; ·01 1/9; ·02	1/9
Polar Micrometer Condenser	5/6

NO POST ORDERS.

BEST SWITCH ARM.

12 Studs THE LOT
12 Nuts. **10½d.**
12 Washers.

CRYSTAL DETECTOR. CALLERS only.

Glass enclosed. Micrometer adjustment. **1/9**

BRASS FORMER

(DOUBLE) 23 spokes each side.. **2/11**

Make your own coils.
CALLER'S PRICE ONLY.

EXIDE.

D.T 9 Type. 2 Volts. (Glass). (For ·06) 5/-

EBONITE 3/16-in.

CALLERS' PRICES.

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

CUT TO SIZE ½d. sq. in.
WE STOCK ¼-in. EBONITE.

"POPULAR WIRELESS."

FREE TO CALLERS.
(Limited number, of course.)

"METAL" (FRENCH) ·06 VALVES, 15/11

DR. NESPER

(SEE TRADE MARK)
4,000 OHM 'PHONES
12/6
(NOT DR. "ANYTHING!")

NO POST ORDERS FROM THIS PAGE LOWEST PRICES.

IMPORTANT.

Don't forget that

RAYMOND'S

have the goods.

Imitation is the Sincerest Form of Flattery!

NO POST ORDERS FROM THIS PAGE.

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'Phone: GERRARD 4637.

K. RAYMOND

27, LISLE STREET, LEICESTER SQUARE, W.C.2

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HOURS OF BUSINESS:
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RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 402.)

We regret that no more booklets describing this set are available for distribution. The last one was given away several weeks ago, and particulars cannot be reprinted.

The basket coils for aerial and anode circuits were of 45 and 70 turns respectively.

The valves named are quite suitable.

* * *

H. B. T. (Llandebie, Carmarthen).—I am living in the country about 17 miles from Swansea as the crow flies, and have thought I would like to put up a wireless set this winter. My intention was to put up a crystal set. Will you be so kind as to advise me of a good one? It may be that it is too far for a crystal set to work when Swansea commences, and it may be wise to have a set which is convertible to a valve set. I am afraid I do not understand very much about it yet.

We are afraid that at 17 miles a crystal set will not be of much use without valve amplification. We should suggest you build or buy a one-valve reflex receiver as described in our issue No. 103, or else a set as advertised in our columns by various firms.

* * *

J. R. H. (Nottingham), "Revlex" (Wigan), W. H. W. (Salford), J. G. N. (Kidderminster), A. E. C. (Tywardreath), W. H. (Romiley), G. J. B. (Dublin), R. Y. (Middleton St. George), Z. L. (Dublin), E. L. (Eastville, Bristol), J. A. (Runcorn), F. C. P. (Olton), W. L. A. (Wolverhampton), W. E. S. R. (Kandy), F. S. (Ardwick), A. C. N. T. (Newport, Mon.), L. W. (Wigston), H. S. (Blackrod, near Chorley).

In sending your queries unaccompanied by a stamped addressed envelope you disregarded the rules of the Query Department. As the questions are not of sufficient general interest to answer through these columns (or else have already been dealt with) replies can only be sent through the post. For this purpose a stamped and addressed envelope should be enclosed.

Foreign readers—whose postage stamps cannot be used for pre-payment of letters to be posted in this country—can send "Reply Coupons," which are obtainable at their local post-offices, and can be exchanged here for British stamps. The queries should be repeated, and should in all cases be numbered. Replies to each question will then be given under the appropriate numeral.

* * *

A. R. (Nairobi).—I am using a receiver with two high-frequency valves, followed by crystal rectification and a stage of low-frequency amplification. The two high-frequency circuits are the two tuned anodes, consisting of home-wound cylindrical coils with ·001 condensers across them. With this apparatus I can, practically every night, hear Morse signals, which I believe are sent out either by Government wireless stations at Mombasa, Zanzibar, etc., or ships in or about those harbours. The distance from here to Mombasa is about 325 miles. My principal trouble is atmospherics. On some days these are so noisy and continuously persistent that the regular signals are drowned absolutely, and I can hear nothing but loud rumbling noises as if something was tumbling down. Rarely, however, when these are at their minimum strength, I can hear the signals very loud in the 'phones. Is there any way you can suggest for the elimination of these noises? I am pretty sure that these are not due to any fault in the receiver, as, as soon as I sever the aerial connection to the receiver, the noises automatically stop and I can find no trace of them. Formerly I was using transformer coupling between the high-frequency valves, but the atmospherics were there.

2. When I am using rectification by means of a valve and grid condenser I find I can hear the signals even without the use of a grid leak and that the addition of the grid leak makes no difference whatever in the strength of the received signals.

3. Is it not possible to increase the range of my receiver with the present apparatus, as I

(Continued on page 410.)

RADIOTORIAL QUESTIONS & ANSWERS.

(*Continued from page* 408.)

have often read of amateurs being able to receive over very long distances with the use of just one valve. I am using a wooden baseboard for the receiver. Can this in any way affect the range of the receiver? The Morse signals I have mentioned above are sent out on a wave-length of about 300 metres, which should go to prove that the wooden baseboard does not allow the radio-frequency currents to leak away across its surface.

1. The atmospherics are incurable, but they can be minimised by the use of a frame aerial, such as was described in "P.W." No. 106.

2. Rectification without a grid leak is possible, but inefficient, and you are apparently using a grid leak which is faulty and which does not leak at all. Try the effect of a new leak, which may be of 2 megohms resistance, or, better still, variable between ·5 and 5 megohms.

3. The wooden baseboard is decidedly inefficient, and we recommend ebonite. Very long distance reception is only possible under good conditions, and we do not advise the attempt until you have minimised the effect of atmospherics.

* * *

W. E. F. (Middlesbrough), D. S. (Northwood), E. A. B. (Swansea), C. D. H. (Lanchester), J. H. B. (Willesden Lane, N.W.6), E. W. (Highbury New Park, N.5), J. S. T. (Milnrow ?), B. F. (Sligo), F. B. (Dalston, E.8), S. W. C. (Harlesden, N.W.10), F. C. (Battersea), G. M. (Paignton), H. W. (Lr. Kersal).

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* * *

"K D K A Hopeful" (Ilfracombe) and B. Miller (Radlett).—What coils are necessary for aerial and reaction in order to tune down to about 100 metres, for the short-wave American broadcasting stations?

Basket coils are best for the purpose, and these may be specially wound upon formers of about 1 in. centre diameter, having eleven slots.

Number 22 gauge D.C.C. should be used, and for the aerial coil about 15 turns are necessary. The value of the reaction coil varies greatly according to the H.T. valve used, etc., and it may be anything between 10 turns and 100 turns, so that various values must be tried until best results are obtained. In series with the aerial a ·0002 condenser is connected, and by using these components connected up in an ordinary straight detector-valve circuit K D K A has been received in this country many times.

It must be clearly understood that such results are freakish, and signals may be quite good one night, and yet there will not be the slightest sign of American stations upon subsequent occasions.

In addition to trying different reaction coils, it may be necessary to vary the size of the aerial coil considerably, to allow for aerials of different size and for the inequalities in the methods of winding and spacing the basket coils.

* * *

J. G. (Radlett).—Where can I obtain a copy of "P.W." Nos. 105 and 106, as I am very interested in the Unidyne, and propose constructing a two-valve set on that system?

Back numbers of Popular Wireless can be obtained for 4d. (post free) upon application to the Amalgamated Press (1922) Ltd., Back Number Dept., Bear Alley, Farringdon Street, E.C.4.

* * *

F. L. P. (Clapham Road, S.W.).—What is the cause of a "knocking" noise in my two-valve set? It has developed recently, and is not like a howl or oscillation, but consists of a series of slow and regular knocks, which appear to be unaffected by tuning.

(*Continued on page* 411.)

RADIOTORIAL QUESTIONS & ANSWERS.

(*Continued from page 410.*)

Your grid leak is at fault, and should be replaced in order to cure the trouble. If a fixed leak is desired it should have a resistance of about 2 megohms, but we advise you to fit a good variable leak, which is of great assistance in accurate work on long-distance and weak signals.

* * *

J. J. A. (Erdington, Birmingham).—I wish to add a condenser in series with my one-valve set, but am uncertain whether it should be connected between the aerial and aerial terminal, or between the earth and earth terminal. Would this make any difference to signals and does it matter which way round the condenser is connected? i.e., moving plates or fixed plates next to the set itself.

Very often a difference is noticeable on a valve set when the condenser position is reversed, and sometimes one position is decidedly better than the other. In certain cases, and especially on the longer wavelengths, there is a noticeable difference in the signals of a crystal set when the condenser position is altered.

With a valve set it should be noticed that when the series condenser is in the earth-lead the set is insulated from earth, and hand capacity effects are consequently more marked.

The actual condenser connections are also found to affect body capacity, and where fixed metal end-plates are used, it is generally preferable to connect these to earth. If ebonite fixed end-plates are used the usual connection for reducing unwanted capacity effects is when the moving plates are on the "aerial" side, and the condenser itself between aerial and coil.

* * *

R. M. B. (Roehampton).—Using a single-valve "straight" set (detector, with reaction), what is the correct number of turns for the reaction coil in order to get best results?

No particular number of turns can be stated as the best value, because results vary under different conditions. If reaction is obtained only when the coils are very closely coupled a rather larger coil should be used for the reaction; and, of course a smaller coil would be necessary where it is difficult to handle reaction, and where the smallest movement of the coil results in oscillation.

* * *

T. D. (Clapton, E. 5).—How can I straighten out a sheet of ebonite which has become warped through being stowed away carelessly?

Procure two flat boards of suitable size and warm them thoroughly. Also warm the ebonite—it may be immersed in hot water—and place it between the two boards. Heavy weights should be placed on the top board, and allowed to remain until the ebonite is quite cold.

READERS' QUERIES.

IMPORTANT ANNOUNCEMENT.

Owing to the continued heavy pressure upon the Technical Queries Department a revision of the Rules has become necessary.

Commencing forthwith the number of queries which can be submitted in one letter is reduced from three to two. These two queries should be stated briefly and concisely, and they must relate to genuine technical difficulties.

The Query Department cannot undertake the design of switching arrangements such as can be solved by reference to any good book of circuits; nor can they enter into long theoretical explanations, which can be found by readers in any textbook on wireless.

Diagrams and layout of components should NOT be submitted for wiring-up, but, of course, any particular difficulty which arises can be accompanied by a sketch to illustrate it.

Remember—

(1) DO NOT ASK UNNECESSARY QUESTIONS.

(The queries you raise may be dealt with on the next page, and by raising them again you are only delaying answers to other queries.)

(2) Two questions only are allowed, which should be numbered, and stated as briefly and concisely as possible.

SIDELIGHTS ON WIRELESS.

(*Continued from page* 368).

1907, and of Debye in 1912, that the same unit occurred in many apparently diverse phenomena connected with atoms, such as "atomic heat," and could be applied to the vibration of atoms in general, even in a solid—a discovery which bids fair to revolutionise the treatment of molecular physics generally.

Thus the twentieth century was heralded by these two momentous discoveries—the electron and the quantum—and by the consequent intrusion of an element of discontinuity into all its problems.

It should not be supposed that the idea of ultimate continuity is thereby interfered with or discarded, but it is relegated to an ultimate and not a proximate position. In dealing with masses of matter, as in the old dynamics, continuity reigned and still reigns. For instance, the science of hydrodynamics treats water as a continuous fluid, though we have long known that it had an atomic and therefore discontinuous constitution. But so long as we are dealing with groups of millions of billions of atoms, such as the minutest visible drop must contain, the ultra-microscopic discontinuity does not matter. Gases can be dealt with in either way. Pneumatics considers them in the gross. The kinetic theory deals with the particles individually or statistically.

This Marvellous Universe.

As soon as we study the phenomena of radio-activity, and begin to penetrate into atomic interstices and consider the atoms individually—especially if we analyse the atom into the almost infinitesimally small electrons which compose it, and deal with these atoms of electricity—the older methods of dynamics, though still applicable to a large extent, show signs of incompleteness. They require to be supplemented by a recognition of certain clear evidence of discontinuities—in the form of jumps or steps—which whether or not they are untimately resolvable into continuous processes, must for a time be dealt with as what they appear to be, and must be recognised as corresponding to some real and genuine property characteristic of such atomic phenomena as we are able to observe. For these atomic phenomena show no obvious sign of continuity with the rest of physics, and prove themselves experimentally to be almost independent of all ordinary physical conditions, such as we summarise under the heads of "temperature" and "pressure," which are statistical terms, only suitable for dealing with matter in the gross. It is when dealing with individual atoms that we encounter discontinuity.

Gradually we are beginning to understand more and more about the mechanism of this marvellous universe; and it is instructive to find the same law and order ruling everywhere—inside the atom and in the remotest depths of space. In so far as there are differences in the region of the infinitely small—in so far as phenomena are found there which are not found in the region of the infinitely great—those differences, of which so far the quantum is chief, are bound to become highly instructive, and are already of exceeding interest. They, and other peculiarities connected with the excessive speeds with which radio-activity has familiarised us, are beginning to dominate twentieth-century physics

Correspondence

A UNIDYNE-DE-LUXE.

The Editor, POPULAR WIRELESS.

Dear Sir,—Having constructed several of the Unidyne sets described by Messrs. Rogers and Dowding in POPULAR WIRELESS to their original layout, I thought that I would have a "de luxe" model and, having decided on 2 valves, 1 det., 1 L.F., I thought I would try what a different layout would do, with the result seen in the photographs. I had fine

results with the original layout, but with the new arrangement results were 100 per cent. better. The first night I tried it out when our local station was quiet, and during intervals I logged the following stations: Glasgow, Newcastle, Manchester, Birmingham, Cardiff, School of Posts, Paris.

Since then I have had Madrid, Breslau, London, and can tune these stations with ease. My aerial is a twin wire 50 ft. long, 6 ft. spreaders, 22 ft. high. The cabinet is of canary wood (well seasoned) 9 ins. deep by 12 ins. by 12 ins., inside dimensions, stained with dark oak stain eggshell finish. The panel is 12 ins. by 12 ins., and fitted with a tray to slide in and out of cabinet. The four valve legs seen in the centre of panel, and the two switches, are to enable one to convert the set to 1 H.F. and 1 det., if required without any further drilling. The components used are as follows: Vav. condensers, Fallon and Service; fixed condensers, Edison Bell and Dubilier; grid leak, Lissen; filament rheostats, "Filostat"; valves, Thorpe K4; coils, "Tandio" basket; ebonite, Silvertown; transformer, Maxim.

I have incorporated a vernier condenser, which gives finer tuning, and I also have a spare ·0003, which fits into the place of the vernier when it is desired to convert the set to H.F.

The results from this set are splendid, and leave nothing to be desired. It gives one the feeling that

The back of the 2-Valve Unidyne.

it will bring in anything that is being transmitted, and Mr. Rogers and Mr. Dowding are to be congratulated on their great invention. It will pay any amateur to make this set up, and he will never go back to H.T.

I am, yours faithfully, J. P. PHILLIPS.

43, Robert Avenue, Harehills Lane, Leeds.

(*Continued on page* 414.)

CORRESPONDENCE.

(*Continued from page* 413.)

ADVENTURES WITH A UNIDYNE REFLEX.

The Editor, POPULAR WIRELESS.

Dear Sir,—In the "P.W." of August 23rd, 1924, there is a brief account of a special reflex set constructed by the writer for portable work. The extraordinary sensitivity of this little set—for it only measures 12 in. by 6 in. by 4 in.—is chiefly due to the elimination of all self-capacity and instability by means of the Neutrodyne system and carefully spaced coils. It was designed and built to withstand a good deal of rough handling, and during the four months or so it has been in constant use it has given every satisfaction.

When the "Unidyne" principle was invented the set was rewired and four-electrode valves permanently fitted in order to do away with the troublesome H.T. battery, which is generally a great burden when taking the set into the country.

As soon as the alterations were complete it was decided to find out at once whether the set, now H.T.-less, had lost anything of its old efficiency through the absence of the plate battery.

Accordingly we set out for the open country to give the receiver a fair trial. The first place of call was a wood on Epsom Downs, near the famous racecourse; a few yards of thin flex were slung from the car to a neighbouring tree, and a short metal rod thrust into some damp mud for an earth connection.

When the valves were switched on the local station (2 L O) was transmitting the afternoon concert, which came through at very strong loud-speaker strength. On the 'phones, of course, the music was deafening. A slight turn of the anode condenser brought in Cardiff, also very loud. Radio-Belgique (Brussels), which was about two hundred and thirty miles away, was nearly as strong as 2 L O.

After this we moved on to Box Hill, which is, owing to its height and unscreened position, an excellent spot for wireless reception.

Radio-Paris (our old friend Radiola in a new guise) could be heard comfortably on the 'phones with no aerial at all; the aerial was simply disconnected and the earth wire attached to the aerial terminal. Ten feet of flex brought in Bournemouth without any interference from 2 L O. Aberdeen, over 400 miles distant, was even louder than Bournemouth, though slightly jammed by Newhaven Coast station. After listening for a few minutes to some guttural talk from Vox Haus and Hamburg, we started for home, thoroughly satisfied that the elimination of the H.T. battery had not impaired the efficiency of the set in any way. Indeed, by cutting out scratching noises and other interruptions on the part of the plate battery, it had decidedly improved the quality of our reception. It is well worth the trouble to adapt any kind of portable set to the Unidyne principle, thereby saving the expense, bother and space of the now obsolete high-tension battery.

Yours faithfully,
G. J. MARCUS.

Firle,
Langley Park Road,
Sutton, Surrey.

B.B.C. PROGRAMMES.

The Editor, POPULAR WIRELESS.

Dear Sir,—Regarding views on programmes. I wrote the B.B.C. recently, suggesting that to split up an evening performance—particularly when an entire musical comedy, say, is being broadcast—with the 9.30 News Bulletin and a talk on Bee Keeping, for instance, is incongruous.

The last act, to my mind, is spoiled by this destruction of atmosphere, and makes it impossible for one to settle down and really enjoy an evening concert.

Have the talk by all means, but place it before the concert proper, and leave the news until the conclusion.

The B.B.C. in reply, say that some people "*are not able to listen absolutely continuously for a protracted period, and these welcome a short break in a transmission such as the 'Dogs of Devon' (this was just mentioned by me as an example), moreover, the artists themselves appreciate a rest.*

"*It should be remembered that there are many owners of sets listening whose chief interest is the News Bulletin, and it would hardly be fair to keep them waiting until an unreasonably late hour.*"

The portions in italics are from the B.B.C.'s reply. Your readers' views on this subject might be of interest, as it undoubtedly needs airing.

By the way, in case you receive complaints regarding 2 Z Y's noisy background (due to his microphone circuit). I wrote them about this also, and am told everything will be all right when the Manchester station moves to new quarters in October, when new apparatus will be installed.

I was agreeably impressed by the obviously individual and careful attention paid to letters by the B.B.C., no less than by their courtesy in replying practically by return.

Yours, etc.,
E. BOTTOMLEY.

Westholme,
Moesley,
Near Manchester.

TECHNICAL NOTES.

(*Continued from page 376.*)

insert the brass tab of the battery into the slots, securing it there by means of the clamping screw of the connector, the wire lead being secured into the other end of the connector in the usual way.

Vertical Aerials.

What are the advantages of the vertical aerial? This question is discussed in "Radio Digest" (U.S.A.) and two main advantages pointed out are firstly, its sensitivity, and secondly, its small inductance as compared with that of a long horizontal aerial.

"With the vertical aerial, this inductance, and consequent tendency to choked reception, is practically overcome. This can be noticed in connection with the grid leak, which may frequently be discarded. This shows that with a vertical aerial you are using your valves to better advantage and are not under the necessity of drowning them down with so many megohms. The vertical aerial system is obtained by the use of an umbrella aerial or, for peak reception, the balloon aerial. It has been found that the vertical aerial functions just as well with fine wire as with heavy-gauge wire.

"It is remarkable the sensitivity of such an aerial. In comparison with a regular horizontal aerial 100 ft. long and 30 ft. high, the vertical aerial, which was 200 ft. high, was estimated to be five times as sensitive as the horizontal one."

Whilst we do not quite agree with some of the remarks quoted above, they may be of interest to readers who are fond of experimenting with different types of aerial.

Paper Loud Speaker.

The new "Primax" loud speaker, which has been on the market for some time in America and also on the Continent, is quickly making its way in this country. In some respects it resembles the parchment cone gramophone reproducer which made its appearance a few years ago, and we believe was manufactured by the Pathé Co. In the "Primax" loud speaker, there is no horn or trumpet of the ordinary kind, but instead, the vibratory member of the reproducer is connected to the centre of the large disc or circular sheet of special paper, which is radially pleated. At the rim the paper is flattened out and gripped in a circular beading or edge of metal. The result is that the paper diaphragm, whilst very light in weight, is appreciably rigid and, furthermore, it has very little tendency to resonate to particular tones. Or perhaps a better way of expressing it is to say that its resonant frequency is far below the frequencies which it is required to reproduce. The comparatively large area of the paper diaphragm enables it to set into vibration a volume of air comparable with that which is operated upon by the conventional horn, and there is the further advantage that the projection of sound from the "Primax" diaphragm is, for practical purposes, uniform in all directions. On test, this instrument gave quite a good and fairly loud reproduction in a moderate sized room.

New Indoor Aerial.

I see that a new kind of indoor aerial, suitable for the ubiquitous "flat dweller"

(*Continued on page 416.*)

TECHNICAL NOTES.

(*Continued from page 415.*)

is available on the market; it consists of a large sheet of copper foil, suspended from a hook on the wall by means of two cylindrical rods or rollers, one at the upper and one at the lower edge, after the fashion of a map or picture. This new aerial, goes by the name of the "Area" indoor aerial, and inquiries with respect to the same should be addressed to Dr. Round, 19, Crescent Wood, Sydenham Hill, S.E.26.

Wireless Weather.

It is often complained by the anonymous "man in the street" that the transmission of wireless waves is playing havoc with the weather, and that it is responsible for the unusually heavy rainfall which has been experienced during the past few months, not only in this country, but in many other parts of the world.

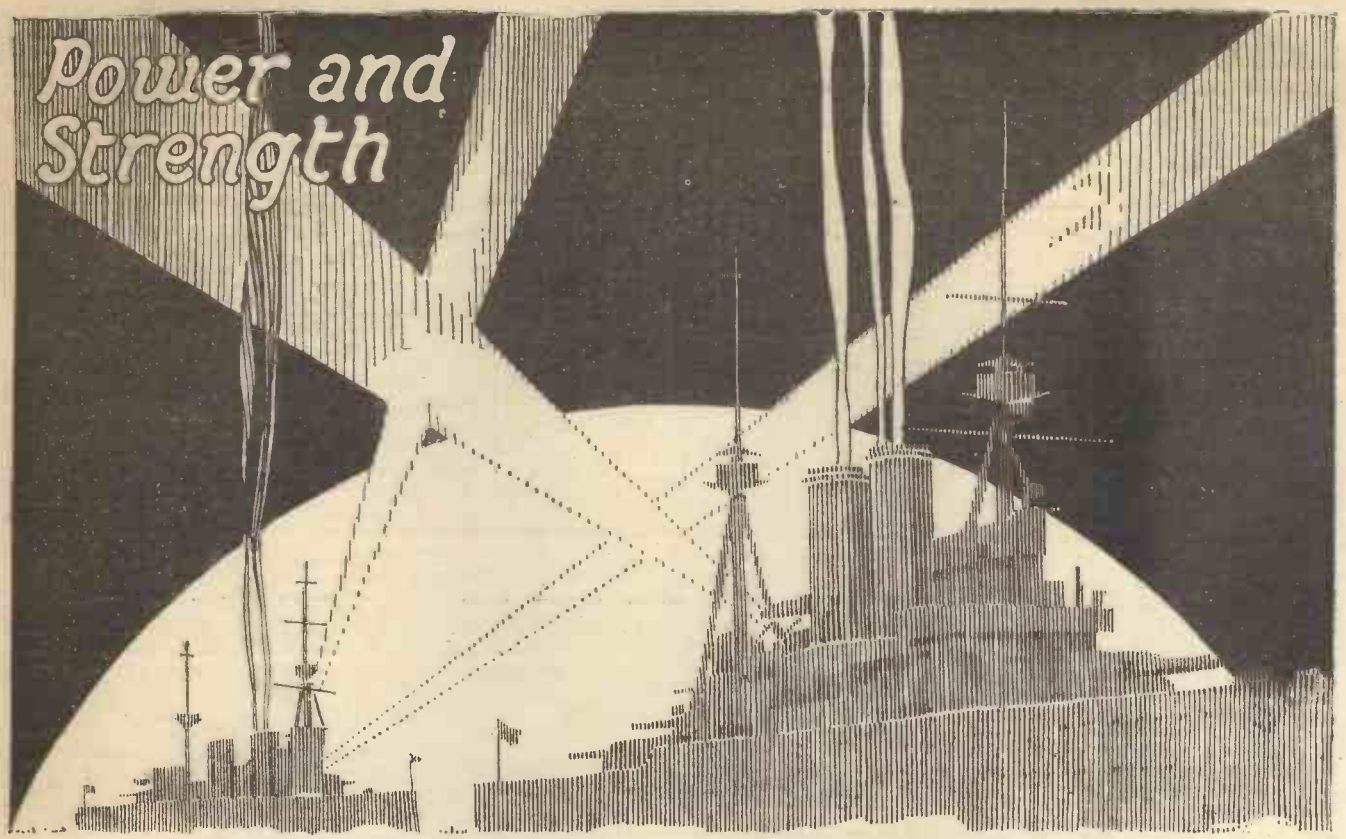
A well-known American meteorologist, Professor J. MacBall, has given reasons substantiating this view, and predicts that so long as the ether is in a constant state of turmoil with wireless transmissions and disturbances from electrical machinery and so on, little hope of improvement in weather conditions can be entertained.

Panel Shielding.

I saw an advertisement in one of the German papers the other day for what was described as a "liquid metal" for painting on to the back of the panel, after the set is complete, and which cuts out body capacity and "brings in music clear and sweet," the operation by which these very desirable advantages are secured being "done in five minutes." The same advertisement referred also to liquid "spaghetti" which can also be applied after completion of the set.

"HARMSWORTH'S HOME DOCTOR."

THIS week sees the publication of a new fortnightly part work, "Harmsworth's Home Doctor." It is to be a complete encyclopedia of good health, and will contain the last word of medical knowledge. Part I. is beautifully printed and richly illustrated. Sir Clifford Allbutt, K.C.B., Dr. C. W. Saleeby, and Sir D'Arcy Power, K.B.E., F.R.C.S., contribute the special introductory articles, and a First Aid Card, which should prove invaluable in all emergencies in the home, is presented with each copy. Absolutely complete and authoritative, "Harmsworth's Home Doctor" is a work of first-rate importance. It is to be completed in about 36 fortnightly parts at 1s. 3d. per part. The first part is now on sale. A copy should be in every home.



STRENGTH IN CONSTRUCTION

and

POWER IN OPERATION

belong to Mullard Master Valves.

Thousands of radio engineers and experimenters all over the world have secured for themselves the very best results by demanding Mullard Master Valves.

You can obtain that perfect reproduction of the broadcasting programmes that you have been seeking so long by choosing the same Master Valves.

Ask for MULLARD H.F. AND L.F. MASTER VALVES.

These wonderful valves have been designed for the wireless amateur who requires something better than general purpose valves.

The H.F. type are for STRONG HIGH-FREQUENCY AMPLIFICATION OR DETECTION and the L.F. type are for PURE LOW-FREQUENCY AMPLIFICATION FREE FROM ANY DISTORTION.

Note the colour distinguishing rings :

Mullard H.F. Red Ring Valves, **12/6** each.

Mullard L.F. Green Ring Valves, **12/6** each.

Write for leaflet M 8 and avoid accidents to your valves by asking your dealer for the Mullard safety disc: it is free. If your dealer cannot supply you send us his name and address and we will send him safety discs for distribution.

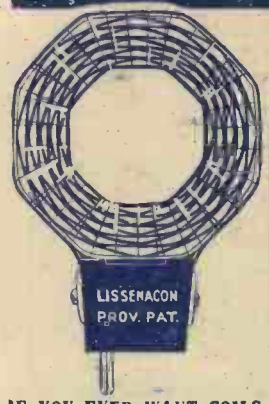
Mullard

THE · MASTER · VALVE

Advt.—The Mullard Radio Valve Co., Ltd. (P.W.), Nightingale Works, Nightingale Lane, Balham, S.W.12.

BRITISH EMPIRE EXHIBITION, PALACE OF ENGINEERING—Avenue 14—Bay 13.

LISSENIUM. Peculiar efficiency in COILS—



IF YOU EVER WANT COILS WHICH INTENSIFY TUNING—USE LISSENAGON COILS.

LISSENAGON TUNING CHART.
Note the Intermediate Coils. 30, 40 and 60.

TABLE 1. Wavelength range when used as Primary Coils with Standard P.M.G. Aerial and ·001 mfd. condenser in parallel.			TABLE 2. Wavelength range when used as Secondary Coils with ·001 mfd. condenser in parallel.		
No. of Coil.	Minimum Wavelength	Maximum Wavelength	Minimum Wavelength	Maximum Wavelength	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	6/6
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

In the UNIDYNE circuit no high tension supply is used. It is obvious, therefore, how essential it is to apply every fraction of energy available. It was found by the inventors of this circuit that LISSENAGON COILS WERE THE ONLY COILS WHICH COULD BE SUCCESSFULLY USED.

In the same way in conjunction with the principle of EDDY CURRENT TUNING employed in the new LISSEN CRYSTAL SET, LISSENAGON COILS ARE PECULIARLY EFFICIENT. No other coils give the same results.

BUILDING UP BIG SIGNAL VOLTAGE—

With a new Crystal Set

All tuning is accomplished roughly in one of two ways—namely :—

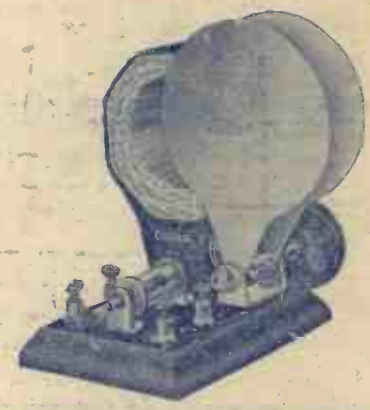
1. By varying the inductance, or
2. By varying the capacity in the tuned circuit

The maximum energy transferred from the aerial to the audio frequency circuit depends largely upon the losses in the circuit. When it is remembered that the effective capacity of the average aerial and earth system is about ·0003 mfd. (and a long aerial is almost invariably used with a crystal set) and that this capacity is shunted directly across the aerial and earth terminals of the receiver, it can be seen that if condenser capacity is added, or a high self-capacity is present in the inductance itself, the signal voltage is likely to be appreciably diminished.

In the new LISSEN CRYSTAL SET, therefore, there has been introduced a form of tuning which, while providing the means of suitably varying the wavelength range does so without added capacity and in combination with an inductance which is peculiarly efficient with the form of tuning employed.

Tuning is achieved by moving a metal plate in relation to the inductance (a LISSENAGON coil), and although the moving plate is entirely unconnected with the electrical circuit, its influence is effectively applied through the medium of the magnetic field created.

By using the appropriate LISSENAGON coil the set can be used for as many stations as there are, or as many more as come along. To receive London and Chelmsford, two coils would be needed—to change over from one station to the other, take one LISSENAGON coil out and plug the other one in.



PRICE of RECEIVER

(INCLUDES CRYSTAL) Patent Pending **10/-**

Price of No. 50 LISSENAGON coil (covers 300 to 350 metres on this receiver) - - - - - - **4/10**

Price of No. 60 LISSENAGON coil (covers 350 to 400 metres on this receiver) - - - - - - **5/-**

Price of No. 75 LISSENAGON coil covers 400 to 500 metres on this receiver - - - - - - - **5/4**

Price of No. 250 coil for CHELMSFORD - - - - - - - **8/9**

NOTE.—One LISSENAGON coil must be ordered with each set—the receiver will not be sold without a coil because it yields much greater efficiency when these coils are used.

In this LISSEN Crystal Set there is no paper—no cardboard—no loose contacts—no loose wires—the whole is an instrument throughout—robust—and THE MOST EFFICIENT CRYSTAL SET MADE — WITH THE MOST EFFICIENT INDUCTANCE.

THIS IS THE NEW CRYSTAL SET PROMISED IN OUR ANNOUNCEMENT OF AUGUST 6th LAST—and now ready for delivery.

LISSEN LIMITED

8-16, WOODGER ROAD, GOLDHAWK ROAD,
SHEPHERD'S BUSH, LONDON, W.12

'Phones: 3380, 3381, 3382, 1072 Hammersmith. Telegrams: "Lissenium, London."

LISSEN PARTS—WELL THOUGHT OUT, THEN WELL MADE

All applications for Advertisement Space in POPULAR WIRELESS to be made to JOHN H. LILE, LTD. (Sole Agents), 4, Ludgate Circus, London, E.C.4. 'Phone: 1080 Central.

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R/R

POPULAR WIRELESS WEEKLY, October 25th, 1924. REGISTERED AT THE G.P.O. AS A NEWSPAPER.

(Free Booklet in :: this issue. ::) **ALL ABOUT THE B.B.C.** (Free Booklet in :: this issue. ::)

Popular Wireless

and Wireless Review

PRICE 3d. EVERY FRIDAY.

No. 126. Vol. VI. SCIENTIFIC ADVISER: SIR OLIVER LODGE, F.R.S., D.Sc. October 25th, 1924.

Mr. Harry Tate (behind the receiver) entertaining veterans of variety at his Sutton Home.

Our Third Special Issue.

ANOTHER FREE BOOKLET:
"All About the B.B.C.,"

and many exclusive features, including

"SATISFYING A NATION."
By J. C. W. REITH.
(*Managing Director the B.B.C.*)

SPECIAL NEW FEATURE FOR THE BEGINNER.
By E. BLAKE, A.M.I.E.E.

And Two Pages of Pictorial Radio Symbols.

"How to Build a One-Valve Reflex Set."

"Another 'All Wave,' Crystal Set."

ETC., ETC., ETC.

FEATURES IN THIS ISSUE.

PILOT

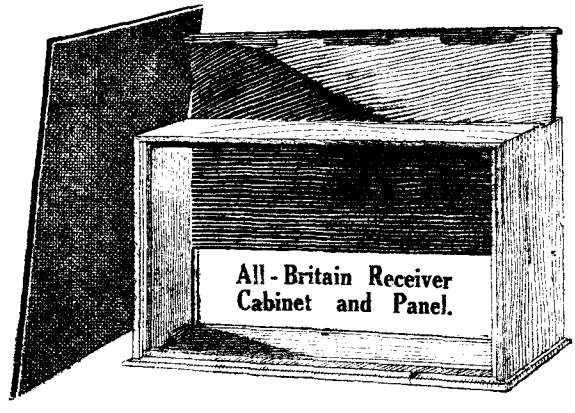
Before you build—or buy—a Set, learn about the new Pilot System.

WHEN a man decides to build a good Receiving Set he immediately comes up against the difficulty of a suitable cabinet and the drilling and the engraving of the Panel. Cabinet-making is a skilled man's job and many a perfectly good piece of ebonite has been spoilt by a hole in the wrong position or because it has been incorrectly cut to size.

To eliminate most of the difficulties in Set-building we have instituted the PILOT Panel Service. In future Sets described in all the principal Wireless Magazines will be available in sets of parts for the Home Constructor with panels ready drilled, tapped and engraved. Two types will be placed on the market—Type A, following the author's literal specification and using his actual components, and Type B, an adaptation using Peto-Scott guaranteed components. Naturally through standardisation of components and our lower manufacturing costs due to large output, Type B will often show a large saving over Type A.

Remember that if our instructions are followed we positively guarantee that all Type B Receivers are the equal in every respect to the more Expensive Type A Sets. Our Service Dept. is available for all our customers and will test and rectify errors of construction at a nominal charge. We want all our customers to have the utmost confidence in every Set produced under the PILOT Panel Service.

¶ *Every Wireless Receiver depends for its efficiency upon the panel. Low grade ebonite will prevent any Set from functioning properly. Every PILOT panel is manufactured from the highest grade Post Office ebonite cast accurately to size, matt finished on both sides, and with edges squarely ground. We guarantee every panel to be leak-proof and non-warping. Each panel engraved with the word "PILOT," and supplied carefully packed in sealed wrapper. Standard ¼-in. thickness throughout.*



The only trouble-proof method for the Home Constructor—

USE the Pilot System and enjoy the following *exclusive* advantages :—

1 **Absolutely no previous Wireless skill required—the only tools necessary are a screwdriver, soldering iron (optional) and a pair of pliers.**

2 **Every Set when completed is quite the equal in efficiency of the original.**

3 **Provides a high-grade Instrument at the cost only of the components.**

4 **Success guaranteed—failure quite impossible if instructions are followed.**

5 **Every Instrument designed by a recognised expert.**

6 **The only System for the Home Constructor backed by a Service Department.**

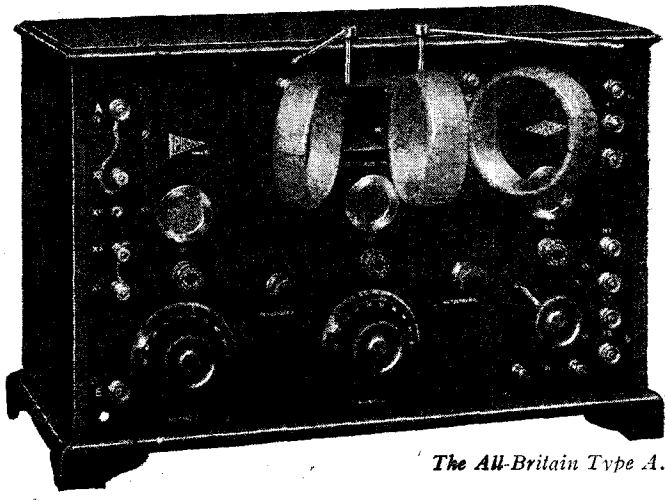
Choose any one of these splendid Receivers designed by experts—

The Transatlantic V (a super 5-valve long distance Receiver).
The S.T. 100 (2-valve).
The 3-valve Dual Receiver.
The Puriflex (4-valve).
The All Concert-de-luxe (3-valve.)
The 4-valve Family Receiver.
The Resistoflex (a wonderful 2-valve Reflex.)
The "Popular Wireless" Constructional Reflex.
The All-Britain Receiver, and others.

The cost of the All-Britain Receiver—a splendid 3-Valve Set—for example, is as follows :—

Panel drilled, tapped and engraved **13/-**, Polished Cabinet **17/-**, Complete kit of all components necessary **£4 : 2 : 6.** Thus for less than **£6** you can own the handsome Set shown here, capable of receiving all the B.B.C. Stations and most of the Continental ones.

Write to-day for a copy of our new illustrated Folder on the Pilot Panel Service—you'll never want to waste your time and money on building a Set in the old method.



The All-Britain Type A.

PETO-SCOTT Co., Ltd.,

Registered Office & Mail Orders : 77, CITY ROAD, E.C.

Branches : LONDON—62, High Holborn, W.C.1. PLYMOUTH—4, Bank of England Place. LIVERPOOL—4, Manchester Street. CARDIFF—94, Queen Street. WALTHAMSTOW—230, Wood Street.

Reprinted by courtesy from the DAILY DISPATCH, *of Friday, September* 19, 1924.

A FAMILY TWO-VALVE SET

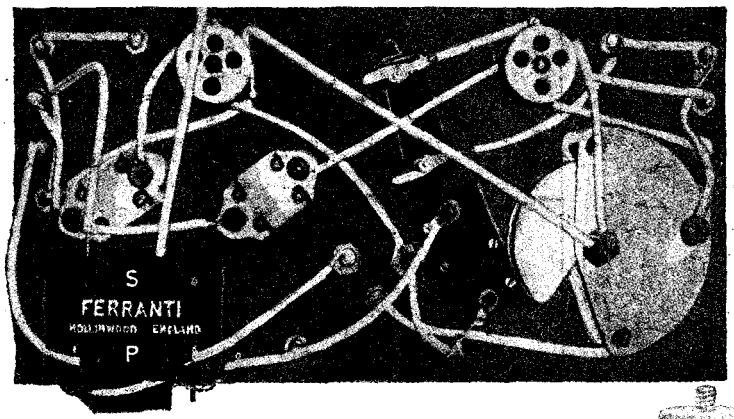
To work Loud Speaker from Local Station—Constructional Details.

By RHEOSTAT.

SO great has been the response to my last week's offer to give full constructional details of the two-valve loud speaker set I then described, that I am making this the subject of this week's article.

Here is the method of procedure.

For the panel get a piece of ebonite, 12in. by 6in., and a quarter-inch thick; do not use thinner, or the weight of the components will buckle it. Take off the outer skin by rubbing with emery cloth stretched over a flat piece of wood, or a joiner's rubbing cork.



With a needle scrape a line all round, three-quarters of an inch from the edge. All the terminals must be drilled on this line; put a distinguishing mark on the top, and mark off the spaces. On the top line, two inches from the left side, drill the hole for the earth terminal, and at 3½ inches drill four holes for the valve. The second valve will be at 8½ inches, and the aerial terminal at 10 inches from the left side. [All the measurements and spacings are on the back of panel, and, of course, will be reversed in the finished set].

Down the left side of panel drill holes for batteries, three-quarters of an inch from the top, and apart.

The terminals are: Top, L.T. positive; second, L.T. negative; third, H.T. positive; bottom, H.T. negative.

On the right-hand side, with the same spacing, drill four terminal holes, the two upper ones for the aerial coil, and the lower ones for the reaction coil.

Rule a line across the panel from side to side, dividing it into two even parts, and at 2 and 4½ inches from the left drill the holes for the two rheostats. At a point 3 inches from the right side, and 2 inches from the bottom edge, drill the hole for the variable condenser.

Divide the panel again, this time from top to bottom, and 1½ inches from the lower edge drill a hole for the switch terminal. One inch above, and an inch on each side, drill two more for switch points.

Two more holes for the 'phones or loud-speaker, at 4½ and 7½ inches from the left side, along the bottom line, complete the drilling.

The transformer will need holes which can be drilled when other components are placed.

Assemble all the terminals—you will need 13—and screw up tight until the nut binds. The valve holders can next be fixed in position.

THE WIRING.

The condenser is an Atlas .0005 variable, the combined grid condenser and leak being of the same make, the values being ·0003 and 2mg.

The transformer is a Ferranti, the .001 fixed condenser across the 'phones, with the same value across the primary of the transformer. The rheostats are the new porcelain Atlas.

The photograph will show the exact position of each component, and with the measurements given even the novice should not find any difficulty in connecting up.

Take a wire from the aerial terminal to the top terminal on right, and to fixed plates of ·0005 variable condenser, then to one side of grid condenser and leak. The grid condenser is fixed flat on panel by Chadderton's compound. The other side of it goes to grid terminal of right-hand valve—the grid terminal is the top socket of the three evenly-spaced ones, the socket that stands away from the other three being the plate.

The earth terminal goes first to the top terminal on the left side, to the fourth on the left, to the right side socket of the left-hand valve, to moving plates of .0005 variable condenser, to right socket of right-hand valve, and on to the second terminal down the right-hand side.

The second terminal down the left side, the L.T. negative, is connected to L.S. on the transformer, and to one terminal on each of the two rheostats, the other terminals on each rheostat being connected to the left sockets on each valve, one to each.

The plate terminal of the right-hand valve, that is, the unevenly spaced one, goes to the third terminal down the right side. The fourth or bottom terminal on the right goes to the terminal in the centre of the bottom of the panel, this being the switch.

The plate terminal of the left-hand valve goes to the right socket of the switch, to the right-hand 'phone terminal, and to one side of a ·001 fixed condenser.

The third terminal down the left side, H.T. positive, goes to I.P. on the transformer, O.P. on the transformer going to the left-hand socket of the switch. Across the I.P. and O.P. of the transformer, the other ·001 fixed condenser is bridged. The grid terminal of the left-hand valve is connected to the transformer terminal marked O.S

Another wire is taken from I.P. on the transformer to the left-hand telephone terminal and the other side of the ·001 fixed condenser, and the wiring is complete.

Looking now at the *front* of the panel, the terminals will be: Top left, aerial; top right, earth; right side, L.T. positive, L.T. negative, H.T. positive, and H.T. negative. The two top left-hand terminals are for the aerial coil and the lower ones for the reaction coil.

I should recommend an R or Ora for the first valve, and one of the new Mullard L.F. for the second, a six-volt accumulator, and Siemens S30 H.T., which is 90 volts, a 35 Atlas coil for the aerial tuning, and a 50 for the reaction.

WEEK-END TESTS.

The sockets are the ordinary valve filaments, and for the switch a valve pin is attached to a short piece of flex joined to the switch terminal. If the pin is placed in the left socket one valve is in use, and if in the right socket and the second filament is turned on, both valves are operating, the first as a detector and the second as a high-frequency amplifier.

Helpful notes on working this set will follow.

During the week-end I made further tests with this set, and found that its performance fully bears out all the claims made.

After the vocal part of 2ZY's programme had finished on Saturday evening we were switched on to some very indifferent dance music, so decided to search around.

I put in the long wave coils, 150 and 200 Atlas and slowly turned the condenser, when 5XX came in with a bang without the least sign of Manchester although only just under four miles away. There was quite enough volume for three loud-speakers, an Amplion, a Brown, and a G.R.C.

It is very evident from these tests that anyone, anywhere south of Manchester, will have at least two stations at loud-speaker strength, often more.

I had at least two dozen amateurs in on Sunday, and just before five, when waiting for the kiddies' corner, Liverpool came romping in on the loud-speakers.

POPULAR WIRELESS

AND WIRELESS REVIEW.

October 25th, 1924] THE RADIO WEEKLY WITH THE LARGEST CIRCULATION. [Every Friday, Price 3d

Technical Editor G. V. DOWDING, Grad.I.E.E. | Editor: NORMAN EDWARDS, M.Inst.R.E., F.R.G.S. | Scientific Adviser Sir OLIVER LODGE, F.R.S.

RADIO NOTES AND NEWS OF THE WEEK.

Worth Visiting.

FEW Londoners are aware of the wonderful wireless exhibits on view at the Science Museum, close to the Albert Hall, Kensington. Amongst the fascinating apparatus assembled are examples of pioneer wireless instruments as used by Hertz, Dr. Fleming, Mr. Marconi, and Sir Oliver Lodge.

* * *

Australian Progess.

COMPREHENSIVE wireless plans are being made in Australia, including a scheme for at least one big 5 kilowatt broadcasting station in each state. Victoria and New South Wales may possess two of these stations, and the wave-lengths reserved for broadcasting range from 250 to 2,500 metres. Experimental licences will cost £1, but ordinary listeners will have to pay thirty-five shillings for their licences.

* * *

New Zealand's Record.

NEW ZEALAND has some splendid radio records to its credit, and it is interesting to find that some of these have been set up when using standard British receivers. Recently one amateur tuned in San Francisco at a distance of 7,000 miles, using an RI set—the Number 5 V A model.

* * *

The Initials Craze.

THE habit of using initials in wireless seems to be on the increase, and after a time it becomes quite natural to use the call-sign instead of a station's name. Everybody knows the meaning of "2 L O," "H.F.," "S.B.," and dozens of similar groups, nowadays. The term "D X" for "long distance" is becoming fairly common, and another abbreviation which is gaining ground on account of its convenience is BCL, which, being translated, means "Broadcast Listeners."

* * *

Neat Work.

"ARRIVED Quebec. Cheerio.—Pat," was the wireless message sent by Mr. Patrick Lee, of the Canadian North-West Mounted Police, to a relative in Ealing. It was picked up direct from the Government steamer "Arctic" by Mr. Gerald Marcuse, of Caterham, who six months ago, was visiting Canada for the International Radio Union Conference. He then arranged with the "Arctic's" operator to listen-in for news from the ship when she returned to the St. Lawrence, and redeemed his promise by taking down the above reassuring message from an Ealing man whose relatives had not heard of him for two years.

Spanish Broadcasting.

NOW that Madrid comes over so well, great interest is being taken in the new Spanish station at Barcelona (E A J 1), which has been testing on 325 metres. At present low power is being used, but this will shortly be increased by the installation of a standard broadcast transmitter, rated at one and a half kilowatts.

* * *

The Great Hobby.

MANCHESTER'S Wireless Exhibition, which is closing to-morrow (Oct. 25th), has proved again how keenly radio has caught the public fancy. Every show that has been organised reports the same enthusiasm, and several manufacturers have recently told me that they have been amazed at the grasp of the subject which some radio amateurs have attained. Already great interest centres around the forthcoming London Exhibition, which is to be held at the White City from Nov. 15th to Nov. 29th.

* * *

WHAT THEY SAY.

"Let wireless weld all humanity together so that they can face their common difficulties in a spirit of co-operation and mutual trust."—Sir Oliver Lodge.

* * *

"There is a man at the end of my road who has a loud speaker so powerful that I can hear Uncle Rex's watch ticking. And when the weather is fine he sticks it in the garden so that everyone in the Home Counties can hear what a loud loud speaker his loud speaker is."—F. W. Thomas, in the "Star."

* * *

"Wireless broadcasting is the youngest of human arts. It is safe to say that there has never been any development of human activity which has interested so many or so diverse minds with such rapidity, or stirred the consciousness of mankind to such universal wonder."—"Daily Telegraph."

* * *

The statement has been made—not by the B.B.C.—that Britain has the finest broadcasting service in the world—and I think the observation is a true one. Are we satisfied? No, decidedly not. We are very dissatisfied with what has been accomplished, and we hope to do much greater things in the future.—Lord Gainford, Chairman of the B.B.C., in an interview with the "Manchester Evening Chronicle."

* * *

THE WEEK'S QUERY.

I am getting the knack of tuning, but am not quite sure of the condenser adjustment. Should the moving plates be all in, half in, or all out?

Long Distance Work.

A SOUTH SHIELDS correspondent has forwarded me some interesting details of long-distance broadcast reception on an indoor aerial. On a recent Sunday evening Rome (425 metres) was received at good strength, and the transmission was perfectly clear. Fired by this success, an attempt was made the same evening to receive American broadcasting, and two unknown Transatlantic stations, and finally W G Y, were all brought in at quite good strength.

* * *

Keeping Anniversaries.

ONE thing that I think the B.B.C. deserves credit for is the way in which they observe anniversaries, and keep memories green. "Army Reminiscences" was a case in point, and another interesting forthcoming programme is the special one arranged for Armistice Day, Nov. 11th.

* * *

Belfast Ready.

WHEN Bournemouth station was opened, about 12 months ago, there seemed little prospect of the erection of another main B.B.C. station; but Ulster has exceeded expectations, and the Belfast station is due to be officially opened to-day (Oct. 24th). The Duke of Abercorn, Sir James Craig, Lord Gainford, the Lord Mayor of Belfast, and the Principal of Belfast University, are amongst the speakers, some of whom will be S.B. to-night.

* * *

Flatter and Flatter.

LEAFIELD'S harmonics have been less troublesome lately, but during the last few weeks the tuning of 5 X X has seemed to get flatter and flatter. At thirty-five miles, on a two-valve set, I can now hear signals quite well with any adjustment of the tuning condenser, and a Copenhagen correspondent tells me that he has noticed the same trouble, even at that distance.

* * *

Secret Radio?

MR. WILLIAM DUBILIER, of condenser fame, has been investigating a new German invention by means of which commercial news by wireless can be transmitted without fear of its being "tapped" by unauthorised listeners. The machine is fundamentally simple, but absolute secrecy is obtained by reason of the fact that countless transmitting combinations can be used and altered at will, the result being meaningless to all except to the authorised listener.

* * *

Wireless in a Hospital.

BY the way, the photo which appeared on page 297 of P.W. No. 124, showing a wireless set in a hospital, is an official photo of the presentation of a loud-speaker equipment (provided by the Birmingham Radio Circle) to the Queen's Hospital, Birmingham. Mr. Percy Edgar and the House Governor of the Hospital can be seen in the photo.

(*Continued on page* 422)

Liverpool Moving.

LIVERPOOL Relay Station will soon be moving to a new home, owing to interference with the wireless branch of the Liverpool Territorial Signal Corps.

The new site will be the one originally chosen at the Corporation dust destructor, in St. Domingo Road.

* * *

Wireless Insurance.

FIRE insurance companies generally ask no extra premium when wireless is installed upon insured property, but they should always be notified by the policy holder when an aerial is erected.

Insurance to cover other wireless risks has now developed into quite a big business, and a great many people have taken advantage of the protection it affords since this class of business was introduced by the Liverpool Marine and General Insurance Co.

* * *

Interesting Experiments.

SOME interesting experiments were recently carried out at Southampton to test the possibility of direct wireless telephone communication between incoming ships and the dock authorities ashore. A 50-watt transmitter and a three-valve receiver were used, and there is no difficulty about tuning in, as the apparatus works on a fixed wave-length of 250 metres. Some very promising results were obtained, and it is possible that this aid to the pilot will soon be universally adopted.

* * *

R 1 to R 9.

THE technical editor tells me that, referring to his contribution, "Some Unidyne Troubles," in "P.W." 124 (page 302), a correspondent has asked him whether weak signals are described there as "R I" or "R I."

It seems hardly necessary to say that in accordance with universal practice he uses the scale R 1 to R 9, to indicate "dead weak" to "very strong signals"; and that in this instance, where the signals were hardly audible, he calls them "signals of R 1 (R One) order."

* * *

Dublin to Broadcast?

AT the time of writing no definite announcement has been made regarding the establishment of a broadcasting service in the Irish Free State; but a scheme has been drawn up provisionally which provides for a main station in Phoenix Park, Dublin, with relays in Cork, Galway, and Limerick.

* * *

A Prince's Set.

READERS who have seen the Western Electric Company's seven-valve super-sonic heterodyne receiver will be interested to know that one of these instruments is packed up in the luggage of Prince Parachatra, brother of the king of Siam, who is now en route for Bangkok. When in London the prince examined and tested the set, and now he has high hopes of receiving British broadcasting regularly in Siam.

* * *

The Radio Week.

INTERNATIONAL Radio Week has this year been fixed for November 23rd to November 30th. Most European and American stations will take part, and the B.B.C. is co-operating heartily in the scheme. Every night from 10.30 p.m. onwards an hour will be devoted to the relaying of foreign transmissions, and talks on international affairs are being planned. It is hoped to secure some good programmes of representative music from the different countries participating.

* * *

Amateur Detectives.

RECENTLY listeners in the Seven Kings district have been driven almost mad by oscillation interference, and a few stalwarts armed with frame aerials have been doing some good detective work in an attempt to stop the nuisance. 2 A U V was red-hot on the trail the last time I heard of him, and he certainly has the good wishes of the neighbourhood to back up his efforts.

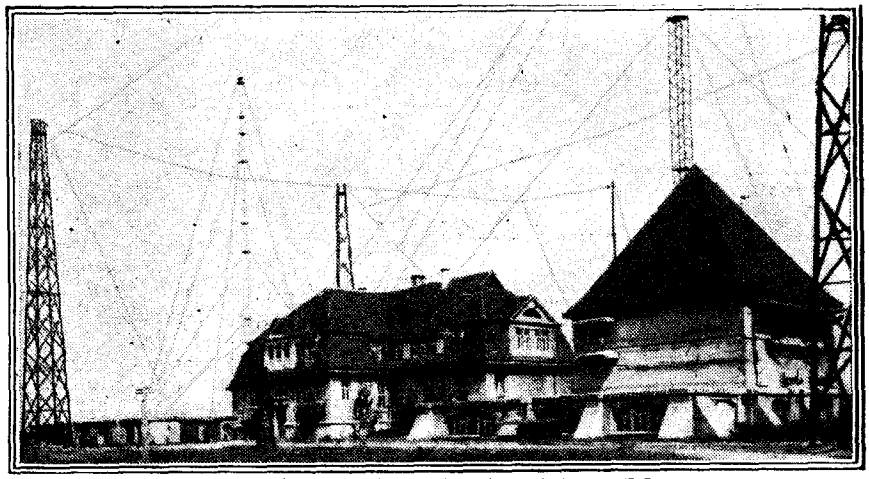
AMERICA ON A ONE-VALVE UNIDYNE.

The Editor, POPULAR WIRELESS.

Dear Sir,—You might be interested to know that on a single-valve Unidyne set of my own construction, using a Thorpe K 4 valve and home-made basket coils, I was successful on Sunday evening, the 12th inst., or rather early this morning, after listening in vain for Captain Eckersley's speech to be relayed through 5 S C from K D K A, in picking up a church service which was being relayed by wireless on a wave-length which appeared to be in the vicinity of 400 metres. I was able to keep on to this station from about 12.45 a.m. till 2 a.m., at which time it closed down, the announcer giving the call sign W G Y, Schenectady, New York. Speech and music being quite distinct, except for some atmospherics and fading. I distinctly heard him (the preacher) read the lesson from Romans, chap. viii., and close by singing verses 1, 2, and 4 of hymn No. 405, "Fight the good fight." I will be glad if any of your readers can confirm this report. I have also received the following stations at above address, 2 B D, 5 N O, 6 B M, 2 Z Y, 5 W A, 2 B E, and of course Glasgow (5 S C), and a French station as well, but I did not get the call sign. As this is my first valve set, and was built entirely to the instructions in your valuable paper, I think this reflects great credit on the inventors of this circuit.

Yours faithfully,
J. RALSTON.

32, Kilnside Road, Paisley.



Station Buildings and Aerials at Konigswusterhausen (L P).

Wireless on Seaplanes.

A WIRELESS-FITTED seaplane which has been undergoing tests at Hamble (Hants) is specially designed to carry invalids ill with fever on British Guiana plantations to the nearest place where they can obtain treatment. Hitherto many sick men have died on the 200-mile journey because, owing to bad transport, it took seventeen days to carry them to safety, but the seaplane is designed to do the journey in about *two hours*, and will be in wireless touch with both ends of the route all the way.

* * *

The "P.W." Photos.

SEVERAL readers have expressed appreciation of the photographs of the interiors of the various B.B.C. stations which have been appearing in "P.W."; but so far as we know only one has tumbled to the fact that a photograph of the Hull station was erroneously described as "The Control Room of the Leeds-Bradford Station," in "P.W." 123 (Oct. 4th).

* * *

Mr. Reith's Book.

I AM told by Mr. J. C. W. Reith (managing director of the B.B.C.) that his promised book is now completed, and will probably be on sale by the time these lines are in print. It is called "Broadcast Over Britain"—a subject upon which Mr. Reith is *the* authority

* * *

The White City Exhibition.

LONDON'S second and biggest wireless exhibition opens at the White City on November 15th, and one of its big attractions will be the POPULAR WIRELESS Constructors Competition. The rules governing this competition will appear in our next issue. There will be a junior section for sets made by amateurs under 15, and a senior section for those made by amateurs over 15.

* * *

Prizes for Constructors.

THE competition is open to all classes of receivers. Neatness, originality, and efficiency will be the main points on which the sets will be judged. POPULAR WIRELESS is presenting two silver cups—one for each section—as first prizes. The organisers of the exhibition are also presenting gold and silver medals as second and third prizes in both sections.

* * *

Send Along Your Set.

READERS of "P.W." desirous of entering this competition should send their sets to the Organisers of the Radio Exhibition, White City, Uxbridge Road, not before November 12th, and not later than November 14th. Every set must have a label attached bearing the owner's name and address. All sets are sent at amateur's own risk. Full details will be given in next week's issue. **ARIEL.**

SATISFYING A NATION.

THE GROWTH OF THE B.B.C.

By J. C. W. REITH, M.Sc.
(*Managing Director of the B.B.C.*)

An article from the pen of Mr. Reith is always of interest and in the following contribution, specially written for "Popular Wireless," the Managing Director of the B.B.C. draws an arresting pen picture of the growth and spread of the activities of the most efficient broadcasting service in the world.—The Editor.

THE B.B.C. is getting a pretty big concern, and it is common knowledge that when a business of any kind expands very rapidly it is rather apt to get out of hand. Many organisations, when comparatively small, were efficiently managed and highly successful in every respect, but when for one reason or another they suddenly began to grow and to launch out in new directions, all sorts of troubles began.

The Critics and the B.B.C.

I heard recently of a man who was making over three thousand a year out of a little bakery business in quite a poor quarter of a provincial town. Then he thought he would start branches in other parts of the town, and generally open out his trade. He lost all his savings, and now, I believe, he has no business at all. There is a line which expresses what happened:

> Like kings we lose the conquests gained before,
> By vain ambition still to make them more.
> Each might his several province well command,
> Would all but stoop to what they understand.

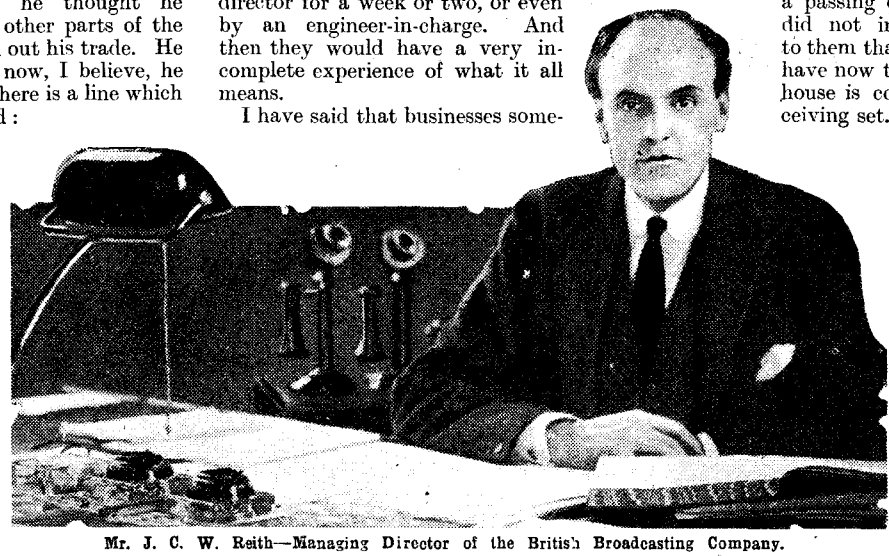
This might seem to put a premium on ambition and initiative, but it really does nothing of the kind. Nor should anyone be discouraged by the toll of disaster which often follows such enterprise as was shown by the little baker. It should just make us very careful to ensure that our projected moves are wise ones, and that we can still keep our business in hand, even though it cannot have the same personal supervision in all its details.

Now an extension of operations from one town to about twenty inside two years is something quite unusual, and it would be so recognised even if the business were such a simple and straightforward one as selling cakes or tobacco, or even, to come a little nearer home, wireless gear. Developing a broadcasting service is a very different thing from extending the market for any ordinary kind of product. There are many serious problems to be considered when one is doing this, but broadcasting includes them all before its difficulties really begin.

Some people are unreasonable towards broadcasting. The B.B.C. has always been very polite to its critics—not that there are many of them—even to the kind of man who, after listening to some particular thing that does not happen to suit him, seizes pen and paper and condemns all that the company ever did, and finishes perhaps by saying that he enjoyed the programmes more when there was no regular service at all, but just a few amateurs sending out a little music now and again. Incidentally, what a tribute and a reward is there!

I think people are beginning to understand that no concern in history ever took on quite such an embarrassing and endless task as that of trying to satisfy a whole nation at once, and to keep on doing it day after day, night after night. But they do not all appreciate it as fully as they should, and some do not yet seem to appreciate it at all. It would do them a world of good to come and sit by a station director for a week or two, or even by an engineer-in-charge. And then they would have a very incomplete experience of what it all means.

I have said that businesses sometimes get out of hand, but the B.B.C. has not overgrown itself in this way, for at the head office we are still able to keep in close touch with all the stations, and not only know what is happening, but have just as much say in what is happening as is necessary. There is a vast amount of work going on—essential work—which no one knows anything about, but without which there would be no programmes for people to criticise at all.



Mr. J. C. W. Reith—Managing Director of the British Broadcasting Company.

The Necessity for Co-operation.

Some of those who listen to programmes are far too much inclined to judge the B.B.C., and British broadcasting in general, by one item from one station on one evening, and forget all about what is being done all the rest of the time in all the other places.

Broadcasting, more than anything else I know of, demands an intelligent and sympathetic co-operation between the two parties chiefly concerned, and it needs also a recognition of other people's requirements, often a difficult recognition to give. There are some things we can do on our own, and there are some we cannot do at all, but between these two categories there lies a great range of possibilities which are made practical by joint action between broadcaster and listener. This happy state of affairs is becoming more and more necessary because new listeners are being added every day.

A Great Development of the Age.

Hardly a manufacturer I meet but reports busy times in his factory. Broadcasting itself is still extending; new stations are being opened and fresh lines of activity developed. People who were originally rather inclined to despise it because they thought it was only a passing craze, or because they did not imagine it would bring to them that they had not before, have now to come to find that no house is complete without a receiving set.

The service is now taken seriously by those who underestimated it before. There is more in it than they thought. There is more in it than anyone thought. We can see opinions on its influence given in all sorts of unexpected quarters. It is no exaggeration to say that it is one of the really great developments of the century—or age—or of any age. People who are accustomed to assessing the value of various influences which have arisen from time to time cannot as yet determine where it is going to lead, or to what extent it will change some of the conditions of life to which we have grown accustomed.

Wireless in general will change the whole face of civilisation, and may revolutionise our established processes in many different fields. Broadcasting, within this greater upheaval, is evolving a silent revolution of its own, and all listeners and broadcasters are concerned in it, and have their parts to play. When we find ourselves becoming involved in some new movement we are wise if we consider carefully what our attitude to it is to be, and if we are to do this properly we must invariably, and to a great extent, try to sink our own individualities and our own inclinations and desires in the wider considerations which may be those of a household, a community, or a nation.

Those who were amateur experimenters when broadcasting began, or who have taken up the pursuit since, and in general those who have participated in the growth of broadcasting through regular listening, are, so to speak, in on the ground-floor, and

(*Concluded on page* 482.)

ARGENTINA'S SUPER-STATION.

The Monte Grande Installation Now Heard Throughout the World.

(FROM OUR OWN CORRESPONDENT IN ARGENTINA).

EVEN before litigation in the English courts drew attention to the commercial value of the Monte Grande (L P Z) radio high-power station, Argentina interest had been centred in this exceedingly important installation, which performs work in international communications throughout the world. From almost any high building in Buenos Aires the aerial towers can be clearly seen, and they are used by the Military Survey Office as points of comparison in the preparation of their maps.

Ten Huge Masts.

The power-house, which is of colossal construction, is built on huge reinforced concrete piles three metres above the common floor level. The height of eight of the towers is 210 metres, the two centre towers being 219 metres. Six were built by the Telefunken Company, a German enterprise, and four by the C.T.S.F., a French company.

The weight of each of the German towers is 125 tons, calculated to withstand a base-pressure of 250 tons at the foundations. The strain calculation in time of storm and hurricane is of 40 tons at top and 20 tons at base. The base of the tower is supported on eight coils of insulators, each of which is calculated to stand a strain of 80 tons, the maximum pressure placed upon the insulators in actual practice being 31 tons. Constructed in pairs, the average time occupied in the mounting of each pair was three months. The base of each tower is formed of reinforced concrete, and, in size, measures 3 by 4 by 4 metres. In some cases the bases are as deep as 5 to 9 metres, the size varying according to the character of the type of soil encountered.

Twelve Thousand Volts.

The four French towers vary but slightly from those of German construction, being square in shape, while the latter are triangular in formation. Each of the French towers weigh over 85 tons, and rests upon a 260-ton foundation securely attached to piles weighing over 85 tons driven down into bed-rock. The towers are stayed at six places to four points, and are not insulated at the base.

Deep beneath the surface a 3-phase power-cable carries over 1,000 kw. at 12,500 volts pressure to the sub-station of the Compañia Alemana at Banfield, providing sufficient energy to run the whole of the installation. Two other cables connect Monte Grande with the central office in Buenos Aires, while both stations (Monte Grande and Villa Elisa) are connected by means of a switchboard in the central office.

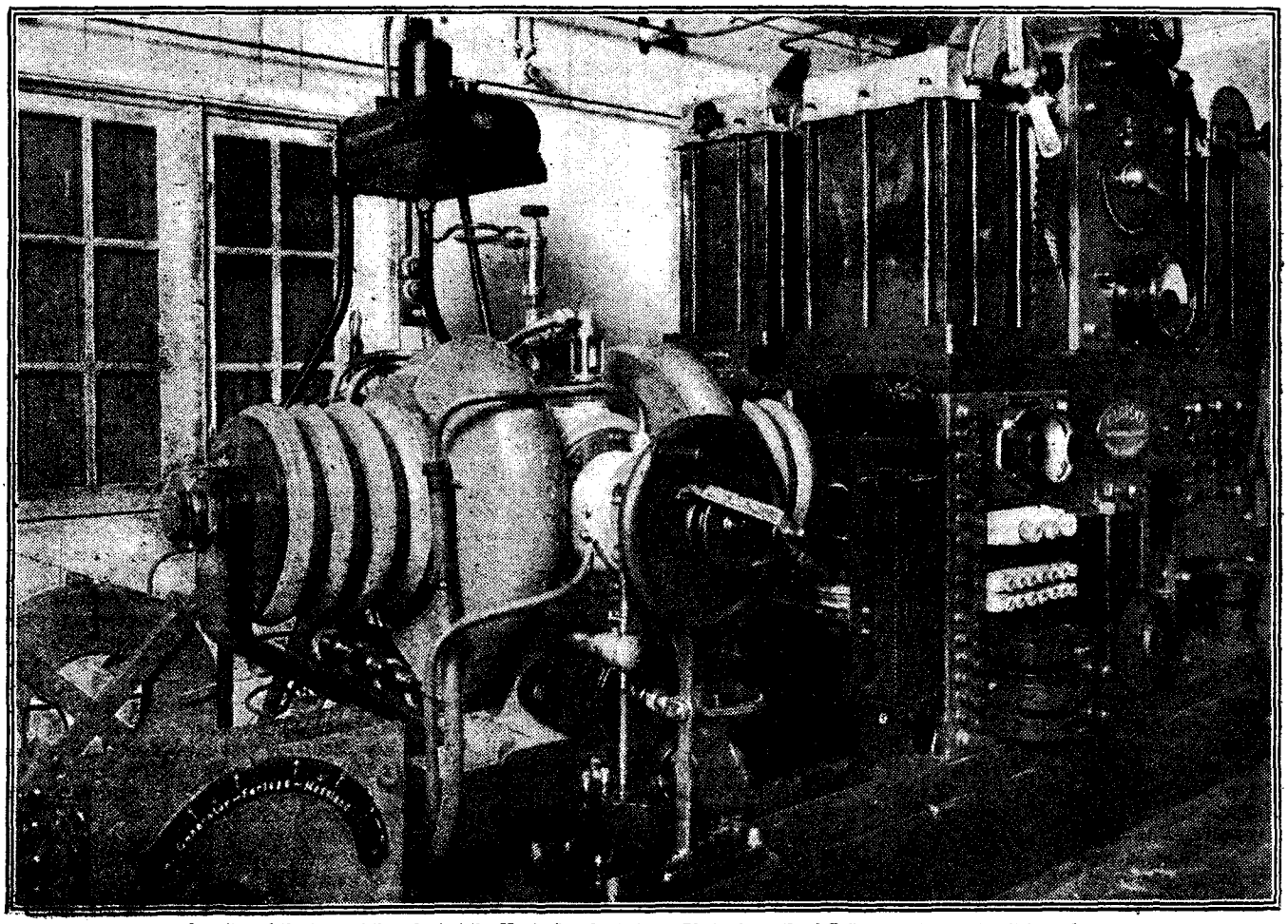
Oil Cooled Transformers.

The Telefunken high-frequency alternators are driven by a 800 h.p. 3-phase motor, delivering 6,000 cycle current at 750 volts and 1,000 amperes. A frequency, varying between 11,000 and 44,000, can be obtained, giving a wave-length from 6,400 to 27,500 metres.

Doubling and tripling transformers coupled to banks of condensers are used, these being oil-cooled. The doubling and tripling transformers are oil-cooled by means of a centrifugal pumping system.

The power enters from the Banfield works at 12,500 volts and is transformed down to 3,200 volts for driving the 3-phase motors, while, for lighting, it is transformed down to 230 and 110 volts.

The huge transformers employed for this purpose are also oil cooled and, of course, very efficient insulation is provided.



A section of the transmitting plant at the Monte Grande station. Photo shows the A.R.C. transmitter and switchboard.

HOW TO BUILD A ONE-VALVE REFLEX RECEIVER.

By E. L. MUNNS.

Straightforward constructional details for the amateur who has had a little experience in building receivers.

THIS article is more especially intended for the amateur who has had a little experience in constructing and operating the simpler types of apparatus. It is a trifle more ambitious than the simple one-valve circuit, and is much more efficient. For this reason the writer does not recommend the use of dual amplification to the absolute beginner.

The Circuit.

Looking at the circuit in Fig. 1 it may be seen that the H.F. oscillations in the aerial are conveyed to the grid of the valve and

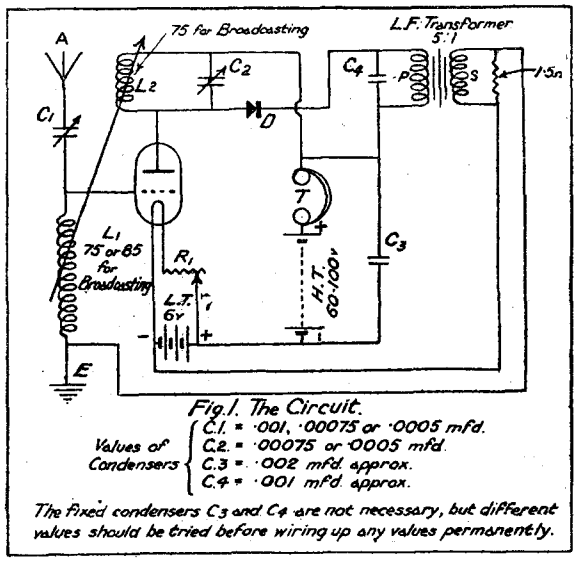


Fig. 1. The Circuit.

Values of Condensers { C.1 = ·001, ·00075 or ·0005 mfd. C.2 = ·00075 or ·0005 mfd. C.3 = ·002 mfd. approx. C.4 = ·001 mfd. approx.

The fixed condensers C3 and C4 are not necessary, but different values should be tried before wiring up any values permanently.

are then amplified. In this state they are rectified by the crystal, D. They have now been converted into L.F. impulses.

Having next passed through the step-up transformer they are again communicated to the grid of the valve, which now amplifies

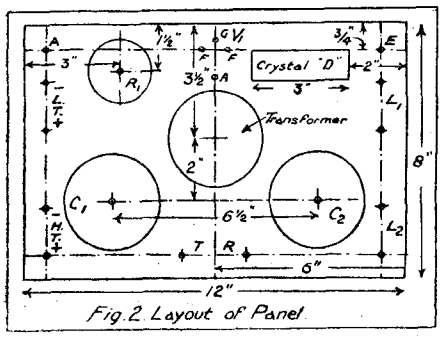


Fig. 2. Layout of Panel.

at low frequency. These magnified L.F. impulses pass through the anode coil, L2, and thus through the telephone receivers, T. Thus it may be clearly seen that the valve is performing two functions: (1) acting as an H.F. amplifier, and (2) as an L.F. amplifier.

This latter fact makes it necessary that the valve, as far as possible, should be suitable for both radio and L.F. amplification. The writer employs a very hard Ediswan A.R. or a Phillips R valve.

Constructional Notes.

A few notes on the actual construction of the set are now given, although little need be said, as the diagram in Fig. 2 is self-explanatory. The panel used was 8 in. × 12 in. × ¼ in., and was found to be very convenient. The components may seem slightly crowded, but the wiring was quite simple, being carried out with No. 16 S.W.G. tinned copper wire.

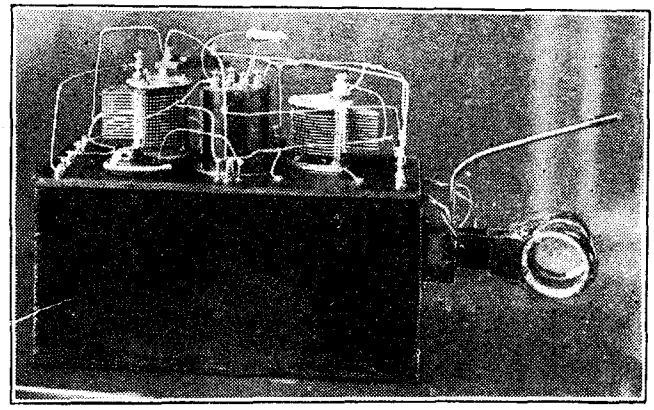
No difficulty should arise if these dimensions are used.

The L.F. transformer, as may be seen, was shrouded in an iron case, which proved a great advantage. If, however, you wish to employ a transformer that is not shrouded, it is advisable to space the wiring with care, as capacity effects may be very noticeable.

The L.F. transformer should be of very good quality, the ratio being either 4–1 or 5–1. The one used on the writer's set was 5–1. If undue capacity effects are experienced the transformer should be looked at first. It might be necessary to shroud it to prevent interaction.

The two variable condensers were both ·0005 mfd., and proved to be very satisfactory. They tune the aerial and anode coils respectively, and the former was wired permanently in series with L1, as this method gave the best results.

If you want this set to have a long range of wave-lengths it would be an advantage to employ a switch for putting the aerial condenser either in series or parallel. If this is done you will not need so many coils.



A view underneath the panel, showing the wiring.

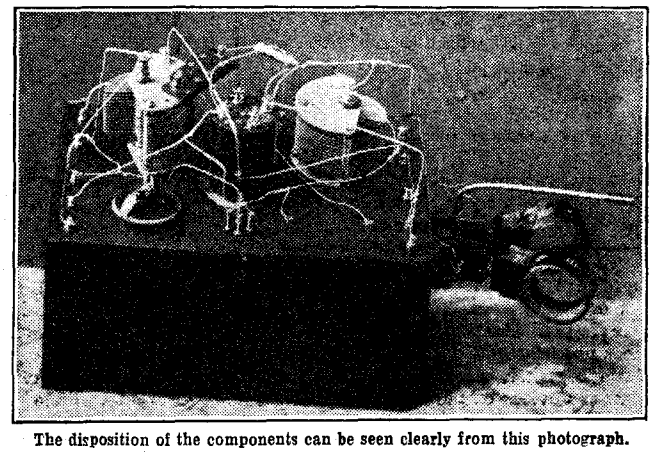
The crystal used was Hertzite, although leonite and galena were tried, but were not nearly as good as the first-mentioned. This is, of course, a very important item, and should be borne in mind when purchasing the crystal.

If possible, test several crystals on the dual circuit in order to obtain a good specimen. The one used by the writer is capable of receiving 2 L O at a distance of 70 miles. The speech is not always audible, but instrumental items are quite good. This crystal proved as excellent in conjunction with valves as when used as a rectifier.

How to Operate the Set.

The operation of the set is carried out in the following manner. First insert in the coil-holder suitable coils to cover the wave-length of the station you wish to receive. Place them a fair distance apart (say, more than 50°) and move the condensers in the usual manner until the desired station can

(*Continued on page* 426.)



The disposition of the components can be seen clearly from this photograph.

TWO TECHNICAL HINTS.

A Switch for H.F. and Detector "Unidyne"—Tuned Anode Control.

A VERY simple switching arrangement for the H.F. and detector Unidyne is shown below. In one operation it switches off the filament, reverses the reaction, and switches the input from the grid of the H.F. valve to the detector grid.

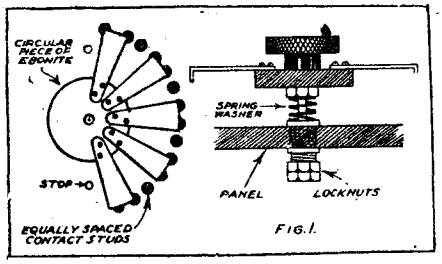


FIG. 1.

instead of employing three separate operations, as in the original model Unidyne described in POPULAR WIRELESS. The articles needed are:

15 Contact studs,
2 Stop pins,
2 inches of 2 B.A. rod,
1 Bush,
1 Spring washer,
3 2 B.A. nuts,
1 Ebonite knob,
1 Piece of spring brass about 2½ in. by 1½ in.
1 Piece of ebonite 1½ in. square.

The ebonite is made into a circular piece 1½ in. in diameter, and when the brass has been shaped into five arms, as in Fig. 1, these are fixed to the ebonite as in Fig. 1. The connections are shown in Fig. 2. Precautions must be taken to see that the contact arms each afford good connection between the studs they rest on.

TUNED ANODE CONTROL.

WHEN the tuned anode method of coupling H.F. valves is employed, two or more stages may be simultaneously tuned by arranging a single sliding member

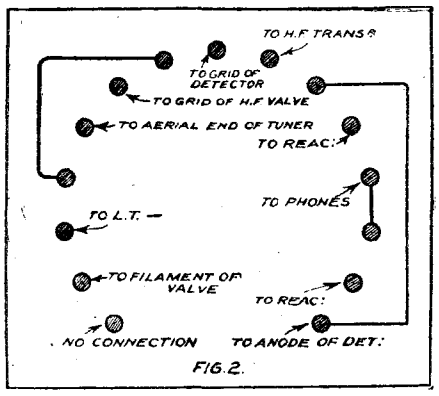


FIG. 2.

in such a way that it engages the edges of the condenser dials, as shown in the accompanying illustration. This arrangement does not necessitate placing the condensers close together, as is the case with other similar devices employing a revolving cone placed between the dials.

Pieces of rubber or cork, A, are secured to a strip of hard wood, B, by means of a little glue or seccotine. The bearings for this strip consist of two small cotton reels, C, which are swivelled to the panel by means of small bolts. The pressure between the edges of the dials and the cork or rubber strips should keep the wooden slider in position.

HOW TO BUILD A ONE-VALVE REFLEX RECEIVER.

(*Continued from page 425.*)

be heard. Now increase the reaction—i.e. bring the coils a little closer, and then retune both condensers. Repeat the operation until the desired strength is obtained.

If this method is carried the set will not burst into self-oscillation, as it probably would if the coils are close when tuning is commenced. If it does oscillate, however, lessen the reaction, or carry out the alternative method, which is dimming the filament of the valve.

The coils used were of the honeycomb type, and below are the necessary coils to receive most of the important stations when C1 is in series:

	Anode (L2)	Aerial (L1)
Broadcasting..	75 ..	75 or 85
Hague	200 ..	150
Eiffel Tower..	500 ..	300
Radiola	400 ..	200

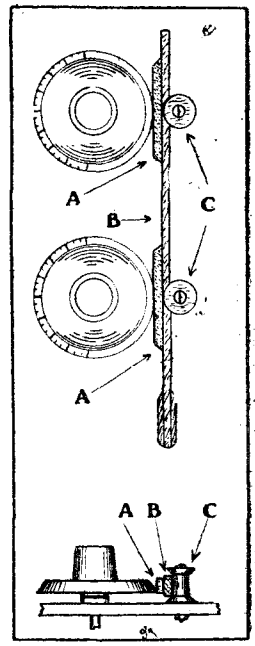
All the stations given in the next paragraph were received on the broadcasting coils (except the three Continental ones given above).

Results.

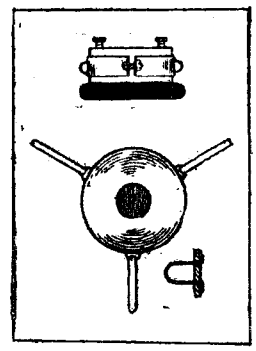
The results obtained with this receiver are far superior to those with a single valve of the usual type. The following stations were logged in one evening: London (2 L O), Birmingham (5 I T), Manchester (2 Z Y), Bournemouth (6 B M), Glasgow (5 S C), Newcastle (5 N O), Cardiff (5 W A), Aberdeen (2 B D), Radiola (S F R), Eiffel Tower (F L), École Supérieure, Paris (P T T), Hague (P C U U), Ramsgate Post Office, North Goodwins, South Goodwins, and several amateurs.

As these results were obtained from Margate, little difficulty should be experienced in receiving all the British stations from any part of the country unless you are situated in a "blind spot."

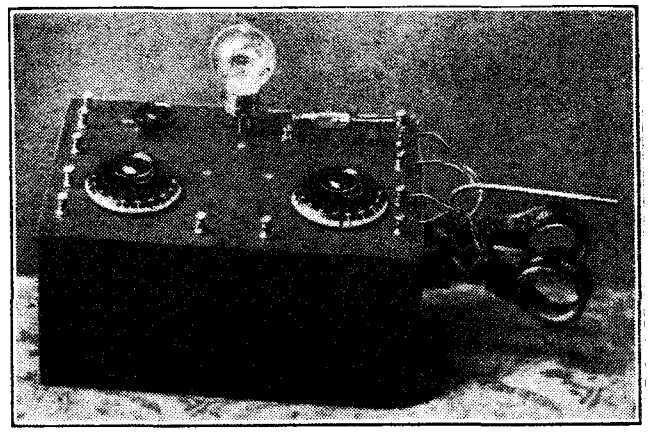
The reaction effect produced by the aerial and anode coils being coupled is a great advantage when used with care. It is necessary to have the coils coupled in the right directions or the effect will not exist. If this is so, reverse one of the pairs of leads, either those to the aerial coil or those to the anode coil. This should remedy the defect.



LOUD SPEAKER EXPERIMENTS.



THE casing of the "loud speaker" receiver is provided with a sheet metal strap to which is fitted three or four staples which are passed through holes in same, bent over on the underside, and then soldered as shown in the diagram.


The complete one-valve reflex receiver.

Lengths of ⅛ in. square-section elastic are then passed through the staples, their outer ends being secured to a suitable frame. The tension on the elastic strips should be well equalised, the idea being to minimise mechanical vibration, which is very pronounced when the receiver is mounted on to any solid structure common with the base.

METHODS OF SWITCHING IN WIRELESS CIRCUITS.

By T. P. BEARD.

This is the third and concluding article of a series dealing with a practical aspect of wireless work of importance to all amateurs.

WHERE a high-frequency valve is used before a valve detector and a switch is required for cutting in or out the high-frequency valve, it is necessary to make provision for connecting the aerial to the grid of the high-frequency valve or to that of the detector as required, and also to switch off the current from the high-frequency valve filament when that valve is not in use. A double-pole change-over switch of low capacity type will be required for this purpose.

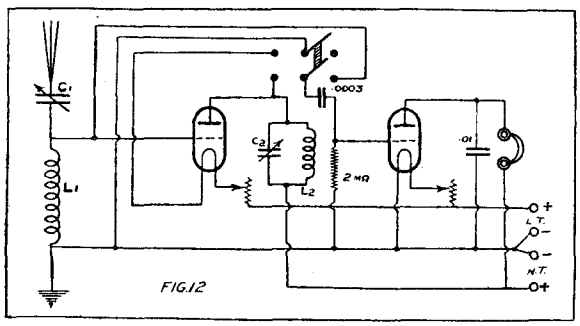


FIG. 12

In Fig. 12 it is assumed that the tuned-anode method of high-frequency coupling is used, L 2 being the tuned-anode coil, and C 2 is a variable condenser in parallel. The centre and left-hand contacts on the upper side of the switch S simply switch on the filament of the high-frequency valve, the upper right-hand contact being left empty. The lower contacts of the switch are connected as follows: The centre contact is joined to the grid leak and condenser on the grid of the second valve, the left-hand lower contact is joined to the plate of the first valve, and the right-hand contact to the aerial lead.

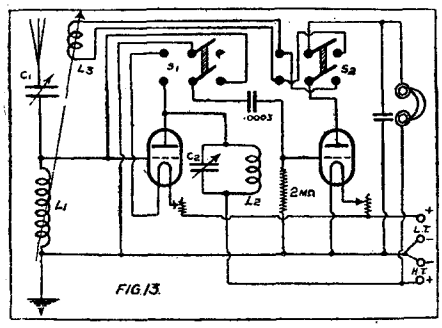


FIG. 13.

If the switch is over to the right, the filament of the first valve is switched off, and the aerial is led round to the grid of the second valve via the grid leak and condenser, and the circuit will therefore be the usual single-valve detector circuit. By placing the switch arm over to the left the filament of the high-frequency valve is switched on and the plate of the high-frequency valve is connected to the grid leak of the second valve, and both valves are then in use. If reaction is used in a circuit of this type, provision must be made for changing the direction of the reaction coil when changing the number of valves in use. A method of doing this is shown in the next figure.

Changing Over Reaction.

The last figure showed the method of switching one high-frequency valve without reaction. Fig. 13 is the same circuit, but with the addition of a reaction coil, L 3, and another switch, S 2. The connections to this switch will be very easily followed.

It will be seen that putting the switch to the right or left comes to the same thing as removing the connections to the reaction coil from their terminals and connecting them up again the other way round. The switch will be in one position for use with two valves (to be found by experiment), and when the high-frequency valve is cut out, the switch S 2 will have to be thrown over to its opposite position.

Switching Reaction from A.T.1. to Tuned Anode Coil.

When reaction is used in a receiver having one or more stages of high-frequency amplification, it is usual to couple the reaction coil to the tuned-anode coil or high-frequency transformer between the high-frequency valve and the detector.

It is often very useful to be able to switch the reaction coil so that it may be coupled to the aerial tuning inductance or to the tuned-anode coil or transformer at will, and Fig. 14 shows how the necessary switch should be connected in the circuit. The connections will be very easily followed, and the diagram does not need any explanation. L 1 is the aerial coil, L 2 the tuned-anode coil and L 3, L 4 the alternative reaction coils.

Changing Over from Tuned Anode to Transformer H.F. Coupling.

In Fig. 15 is shown a method of using a change-over switch to change the high-frequency coupling from tuned-anode to high-frequency transformer, using the same variable condenser in each case. It will be seen that the upper centre switch contact is connected to the plate of the high-frequency valve and also, by way of a ·0003 mfd. variable condenser, C 2, to high-tension positive.

The upper and lower left-hand switch contacts are connected together, and are taken to one side of the tuned-anode coil, L 2, the other side of this coil being connected to high-tension positive. One end of the primary of the high-frequency

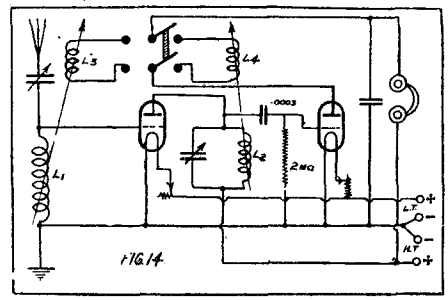


FIG. 14.

transformer, T, is joined to high-tension positive, and the other end to the upper right-hand switch contact. The lower centre contact is taken to the grid condenser, C 3, of the second valve as shown, and the lower right-hand contact goes to the secondary of the high-frequency transformer.

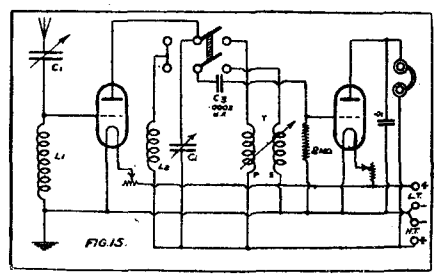


FIG. 15.

By following the diagram it will be seen that when the switch arms are over to the left, the plate of the first valve is joined to the upper side of the tuned-anode coil, L 2, also to the grid condenser of the second valve, and the anode condenser, C 2, is

(*Continued on page* 428.)

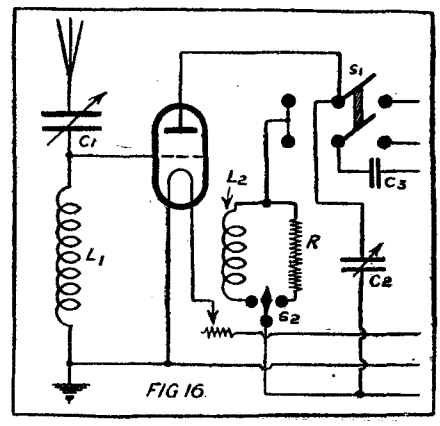


FIG 16.

Technical Notes

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

Tinning Made Easy.

A SIMPLE method of tinning terminals and metal parts generally is described in an American wireless journal. A metal vessel, sufficiently large to hold the articles to be tinned, is obtained, and is filled with sufficient water to cover the articles. To this is to be added not less than an ounce of cream of tartar per pint of water.

A stick of solder is melted in an old spoon, and is dropped, in this molten condition, into the water, the cream of tartar being added subsequently. The metal articles to be tinned should be thoroughly cleaned (by dipping in nitric acid for a few moments, and then rinsing with water) and should then be placed in the bath described above, and the solution boiled for an hour or longer.

A Frame Aerial.

It is well known that the amount of energy picked up by a loop aerial is very much less than that received by a good outdoor aerial in the same circumstances. It would appear advantageous, therefore, to use an outdoor aerial on a loop set; but this entails a separate tuning unit. If, however, a second loop of, say, two or three turns, be wound in the centre of the frame aerial, this second loop being in series with the outdoor aerial and the earth, there will obviously be inductive coupling between this second loop and the frame aerial proper.

The second loop and the frame aerial loop may be separated by a distance of, say, 1 to 3 inches; if the distance is increased, the selectivity is increased but the sensitivity decreased. The second loop thus functions as an untuned aerial circuit. Greater signal strength may sometimes be obtained by increasing the number of turns on the second loop to six or seven, and a small fixed condenser may sometimes with advantage be included in the circuit of the second loop. The frame aerial loop, of course, remains connected to the set in the ordinary way.

Rattling Telephones.

Rattle in the telephone receivers may be due to different causes. In the first place it may be that the diaphragm is slightly bent and is practically touching the magnets, so that when signals are being received, intermittent contact is made between the magnets and the vibrating diaphragm. If so, the remedy is to remove the diaphragm and reverse it. Another cause of rattling is the presence of grit between the diaphragm and the magnets which, owing to the extremely small clearance between the two, may easily cause mechanical contact. It sometimes happens that small iron filings or specks of iron dust may remain within the receiver case after manufacture, and these are particularly liable to adhere to the pole-pieces. If, therefore, rattling in the 'phones is noticed, the pole-pieces should be carefully inspected for the presence of any such magnetic particles.

Fading Signals.

When a station fades out, after having been properly tuned in with maximum intensity, it is usually better to wait a few moments to see if it comes up again to normal strength, rather than to upset the adjustment of the dials. It is true that cases have been recorded where the wavelength of the transmitting station, more particularly certain foreign stations, has varied quite considerably during the transmissions, but generally speaking, sudden or momentary variations in the intensity of reception are due, not to the transmitter or to the receiver, but to atmospheric and other conditions prevailing at the time. Of course, in some cases, nothing more mysterious than a failing filament battery will be found to be the cause.

Artificial Crystals.

Many of the crystals used for wireless detection are metallic sulphides, and can be prepared artificially in the chemical laboratory. It is remarkable, however, that when so prepared they usually appear in an amorphous form and possess little or no rectifying properties. It seems from this fact, and also from many other observations, that the rectifying property is dependent upon the crystalline formation. It is possible, by special arrangements, to manufacture most, though not all, of the commoner wireless crystals by artificial means and in the crystalline form. The

(*Continued on page* 483.)

METHODS OF SWITCHING IN WIRELESS CIRCUITS.

(*Continued from page* 427.)

shunted across the tuned-anode coil. The windings of the transformer are now out of circuit. With the switch in this position, the tuned-anode method of coupling is in use.

If the switch arms are put over to the right the plate of the first valve is joined to the upper end of the transformer primary, the variable condenser C 2 is shunted across this winding, and the grid condenser of the second valve is connected to the upper end of the transformer secondary. The lower end of this winding is joined to low-tension negative in the usual manner. This switch position gives transformer coupling.

Changing from Tuned-Anode to Resistance-Capacity H.F. Coupling.

A simple two-way switch incorporated in the last figure enables this to be done. Fig. 16 is a reproduction of part of the circuit given in Fig. 15, showing a high resistance of 100,000 ohms, R, connected to the upper end of the tuned-anode coil, L 2. The lower end of this resistance is taken to one of the contacts of the switch S 2.

The lower end of the tuned-anode coil is joined to the second contact of S 2, and the arm of this switch is joined to the positive of the high-tension battery. It will be seen that S 1 and S 2 enable any of the usual combinations of high-frequency coupling to be used at will.

Switching One Stage of L.F. Amplification.

This circuit, Fig. 17, shows how a change-over switch may be used to cut in or out of circuit a stage of low-frequency amplification after a detector valve. P and S are the primary and secondary windings of a low-frequency transformer, and L 2 is the reaction coil. The upper centre switch contact is taken to one end of the reaction coil, the other end of which is connected to the plate of the detector valve in the usual manner.

The upper left-hand contact of the switch is joined to one end of the transformer primary, and the right-hand upper contact to one side of the telephones. The lower centre and lower left-hand contacts of the switch are joined to the filament of the second valve and to L T—respectively.

When the switch arms are over to the left, the reaction coil L 2 is connected to the primary of the transformer, and the lower centre and left-hand switch contacts close the filament circuit of the second valve, allowing the filament of that valve to light up. In this switch position the low-frequency amplifier is in circuit.

If the switch is thrown over to the left, the filament circuit of the second valve is broken and the reaction coil L 2 is joined directly to the telephones. In this position the circuit is an ordinary single valve detector arrangement with reaction.

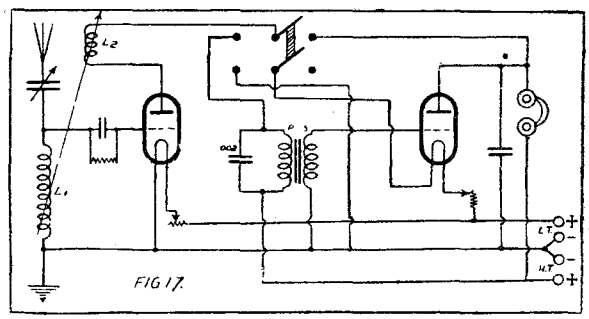


FIG 17.

Still another Pair of Phones!

can be added, up to the full capacity of your set, with a simple movement of the hand the 'phone-tags (fitted with the Newey Snap Multi-connectors) are pressed over the last pair.

NO TURNING OF SCREWS OR TWISTING OF WIRES they JUST SNAP ON and the phosphor-bronze Spring in the connector socket grips the terminal stud or the stud on top of the last connector.

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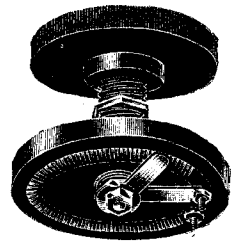

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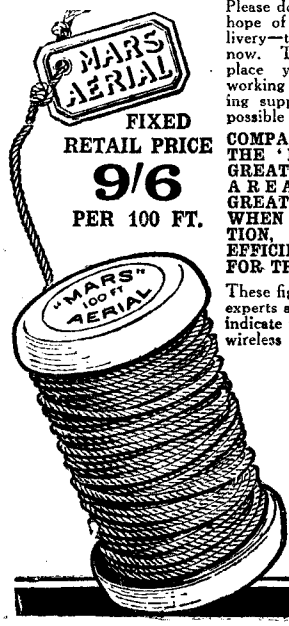

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WIRELESS FOR THE BEGINNER.

A NEW SERIES FOR AMATEURS.

By E. BLAKE, A.M.I.E.E.

This new series, by one of the most popular radio writers of the day, will directly appeal to the thousands of new enthusiasts who have taken up wireless as a hobby this winter.

PART I.—A GENERAL TALK ABOUT WIRELESS.

LET us admit at the outset that a description of wireless as a co-operation between broadcasting stations, receivers, and "wireless waves" is no help to the person who, unversed in the elements of electricity and magnetism, wishes to know in detail how this seeming miracle or broadcasting is accomplished. But it must be admitted also that, in order to write lucidly of the processes of wireless, assuming on the reader's part little or no understanding of the properties of electric and magnetic circuits, one is forced to make use of rough analogies, makeshift images, and mechanical comparisons.

This is apt to give the learner only a crude idea of what are some of the most awe-inspiring revelations of the unseen world of vibrations. Still, the facts and figures which will be given in this and the following articles will, I hope, give a simple and fairly complete exposé of the secrets of wireless, and imagination will complete the story.

Wireless Waves.

As a rule, when we wish to understand how something works we do not trouble very much about its superficial appearance, its colour and form, and so on. We strip off the outside to get at the fundamentals inside. Steam-engines are given many forms, but they nearly all work on some common principle. So it is with wireless. There are wireless telegraphy, wireless telephony, broadcasting, wireless beams and wireless "lighthouses," wirelessly controlled ships and aircraft, and wireless "death rays."

But these are only different applications of one process which is fundamentally the same in all; that is, the production and propagation of waves. Can we reduce the matter to even more simple terms? Yes.

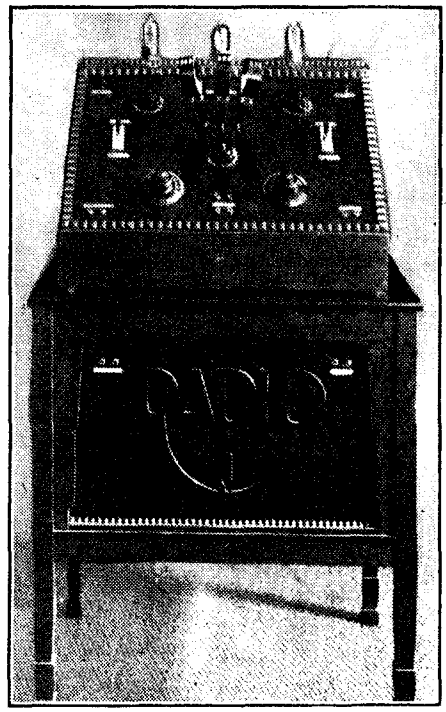
The waves are, after all, only a means to an end. What part do they play in wireless? Well, one step brings us right to the heart of the matter. *The function of the waves is to convey something from one place to another.*

Just as in ordinary telegraphy the wires link town to town and carry the electrical impulses in "dots and dashes," so wireless waves transfer electrical impulses or signals from wireless stations to wireless receivers. That is the point to grasp; there is no mystery, no miracle; wireless is not a magic method of communication employing no connecting material between sender and receiver. It is not a sort of imitation telepathy by an electrical Zancig.

The message, whether it be in Morse code or a violin solo, is turned into a form in which it can be carried by wireless waves, and these faithfully bear their burden far and wide. Do not be bewildered at the statement that the messages are turned into another form. Remember that on the surface of the gramophone record there is music or speech *in another form.*

So in the printed score there is music *in another form.* And in the Braille type of the blind there is intelligence in an unusual form. The secret lies in the interpretation. In wireless, the interpreter is the receiver.

It will be much easier for you to understand wireless, and broadcasting in particular, if you assimilate the idea of music and speech having electrical counterparts, or being recorded somehow in some form so that they can be turned back into sounds



A 3 Valve Cabinet Set made by a Dutch Amateur which won first prize at the Amsterdam Exhibition.

at will. You will wonder at this stage *how* music can be recorded electrically, and in what appears to be empty space.

The explanation of that must come a little later. In this article I want to pave the way to the explanations of the technique of wireless by laying open to you the process in general, and up to now we have learned that music and speech, or any sounds, are capable of being, as it were, *moulded* in electricity and turned by the receiver back into sounds again. The vehicles which carry the electrical impressions of these sounds from the broadcasting station to the receiver are wireless waves.

Evidently the next question is, "Well, but what are wireless waves? In what do they occur, and how are they caused?" We cannot get at the explanation of all that at the moment, because I want first to give a few examples of broadcasting not under the control of the B.B.C., which will help you to grip the essentials of the matter.

In olden times, when danger threatened the country and it was necessary to rouse the men of the shires, our forefathers used to light beacons; the first was lit, and those watching at the next saw the flames and lit their beacon also, and so the signal ran the length and breadth of the country—a pretty example of broadcasting by relay stations.

There is more similarity between this old-time method of conveying a signal and modern broadcasting than you might guess. First, the signal from the beacon went out in all directions. Secondly, the signal carried farther across flat country than across hilly country. Thirdly, the signal could be received in a given locality by any number of receivers tuned to the wave; the receivers being men's eyes.

Fourthly, the signal was carried by means of waves—waves of light. Fifthly, the signal travelled across space at exactly the speed at which "broadcasting" travels. Sixthly, the signal could be received at a greater distance if the receiver, the eye, had an amplifier (say, a telescope). Seventhly, the signalling waves were caused by exactly the same natural phenomena as those which cause wireless waves. One could give other parallels, but those seven are enough to show you that broadcasting is but a modern adaptation of an old, old method.

Intelligence Across Space.

The drums of savages in the African forests signal news of war and death to other tribes far distant. Another example of broadcasting—by waves in air. Ships that pass in the night signal to each other by lamps. A flickering light from the bridge of one tells in the longs and shorts of the Morse code the name of the ship, whereto it is bound, and the port from which it sailed. An officer on the other vessel receives the Morse signals—by eye—and flashes back similar information on his lamp—an illustration of a system of wireless telegraphy which was used long before Marconi was born.

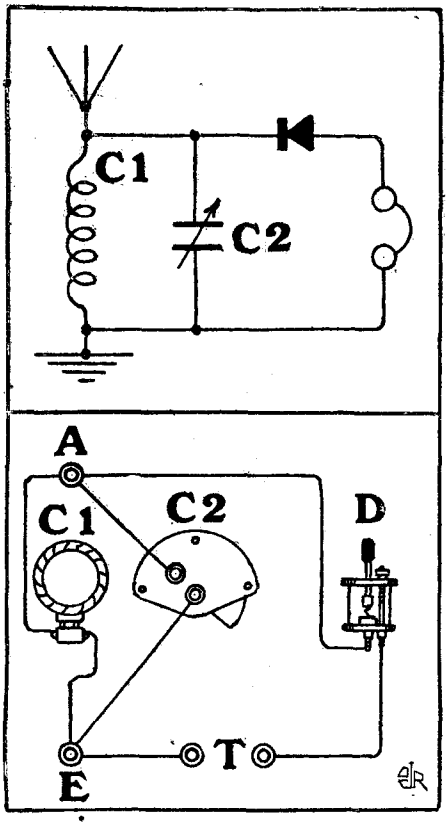
Here again we have an instance of intelligence transmitted across space by waves; the lamp is the wireless station, the eye is the receiver. The difference between this wireless telegraphy by lamps and that by which Marconi will flip your message across the globe consists chiefly in the length and power of the waves used. In nature and properties the waves of both systems are alike and are caused by the same natural phenomena.

In the next article we shall learn more about wireless waves and how wireless engineers produce them.

ANOTHER "ALL-WAVE" CRYSTAL SET.

By OSWALD J. RANKIN.

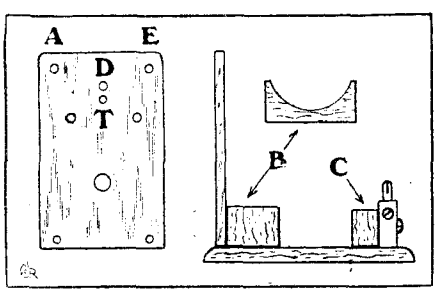
THE crystal receiver to be described in this article was hurriedly constructed from a few spare components and odd pieces of material, being originally intended as a rough-and-ready standard tuning receiver to be used only for the purpose of



making certain comparisons during a series of experiments, but since the simplicity of its design may possibly appeal to the amateur of limited workshop experience, it is here proposed to detail its construction and use. As will be seen above, the circuit is a standard crystal circuit with a No. 35 or 50 plug-in honeycomb coil, C1, which is shunted with a ·0005 mfd. variable condenser, C2, the crystal detector and telephones completing the circuit in the usual way.

Simple Construction.

The figure below and the accompanying photograph should convey the idea to the reader's mind. The panel is 5½ in. by 3½ in. by 3/16 in. in thickness, this being cut out from the best quality matted ebonite sheet. Holes are drilled to take the A and E terminals, the crystal detector, D, the telephone terminals, T, and the condenser bush. Two small holes are also drilled through the lower end to take wood screws which secure the panel to one side of a wooden block, B, previously recessed to take the moving plates of the condenser and screwed to a wooden baseboard which is 5 in. long by 4 in. wide. This block, before being recessed, should be about 3½ in. by 2½ in. by 1 in. in thickness.



Wiring Up.

The coil socket is drilled through the centre and screwed to a small wooden block, C, which is secured to the opposite end of the baseboard in the manner shown.

The terminals, condenser, and detector may now be mounted on the panel, these being wired up with square section bus-bar exactly as shown in the wiring diagram, on the left.

Testing the Coils.

Using the average aerial a No. 35 or 50 plug-in coil will bring in any broadcasting station, providing the condenser has a capacity of ·0005 mfd. and that the operator is within crystal range of a station, and a No. 150 coil will be about correct for 5 X X. The position of the moving plates of the condenser should be carefully noted and if, for instance, they should be adjusted to maximum capacity when using a No. 35 coil on the broadcasting wave-lengths, then a No. 50 coil should be substituted and the capacity reduced. Similarly, if the condenser is set at zero, that is, if the moving plates are "all out," this indicates that a smaller coil may give better results with a little capacity. The point which should always be aimed at is to use as little capacity as possible.

With the present arrangement the operator is enabled to note the condenser settings at a glance, and one is thus able to gain a considerable amount of knowledge on the subject of tuning.

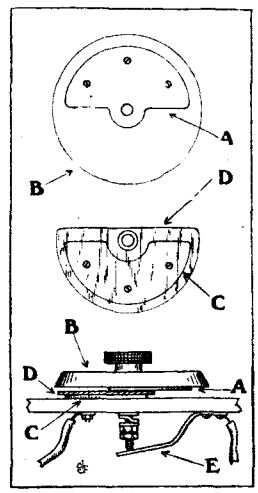
A FINE TUNING CONDENSER.

A VERY useful vernier condenser can be easily made from a few odd pieces of material and an old condenser dial. The idea is clearly outlined in the accompanying sketch and needs little explanation. A is a thin brass plate which is drilled to take a short piece of threaded brass spindle, and three small screws. All holes are well countersunk, those for the screws to take the heads of same, and the large hole to take a little solder which joins the plate to the spindle.

Mica Dielectric.

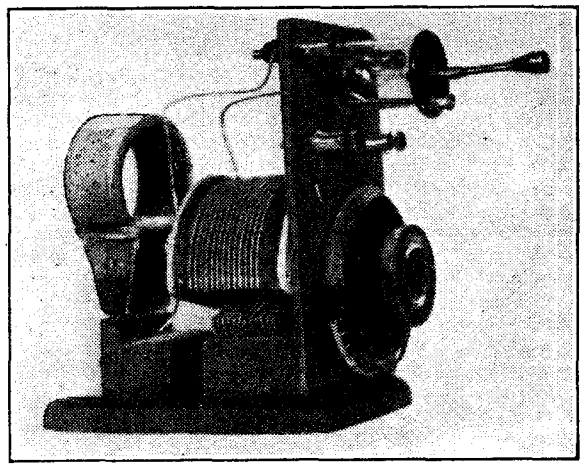
The spindle should be about 1½ in. long (according to the thickness of the panel), and before screwing the plate to the under side of the ebonite dial, B, the edges should be nicely rounded off with a file and some emery cloth. It is most important that the face of this plate should be perfectly smooth. The fixed plate, C, is then screwed down on to the panel and covered with a sheet of ruby mica, D, which is secured to same by means of a little shellac varnish and a hot iron. One of the screws is longer than the others, and this is arranged as a bolt for connecting up purposes.

The complete condenser is shown in the lower sketch, where it will be seen that the contact from the movable plate is taken from the end of the spindle by means of a strip of spring brass, E, and from the fixed plate by means of a nut attached to the end of the long screw.



Naturally this condenser will not have a very great maximum capacity and should only be used in conjunction with a condenser of the ordinary type in order to provide finer tuning. The connections in this case will therefore be from each of the sets of plates, of the larger condenser to C and E of the small vernier.

Tuning will then be carried out in the usual way until best results are obtained and the final tuning is carried out by varying the vernier.



A photograph of the "All-wave" Crystal Set described above.

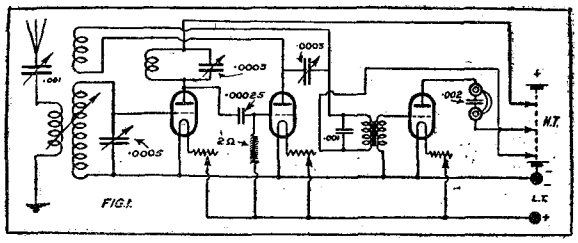
THE RECEPTION OF SHORT-WAVE SIGNALS

A LONDON AMATEUR'S EXPERIENCES

By W. PULLMAN (5 L P, of London.)

The amateur station, 5 L P, is well known to London listeners, and in this short article Mr. Pullman offers some interesting suggestions to readers of "P.W." with regard to short-wave reception.

IN these days, when every amateur is doing his best to transmit on a short wave-length of, say, 120 to 150 metres, and in some cases down even lower, many people have found it difficult to get good reception. Not that short-wave reception is any more difficult than any other reception, but everyone has got used to one type of working.

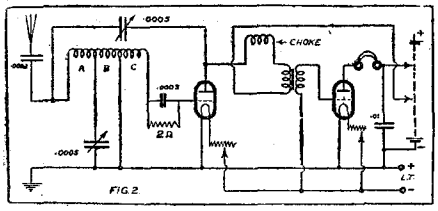


First of all, one must realise that short-wave tuning is much finer than long wave, and therefore greater care is required. I venture to give one or two circuits which have proved very successful for this particular work. Fig. 1 is very simple to operate, and it will be noticed that the aerial coil of eight turns is wound on the secondary to give a close coupling.

Some Important Points.

Fig. 2 is an extremely efficient circuit. It is well-known, but, I venture to think, little used, though it is worthy of a trial both for short and long wave reception.

I could give dozens of circuits, each of which would be found to have some advantages over the ones at present in use; for it must be owned that a very large number of amateurs are far from expert in the reception of short-wave signals.



The insulation both of the aerial itself and the lead-in are highly important, and every care should be taken to avoid losses in this direction; and it must not be forgotten that even the smallest trace of soldering paste left at the back of the panel may have disastrous effects. I mean from the point of view of signals.

Again, the wiring of the panel itself should be well done in bare wire, and care should be taken that the various components are so disposed that the wiring is as short as possible.

Having due care to all these points, let us commence on a receiver which, though well known, is little used, and so dispose it that it may be truly portable. Taking the circuit shown in Fig. 2, we may lay it out as shown in the rough sketch, Fig. 3. I think all the components speak for themselves.

The coil is wound in three sections (Fig. 2), A and C being $\frac{1}{3}$ of the number of turns on B, and the minimum wave-length of the coil is equal to the turns at B multiplied by 10.

The writer saw this, or, at any rate, a similar circuit, some time ago in an American paper, and tried it out with most excellent results, and for this reason feels that it is a quite worth while circuit for any amateur.

A Counterpoise Earth Advisable.

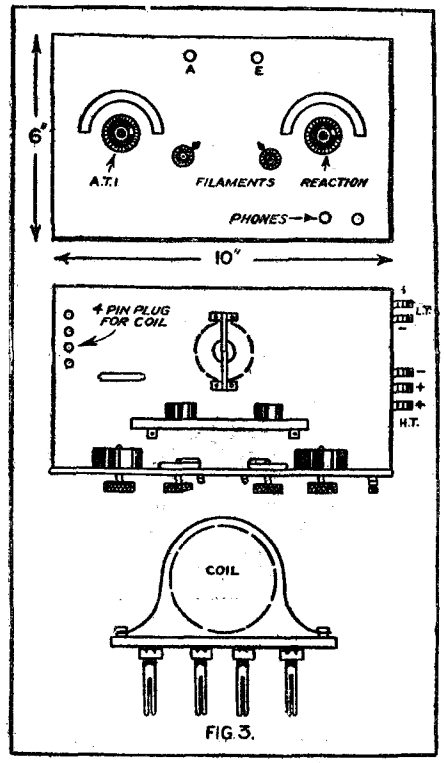
To those interested in the transmission of short-wave telephony, I would recommend the circuit shown in Fig. 4, which is similar to that used in my own station, 5 L P. It is simple to operate and gives quite full modulation, and is quite efficient.

The grid coil, it will be noticed, is not in any way coupled to the aerial inductance, but is separately tuned with a condenser (·0005). This gives very sharp tuning, and enables very critical adjustment of modulation to be obtained. This circuit is also shown with a ·1 mfd. condenser in the earth lead, which may be dispensed with if the household light supply is not used.

It will also be found that a counterpoise or earth screen will be of considerable advantage, especially for short wave work. The valves used, and for which this circuit is designed, are power A.T. 25, modulation L.S. 2, and speech amplifier, any good R type. It will thus be seen that this transmitter has the added advantage of not requiring two-power valves, which is quite a consideration when expense has to be studied.

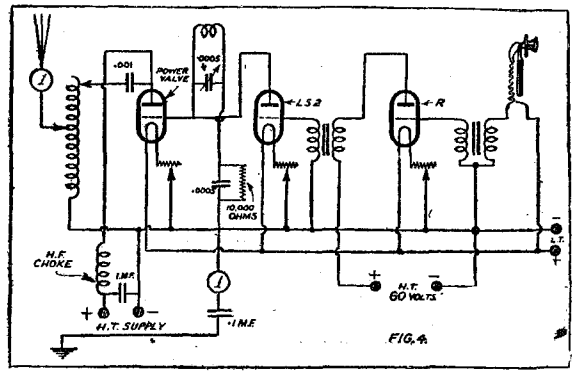
The aerial inductance should be wound of heavy-guage wire or strip on a skeleton former made from ebonite rods, fixed to ebonite end plates about 10 in. diameter and 14 in. long, and the wire should be spaced about $\frac{1}{16}$ in.

The grid coil is wound on a 4-in. former of 22 S.W.G., D.C.C., and it will be found that about 22 turns will work quite well on 160 to 200 metres' wave-length. If preferred, ordinary plug-in coils may be used.



Winding the Radio Choke.

The high-frequency choke may be wound on a 4 in. former of ebonite, and have 300 to 400 turns of 28 S.W.G., D.C.C. wire. It is quite as well to wind this to 500 turns, and tap every 50 from 300, so that the most suitable value may be easily found. Apart fron the foregoing points, the whole transmitter is so simple that it hardly requires explanation, but of course, the aerial, as for reception, should receive most careful attention.

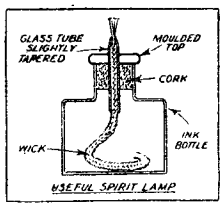


Constructional Notes

Conducted by Dr. J. H. T. ROBERTS, F.Inst.P.

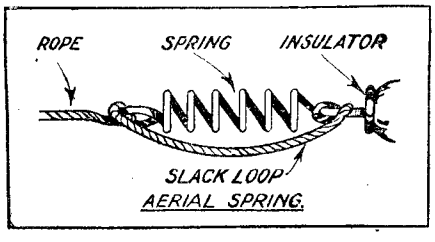
Useful Spirit Lamp.

A SPIRIT lamp is very useful for a great variety of purposes in the experimenter's laboratory. It gives a small and not too hot flame, without any soot, and is very convenient for fixing crystals in fusible metal in their crystal cups, for soldering small joints, and very many other purposes. It is not necessary to buy a conventional spirit lamp, however, as one may readily be made from an ink bottle, through the cork of which a central hole is drilled for the insertion of a short piece of glass tube. A piece of round wick, about $\frac{1}{8}$ or $\frac{3}{16}$ in. diameter, should be passed up the glass tube, and if the tube has previously been slightly tapered (as shown) by heating in a Bunsen flame and drawing out, and then cut off with a sharp edge, the wick may from time to time be pulled upwards, and will not be liable to fall backwards down the tube again.



Aerial Spring.

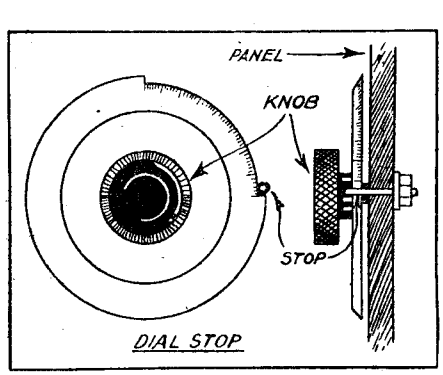
It is well known that, owing to variations in the humidity of the atmosphere, the ropes frequently used for supporting the outside aerial wire vary in length, with the result that in certain kinds of weather the aerial may sag quite considerably, whilst in other conditions it may become so taut as to be in danger of snapping. In order to maintain the aerial in a taut condition in all weathers it is sometimes recommended to pass the supporting rope over a pole on the mast, and to attach a weight to the lower end of this rope. A simpler method, however, is that indicated in the illustration. The aerial is attached to the mast or other support by means of a strong spiral spring of fair length, and this spring takes up any



variations in length due to the supporting rope. In case the spring should break at any time, it is a good plan also to connect a slack loop of rope across the ends of the spring.

Dial Stop.

The following hint, from "Radio Digest" (New York), is useful for the dial of a variometer, where it is undesirable to turn too far in one direction, and has the advantage that it prevents the flexible leads from being twisted off. The method will be seen from the figure. Over one-quarter of the circumference of the dial, the latter is filed away for about one-sixteenth of an inch, and a stop is then inserted in the panel from the back, projecting through in such a way that the dial is limited to a revolution of 90 deg.



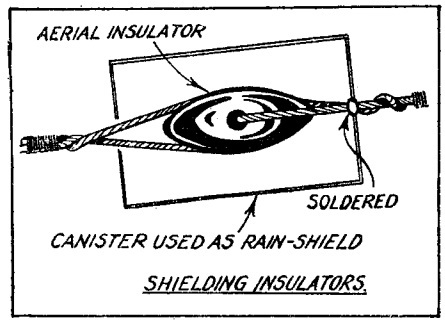
Of course, the same result can be accomplished by using a panel stop and securing a projecting pin to the dial.

Universal Connectors.

The small dress fasteners, variously known as snap-fasteners and patent-fasteners, not unlike a diminutive version of a glove-fastener, may be made to serve a great variety of useful purposes as connectors. For example, by soldering one half of the fastener to the 'phone tips and the other half on the panel by means of a pin or small screw, the 'phones may be plugged in easily and, furthermore, if the cord should accidentally receive a strong pull, the connector is released without any danger of disturbing the set. A very good multi-point switch may be made by pinning to the panel as many points as are required in circular formation, with one at the centre of the circle, and then to employ a switch-arm consisting of a strip of brass with half of a connector soldered at each end at a distance apart equal to the radius of the circle. The fastener in the centre forms the swivel and when the right point of the switch is found the other fastener is inserted. Another use is to form a contact-swivel for honeycomb or other coils. The ends of the coil are brought to the two projecting halves of the connectors, the opposite halves of the connectors being soldered to the ends of the two brass strips. The coil is sprung in between the two strips, the snap fasteners in this case doing duty both electrically and mechanically. Coils may easily be interchanged. A great many other uses for these connectors will occur to the reader.

Shielding Insulators.

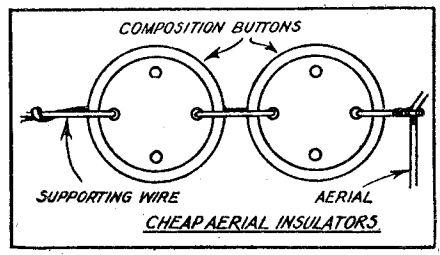
Here is a very simple and useful arrangement from "Radio News" (N.Y.), which considerably improves the efficiency of aerial insulators, especially in wet weather. Everyone knows that an insulator can only function efficiently so long as its surface is clean and dry. A film of rain water on the surface of the insulator will very materially



reduce its insulation resistance, and likewise the deposition of soot and other dirt upon the surface will produce a more or less conducting film. A tin canister or other convenient shield may, however, be slipped over the insulator, in the manner indicated in the drawing, and will have the effect of preventing rain from reaching it and also, to a large extent, of retarding the deposit of dirt upon its surface. In order to prevent rain water from entering the shield or cover, and also to keep the cover in a symmetrical position, the latter should be soldered at the point of contact of the shield with the shaft of the insulator, as shown in the figure.

Cheap Aerial Insulators.

It is very important to have the aerial, even if it be an indoor one, adequately insulated, and for use as improvised insulators a considerable variety of more or less common objects have from time to time been suggested, including bottle-necks, glass tubes, rubber rope, and so on. One of the simplest and readiest insulators, however, is a large composition or bone button. Practically any type of moulded button will be found to be a good insulator, and those which are made of a



vitreous substance are frequently very good insulators. The holes already present in the button are convenient for looping the wire, and two or three buttons used in series give insulation quite equal to that provided by the more conventional article.

For outdoor aerials which have to stand considerable variations of temperature and the different pulls due to wind pressure, etc., the button insulator is not recommended, as it is not sufficiently strong. But for all types of indoor aerial it will be found very satisfactory if a suitable insulating material has been selected.

The New Method of Learning a Foreign Language

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Indeed, the introduction of this new method is a really great achievement and one of the most valuable things the Pelman Institute has ever done. Those who would like to read more about it should write for particulars to-day (using the coupon printed below) to the Pelman Languages Institute, 97, Bloomsbury Mansions, Hart Street, London, W.C. 1.

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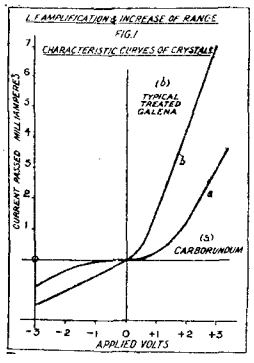
L.F. AMPLIFICATION AND INCREASE OF RANGE.

By LIEUTENANT-COMMANDER H. W. SHOVE, D.S.O., R.N.

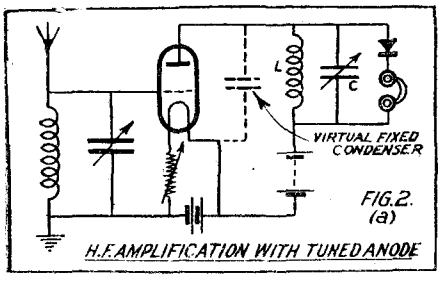
This interesting article, by a wireless expert of the Royal Navy, deals with a subject of importance to every experimenter, and gives a clear outline of the comparative merits of H.F. and L.F. amplification.

IT is commonly said, and popularly taken for granted without further question, that when it is desired to increase the "range"—i.e. the sensitivity to distant or weak signals—of a receiver the correct procedure is the addition of H.F. amplification, whereas L.F. stages only add to the volume of signals already detectable. It is the object of the writer in the present article to examine this generally accepted idea, with a view to putting before his readers considerations which may tend to a clearer conception of the reasons for this belief and the limitations within which it is true. Finally, he has a few practical suggestions to make. Crystal rectification is primarily considered, although a good deal of the argument applies equally to cases where the rectifier is a valve. In the first place, it is necessary to get a clear idea of what constitute "detectable" signals, and of what exactly an amplifier does.



Crystal Limits of Sensitivity.

Fig. 1 shows the characteristic curves of (*a*) a carborundum and (*b*) a treated galena crystal, such as the ordinary types sold under various trade names. It will be seen that in both cases there is a sharp bend in the curve—i.e. a fixed original potential at which the increase of current due to a certain increase of applied E.M.F. is considerably greater than the decrease of current due to an equal decrease in E.M.F. It is on the sharpness of this bend that the value of the crystal as a rectifier depends. But I do not propose to discuss this point here. The object of the figure is to show the *continuity* of the curve.



It will be seen at once that, provided we are actually working at the bend—i.e. provided the correct initial potential is applied to the crystal, there will be a difference in the currents corresponding to equal increase and decrease of signal voltage, *however small such increase or decrease may be.* That is to say, there is no definite point at which we can say, so far as the crystal is concerned, that the rectifying action ceases and that signals are undetectable. The position of the bend in the characteristic curve is, of course, all important, and in trying out any new detecting crystal it is necessary to ascertain by experiment where it lies. Fortunately for the simplicity of our apparatus it happens to be at "zero" or earth potential in all the generally used crystals except carborundum. But this must not be assumed with a new detecting substance (of which, by the way, there may be a very large number not yet discovered).

Amplification Efficiency.

Now it would seem from the foregoing that, however distant or weak signals may be, we ought, if we have a satisfactory device, to be able to render them audible by amplification, either before or after rectification, with equal ease. Why, then, is this not found to be the case in practice?

The two chief reasons are: (1) That it is not generally practicable to make use of reaction on the L.F. side (though it has been done); (2) That the ordinary system of L.F. amplification by iron core intervalve transformers is not so efficient as the systems used in H.F. work.

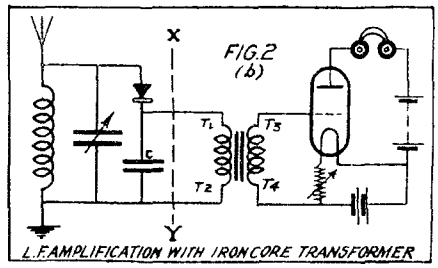
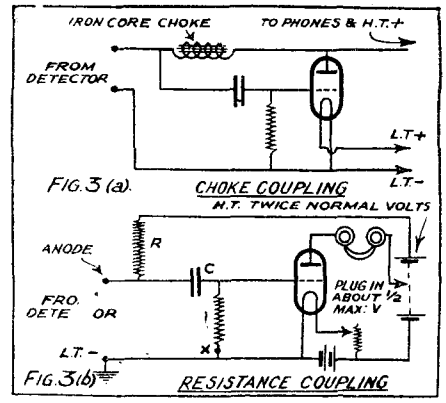


Fig. 2 shows, side by side, the two commonest methods of adding a valve to a crystal detector: (*a*) as an H.F. amplifier with tuned anode coupling, and (*b*) as an L.F. amplifier with iron core transformer. In (*a*) the potential variations applied to the detector and 'phones are those across the tuned anode circuit L C, and it is the amplitude of these variations that governs the current variations in the detector circuit and consequent signal strength.

The principle on which these voltages are built up is really that of the "rejector"—i.e. when the anode circuit is exactly tuned to the incoming wave it opposes a practically infinite impedance to the passage of currents of the incoming frequency. Thus the voltage drop across it is the maximum amplified voltage obtainable from the valve and all the current due to this voltage is available in the detector circuit. There are, of course, losses in the circuit L C, but it is not difficult (on the broadcast wave-lengths, at any rate) to design the apparatus so that they are very small.

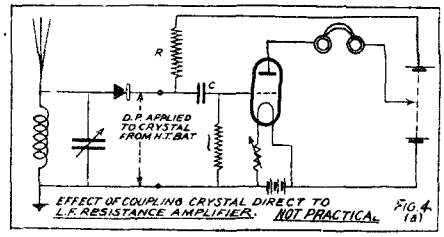


So far it would seem that we could substitute a very high resistance for the tuned anode and get the same results. But here we come up against two considerations.

(1) Whereas the impedance of the tuned anode to the D.C. of the H.T. battery is low, so that we do not need to consider it in fixing the voltage which must be used to get the anode potential necessary to the proper functioning of the valve, the resistance will oppose the passage of the D.C. just as much as that of the H.F. oscillations, so that, to reach a high degree of efficiency, the H.T. battery would require to be large.

(2) There is a "condenser" effect, as shown by the dotted lines in the figure, between the anode and filament of the valve which short-circuits the external anode circuit and, at the very high frequencies (short waves), the loss by this path destroys the efficiency of the apparatus.

Objection (1) is only a matter of degree and can be compromised, so that the resistance method can be, and in fact is, used with success on frequencies lower than about 300,000 per second (waves over 1,000 metres). But objection (2) is serious, and indeed, save with specially designed valves, etc., practically fatal for higher frequencies than those named.



(*Continued on page* 442.)

L.F. AMPLIFICATION AND INCREASE OF RANGE.

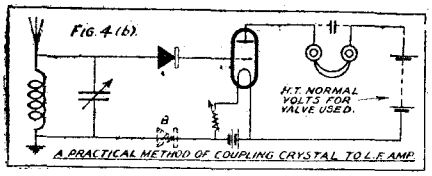
(Continued from page 441.)

In Fig. 1 (*b*) everything to the right of the dotted line X Y is at low frequency. The small condenser *c* is used, as a rule, for the express purpose of by-passing the H.F. impulses, but its high impedance to L.F. forces these impulses to apply themselves to the primary of the iron core transformer T_1 T_2. This transformer is usually designed with a "step-up" between the windings, so that theoretically the voltage across the secondary T_3 T_4 is higher than across T_1 T_2. It is not possible to examine this theory within the limits of the present article, but it may be said at once that in practice this step-up is largely illusionary.

There are always losses opposed to the action which very quickly bring down the voltage across T_3 T_4. And these losses, due to interwinding capacity, hysteresis in the core, etc., are not merely a certain percentage of the theoretical E.M.F. They vary with the frequency as well as with the amplitude, and may easily—and in the case of weak signals very quickly do—damp out the oscillations sufficiently to leave us with an actual loss of potential in the transformer. And we cannot save ourselves by using a tuned circuit here, because the oscillations at audio-frequency are not (like those at radio-frequency) on one wave-length.

Avoiding Distortion.

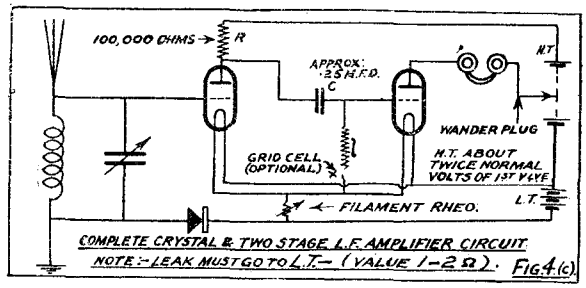
They cover the whole range of note-frequencies audible to the human ear. So that all we can do with an L.F. transformer is to make its resonance curve as flat as possible, to avoid distortion put up with the



inevitable losses introduced. Unless, then, our signals are already strong enough to overcome these losses we cannot usefully employ this method of amplification. It is this fact that explains why it is commonly said that L.F. amplification does not bring in signals previously inaudible.

Fig. 3 (*a*) shows "choke" coupling. I will not linger over this, beyond saying that as we again have an iron core the hysteresis losses will still be with us, while we have sacrificed the "step-up" and limited the possible amplification to the amplification factor of the valve. The only advantage of the method over the resistance coupling shown in Fig. 3 (*b*) is that it is somewhat easier to get a high percentage of the theoretical maximum (but at the expense of introducing distortion) without using a high plate voltage. In Fig. 3 (*b*) we have a diagram of a resistance coupled L.F. amplifier, which in the form shown is suitable for use after a valve rectifier.

Here the E.M.F. applied across the grid and filament of the valve is that across the resistance R. As there are no hysteresis or capacity losses, and as we do not require to compromise, as with the transformer, to avoid distortion (which is wholly absent owing to the aperiodic nature of the apparatus) this form of L.F. amplification will respond to very weak signals. The actual amplification is limited theoretically by the amplification factor of the valve, but to obtain this in practice R would have to be infinite. The H.T. voltage would likewise have to be infinite, so that in practice we



have to be content with a degree of amplification less than this factor.

"Direct" Amplification.

Without going into detail, for which I have not space, it may be said that with an average "R" valve we can get about 2/3 of the theoretical maximum by making R = 100,000 ohms and using double the normal H.T. voltage. The function of the condenser C is to prevent the D.C. voltage getting to the grid, and so rendering the arrangement inoperative. It should be fairly large (about ·25 mfd. is suitable), but the value is not critical.

The grid leak I is not for rectification, but to give a suitable grid bias. A biasing cell at X may be used sometimes to assist this. The arrangement of Fig. 3 (*b*) is not suitable to follow a crystal detector as the first stage of L.F. amplification, since it would involve putting a large potential on the crystal, as we see in Fig. 4 (*a*). To avoid this we can adopt the arrangement of Fig. 4 (*b*), where the crystal is connected directly in the grid circuit of the first amplifying valve. It can, of course, be either at A or at B without affecting the theory of the circuit, but the writer favours B as the point for best results. This, however, is easily settled by experiment.

Purity Before Signal Strength.

We do not now, of course, get the benefit of any step-up effect whatever, the function of the crystal being merely to rectify the impulses before they reach the valve, and the signal strength will not probably be greater from this arrangement, without further amplification, than they would be with a single detector valve without reaction. But the signals will be of "crystal" purity, and, if a second valve be added, by the use of the arrangement shown in Fig. 4 (*c*), we shall have a very fairly sensitive circuit of quite respectable power and still giving absolutely pure reproduction. The addition of a third, or even a fourth, valve may be tried, and it will be found that not only volume but "range" is increased.

And this will be accomplished while still retaining the incomparable purity of the crystal receiver. It seems to the writer that a great many listeners are not fair to the B.B.C. or to themselves. The present broadcast transmissions are a triumph of pure reproduction.

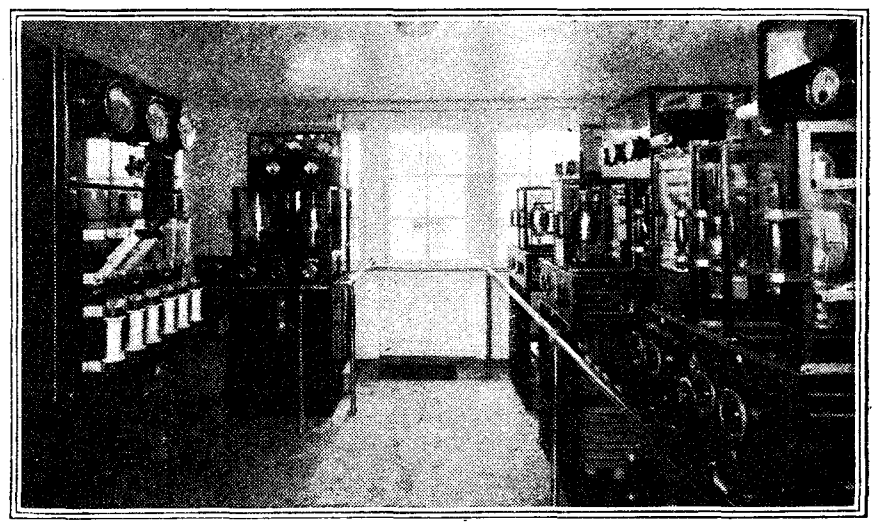
A very large percentage of users of valve sets lose all the pleasure of this by employing distorting methods of reception. L.F. transformer amplification is one of these, reaction can easily become another. H.F. amplification, apart from reaction, is less dangerous. But it complicates tuning.

Three Striking Advantages.

The arrangement described above does *not* claim to give the same results as regards sensitivity, in proportion to the number of valves used, as the ordinary H.F. methods. But it should appeal to many because:

(1) there is no distortion;
(2) there is no tendency to "howl";
(3) above all, there is no complication in the tuning, which remains exactly the same as for the simplest crystal set.

With the editor's indulgence, I hope in a future article to describe in detail the construction and use of a set on these lines and to give a few figures as to my own results. Meanwhile, I shall be glad to hear from anyone interested in this very promising line of development.



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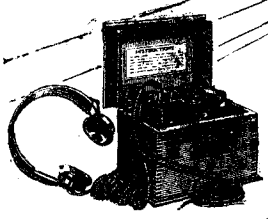

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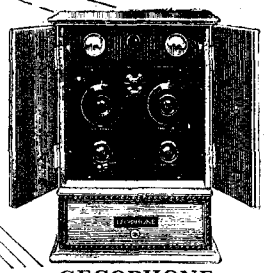

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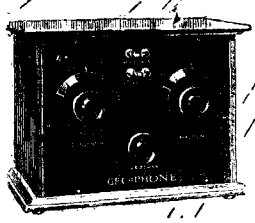

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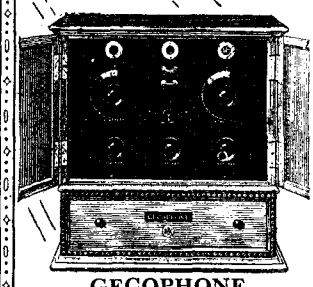

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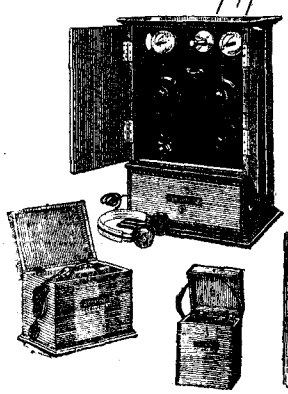

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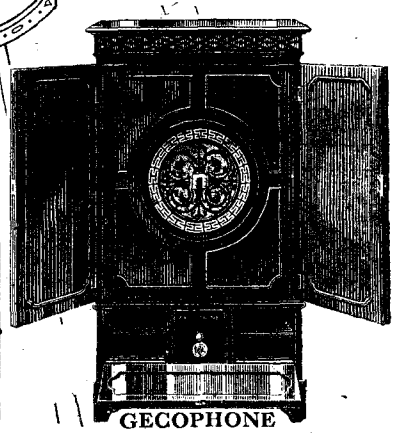

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Mainly About Broadcasting

by The Editor

THE fact that the B.B.C. obtained permission from the Post Office to broadcast political speeches by the leaders of the three chief Parties augurs well for the future and freedom from red tape of the B.B.C. They cannot be accused of not being impartial in the broadcasting of these speeches. Mr. MacDonald, Mr. Baldwin, and Mr. Asquith have been given equal facilities for placing their Party's views before an audience of unprecedented size.

It is to be hoped that this innovation of broadcasting political speeches will pave the way, and will eventually result in the B.B.C. obtaining permission to broadcast occasional speeches from the House of Commons.

Everybody is interested to some extent in politics these days, and if it were possible to listen-in one or two evenings a week and hear big political leaders address the House on some vital question of the day, I am sure many, many thousands of people would make up their minds to install a wireless set, if only for the reason that they would be able to hear speeches from Parliament. Admittedly, a good deal of the Parliamentary business would be unfit for broadcasting.

"Educational" Broadcasting.

There is a lot of dull routine in the House of Commons; but, on the other hand, there are times when the Man in the Street opens his morning newspaper and reads a vivid account of some great speech made in the House of Commons the night before, and wishes that he could have been there to hear it.

Once the B.B.C. obtain permission to install a microphone in the House of Commons, and to broadcast really interesting speeches, there will be a great and increased revival of interest in wireless throughout the country.

I have noticed in the papers lately, and in various magazines, a good many platitudes about the "educational effect" of broadcasting. A good many of the writers of these rather smug articles, dealing with the "psychology of broadcasting and its effect on the child mind," etc., seem to be obsessed with the idea that anything new (like broadcasting) must be twisted and contorted so that it can be used in some way or another as a means of "educating" people.

A good many of my readers have probably noticed a lot of jargon of this sort in the papers in connection with theatres. The high-brow critics write column after column emphasising the need for loftier plays, and well-known authors, producers, actors, etc., submit themselves to interviews and dilate with considerable self-satisfaction on the "educational effect" the stage has, and hopes to have, in increased measure, on the poor public.

This craze for educating people must not be allowed to swamp the true vocation of broadcasting. First and foremost, broadcasting is a source of entertainment, and first and foremost the theatre should primarily concern itself with entertaining its patrons.

When a man goes home from his office and decides to go to a theatre, he may, according to his temperament, prefer to be superficially amused or to have his brains stimulated. If he wants to be amused he goes to see George Robey; if he wants his brains stimulated he goes to the Everyman Theatre, or some other high-brow theatre, and revels in a dose of Bernard Shaw.

That is quite all right, but the trouble is that a movement seems to be spreading to make nearly every sort of entertainment of "educational" value, and the same disease is in danger of attacking broadcasting. The trouble has not gone too far at the moment, and with luck it can be nipped in the bud.

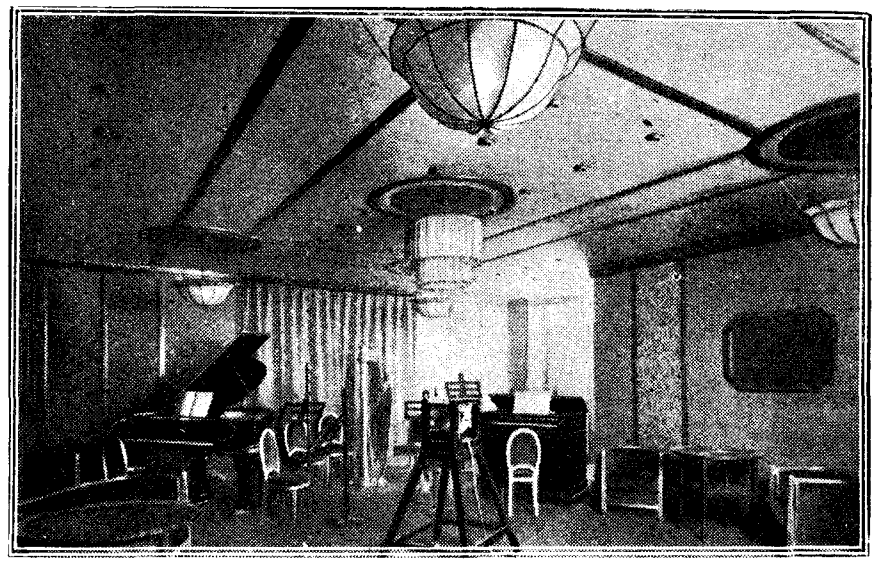
But, frankly, there seems to be a craze amongst certain members of the B.B.C. staffs at various stations to produce programmes which will have an "educational" effect. There is a good deal of talk about "educating" the public to appreciate good music, and there seems to be a good deal of talk about "educating" the public to appreciate good poetry.

Whether the public wants all this education, and whether they thank the B.B.C. for their efforts to "educate" them, is a matter of opinion. I write this in no carping spirit; in fact, I cannot help feeling rather amused at the whole business. But the thing is becoming so noticeable of late that I cannot refrain from drawing my readers' attention to it, and inviting them to express their views in letters for publication in this journal.

For all I know the majority of listeners-in may prefer this subtle form of "education," but on the other hand there may be a considerable number of people who prefer to seek culture and general enlightenment in other directions, and who, when they put on the 'phones, would much prefer a straightforward course of entertainment, mixed with one or two sensible and straightforward talks, instead of programmes which, although at the moment are not unduly obsessed by the craze for disseminating education right and left, certainly show a tendency to slip that way.

"Guff."

I remember publishing in POPULAR WIRELESS, about eighteen months ago, a number of letters from well-known people expressing their views on the educational possibilities of broadcasting, and one of the choicest letters published was by that well-known authoress and critic, Miss Rebecca West. I will not reproduce that letter here again, but the gist of Miss West's views was "never mind all this guff about educating people by wireless; bring a little laughter and entertainment into thousands of homes, and the B.B.C. will be doing a wonderful work."



The Studio of the Broadcasting Station at Brussels.

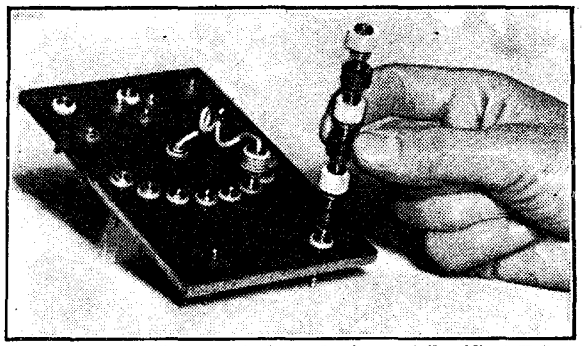
Frankly, I am heart and soul with Miss West in that opinion.

Re-reading this article, it occurs to me that some readers may say it is contradictory—because the opening paragraphs advocate the broadcasting of political speeches in the House of Commons. Some may regard such transmissions as educational—some may not. Personally, I find politics of to-day more amusing than any revue; but there again crops up the slogan of the B.B.C., "We cater for the majority." And possibly the view I hold is very much in the minority. Anyway, it's an amusing question, if nothing else!

HUMOUR AT THE RADIO EXHIBITION.

By "ARIEL."

IN the Radio world the exhibition recently held at the Royal Albert Hall was considered by some to be the greatest event of the year, over 31,000 visitors having passed the turnstiles during the eight-day show. Of this large number two-thirds were men. The exhibitors told me they were very pleased with the results of the exhibition. The interest of visitors, they said, was most encouraging, and it is expected that this winter will see a boom in the wireless trade; in fact, the optimism shown by some was somewhat far-reaching. One



One of the "Clix" Terminal Boards shown at the Albert Hall Exhibition.

trader told me that the Albert Hall will not be large enough for the next year's show, if one is organised—Olympia would have to be used.

Exhibitions usually mean hard work for the exhibitors and their representatives. The long hours kept are very tiring to the man who has to stand and answer visitors' questions. But in spite of this there is much amusement to be gained, and the change from everyday life is most welcome to many of the representatives sent by the exhibitors.

I spent nearly every evening at the Albert Hall during this exhibition, waiting on visitors who came to the "P.W." stand. I remember one lady asked me a very simple question on crystal reception, and, after I had given her a reply, she asked me another question, and yet another. At the conclusion of a discussion I asked her where she had obtained her wireless knowledge.

A Wireless Fiend.

"Oh," she replied, "I have three sons who are simply mad on wireless. They argue morning, noon, and night, until at last I myself have become a wireless fiend!"

I was glad I had met this lady early in the show, as it gave me a warning that I might meet others equally well acquainted with the subject.

The exhibitor next to the "P.W." stand was showing wireless magazines of foreign countries, and during the day, when a large crowd had assembled round his stand, an elderly lady asked if they supplied magazines all over the world.

"Of course," replied the assistant. "Do you supply them in India, Australia, Canada?" "We do," was the answer. "In that case," she said, "you ought to be able to answer my questions." "Certainly, madam," replied the assistant. "Well, can you tell me where I can buy a crystal—a really good crystal, you know—one that will get all the world—if I wish it!" The polite assistant hastily escorted her to a stand, which was exhibiting crystal wireless receivers.

I had rather an amusing experience one day with a family who showed great interest in my explanation of the twenty-four valve which was showing on our stand. At the conclusion of my explanation, the father came up to me in a confidential way and asked whether it would be possible for his son to make the set. If so, would I draw out the diagram?

I quickly glanced at his son—a boy of about fourteen—and told the father that it might be possible if he thought his son was skilled enough; but it would take me too long to draw the diagram now, and I would do so after the exhibition.

The Young Constructor.

The father then introduced me to his wife and son. The mother of the boy immediately commenced to tell me the good points of her son. "Henry (no relation to John) is very clever," she said, "and is top of his form in scripture and history—aren't you, dear? And," continued his mother, not waiting for a reply from her son, "his master, Mr. Scribbins, told Arthur, my husband, that he would be quite good at engineering."

"Has he a wireless set?" I interrupted. "Oh, yes, a crystal set he made himself," she replied. "And I think that is very good for a boy of his age; only fourteen next month, you know."

I then asked the father: "Do you think he can make a set as big as this twenty-four valve set?"

"Well—Henry, do you think you can make this set?" the father asked his son, with pride—as much as to say, "Of course you can, easily!" The boy spoke for the first time, "N-n-n-no, daddie, I-I-I d-d-don't think s-s-so!"

His mother turned angrily to him. "You're a ninny, child! Why didn't you say 'yes'? Come along, Arthur, we are taking up too much of this gentleman's time."

The father shook hands with me and they all left the stand.

It is a pity that parents will make such fools of their sons, or, as the parents would say, "It is a pity our sons will make fools of us!" The above story will probably be quoted by the parents to their friends, prefaced by this ejaculation, to warn them what they have to contend with in this hard world.

On one of the stands at the Exhibition a lamp was placed, which flashed at intervals. It was there only for the purpose of advertising, but it is surprising how many visitors discussed this lamp. Some said it was transmitting messages, and a whole family, sister, mother, and father, were taken in by a little boy who told them the lamp was used for receiving Morse signals from the other side of the world!

Awkward Questions.

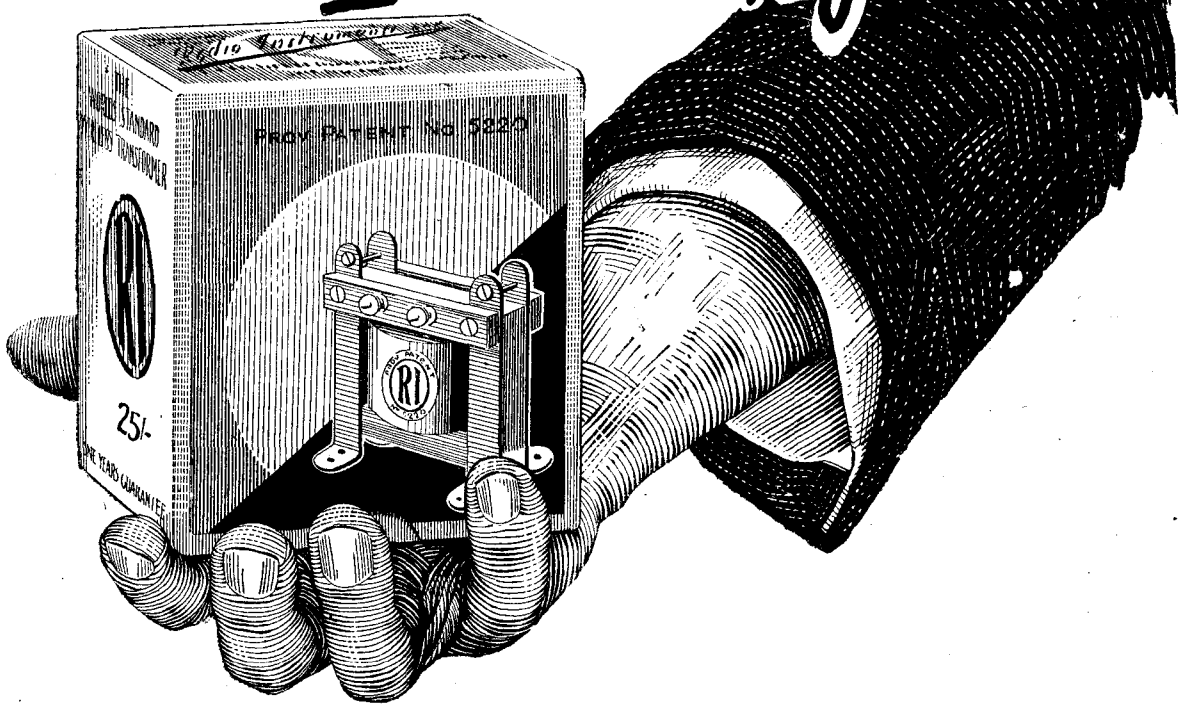
Another exhibitor, who was showing a patent crystal of the "ites" family, was asked by a visitor several questions on crystal reception. Having at last satisfied himself, he went away, but returned to the tired representative just before closing time. "Can you tell me," he asked, "how many crystals of the 'ites' family there are on the market?" "I can't tell you off-hand," was the reply, "but of course there is Hertzite, ebonite, zincite, sunlight, daylight, searchlight, and appetite!"

It was amusing to see how carefully some of the visitors collected the leaflets given away on almost every stall. Arms full and pockets bulging, they still could not resist taking every scrap of descriptive literature they saw!

It is surprising, too, how many people came up to our stand during the Exhibition and asked what was the reason for the blind at the back of the twenty-four valve set, and numbers asked whether we use 'phones or loud speaker! But in spite of many funny questions, the public showed a greater interest in the exhibits and much more enthusiasm than at any previous exhibition.

One of S. G. Brown's Giant Loud Speakers at the recent Exhibition.

This is the Transformer



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SOME USEFUL IDEAS.

An Ivorine Scale—A Note on Long-Wave Coils—A Loud-Speaker Plug—Neutralising Condensers.

AN ivorine scale, as sold for filament resistances, was obtained and the back divided into 26 equal parts—i.e. 2 for each broadcasting station One segment was marked "London, 2 L O,

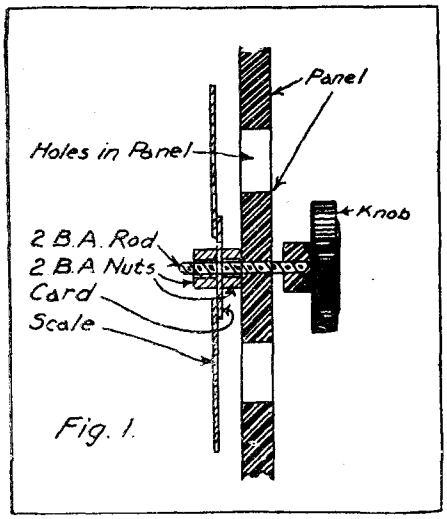


Fig. 1.

365 m.:" and the opposite segment marked "Ae 45, An 80, Re 156," for the readings of the aerial anode and reaction condensers respectively. Other stations and their respective readings were filled in in opposite segments. A piece of circular cardboard was stuck concentrically with and on the scale so as to enable a piece of 2 B.A. rod to be fastened (by nuts) to the centre of the scale. Then by passing the rod through a hole in the panel a knob could be fitted. With a fret-saw two square holes were cut where the names and readings are to appear. A sectional view of the device is as Fig. 1.

A Loud-Speaker Plug.

A piece of ebonite, 3 in. by ½ in. by ¼ in., with pieces of thin brass screwed to each side to which connections are made, composes the plug, and the jack is simply a hole ⅝ in. by ⅜ in. cut in the panel and two pieces of springy brass shaped to make contact with the brass parts of the plug. This is more clearly shown in Fig. 2.

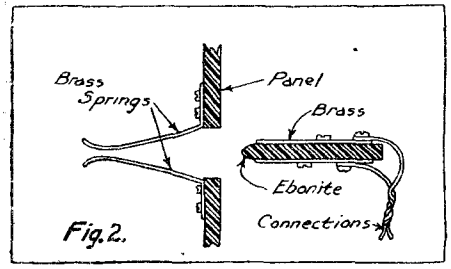


Fig. 2.

Neutralising Condensers.

The very small capacity neutralising condensers used in neutrodyne and similar circuits may conveniently be constructed on the lines indicated in the diagram Fig. 4. The moving plates consist of sheet brass discs, A, about ½ in. in diameter, which are soldered to one end of a small threaded brass spindle in the manner shown at B. The supporting pillars, which are attached to the panel, consist of nuts, soldered to the ends of threaded brass rods, as shown at C. The fixed plate, D, is soldered in a slot cut in a short brass rod, E, which is also threaded and provided with nuts for the purpose of fixing same to the panel.

Diagram F shows such an arrangement mounted on the outside of a receiver panel. In some cases the discs may be dispensed with if rods of about ¼ in. diameter are used and the "electrode ends" are filed perfectly flat.

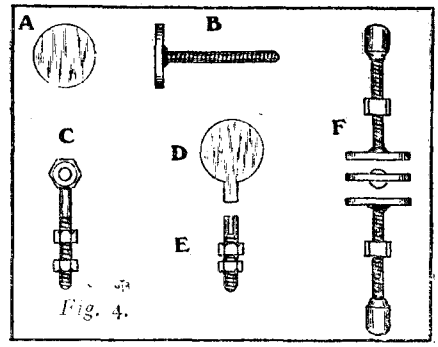
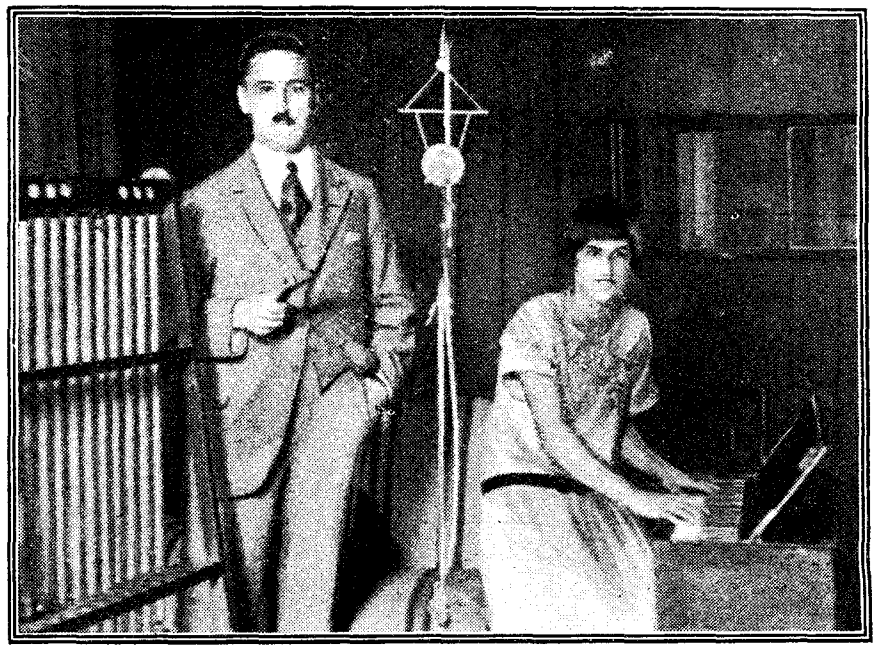


Fig. 4.



Mr. Marshall (station director) and Miss Taylor (Aunt Muriel) of the Edinburgh broadcasting station.

A NOTE ON LONG-WAVE COILS.

MANY listeners are considering the question of winding coils suitable for the new 1,600-metre transmissions, but are deterred by the prospect of getting the values wrong. The following figures may serve as a rough guide. Two brass "spiders," costing 1/3 each, were obtained, having 11 spokes each around centre discs 1 in. in diameter, and were bolted ¾ in. apart in such a way as to have the spokes staggered.

Starting at spoke 1 on "spider" A the wire is taken to spoke 4 of B, passed over 4 and 5 and back to spoke 9 of A, thus finishing 2 spokes behind the commencement. Each turn is therefore two spokes behind the previous one, as shown in Fig. 3, where the first turn is drawn as a thick line and the second as a dotted line. Three coils were wound, using in all 7½ oz. of No. 26 gauge D.S.C. No. 1 had 216 turns; No. 2, 260 turns; and No. 3, 320 turns.

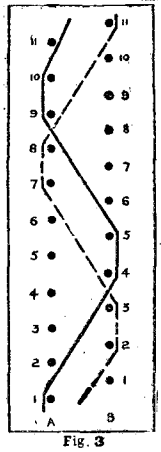


Fig. 3

On a 40-foot single-wire aerial, with a 10-foot lead-in, using No. 2 in the aerial and No. 3 in the anode (both condensers ·0005 mfd.), Radiola on 1,780 metres came in at about 110 degrees on the aerial and 50 on the anode condenser. On a single-wire P.M.G. aerial, with ·00075 aerial and ·0003 anode condenser, No. 1 coil required about 40 degrees as aerial coil, No. 2 required about 20 degrees as aerial and about 180 as anode coil, while No. 3 required about 80 degrees when used as anode coil. Exact figures cannot be given, as none of the condensers were calibrated.

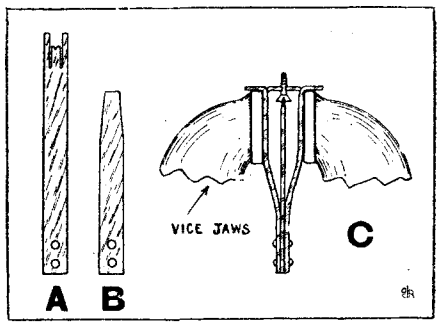
A USEFUL TOOL
FOR THE CONSTRUCTOR.

By O. J. R.

EVERY seasoned mechanic knows what happens when the head of a small screw is gripped in the jaws of the vice in order to carry out some operation on the shank. No matter if it be a round, cheese, or countersunk headed screw, the result is that two ugly flats are unavoidably produced, and thus the appearance of the screw head is ruined. Now it often happens that (a) a small B.A. brass screw is rather too long for its intended purpose, (b) that the thread is damaged and requires trimming, or (c) that it becomes necessary to convert the thread to the next smallest size; and in order to effect either operation the head of the screw must essentially be held very firmly in the vice.

Not Difficult to Make.

During a lifetime of practical workshop experience, coupled with an intimate knowledge of all the latest and improved tools, the writer has never yet found any available device which would hold the screws in such



a way as to prevent damage to their heads, except of course the orthodox idea of small lead or fibre clamps, a method which usually necessitates the making of a new pair of clamps for every single operation.

There are other things which might be said against the use of these clamps, and particularly in the case of lead clamps, as every experienced mechanic will know, and so it occurred to the writer that some simple and effective device was badly needed. During an interesting constructional undertaking it became necessary to file rather less than $\frac{1}{16}$ in. off the ends of a large number of countersunk headed B.A. brass screws, and being seriously up against the problem led to the invention of the device to be described in this article. The construction of same will present no difficulties to the average enthusiast with a little workshop experience, and it can be made for a few pence, and will be one of the most useful tools in the workshop.

Hardening the Steel.

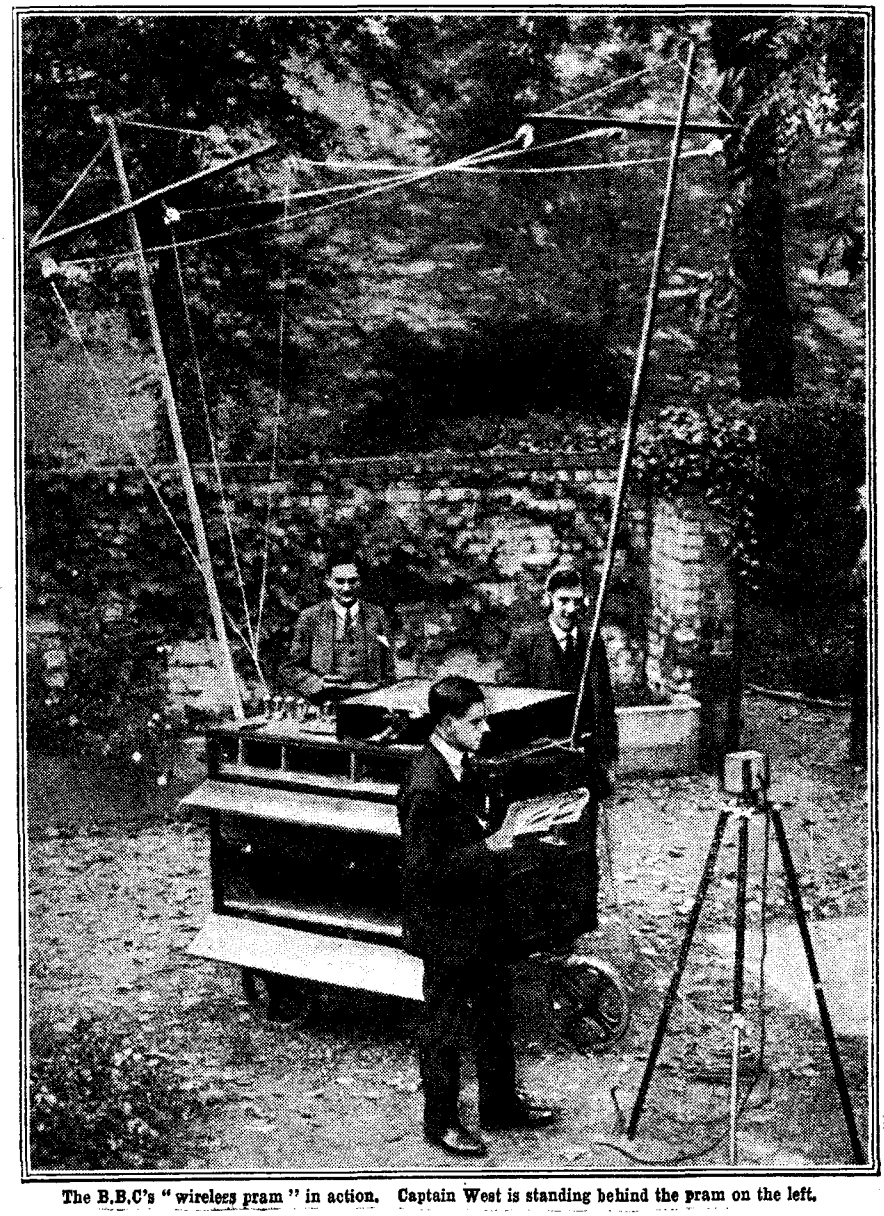
Cut out two strips of sheet steel, each $3\frac{1}{4}$ in. long by $\frac{1}{2}$ in. wide, and by means of a fine hacksaw and a small cross-cut chisel shape one end of each piece as shown at A in the accompanying diagram. The saw cuts should be a little more than $\frac{1}{4}$ in. deep, and when the small "V" has been filed in the small central projections heat the work in a clear coal fire and bend over the outer ears and the small central pieces at right angles to the strips and in opposite directions.

Next, cut out another $\frac{1}{2}$ in. steel strip $2\frac{7}{8}$ in. long, as shown at B, and grind or file off the tapered end so that it fits nicely into the slots of small screws in the same manner as an ordinary screwdriver. Drill two small holes in the opposite end, and then use this piece as a template for marking off the holes in the ends of the other two pieces. Now shape each of the latter as shown, firmly rivet the three pieces together with soft iron rivets, place the whole device in the fire again until it becomes a blood-red colour and then plunge it into a tin containing ordinary lubricating oil.

For Readers Use Only.

Diagram C shows how to use the device where it will be seen that the outer ears act as supports to prevent it from slipping down between the jaws of the vice during adjustments. The slot in the screw head is made to engage the inverted blade, the screw being placed directly between the small "V" jaws, which are then tightened up by simply screwing up the handle of the vice. If the steel is "spring hardened" in the manner described above, the jaws will open out quite freely every time the vice jaws are released. The device might be made in two sizes; the size just described for small to medium screws, and a larger size for medium to large screws.

The writer would like it clearly understood that this article is intended only to benefit readers who construct apparatus and tools solely for their own use. Manufacturers are kindly requested to note that the design of the device has been registered at H.M. Patent Office.



The B.B.C's "wireless pram" in action. Captain West is standing behind the pram on the left.

ON THE HIGHER FREQUENCIES.

EXPERIMENTAL RECEPTION & TRANSMISSION ON 3,000 & 6,000 K.C.

By **LLOYD JACQUET**
(2 O Z *of America*).

Experimenters will be interested in the following details sent to us by a well-known American amateur Radio experimenter.

IN an attempt to explore the higher frequencies, in the ranges of 3,000 and 6,000 kilocycles, some very interesting and gratifying tests were conducted recently. For transmitting, a special set was constructed, making use of the modified 1 DH circuit. The antenna coil L-1 was wound on a threaded bakelite cylinder, 4 inches in diameter, with 20 turns of bare No. 18 copper wire. This coil was tapped every even turn.

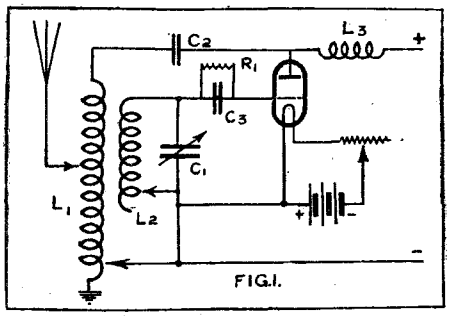


FIG.1.

The grid coil, which was wound on a bakelite form 3½ inches in diameter, threaded to take 12 turns of No. 18 bare copper wire, is placed inside of L-1. A condenser, C-1, is used to adjust the grid circuit. It has a capacity of 0·001 mfd., and is variable. The radio-frequency choke coil L-3 is wound on a cardboard tube with No. 28 or 34 wire. No varnish or "dope" should be applied to the 250 turns wound on this form. A honeycomb coil should not be substituted for this, and bank windings should be avoided.

Suitable Aerial Systems.

A fixed condenser of good make is used for C-2, and is of 0·001 mfd. capacity. It should be able to withstand the high plate voltage. With this set, the antenna radiation on 3,000 k.c (100 meters) was 2·4 amperes. On a frequency of 6,000 k.c. (50 metres), this decreased to 2·1 amperes. Two five-watt W.E. vacuum valves of the "E" type, with 500 volts on the plate, were used.

The antenna for this work was comparatively small. It consisted of a 6-wire 6-inch cage. For 6,000 k.c. work, its length was 20 feet and height 20 feet. For the 3,000 k.c. tests, this was altered to 35 feet for the length and 35 feet for the height. A counterpoise of four wires on ten-foot spreaders and 35 feet long was used for both tests without modifications. The radiating system was so designed as to maintain its rigidity, so as to keep the frequency constant. Both the loop and grid systems of modulation were used for radio telephone work.

The tuning of the circuits of such a transmitter is naturally not as easy as when lower frequencies are used. In these experiments, the radiated frequency was but *one* meter above the fundamental of the antenna system. If this relation was not maintained, the transmitter radiated energy, but this did not register.

A special receiving apparatus of novel type was designed for this work. It was made along the lines of a super-regenerative receiver. In this kind of circuit, the amplification increases with an increase in frequency. Hence, the amplification obtainable in the 6,000 and 3,000 kilocycle signals was very great.

Constructional details of the special super-regenerative receiver for this work follows: The antenna coil L-1 is wound on a bakelite tube 3 inches in diameter. with 7 turns of No. 22 D.C.C. wire, with no varnish or "dope" on it.

Short-Wave Reception.

For the secondary and tickler coils, winding of 20 and 19 turns of the same size wire as the primary. These three coils, L-1, L-2, and L-3, are arranged so that they are in a variable inductive relation to each other.

A grid oscillator coil, L-4, and a plate oscillator coil, L-5, consist respectively of a DL-1,500 and a DL-1,250, connected in the method shown. The values for the various condensers necessary are given in the drawing.

To tune the receiving circuits, place L-3 about ½ inch from L-2. Condenser C-2 should be advanced to maximum capacity and C-3 reduced to zero. Coils L-4 and L-5 are placed at right angles. Condenser C-7 is advanced until a thud is heard in the 'phones, later becoming a shrill whistle. If everything is correctly connected, the audio-frequency hum will be audible. Do not alter these adjustments.

For Receiving.

Adjust the three tuning condensers, C-1, C-2 and C-3, until clear and strong signals are heard. Some practice will be necessary before the best results are obtained.

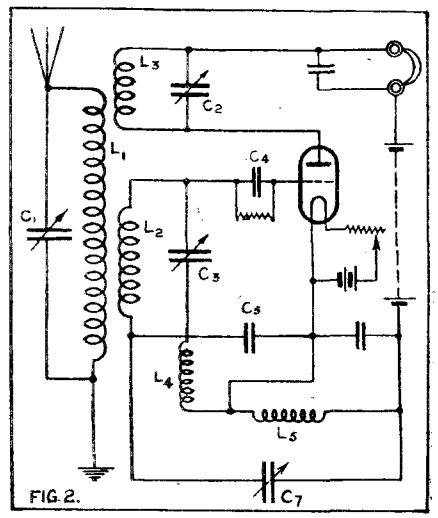


FIG.2.

For receiving purposes, an antenna consisting of a single wire 35 feet in length over-all dimensions, including lead-in and ground, was used. If coils L-4 and L-5 are reduced in size, the audio-frequency noises will disappear, and so will the signals. Static seems to affect the proper operation of this receiver.

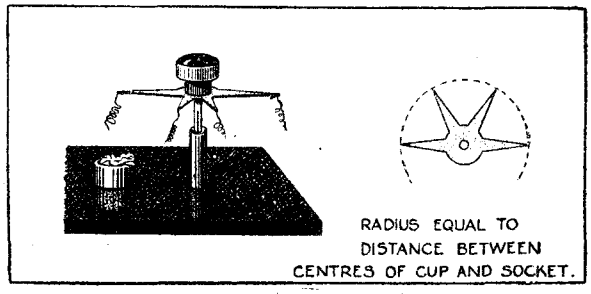
A CRYSTAL DETECTOR HINT.

THE annexed sketch shows a simple and efficient crystal detector, which allows various kinds of cats'-whiskers to be brought into use with a minimum amount of trouble. The materials required are of the simplest, consisting of an ordinary crystal cup, a valve socket, valve pin, a small ebonite knob, and a piece of thin copper or brass sheet.

From this latter a star-shaped pattern is cut as shown and the various whiskers are soldered to the tips of the points.

Varying the Pressure.

The assembly of the parts is easily followed from the drawing, and when erected this arrangement allows of a rotary movement combined with a vertical one by which the pressure of the cat's-whisker on the crystal can be varied.



THE PUBLIC AND BROADCAST CONCERTS.

MUSIC FOR ALL.

By **CAPTAIN C. A. LEWIS** (*of the British Broadcasting Co.*).

In this short article Captain Lewis deals with an aspect of broadcasting in a new and interesting light and places before the reader an argument of considerable importance.

SOMETHING for nothing is rather a slogan nowadays. Music for nothing is an attractive variation of this; but the thing I want to write this article about is not quite the obvious interpretation of the idea—i.e. that everyone who has a wireless set is getting music (practically speaking) for nothing, but something projected—an idea by which everyone could hear and enjoy the best in music, in person, for a nominal sum.

Most Londoners are proud of their city, and well they may be. It stands for Britain, for our great Empire, the largest and richest city in the world. But, though London may take the lead in many things, there is one thing in which it certainly does not take the lead, and that is in Art.

What is the Reason?

In its day, London has held great men—great architects, great poets, great musicians—but, taking a superficial view, there is little to show nowadays that this is the case, particularly in Music.

London does not, as it should, take the lead in every branch of Art.

Has it ever struck you that nearly every musical event of any importance in this country takes place outside its capital?

There are festivals at Norwich and Gloucester, there are singing contests in Wales and Sheffield, there are many activities, but they are all off the centre. Music does not gravitate, as one would suppose it should, to the capital of the country.

What is the reason for this?

Are we Southerners less musical? Are we more apathetic about it? Are we content to do without music? Perhaps we are all these things. But it must be said in our defence that there are not many places where music is to be heard, and *nowhere* can it be heard at a price which would put it within the reach of everybody's pocket.

A Deadlock.

What is the underlying reason for this? Let me try to expound what I consider to be at the root of the matter.

If people are to be induced to listen to music in a public hall, that hall must be central and easily accessible. Now, ground in the centre of London is extremely expensive; rentals are high, and therefore the hall must be *hired out* at a high price if it is going to pay its way. This puts the next move on to the artiste or group of artistes who desire to use the hall. What do they do? They also expect to get their money back, and so they charge high prices. The net result is that concert artistes and concert providers, as far as London is concerned, run their concerts at a loss in the large majority of cases, because the public cannot afford—and should not have to afford—high prices.

This looks rather like a deadlock. What is to be done, since at the bottom of it all lies the value of ground in London?

There may be many ways out of this, but there is certainly one, and that is found by looking at the next segment of the vicious circle I have depicted above—namely, the hall. It is here that the secret of the trouble lies.

A hall which is nothing but a hall is foredoomed to failure. It *cannot* pay. Concert-giving is a seasonal, spasmodic affair, and never a gold-mine. The hall must contain other things, which give a constant, regular revenue—offices, studios, flats, dance-halls, restaurants, anything which can be used to bring in money to cover the deficits which will be made on the halls themselves.

This means a building whose outer and surrounding walls contain all manner of flats, etc., and in the centre, the heart, lie one or more public halls; one, perhaps, holding five or six thousand people, and two smaller ones for recitals holding, perhaps, one thousand people apiece.

What would be the immediate result of a building such as this? It would mean that the high cost of renting the hall would go. Cheap seating would follow as a matter of course.

Sixpence and a shilling ought to be the price of admission to a first-class concert, not prices varying from 7s. to 27s. 6d. The thing is impossible from every point of view.

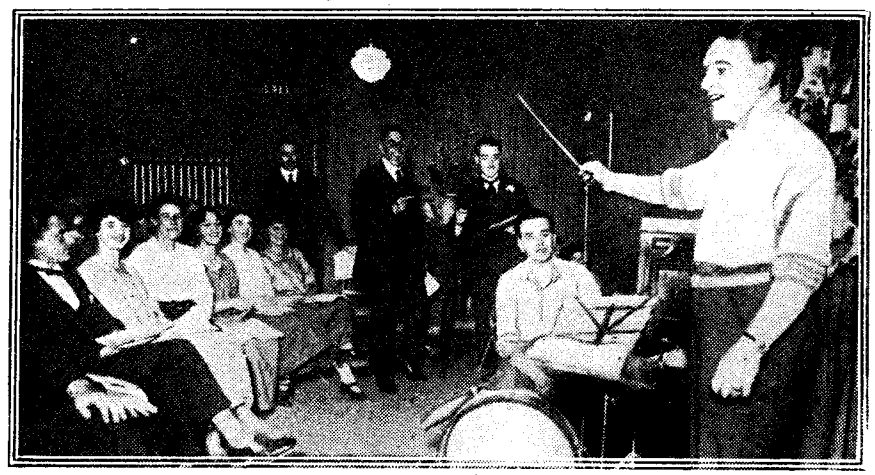
Lowering the prices in this way immediately increases a thousand-fold the potential public, and, furthermore, gives the young artiste, who has a very difficult time to obtain recognition at present, a much better chance of putting his art before the public.

Broadcasting Can Help.

You may say that the public does not want to hear concerts. I reply that, since the advent of broadcasting, the public interest in music and their appreciation has increased enormously.

There was no lack of appreciation in the Central Hall concerts at Westminster, and the prices there were twice as high as they would be under this arrangement.

Broadcasting is the means to an end; it stimulates the appetite, but it does not take upon itself to usurp the place of the real thing. For some time there will always be a good deal of difference between the real thing and the broadcast version of it.



Mr. Joseph Lewis, of 5 I T, conducting the first comedy opera given by the Birmingham Repertory Co.

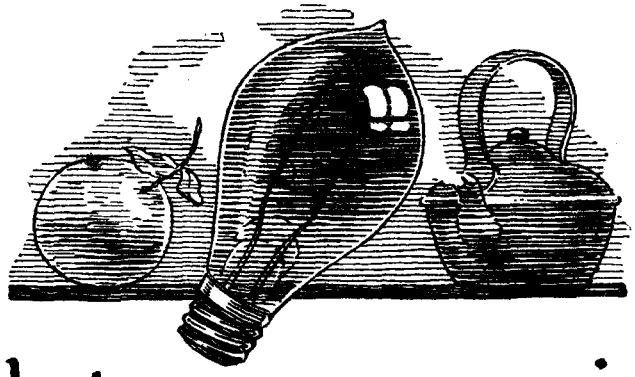
But we have, at least, awakened an appetite. Who is going to take advantage of it, not for his own benefit so much as for the benefit of the public?

This is the democratic age. Here is a chance for someone to come forward and put up a house of music for all, something into which everyone can enter and partake of the best in the greatest of all arts—Music!

My only fear is that it will be done half-heartedly. There are certain things which only succeed and deserve to succeed because of the magnitude of their conception. This is one of them.

The building—this temple, palace, sanctuary of Music—call it what you will—must be on a great scale worthy of London, worthy of the Empire, worthy of the Muse. It should stand up like a monument to reflect our national love of Music. It should be comparable architecturally to the greatest buildings in our great city.

If broadcasting aids in bringing about such a thing, it will have served great ends, and this is an end worth the serving.



What one man saw in a blackened bulb

THE history of progress is tied up with trivialities. Newton made history under an apple tree; Watts saw it in a tea kettle. Modern "wireless" came from a blackened bulb. It was an ordinary carbon filament lamp. Everybody knew that it turned black as it grew older. One man wondered why—and made it his business to find out. What he found was the principle of the thermionic valve. Dr. Fleming was the man and his experimental valve was made in the Ediswan Laboratories.

That was 30 years ago. Since then many developments have taken place in the evolution of the valve. Ediswan Valves retain the lead they won in the early days of wireless. They are wholly reliable — experienced workers and careful testing see to that.

Ediswan Valves will bring the best out of your wireless set—get some on the way home and enjoy a better programme from to-night onwards. All dealers sell them.

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An interesting study of early wireless history may be made at the Science Museum, South Kensington, London, where the complete series of Dr. Fleming's experimental valves can be seen.

EDISWAN
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Artistes of the Aether

By "Ariel"

Some of the artistes who have given you pleasure when listening-in.

WITH the advent of wireless, and the everlasting miracle of having your music "laid on" in the house, like light or heat, the expense side was waived. Even the most parsimonious of licensees could not forbear to pay for a new valve, or to renew exhausted batteries, but like all other miracles of civilisation, familiarity breeds—if not contempt, shall we say at least, contemplation?—and this compels us to admit that the B.B.C. plays its favourite item, "Two minutes, please," rather more frequently than is pleasant for our batteries. These odd "minutes," reckoned up at the close of a none too "perfect day," make a marked difference in their life, and as there is no change of scenery, and we presume the orchestra is still there, it is difficult to understand the cause.

Miss Dorothy Franklin.

The Winter Programmes.

From the look of the first ones, like our clothes, they look a bit on the heavy side. Maybe it was a cynic who said "Life would be endurable if it were not for its pleasures." Still, I would have liked him to have had just a taste of wireless. A "talk" at 3.15, another at 4 something or other, another in the Children's Hour—and which also, by the way, might be made a special weekly treat instead of a daily expense—another at 6.45, and a so-called comedy that only appealed to the sporting community, followed by still another "talk" before the Savoy Orpheans commenced at ten o'clock, to take the taste away, as it were. Now, B.B.C., "What about it?"

Miss Olive McKay.

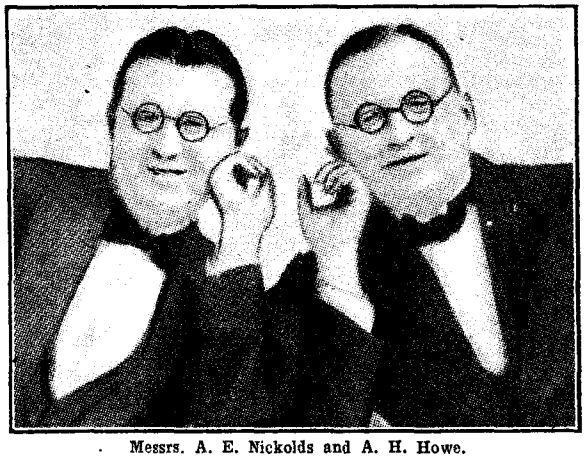
Sunday Programmes

These, we admit, are not easy to frame under the present policy. At 2LO recently, however, the J. H. Squire Celeste Octet were heard, demonstrating once more the good results obtainable from a small orchestra of real artistes. The playing of Mayer Gordon (violin) was another triumph of technique and artistry.

The Leaven of Humour.

The very word "humour" recalls to some people the red-nosed comedian or the knockabout so-called "artistes" of the old tenth-rate music-hall days. Wireless has at least done one thing in reviving the art of witty anecdotage and dialogue, while on the musical side, also, humour has learnt to take its share. One of the most successful of turns is that of Messrs. A. E. Nickolds and Albert H. Howe. Each is an artiste in his own branch, and together they are irresistible.

As a musician, Mr. Nickolds has ranged through most of the instrumental gamuts, for he started his musical career as an organist at the age of twelve, studied the piano and violin, made good as an accompanist, threw in the mandoline, and played at several big London theatres, added the zither-banjo to his effects, and a bagful of good stories, and there you are.



Messrs. A. E. Nickolds and A. H. Howe.

In Mr. Albert H. Howe he found a kindred spirit. Mr. Howe is a West of England baritone with a perfect gift for the piano and finding the words which his partner sets to music. The composite turn is always welcome, and we understand the pair have just returned after four weeks entertaining the British Army on the Rhine. Besides over the aether again, they will be heard at many of the London halls, Queen's and Palladium, etc.

Humour was well represented, also, by the work of a clever actor known as Syd Mac. He has a twenty-five years' experience, commencing his career as a ventriloquist, which possibly accounts for his success over the aether and his ability to give real "character" studies, for he seems to change his very voice for each part enacted.

An Ambitious Choice.

"The Immortal Hour," by Rutland Boughton, written round the poems of Fiona Macleod, will be remembered for its huge success at the Regent Theatre, where it had the additional power and attraction of the acting. Over the aether much of its charm is necessarily lost, and the music becomes at times strangely complex.

Miss Violet Vanbrugh.

A good cast was announced in Miss Elsie Suddaby, Miss Gladys Palmer, and Messrs. Arthur Cranmer, Sumner Austin, Kenneth Ellis, and William Heseltine.

Well-Known Speakers.

Every week sees more and more well-known people taking advantage of wireless, either to air their views or make appeals. Amongst those who have been heard recently, mention must be made of Sir Henry Walford Davies, LL.D., F.R.C.O., for his talk on "Music," Mr. F. A. Mitchell Hedges, F.L.S., F.R.G.S., on "The Mystery of the Jungle," Sir George Newman's Ministry of Health talk, Miss Dorothy Jewson, M.P., and Miss Violet Vanbrugh, the famous actress.

Manchester.

Noted for its fine programme, 2ZY can flatter itself on its very own artistes. One of them is Miss Olive McKay.

She was one of the first provincial contraltos to broadcast when the old station of 2ZY was at Trafford Park. In its dramatic company, Manchester numbers, also, another clever artiste in Miss Dorothy Franklin. She is the leading lady in their dramatic productions, and has the emotional capacity that is required for acting, especially before the microphone.

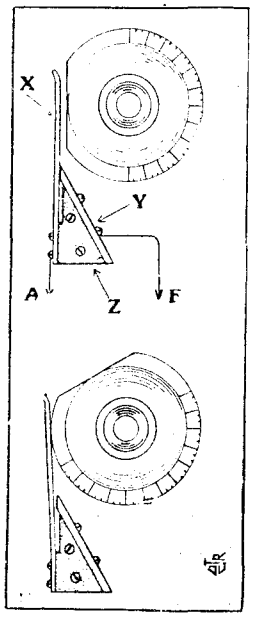
Mr. Syd Mac.

A SIMPLE COMBINATION SWITCH

By O. J. RANKIN.

THE function of the somewhat unorthodox type of switch shown in the accompanying sketch is to short-circuit the aerial and earth terminals of a receiver when not in use, and is operated from any existing control which is fitted with an ebonite dial or similar arrangement. The idea is presented in its most simple form, and no doubt many readers will be sufficiently interested to try out one or two of the modifications suggested in the last paragraphs.

By means of a fine hacksaw and file a flat is provided on the edge of the dial which is selected as being most suitable for the purpose. Assuming this dial to be attached to the spindle of a variable condenser, it is so arranged that the flat portion is set at right angles to either extreme setting of the plates so that the movable contact strip on the switch will be engaged by the round portion of the dial when the instrument is adjusted to the normal working position.



It will be seen in the upper sketch that the movable strip, X, is normally in contact with the thick stationary strip, Y, in order to earth the aerial. These brass strips may be about ½ inch wide, and secured one each side of a piece of ebonite or good hard wood, Z, the thickness of which is equal to the width of the strips. The long strip is preferably cut out from fairly heavy hard-rolled brass sheet, and one edge is filed to permit the necessary movement when the ebonite block is secured to the panel.

Capable of Extension.

When the condenser is adjusted from zero to the usual working position the round portion of the dial acts as a cam and breaks contact with aerial and earth by forcing the long strip away from the shorter one and holding it in that position while the average tuning adjustments are made. This will be readily understood by referring to the lower sketch.

As mentioned above this idea may be carried much farther and may eventually lead up to something approaching the much discussed uni-control receiver if given a little thought. If the arrangement of the clips is reversed; that is, if they are normally *out* of contact with each other, the switch would function as an L.T. or H.T. battery cut-out every time the condenser was set at zero. The current would, of course, be switched on simultaneous with the condenser adjustments. To effect this it is only necessary to turn the switch completely over on the panel and shorten the stationary contact strip.

Further Possibilities.

Coming now to the possibilities of combination switching afforded by this idea, one might carry out many interesting experiments with old key switches, making the cam function in the place of the usual hand operated knob and roller. As an example, a six-point key switch could be thus made to effect the following changes: (1) the H.T. or L.T. current control; (2) aerial to earth change-over; and (3) switching primary tuning coil to aerial—all these simultaneous with the first condenser adjustment.

Space will not permit a lengthy description of all the little dodges one could try with such a device, and so the reader is left to experiment along these lines with the assurance that he might easily peruse a much less interesting subject.

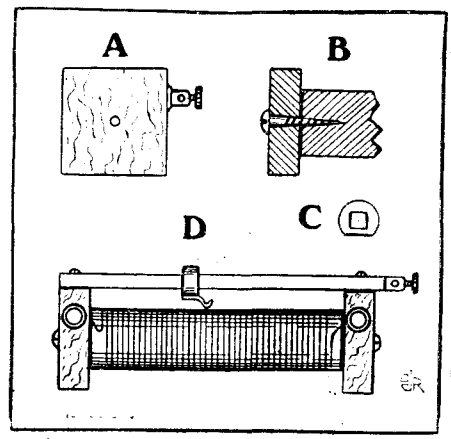
Part of the transmitting gear at the German station at Koenigswusterhausen.

MAKING A CHEAP POTENTIOMETER.

HERE is an easily made 300 ohm potentiometer which should not cost more than a shilling to make. The following materials and parts will be required: Two hardwood end pieces (A), each 1¾ in. square by about ⅜ in. in thickness; a piece of round wooden broom handle, 4 in. long by 1 in. in diameter; a 5 in. length of ¼ in. square brass rod, a slider, three terminals, some paraffin wax, some screws, and 22 yards of No. 36 S.W.G. enamelled "Eureka" resistance wire.

Winding the Former.

Attach the two square end pieces to the ends of the wooden former in the manner indicated at B, impregnate the wood with melted paraffin wax, and fit a small wood-screw terminal to each end piece, as shown

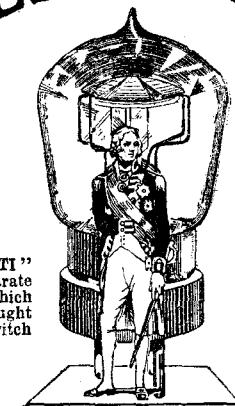


at A. Wind on the wire, keeping the turns close together, and secure the bared ends under the two terminals, taking care to see that a good electrical contact is made to each. Apply a coat of shellac varnish over the whole winding, and after cutting and drilling the slider rod solder a small terminal to one end, and make the slider. This should be of the flat spring type, and the best way to make it is to obtain a 2 B.A. threaded spacer or bush (as used for variable condensers), and file the threaded hole quite square, as shown at C.

A small flat is then filed on the periphery, and to this is soldered a short strip of thin spring brass which is bent as shown at D, which represents a side view of the completed instrument. The insulation is, of course, scraped away under the slider, so that it makes a smooth rubbing contact with any portion of the winding.

A famous name for a famous Valve.

NELSON MULTI



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The "NELSON MULTI" will function as a Detector, L.F. Amplifier, or H.F. Amplifier.
Owing to its unique construction it is unequalled for pure clarity of tone.
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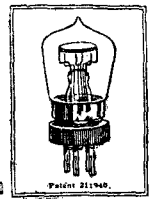
Telegrams: "Nelson, Wimbledon 172."



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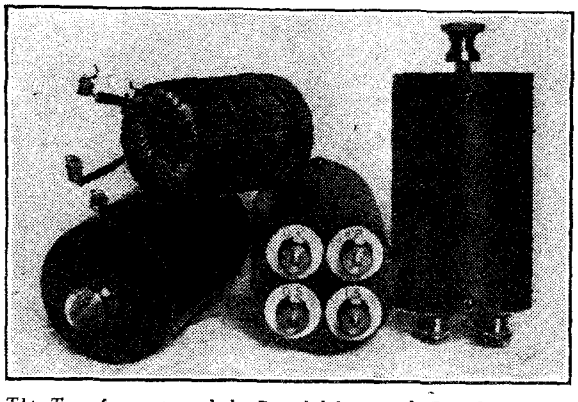

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The Primary circuit is wound with SILK COVERED Wire.

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The Coil is baked to exclude all moisture, then placed in its SOLID Steel case, and a special compound is run in until the coil is impregnated and surrounded with this compound, thus rendering the whole coil impervious to moisture.

It has a single hole panel fixing.

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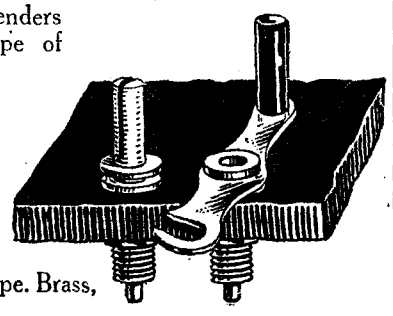

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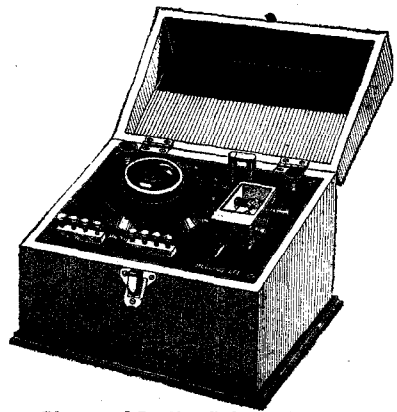

Phones and Loading Coil extra if required.

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Indicating Terminals, Brass 3½d., N.P. 4½d.
Rotating Crystal Detectors, N.P., 3/9 each.
Variometers, Ball Rotor, Cotton Wound, 4/- each.
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INDOOR AERIAL EXPERIMENTS FOR THE AMATEUR.

By OSWALD J. RANKIN.

An article detailing the use of the special "drum" type and indoor aerial described in a recent issue of "Popular Wireless."

READERS who have constructed the novel type of indoor aerial recently described in these columns will no doubt appreciate a few further remarks concerning its use with various types of receivers. Most of the experiments were carried out in the writer's workshop, which is situated in a low-lying district about eleven miles from 2 L O.

Model A was tested first, this being connected up to a crystal set employing a tapped coil wound specially for the ordinary 100-ft. outdoor aerial. Tuning was rather

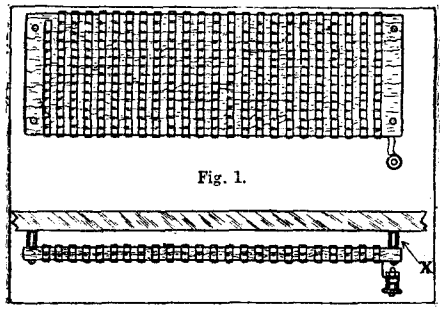


Fig. 1.

flat, and, remembering that the aerial on test contained only about 85 ft. of corrugated copper tape, a small slide inductance was connected in series for loading purposes. About twenty-five turns were loaded before the tuning became really sharp, and a special set was then built to work in conjunction with this aerial. This is shown connected to model A in the accompanying photograph.

The Special Counterpoise.

Briefly, it consists of a variometer-tuned crystal receiver, with the detector and terminals mounted on the lower portion of the stator. No. 30 D.C.C. wire was used for the windings, some 60 turns being wound on the stator and 50 turns on the rotor. The results now left nothing to be desired.

The aerial was then tried on a 1-C-2 valve set fitted with very selective tapped coils, and, when using the loud speaker, signals came through with a remarkable degree of clearness, and with the same amount of volume as when using the outdoor aerial. The valve set was then connected to the outdoor aerial and the earth lead connected to the indoor aerial, which was placed on the floor. Results were excellent. The indoor aerial (model A) was then connected to the aerial terminal of the receiver, while model B, connected to the earth terminal, was placed on the floor. Results were equally satisfactory.

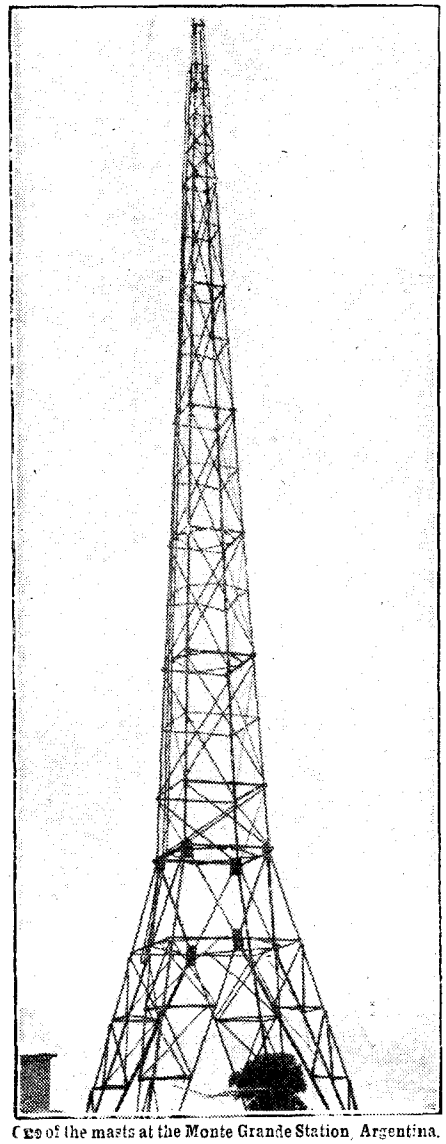
The special "counterpoise" shown in Fig. 1 was then constructed, and this was secured under the table directly below the receiver. This simple device comprises 100 ft. of corrugated copper tape wound over a piece of board, which is attached to the under-side of the table by means of four long wood screws and four tubular spacers, X. Results were in every way equal to those obtained previously.

Models B and C were designed to be used in conjunction with receivers employing standard tuning coils; that is, with coils designed for use with the standard outdoor aerial. Both models worked well with a No. 35 or 50 honeycomb coil, shunted with a ·0005 mfd. variable condenser

The "frame" aerial gave excellent results on a simple crystal set, using a No. 50 Igranic coil and a parallel ·0005 mfd. variable condenser; and as it appeared to be directional in any position, it was simply slipped away out of sight behind a picture during tests. This and model C were not tried out on a valve set.

At a later period, models A and C were tested out on crystal sets about half a mile from 2 L O, and, as expected, signals were then very much louder. However, it was found that when the aerial lead was disconnected from either of the models and held in an upright position, the decrease in signal strength was very slight, in fact almost negligible.

A piece of bell wire stretched round the room gave equal results, and one might have tried many other alternatives had it not been realised that tests were being made in the "swamping" area, and that almost any receiver would, under the circumstances, work quite well without any form of aerial whatever. This was an experience which, indeed, provided much food for thought, and I actually found myself wishing I was a London flat-dweller. Why these enthusiasts complain remains a mystery, for I am sure that aerials should be amongst the last of their troubles.

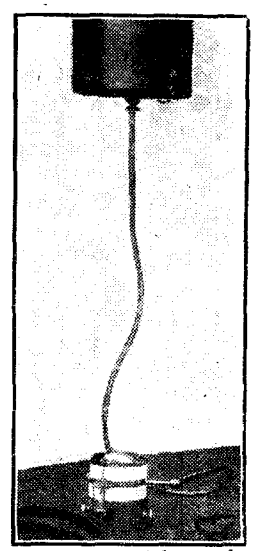


One of the masts at the Monte Grande Station, Argentina.

Scope for Experimenters.

Back again to the "unswamped" area, and the bell wire, no-wire, and several other stunts were tried in turn, but no signals could be heard until the "drums" were again brought into service. Thus it was concluded that where the device was *unnecessary* for operating a receiver in very close proximity to a broadcasting station, it was, indeed, a very interesting proposition some 10 miles out.

The writer was reluctantly compelled to abandon these experiments just at the time when they were becoming really interesting, but it is hoped that those readers of POPULAR WIRELESS who are fortunate enough to be able to devote a little time to experimenting along these lines will further develop the idea, for there is no doubt that, even in its present form, it is a definite step towards scrapping the outdoor aerial. The scope for experimenting in this direction is practically limitless.



Model A connected up ready for use.

The device could be made much smaller by cutting the tape into narrow strips about one-third of its original width, and experiments with fixed condensers and filter circuits might also be tried. It will be found that the higher the device is hung, the louder will be the signals, and when suspended from the rafters of the roof the signal volume was increased by about 30 per cent. An average suspension of 18 or 20 ft. from the ground floor should be considered the minimum for good results.

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COIL HOLDERS:—All Ebonite, really fine, 2-way, **2s. 6d.**; better finish 2-way plated, **3s. 6d.**, ditto, 3-way, **4s. 6d.**; vernier movement 2-way, **4s. 6d.**, **6s.**; 3-way, **6s.**, **9s. 6d.** Many other makes in stock. State your wants, we will assist you.

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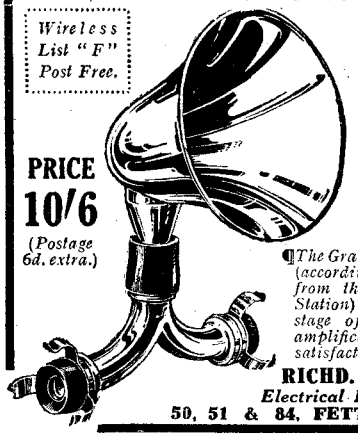

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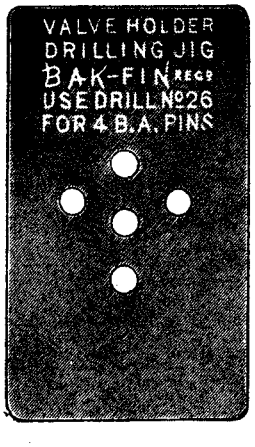

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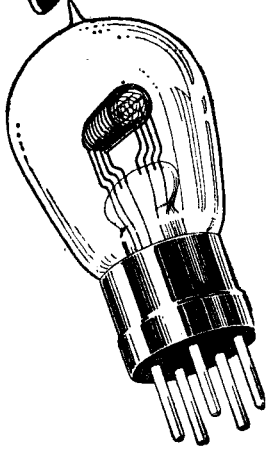

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RECEIVING SET FROM THIS COMPLETE SET OF PARTS.

No tools are required, no experience needed. It is just a question of following simple directions. You could do it though you knew nothing whatever about Wireless, and the result is a RECEIVING SET which, for CLARITY of TONE and LONG-DISTANCE WORK, has no equal.

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Carriage Paid to any part of U.K.

Complete Set of Parts for 2-Valve "UNIDYNE" Receiving Set.

Polished Mahogany Cabinet, 11 in. by 8 in by 8 in.
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6 Terminals.
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Panel, 5½ in. by 1½ in. by ¼ in., drilled to hold 2 5-Pin Valve Holders.
2 5-Pin Valve Holders.
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1 ,, ·0002.
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8 yds. No. 18 gauge Tinned Copper Wire.
Necessary Screws, Nuts and Washers.
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COMPLETE SET OF PARTS FOR ONE-VALVE SET, £4-10-0

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Engraved 3" 8d.
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All sizes, yd 3d.
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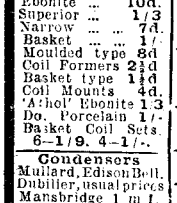

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NO MORE CATWHISKERS
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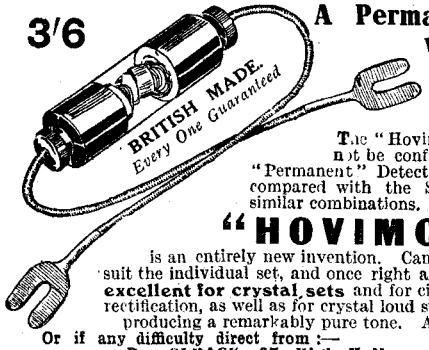

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"Holds tight" on to the Crystal, and will not slip.

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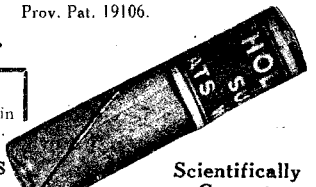

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EBONITE TUBE.—All sizes stocked.
FILAMENT RHEOSTATS.—Velvet Perfecta, 1/6; Ormond, 2/-; Filostat, 2/6; Microstat, 2/9; T.C.B., 30 and 6 ohms, 4/-; Igranic (with Vernier), 7/6; Igranic (Plain), 4/6; Lissarstat Minor, 3/6; Lissarstat Major, 7/6; 30 ohm Special for ·06 Valves, 3/3.
FORMERS.—Cardboard, very stout, from 2 in. to 4 in. diameter, 1d. to 4d.
FORMERS, VARIOMETERS, in Black Composition, per pair, 3d.
FLEX.—For 'Phone Cords H.T. Leads to many other jobs, per yd., 2d.; Red and Black Twisted, per yd., 2d.; Silk Covered, per yd., 1½d.
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HIGH TENSION BATTERIES.—"Phœnix," M.A.L., S.D.H., 15 volts, 2/9; 30 volts, 5/6; 36 volts, 6/6; 60 volts, 10/6; 90 volts, 16/6; 100 volts, 16/6; Siemens, Ever Ready, etc., in stock.
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CONTACT STUDS.—5d. per doz., complete with nuts and washers; Nickel, per doz., 1/3.
CONTACT STOPS.—Two for a 1d., complete with nut and washer.
CONDENSER VANES.—6d. per doz.
CRYSTALS.—Small Box Hertzite, 9d.; Large Box Hertzite, 1/-; Midite, 1/-; Tungstalite (Blue Label), 1/6; Gecosite, 1/3; Lapisite (Gold Whisker) 6d.; Carborundum, 4d.; Bornite, 6d.; Zincite, 9d.; Crystal Cups, patent screw tops, 2½d.; 3 screw tops, 1½d.
CRYSTAL SETS.—Excellent results are being obtained on these Sets, which are all guaranteed Square Set, 8/6; Oblong Set, 10/6; Slope Panel, 12/6; "Hawker's" Mark III Set, Maker's Price, 21/-; Our Price, 17/6; "Service Set," splendid value, 30/-, with Variometer, Tuning Plug, 1,600 Meter St.

Valves and High Tension Batteries sent through post at purchaser's risk only and are not returnable. Price Lists Free.

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A perfect Crystal, sensitive in every point. Cash refunded if not satisfactory. All specially selected.
Price 1/- (per Box), **1/3** (in Glass Tubes).

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A neat and portable indoor or outdoor aerial. No insulators required .. .. **Price 2/6 each.**

"CABLE" CRYSTAL SETS AND VALVE AMPLIFIER

		£	s.	d.
Cable No. 1.	Crystal Receiver		10	6
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"The coming of the 'Six Sixty' dull emitter valve marks a new era in the perfection of the thermionic valve. This valve can be used for either high or low frequency amplifiers, with equally good results, and in the tests we have made has functioned as a detector even better than a bright emitter. On a single-valve reaction set, using an indoor aerial, on a two-volt cell, the signal strength was increased by at least fifty per cent. compared with the bright emitter."

"The valve is very economical in current, one re-charge will suffice where ten or twelve have been necessary with ordinary valves."

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

SOME NOTES ON TRANSFORMERS.

REASONS FOR LOSS OF ENERGY.

By SIR OLIVER LODGE, F.R.S., D.Sc., LL.D.

(*Scientific Adviser to "Popular Wireless."*)

In this article both the manufacturer and the home constructor will find practical advice about the transformer, and a lucid explanation of the reasons for loss of energy.

IRON, when used as the core of a transformer or any kind of induction coil, has two chief properties, magnetisation and conduction. In that it differs from any of the other ordinary metals, which practically only have the property of conduction. When a varying current circulates round in ordinary metal, it induces short-circuited opposite currents in the substance of that metal, and these secondary currents react on the primary circuit, in a way which is most simply described as increasing its effective or apparent resistance and diminishing its effective or apparent inductance.

In this respect iron has the same properties as other metals, except that it is not so good a conductor as some of them, and hence secondary induced, or so-called Foucault, currents are not so strong in iron as they are in copper; but otherwise they are just the same, in kind though not in degree.

Iron, however, has the additional property of being magnetisable. But so long as these Foucault currents last they tend to screen it from the magnetising effect of the primary current, since they are opposed in direction to that current. They therefore delay the magnetism, and at high frequency might protect it altogether, acting as a sort of screening skin, so that hardly any magnetic lines of force are generated inside the iron.

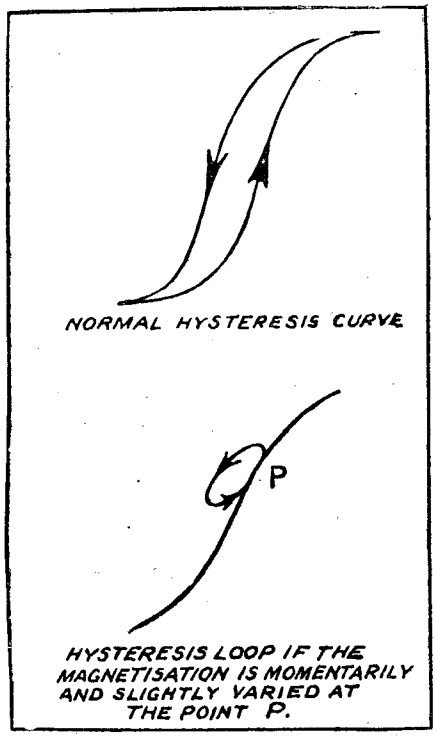
The Iron Core.

This screening action would certainly take effect at what in wireless practice is known as "high-frequency." But at audio-frequencies the Foucault currents would have time to subside, killed by the high resistance of the thin skin in which they circulate; magnetic lines of force would have time to develop, and the iron core would be magnetised and demagnetised, or reversed in magnetism, in accordance with the fluctuations of the exciting current, though with a certain amount of lag.

Of course, the Foucault currents must be kept to a minimum by subdividing the iron. It would never do to use a solid core, or a core built up of cylinders one inside the other, or of disks screwed up together so as to make a cylinder, because in either a cylinder or a disk the Foucault currents would have a free path for circulation, and the interior of the iron would hardly get magnetised at all. The core must be subdivided laterally, not longitudinally. That is why it is usually built up of a bundle of thin iron wires, which, though incompletely insulated from one another (because insulation would take up valuable room), may yet be varnished, or at any rate slightly coated over with sufficient oxide to prevent free electrical circulation or passage of current from wire to wire. Their longitudinal continuity is necessary for the magnetic lines of force; their lateral discontinuity is necessary for the stoppage of induced currents.

The Meaning of Hysteresis.

It is true that some transformer cores are made of thin sheet stampings, but the plane of these stampings is always at right angles to the plane of the primary coil. The stampings being in the form of disks with the centre part cut away, the windings of the primary circuit are taken through the centre hollow of the disks and back round outside, so that they are continuous only in a direction at right angles to the current, and are discontinuous in the direction of the current itself.



All this is probably well understood. Certainly it is understood by instrument makers.

But iron has another property called hysteresis. This means that its rise in magnetism and its fall in magnetism are not quite similar. It rises, as it were, by one path, and it falls by another. The rise of magnetism, when plotted, follows what is called the "magnetisation curve." The fall follows a similar but not identical curve; so that the two curves, when plotted, enclose an area, an area something like this when the magnetisation and demagnetisation are fairly complete.

If the magnetisation and demagnetisation are only partial, the two curves will still enclose an area, but more of this shape:

Now, wherever curves of this kind enclose an area it means that work is done during the magnetisation which is not got back during the demagnetisation. There is loss or waste of energy. If the up-and-down paths were identical there would be no loss. But when they differ from each other it is like imperfect elasticity; you don't get back from the spring all you put into it. You never get more, and you may get less. The difference or the loss at each cycle is represented by the area enclosed between the two curves. The fatter this area is the more the hysteresis. In fact, hysteresis may be considered as the name given to this area, the loss of energy per cycle.

H.F. Transformers.

Some kinds of iron have much less hysteresis than others, but there is always some, and accordingly an iron core does involve some loss. But the advantages due to its extra magnetic lines of forces are so great as to overwhelm this loss and give us a balance of advantage, if the number of cycles is not too great.

The loss in commercial transformers at a frequency of fifty or a hundred per second is by no means insignificant. It results in heat, which is always the outcome of waste energy, and the transformer has to be artificially kept cool. At a frequency of a thousand a second the loss is greater, though, inasmuch as the magnetisation is probably feebler, the area per cycle is likely to be less. And so for audio-frequencies, such as are used in wireless, this source of loss can easily be tolerated; and the transformer with an iron core is more efficient, much more efficient, than one with only an air core.

But when you come to a frequency of a million a second, the slightest loss per cycle is multiplied to such an extent that it cannot be tolerated. Both things, Foucault currents and hysteresis, dissipate energy, and when even a small amount is dissipated a million times a second it naturally mounts up. Hence high-frequency transformers must not have iron cores. An air core has no hysteresis nor Foucault currents; there is then no dissipation of energy, except the inevitable amount due to resistance in the wire; there is no supplementary loss. The effect of iron in a high-frequency core would be to confuse everything hopelessly. The iron would not get properly magnetised; it would be screened by its Foucault currents. Nevertheless, it would dissipate energy, and tend to wipe out or smear out the primary oscillations, destroying their features and making anything like clear speech impossible. There would not only be waste

(*Continued on page* 482.)

THE UNIDYNE IN TASMANIA.

The Editor, POPULAR WIRELESS.

Dear Sir,—I think the following report of my success with the two-valve (detector and audio) Unidyne circuit might be of interest to you.

I have been interested in the circuit from the very start, and have followed all your descriptive articles carefully. Last night I literally strung the circuit together on my experimental units and tuned in to 2 F C (Farmers' Broadcasting Service), Sydney. The music and speech were exceptionally clear, and free from those small noises which I have noticed on H.T. sets. The strength also was equal to, if not better than, my two-valve (H.F. and D.T.R.) H.T. set. Perhaps the following details regarding the values of the various components may be of interest also.

The A.T.I. consisted of a 172-turn honeycomb coil with a Polar ·001 condenser in series. A 250-turn H.C. coil was used for the reaction. Two Phillips D.VI valves were employed, and a Kellogg 3–1 audio transformer. The only source of power was a 6 volt car accumulator. 2 F C is over 500 miles air-line from here, and is transmitting on a wave-length of 1,100 metres, with a present aerial input of about 400 watts.

In view of the challenge to Senatore Marconi in the latest number of "P.W." to hand, I think the above report will be of interest to some of your other readers.

You are at liberty to use any part, or all, of this letter as you see fit.

Yours faithfully,
P. OAKLEY FYSH.

181 to 187, Charles Street, Launceston, Tasmania.

REAL "O X" WORK.

The Editor, POPULAR WIRELESS.

Dear Sir—We are eager readers of your paper whenever we are able to procure a copy, and we think that you and the readers of the "P.W." will be interested in the excellent results obtained with our set.

It is a simple one-valve receiver of the "tuned anode" type, not a super of any kind, and without any amplification. It is not a compact set, but made up of a unit-receiver, etc., all mounted on a board, aerial UNDER roof, lead-in parallel with wall, at least 25 yards long, no connections soldered, electric motor and several hundred yards of electric wiring in the immediate vicinity. Altogether unfavourable circumstances! It has only been in working order since the 13th inst., yet so far we have received the following stations:

Vienna (Ravag), 15 miles away, very good 'phone strength.
Frankfort-on-Main, 384 miles away, very good 'phone strength.
Zürich, 372 miles away, very good 'phone strength.
Berlin, Voxhaus, 342 miles away, very good 'phone strength.
Berlin, Telefunken, 342 miles away, very good 'phone strength.
Aberdeen, 1000 miles — good 'phone strength.
Stuttgart, 336 " } faint 'phone strength.
München, 223 " } faint 'phone strength.
Breslau, 220 " } faint 'phone strength.
Cardiff, 905 " } faint 'phone strength.
London (2 L O), 762 " — weak 'phone strength.

We received three other stations clearly but faint, so that we are not sure about them.

They probably are:
Hamburg, 479 miles
Bournemouth, 834 "
Manchester, 890 "
The latter two were certainly English, but perhaps not the two stations named.

Vienna we can get quite loud without an aerial, and using no substitute.

On the 17th of Sept. we got a rather weak reception of speech, then, at 10 p.m., a time signal and what apparently were the Savoy bands afterwards, on about 4–500 m.; on the 24th we got a similar reception of a talk on railways on a somewhat smaller wave-length—in both cases we could not hear the station's name mentioned. On Sept. 25th we got a good reception of an English musical play, from 11–12.15, when all of a sudden they ceased, without having mentioned the station's name.

Chelmsford, Radio-Paris, and Centralle we could not get yet, owing to lack of the correct coils; we ought to get a very good reception of these high-powered sending-stations, especially in the winter.

We trust that the above facts will be of interest to you and your readers, and hope to receive in reply a criticism of our accomplishments.

We remain, Yours very faithfully,
A. LIPSCHITZ,
M. WILLIAMS.

Baden bei Wien (nr. Vienna), Trostgasse 9, Austria.

Re 5 X X AND 2 L O.

The Editor, POPULAR WIRELESS.

Dear Sir,—In your issue of the 4th instant I observe a letter from Mr. W. J. Winter, of Kingston-on-Thames, complaining that the only thing 5 X X has done for London is to jam the most convenient Continental stations.

May I point out to Mr. Winter that 5 X X was not started for his benefit in any way, but for the many thousands of people such as myself who live outside the normal range of the ordinary stations, and that, therefore, strictly speaking, he is not entitled to criticise this station, as 2 L O is supposed to serve his requirements.

With regard to jamming, I have just returned from a visit to Kingston-on-Thames, and can assure Mr. Winter that when there I had not the slightest difficulty in eliminating 5 X X and receiving Radio-Paris, to which station I presume Mr. Winter refers as now being jammed, and if, therefore, Mr. Winter is unable to do likewise I strongly recommend him to look to the selectivity of his instrument before criticising a station which is serving many thousands of remote listeners.

Yours faithfully,
H. V. PRESCOTT.

Natproban Chambers, Victoria Viaduct, Carlisle.

B.B.C. PROGRAMMES.

The Editor, POPULAR WIRELESS.

Dear Sir,—I did not expect Editorial comment on my letter re B.B.C. programmes such as appears in your recent issue.

I am sure that POPULAR WIRELESS will increase its already wide circulation and value if it will take up the question of the B.B.C. programmes.

Surely the listeners must form by far the greatest number of those interested in wireless, but although constructors are most generously catered for there is no wireless publication that does not treat the programmes as of secondary importance, and several scarcely touch on them at all.

Personally, I am convinced that many thousands of listeners are too indifferent or too lazy to write to the B.B.C., and this is the reason why public opinion does not force the matter on the programme arrangers.

Only this morning in the train and in my office I have heard the most contemptuous criticism of three nights' programmes s.b. this week.

I have addressed many letters to the B.B.C., and acknowledge the great courtesy and attention that they give, but the fact remains that the greater part of the musical items are of a class that appeal to a

(*Continued on page* 480.)

BOOK THE DATES!

November 15th to 29th

BRITISH

WIRELESS EXHIBITION

AT THE

WHITE CITY

LONDON, W.12.

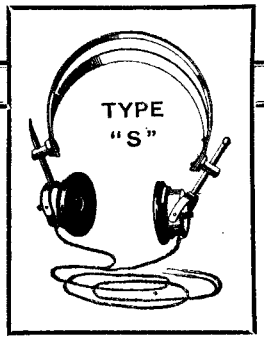
A gigantic show of Sets and Component Parts, including some wonderful new ideas and improvements. In order to make the Exhibition representative of the

Entire British Wireless Industry

every manufacturer of British goods has been invited to exhibit. Come and see ALL that the industry can offer. All goods will be on sale at the stands.

✳ **"POPULAR WIRELESS" CONSTRUCTORS' COMPETITION** (*judges to be announced later*).

See this issue.



M.E.L. PRODUCTS

REPRODUCTION THAT SURPASSES BELIEF

The extreme sensitivity and complete absence of distortion of the New Improved M.E.L. Phone, coupled with the greater volume and clarity of reproduction which they afford, simply surpasses all belief of those who have not tried them.

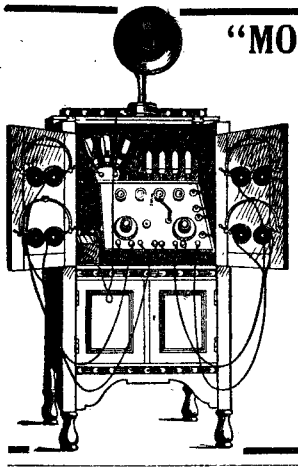
M.E.L Phones are the unswerving choice of every expert and amateur who has used them.

The spring Slider Adjustment of the Earpieces allows of instant and easy setting to the most comfortable position and prevents any "sloppiness" due to wear. Each pair of Phones is individually matched and tuned, resulting in perfect "balance."

Your usual Dealer will be glad to show you a pair —ask him to let you try them, a test will readily convince you.

Price only **17/6** *per pair.*

Telephone : M.E.L. LTD. 45-47 KINGS ROAD CAMDEN TOWN, N.W.1 North 2515.



"MORRIS" Solid Oak Standard Cabinet, with lock,

for any kind of receiver. Bottom cupboard with lock for accumulators and stores. Height 3 ft. 6 in., width 2 ft., depth 15½ in. Inside dimensions of top compartment: width 22½ in., depth 13½ in., height 18 in.

Back panel removable.

Further particulars on application.

PRICE **£4 10 0.**

Part Carriage and Packing 7/6 extra.

SOLID OAK WIRELESS TABLE with large drawer and bottom shelf for accumulator, length 25 in., width 16 in., height 26 in.

Dismounted in crate, plain (unstained) **20/-**
Mounted, stained and polished - - **27/6**
Carriage paid.

TRADE INQUIRIES INVITED.

M. VERSTRAETEN (Dept. 5), Melvill Chambers, 50a, Lord St., Liverpool

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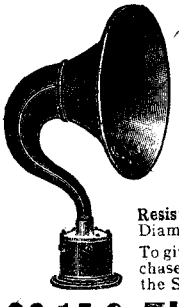
JUST WHAT YOU WANT

THE **"CURFEW"**

LOUD SPEAKER. (*Pat. appd. for.*)



This instrument is NOT A BABY. It is guaranteed to give as much volume as most of the more expensive makes, and the quality of its tone is wonderful. It can be used for private entertainment or public concerts and dances.

Using 5 valves it has been heard from a distance of 1 mile. Will work efficiently on a 3-valve set 30 miles from a B.B.C. Station.

Resistance 2,000 ohms. Height over all: 22 inches. Diameter of Bell mouth: 14 inches. British manufacture.

To give our customers an opportunity of testing before purchase is completed we will return the remittance in full if the Speaker is received back in good order within 7 days.

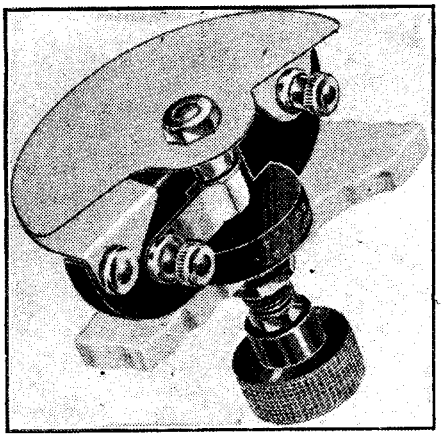
£3 15 0 Carriage Paid.

THE ACROPHONE COMPANY,

Metropolitan Chambers, WOLVERHAMPTON, Staffs.

The Technical Editor of "Popular Wireless" will be pleased to receive wireless sets and component parts for test. Reports will be published under this heading.

THE "Colvern" Tuning Condenser, a speciality of the Collinson Precision Screw Co., Ltd., of 150, King's Cross Road, London, W.C.1, of which some samples have been sent us for test, is a neat little fitment which should appeal very strongly to constructors of valve apparatus.



The Colvern tuning condenser, showing the method of mounting it on a panel.

It is a neat little "vernier," designed for one hole mounting. As the maker's point out, it is generally desirable to accomplish final "balancing" with a "vernier" *not* in too close proximity to the main tuning condenser, as "capacity effects" are so marked in some circuits that "hand capacity" is apt to render the vernier attachment of a combination condenser useless.

At 2/6 the "Colvern" Tuning Condenser should command a ready sale.

* * *

We have received a sample "Radion" panel from the American Hard Rubber Co. which is made of their new substance, "Mahoganite." The result is a panel of the insulative value of ebonite, which has the appearance of beautifully grained and polished mahogany.

It is easy to work, and is, in fact, except as to appearance, to all intents and purposes first-class ebonite. "Mahoganite" will appeal to all constructors with artistic inclinations, and *should* tend to increase the popularity of well-finished amateur sets and help to sound the death-knell of "junk"—but in our opinion, it won't!

* * *

The earth connection is quite as important as the aerial, if not more so, and if efficiency in reception or transmission is to be obtained, then it is essential that it should be as near perfection as possible.

A means of securing a first-class "direct" earth connection is available in the Hedges Patent Tubular Earth, manufactured by R. C. Cutting & Co., of Vulcan House, 56, Ludgate Hill, London, E.C.4, and sold retail at 8/6.

We have received a sample for test, and are able to endorse the opinion of our scientific adviser, Sir Oliver Lodge, F.R.S., who has reported that in his opinion the Hedges Tubular Earth possesses considerable advantages over the usual plate earths.

It is interesting to note that the designer of this form of earth has installed a system of similar units for earthing the lightning conductors on St. Paul's Cathedral and many other famous buildings—a clear proof of the efficiency of Tubular Earths.

One has not to worry much about the "finish" of an article that is to be buried, but at any rate the Hedges Tubular Earths are solid and of sound construction, while the design is ingenious and technically sound.

* * *

Messrs. Alfred Graham & Co. inform us that owing to the continual expansion of "Amplion" business, and the rapid development of overseas trade, they have decided to organise an independent overseas section. The management of this department will be undertaken by Mr. J. M. Richard, who was, until recently, commercial manager of the Marconiphone Company.

* * *

Probably fixed crystal detectors can never be quite so sensitive as the adjustable type, but nevertheless the demand for the sealed-contact type, which can be connected in circuit and left alone indefinitely, is steadily growing. Messrs. A. H. Clackson, of 119, Fleet Street, E.C.4, have forwarded us a sample of their "Catseye" fixed detector, and for the past fortnight this small instrument has been tested against an adjustable detector, and has proved thoroughly sensitive and satisfactory.

* * *

Messrs. W. Edwards & Co., of Arc Works, Dorset Street, Brighton, have forwarded several samples of their cheap components, which, notwithstanding the low prices, prove to be quite efficient in operation. For instance, the two-way coil-holder at 3/-, post free, is quite a useful, workmanlike job, and the wire type filament rheostats at 1/6 are excellent. Experimenters will also find this firm's sets of basket coils very useful, and quite efficient inductance units.

* * *

An ingenious little device is the Newey Snap Terminal, which resembles a dress-fastener in principle and appearance. It provides a very convenient means of making connections, and on test we discover that contacts so made are electrically and mechanically "A1." They are supplied in brass for 1½d. each, or in nickel for 2d., or at 2/- and 2/6 a dozen respectively.

From Messrs. H. A. Hunt & Co. we have received a well-finished crystal detector and a tapped grid leak. The crystal detector is of straightforward design, and is so constructed than an excellent adjustment is possible.

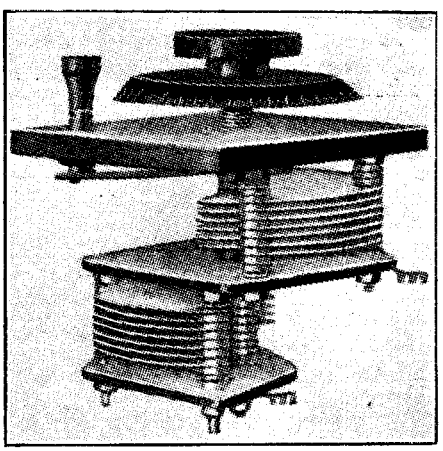
The grid leak is designed for "back-of-panel" mounting, and is fitted with an anti-capacity handle. Special precautions are made to ensure constant resistance values.

Having carefully tested both the above components, we are able to recommend them to the attention of our readers as being in all respects well-made and efficient instruments.

* * *

Two interesting booklets have reached us this week. The "Plain to See" Continental Radio Time Table, which is published by E. T. W. Dennis, Ltd., Scarborough, lives up to its title by an arrangement classifying signals according to the time they are received. It is priced at 4d.

The Chronicle Wireless Guide is an ambitious attempt to describe in clear language how the home constructor can make a range of wireless receivers and amplifiers. It is well illustrated, and full of information, and is published by Allied Newspapers, Ltd., Manchester, at the modest price of 6d.



A double condenser for controlling two stages of H.F. with one knob, to which is fitted a vernier attachment (Jackson Bros.)

In reviewing the exhibits at the N.A.R.M. Wireless Exhibition in our issue of the 4th inst.) Mr. Sholl says, "In view of the rather extravagant claims put forward by the makers, we prefer to make a trial—" etc.

Now Mr. Sholl was referring to the C.A.V. Loudspeaker which we had already reported on very favourably in these columns, so we must hasten to point out that the claims in question might sound extravagant to one who has not heard the instrument in operation, but that applies to all really first class components of novel construction.

* * *

In the advertisement of Messrs. Hamilton May, Doone Cottage, Weybridge, Surrey, which appeared in our issue of 11th inst., an error occurred. Referring to steel wireless masts 150 ft., 90/-, should have read 50 ft., 90/-.

HULLO EVERYBODY!!

POST FREE OFFER. **POST PAGE No. 1.** Not Applicable to Foreign Orders.

DELIVERY. Every endeavour is made to despatch goods by return, but sometimes delays occur which are beyond our control and in which cases customers may rest assured that their orders will be executed in the very shortest period. They will therefore realise that it is not possible to have orders cancelled through above causes. All orders over 20/- post free U.K. only.

LISSEN.

Variable Grid Leak	2/6
Anode Resistance	2/6
Lissen Minor ..	3/6
Lissenstat ..	7/6
Do. Universal ..	10/6
2-way Switch ..	2/9
Series Parallel ..	3/9
T1 Transformers..	30/-
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	

POST 3d. each.

DUBILIER.

.001, .002, .003, .004, .005, .006, Fixed, 3/-
.0001, .0002, .0003, .0004, .0005 .. 2/6
Type 577, .01 .. 7/6
Grid Leaks each 2/6
Anode Resistance 50,000, 70,000, 80,000, 100,000, on stand complete 5/6
Minicap Switch .. 8/-

POST 3d. each.

IGRANIC.

Coils: 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
Fil. Rheostat .. 4/6
Potentiometer .. 7/-
Vernier Rheostat.. 7/6
30-ohm Rheostat. 7/-

POST 3d. each.

STERLING SQUARE LAW CONDENSERS.

with Vernier.

.001	30/-
.0005	25/6
.00025	23/6

EDISON BELL.

.0001 to .0005 Fixed	1/3
.002 to .006 ..	2/-
.001	1/3
.0003 with Grid Leak	2/6
Variometer ..	10/6
Twin Detector ..	5/-

POST 2d. each.

WEST END DEPOT FOR

POLAR; JACKSON BROS.; R.I.; BURNDEPT; GOSWELL ENG. CO.; SILVERTOWN; IGRANIC; LISSEN; RADIO PRESS ENVELOPES; DUBILIER; EDISON BELL; ETC.

RHEOSTATS.

Ormond	2/-
Raymond	1/6
Do. with dial	2/-
Extra value do. ..	2/6
T.C.B. 6 ohms ..	4/-
Potentiometer T.C.B.	5/-
Burndept Dual ..	7/6

POST 3d. each.

TRANSFORMERS (L.F.).

Radio Instruments ..	25/-
Igranic, Shrouded ..	21/-
Powquip, Shrouded ..	18/-
Formo, Shrouded ..	18/-
General Radio 83 ..	14/11
Brunet, Shrouded ..	13/6
Formo, Open.. ..	12/6
Powquip, 2-1 or 4-1..	14/6
Raymond	10/-
Eureka Concert Grand	30/-
Ditto, 2nd Stage ..	22/6
Silvertown	21/-

TRANSFORMERS (H.F.). POST 3d. each.

McMichael, 300/600..	7/-
Ditto 1100/2000 ..	7/-
Energo, 250/700 ..	3/11
Ditto 900/2000 ..	4/6
Raymond, 300/600 ..	2/9

Others Stocked.

H.T.C. POST 2d.

Special valve holder above panel	1/9
Ditto, for under panel	1/6

POLAR POST 6d.

.001 var. Condenser ..	10/6
.0005 „ „ ..	10/6
.0003 „ „ ..	10/6
Micrometer Condenser	5/6
Cam Vernier 2-way Coil Holder.. ..	11/-

GRID LEAK.

Dubilier	2/6
McMichael ..	1/6
Edison Bell ..	1/3
Raymond ..	1/-

POST FREE

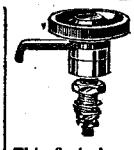
WATMEL

Var. Grid Leak	2/6
Anode Resistance ..	3/6

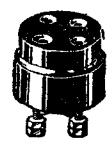
BRETWOOD (New Model)

Var. Grid Leak.. ..	3/-
Anode Resistance ..	3/-

POST 2d. EACH.



This first-class Switch Arm, with 12 Studs, 12 Nuts, 12 Washers. By Post 1/6 set.



Ebonite Valve Holder, cut from solid rod, hand-turned, 8 nuts and washers. Each, 1/3.

"POWQUIP" L.F. TRANSFORMERS.

POST FREE

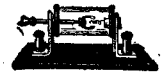
BUCKS. (for Reflex. etc.) -	12/6
MANCHESTER (similar to R.I.)	14/11
STANDARD -	14/11
SHROUDED -	18/-

COIL PLUGS.

Single Coil Holder mounted on ebonite base and fitted with terminals	1/4
Ditto, swivel movement ..	1/8

Post Free.

CRYSTAL DETECTORS Post 4d. each



Enclosed glass. As Sketch. Ebonite Base.

Brass ..	1/-, 1/4, 1/6, 2/-
Nickel	1/6, 2/-
Ebonite	1/6
Perikon	2/3

(With Zincite and Bornite.)

NOTE!

OUR WONDERFUL MICROMETER ADJUSTMENT GLASS-ENCLOSED DETECTOR. WHY PAY MORE? POST 6d. each. **1/11**

"BABY" COIL STANDS (EBONITE)

GRAND VALUE

2-Way, 2/6; by Post, 3/-
3-Way, 4/3; by Post, 4/9
Brass Fittings, Knob Type, on Base.

WATES MICROSTAT

FOR D.E. or R. VALVES .. **2/9**

Post Free.

14/6

"ORMOND" L.F. TRANSFORMER

Post Free.

RHEOSTAT

(Ebonite Former)

EUREKA WIRE, KNOB, AND DIAL

1/11

By Post, 2/3

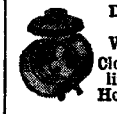
EDISON BELL Shaped Plug

1/- By Post, 1/3

Also with Base, 1/3

By Post 1/6

FINE VARIOMETERS



DOUBLE SILK WOUND, Close Coupling. One Hole Fixing,

EBONITE—

4/11 and **5/11**

Post 6d. each.

DUPLEX WAXLESS BASKET COILS

Min. Self-Capacity Set of 5 **1/8**

By Post 2/- Set

"BUCKS"

for Reflex **12/6**

EBONITE

2 for 1/2
2 for 1/4
2 for 1/6
3 Qualities.

BASKET HOLDERS

2 for 2/-
2 for 2/8
2 Qualities.

FORMO SHROUDED

18/-

RAYMOND 10/-

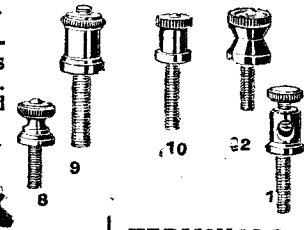
By post 10/6.

FORMO 12/6

Post Free.

ONE HOLE FIXING 1/3

By Post 1/6



TERMINALS WITH NUT & WASHER

No. 8	per dozen	1/-
No. 9	„	1/3
No. 10	„	1/1
No. 12	„	1/3
No. 13	„	1/1

POST FREE All 4 B.A.

BATTERIES (H.T.) EVER-READY

60v. - 13/6
180v. - 22/6

POST FREE

FIBRE STRIP FOR COILS

3 FEET Lengths
1 inch wide.
12 feet 1/-

Post Free.

GOSWELL ENGINEERING

POST FREE

Patent Valve Holder	1/6
2-Way Cam Vernier Coil Stand ..	9/-
3-Way Cam Vernier Coil Stand ..	12/6
3-Way Ordinary ..	7/6

PARTS FOR 2-VALVE "UNIDYNE" RECEIVING SET

THE 4-ELECTRODE VALVE Thorpe K4	each	17/6
6 Terminals	for	10d.
2 Microstat Filament Resistances	each	2/9
1 Variable Grid Leak..		2/6
1 Single-Pole Double-Throw Switch	1/9 or	2/-
1 ·0005 Variable Condenser, with Vernier		7/3
1 Cam Vernier 2-way Coil Holder		9/-
Panel, 5½ in. by 1¾ in. by ¼ in., drilled to hold 2 5-Pin Valve Holders.. ..	for	2/-
2 5-Pin Valve Holders	each	1/6
1 Fixed Condenser, ·001	1/2, 2/2	3/-
1 „ „ ·0002 ..	1/2, 2/2	3/-
1 Shrouded L.F. Transformer		20/-
8 yds. No. 18 Gauge Tinned Copper Wire		1/2

Necessary Screws, Nuts, and Washers, Free if above lot purchased. Post Extra.

RIGHT OPPOSITE **DALY'S** GALLERY DOOR

K. RAYMOND

27, LISLE STREET, LEICESTER SQUARE, W.C.2

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TWO PAGES MORE OVERLEAF

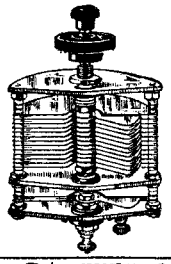
ALL OUR CONDENSERS HAVE BEEN TESTED AND RECOMMENDED BY LEADING JOURNALS UNSOLICITED. BRITISH MADE *SPECIALLY ADAPTED FOR* ALL LEADING CIRCUITS

NEW MODEL

WITH VERNIER		WITHOUT VERNIER	
·001	9/3	·001	6/6
·0005	7/3	·0005	5/3
·0003	6/9	·0003	4/11
		·0002	4/6
		Vernier, ·00005	3/9

With EBONITE DIAL and Two Knobs. Post 6d. Set.

Complete with knob and dial. Post 6d. Set.



SQUARE LAW

·0005	7/11
·0003	7/6
With Vernier.	
·0005	10/11
·0003	9/11

Post 6d.

Knob & Dial included.

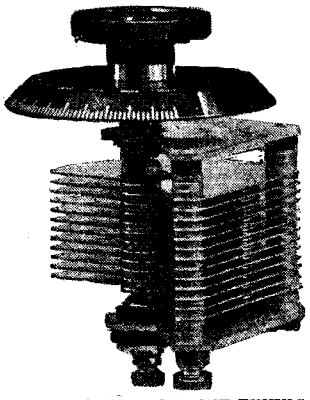
RAYMOND VARIABLE CONDENSERS

Exclusive Design. Stout Vanes.
Extra Insulation. Very Compact.
Narrowest Spaces (Pressed Aluminium).
Centre Rod cannot bend.
Terminal Connections Wonderful for Portables. Capacity Guaranteed.
Perfect Efficiency. Handsome Design.
Takes up very little space in panel.
Nickelled Fittings. Beautifully Made.
New one-hole fixing method.

COSTS A TRIFLE MORE,

A Few Pence Only, and is Just what You Want.

NICE DIAL and KNOB included.



UNSURPASSED FOR FINE TUNING.

'DE LUXE' MODEL

AS SHOWN, WITH DIAL, KNOB AND BUSH.

·001 - 7/3
·0005 - 5/11
·0003 - 5/4
·0002 - 4/11

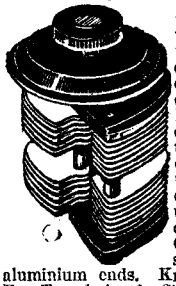
POST 6d. SET.

John Blair, Esq., Rexall Pharmacy, Millom, says:— "Your Condensers are a REVELATION to me as a Dealer. Sept., 1924."

C. Walton, Esq., Andover. Tested your Condensers on Megger and got "INFINITY."

9/- TWIN CONDENSER

POST FREE.



Composed of two equal units of .00025 or .0003 mfd., operated by one Knob and Dial, thereby enabling you to tune two circuits by one turn of the dial. Can be used in series or parallel. Complete as shown with aluminium ends. Knob and dial. For Tuned Anode Circuits.

MANSBRIDGE FIXED CONDENSERS

T.C.C. (New.)

1 M.F.	4/6	Various others Stocked.
2 M.F.	5/-	
·25	4/-	
·05	4/6	

Delivery very slow from makers.

"RAYMOND" FIXED CONDENSERS.

Ebonite Base. ·001, ·0001 to

·0005	1/2
·002 to ·004	1/3
·006	1/6
·01 and ·02	1/9
·05	3/3

POST FREE.

W Kennard, Sig.-Telegraphist, H.M.S. Leamington. 2nd July, 1924. The Condensers are splendid, and superior to any I have ever seen. Please find repeat order. W. Hale, Esq., 3, Gaye St., Walsall. 30th April, 1924. The last 4 Condensers gave every possible satisfaction—highest quality at extremely low prices. Kindly despatch enclosed further order. E. Shepherd, Esq., 23, Warden Street, Dunedin, 12th May, 1924. Everything came to hand in splendid condition, the quality far exceeding my expectations.

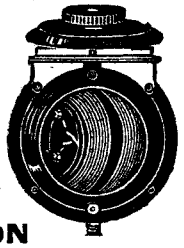
The set used by **Miss Evelyn Laye** in her dressing-room at Daly's is made of Raymond parts.

LOUD SPEAKERS

30/-	STERLING "DINKIE"
25/-	DRAGON FLY AMPLION (Baby New Model.)
55/-	BABY STERLING (Brown Floral.)

ALL MODELS OBTAINABLE.

VARIOMETERS



RAY-MOND 8/11

Post 3d. each

FALLON
IGRANIC
EDISON-BELL

Post free 10/-

ENERCO

H.F. Plug-in Transformers Post, 2d. each.

No. 1. 150-450	3/6
No. 2. 250-700	3/11
No. 3. 450-1200	4/3
No. 4. 900-2000	4/6
No. 5. 1600-3000	4/9
No. 6. 2200-5000	4/11

BRUNET (genuine)

4000 ohm Double	16/6
4000 ohm Single	8/3
2000 ohm Single	7/6

POST FREE.

From S. H. COULTER, Esq., 55, Court Road, Barry Dock. 30/9/24.

Condenser to hand this a.m. No wonder you are snowed under with orders! IT IS AN EXCELLENT COMPONENT. Please find repeat order.

JACKSON BROS.

"J.B." VARIABLE CONDENSERS

	Standard	Super.	Microdenser
·001	8/6	9/6	11/6
·00075	8/-	9/-	11/-
·005	7/-	8/-	10/-
·0003	5/9	6/9	8/9
·00025	5/9	6/9	8/9
·0002	5/-	5/6	8/-
·0001	4/9	5/3	7/9
Vernier	4/-	4/6	

Post 3d. set.

SQUARE LAW SHORTLY.

HIGH GRADE EBONITE

POST PRICES	3/16 in.	¼ in.
6 x 6	1/6	2/-
7 x 5	1/6	2/-
8 x 6	2/-	3/-
9 x 6	2/2	3/3
10 x 8	3/-	4/2
12 x 6	3/3	4/2
12 x 9	4/3	5/6
12 x 12	5/6	7/6
14 x 10	5/6	7/6

Cut to Size, 3/16 in. at ¼d. square inch.
Post 3d. Foreign Post extra.

CALLERS' PRICES ELSEWHERE

D.C.C. WIRE POST PRICES

16	D.C.C.	½ lb. - 2/-	20	D.C.C.	¼ lb. - 1/3
16	„	1 lb. - 3/6	22	„	¼ lb. - 1/4
18	„	½ lb. - 2/3	24	„	¼ lb. - 1/6
18	„	1 lb. - 3/9	26	„	¼ lb. - 1/8.

28 D.C.C. ¼ lb. - 1/10

CALLERS' PRICES ELSEWHERE

FRENCH THOMSON-HOUSTON

4000 ohm 'Phones
100 pairs at 12/11
POST 6d.

SUNDRIES

Post free

Screw Spade Terminals	doz.	1/-
Pin Screw Terminals ..	doz.	10d.
Spade Tags	doz.	5d.
Empire Tape, ½ in. ..	12 yds	9d.
Insulating Sleeving ..	6 yds.	2/-
Ebonite Knobs, 1½ in.	2 B.A...	6d.
Moulded Knobs 1½ in.	2 for	8d.
Ditto 1 in. 2 B.A. ..	2 for	8d.
Ebonite ex-handles 6 in. ..		9d.
D.C.C., I.R.C. Bell Wire	10 yds.	1/-
Double 'Phone Cords, 72 in. ..		1/11
Porcelain S.P.D.T. Switch ..		1/11
Ditto D.P.D.T. Switch ..		2/6
Battery Clips	doz.	10d.
Ebonite Valve Holders	1/3 and	1/-
Lead-in Wire 4 M/M..	10 yds.	2/6
Lead-in Wire	10 yds.	1/6
Twin Flex	12 yds.	1/11
100 ft. 7/22 Aerial Wire with four insulators		3/6
Nugraving Titles or Scales ..		8d.
"R.I." Choke Coil		10/-
Nickel Panel Switches, D.P.D.T.		1/5
Ditto, S.P.D.T.		1/2
Insulating Sleeving 3 yds. ..		1/4
Tinned copper sq., 16 gauge,	15ft.	1/-
Spearpoint Whisker, gold ..		4d.
Gold Whisker		4d.
Set of 5 (one gold)		6d.
Variometer (250/650) ..	3/3 and	2/6
Ditto Ebonite		4/11
Ditto Ball Rotor		6/11
Burndept Detector		5/6
Screw Wander Plugs ..	pair	6d.
Skinderviken Button, Alumin.		5/-
Seven Twist Drills (H.S.) ..		1/11
Taps 0, 2, 4, 6 B.A. ..	set	2/-
Sorbo Ear Pads ..	pair	1/9
Neutron Crystal		1/6
Blue Tungstalite		1/6
Gecosite (G.E.C.)		1/3
Tumbler Switches (Ebonite) ..		1/9
Valve Sockets, Plain (nut and washer) doz.		1/-
Sets of Spanners		2/-

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POST PAGES CONTINUED

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The CREAM of the WORLD'S HEADPHONES

4,000 ohms.

STERLING 4,000 ohms NEW MODEL	25/-
BROWN'S (Featherweight)	25/-
B.T.H. (Wonderful Tone) ..	25/-
BRANDES (Matched Tone)	25/-
GENERAL RADIO	20/-

TELEFUNKEN 4,000 ohms HEADPHONES

As light as a Feather .. 17/11

Dr. NESPER HEADPHONES

Genuine Nesperphone, 4,000 ohms. Fitted with adjustable diaphragm, detachable receivers, double leather-covered headsprings, long flexible cords, nickel-plated parts. Very comfortably fitting to the head. LOOK FOR THE TRADE MARK. 4,000 ohms .. 12/6 Post 6d. pair.

GENUINE "N & K" HEADPHONES

Guard against inferior imitations which are "cleverly" got up to deceive. Make sure of the genuine article, the original "N & K," and avoid dissatisfaction. See that the letters "N & K"—and no other—are stamped. 4,000 ohms..12/11 6,000 ohms..13/3 Post 6d. pair.

BEWARE OF "PATTERN" OFFERED CHEAPLY

ACCUMULATORS

MADE BY WELL-KNOWN FIRM FOR ME.

2 v. 40 amps. 9/6.	By post 10/6
4 v. 40 amps. 16/6.	By post 17/6
4 v. 60 amps. 19/6.	By post 20/6
4 v. 80 amps. 23/6.	By post 24/6
6 v. 60 amps. 27/6.	By post 29/-
6 v. 80 amps. 33/-.	By post 34/6
6 v. 105 amps. 38/6.	By post 40/6

UNIVERSAL (FRANCO)

Basket Coil Stand, 2-way

POST FREE 5/9

FRANCO, 2-way (plug-in) 12/6
Ditto 3-way 17/6

The only GEARED COILHOLDER on the market.

CHELMSFORD (5XX)

D.C.C. Basket Coil, complete with adapter, specially made to use with 650 variometer, 2/6. By post 2/9

LOADING PLUG and Socket .. 9d.

D.C.C. COIL for 5 X X, 1/6. By post 1/9

BRASS FORMER

TO MAKE YOUR OWN COILS

DOUBLE, 23 spokes each side. POST FREE 3/11

POST PRICE TINNED COPPER

18 Round ½ lb.	2/6
20 Round, ½ lb.	2/6
16 Square, 12 ft. ..	10d.
18 Square, 12 ft. ..	9d.

GUIDE FOR CHELMSFORD

On 1,600 Metres

Aerial	Reaction
Coil No. 150	200
Tuned Anode	250 or 300

"SUCCESS" L.F. TRANSFORMER

Super 21/-

"MURRAY"

(Prov. Pat.)

VALVE HOLDERS

High finish. Absolutely Safe. Low Capacity. EASILY FIXED.

Exceptionally neat appearance 1/3 POST FREE.

RADIO PRESS TRANSFERS 6d.

By Post 8d.

POST PRICES

VARIOMETER 250/600 2/6

Ditto with fixing clips 3/-

EBONITE BALL ROTOR 6/11

ALL KINDS STOCKED at 2/11 3/6 3/9 4/- 4/6

Leave the selection to me and you won't be disappointed

VALVES

Cossor P.1 and P.2	12/6
Mullard L.F. & H.F.	12/6
Mullard D.F. Ora	21/-
B.T.H. R.4 - - -	12/6
B.T.H. P.5 ·06 - -	25/-
Ediswan A.R. - -	12/6
Ediswan A.R.D.E.	21/-
Ediswan A.R. ·06	25/-
Marconi R. and R.5	12/6
Marconi D.E.R. -	21 -
Marconi D.E.3 - -	25/-

POST FREE

French "R" - -	6/11
Phillips "R" - -	7/6
French ·06 - - -	15/11

Post 6d. each

ALL VALVES ON POST SENT AT PURCHASER'S RISK.

MYERS VALVES

UNIVERSAL DULL EMITTER

12/6 21/-

POST FREE

PHILLIPS D.E. VALVES

·04 Type 1·5 to 1·8 each **17/6**

Post 6d. each.

THORPE K4 VALVES

(5-pin) for UNIDYNE **17/6**

THORPE K 1 .. .. **10/-**

POST FREE

5-Pin Valve-holder - - 1/6

"OOJAH" GRAPHITE

Pile Rheostat for D.E. or R Valves **4/-**

N. & K. LOUD SPEAKER

A LITTLE GEM

21/-

POST 1/-

RADIO PRESS ENVELOPES

No. 1 at 1/6
2, 3, 4 at 2/6

COIL STANDS

Ebonite 2-way with Extension Handles Nickel Fittings

3/3

By Post 3/9

Ditto 3-way

4/9

By Post 5/3

CAM-VERNIER

(2-way)

POST FREE **7/6**

POLAR (2-way)

11/-

GOSWELL

(see elsewhere)

"R.I." NEW MODEL

IN SEALED BOX

Don't Buy Otherwise

Post **25/-** Free

NEW LISSEN LINES

5 Point Switch - 4/-
Auxiliary Res. - - 1/3
Lissen Choke - 10/-

Post Free

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GALLERY DOOR

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OPEN WEEKDAYS 9 to 7.45 SUNDAYS 10 to 1

Prices subject to alteration without notice. Every endeavour made to keep large stocks; but am not responsible for manufacturers' non-deliveries.

NO POST ORDERS FROM THIS PAGE.

SUNDRIES.

Legless Valve Holder Solid Ebonite .. 1/-
'Phone Cords (6 feet) 1/5
Nugraving .. .. 7½d.
Similar Sets (Titles or Scales) .. .. 3d.
Good Knobs .. 1½d.
Small Knobs, 2014 B.A. 2d.
Studs, Nuts and Washers doz. 4½d.
Switch Arms 8d. to 1/-
Copper Foil .. ft. 2½d.
18g. Sq. Tin Copper 15 ft. 5d.
16g. Sq. Tin Copper 12 feet 5d.
Round Tin Copper, various Sizes.
Insulated Staples 5 a 1d.
Insulated Hooks 4 for 3d.
Rubber Lead in, 30 feet 1/3
7/22 Copper Aerial, 100 ft. 1/10½
Extra Heavy Aerial 100 ft. 2/- & 2/3
Good Valve Holders 8d.
H.T.C. in Stock 1/6, 1/9
H.F. Transformers, 300/600 .. .. 2/9
Empire Tape, ½ in., 2 yds. .. .. 1d.
Ditto, ¾ in. .. 2 yds. 1½d.
6 in. Ebonite Anticap Handles .. .. 8d.
Skinderviken Buttons (Aluminium) 4/6
Connecticut Switches 1/4
1,000 ohm Bobbins .. 1/3
2,000 ohm Bobbins .. 1/8
Sorbo Rubber Ear Caps pr. 1/4
Adhesive Tape Roll .. 2½d.
Allen var. Gd. Lk. .. 1/3
Allen Anode Res. .. 1/3
Scales, 0-180, 2d., 3d., 4d.
Dial and Knob (Ed. Bell) 1/3
Dial (Ebonite) .. 10d.
Brunet Headphones .. 14/6
Twin Flex .. 4 yds. 6d.
D.C.C. Bell Wire, 10 yds. 5d. (Indiarubber covered)
Sleeving .. yd. 4d.
Wander Plugs pr. 3d.
Coloured Plugs each 1½d. (All screw pattern)
Electron Aerial .. 1/3½
Polished Boxes, 8 by 6 3/6
Strong Valve Template 4d.
Egg Insulators .. 1d.
Reel ditto .. .. 1d.
Thick Rubber Lead-in per yd. 2d., 3d.
Ribbon Aerial 100 ft. 1/10
Panels Drilled
Radio Press Envelopes.
Raymond Fixed Condensers ·001, ·0001 to ·0005, 10d.
·002, ·003, ·004 .. 1/-
·006 1/3; ·01 1/9; ·02 1/9
Polar Micrometer Condenser 5/6
2 Meg. Grid. Leak .. 1/-
Rubber Lead-in 10d. doz. yds.
Valve Windows 6d., 7d., 9d.
R.I. Choke Coil .. 10/-
Lissen Ditto 10/-
Bretwood Valve Holder 1/9

SWITCHES ON

Porcelain D.P.D.T. .. 1/7½
Porcelain S.P.D.T. .. 1/3
Ebonite D.P.D.T. .. 1/8
Ebonite S.P.D.T. .. 1/3
Min. Panel D.P.D.T... 1/-
Min. Panel S.P.D.T. ..10½d.
Tungstalite 1/-
Microstat 2/6
Tumbler Switches (Ebonite) 1/4
Fibre Strip (for Coils) 3 feet 2½d.
D.C.C Wire, per ½ lb.—
13 g. .. 9d. 20 g. 9d.
22 g. .. 10d. 24 g. 1/-
26 g. .. 1/1 28 g. 1/3
30 g. .. 1/6 Etc., etc.
Solder.. per stick 2d.
2 Color Flex .. yard 2½d.
Shellac .. .. 5d.
Battery Box .. .. 4/6 (with clips for 36 v.)
Nickel Pillar Terminals 2d.
Nickel Contact Studs 2 for 1½d.
Nickel Switch Arm .. 1/- (one-hole fixing)
Loading Coil and plug 8d.
Gamages Permanite .. 1/-
Condenser Brushes .. 6d.

BRASS PARTS.

W.O. or Pillar Terminals 1d.
Small Pillar .. 4 for 3½d.
'Phone 4 B.A. .. 1d.
'Phone 2 B.A., 2 for.. 2½d.
Valve Sockets 4 for 3d. (Above with Nut Washer)
Valve Pins and Nuts, 2 a 1d.
Stop Pins and Nuts 2 a 1d.
Plug and Socket pr. 1d.
Spring Washers 4 a 1d.
Spade Screws.. .. 1d
Pin Screws .. 2 for 1½d.
Spade Tags .. 5 a 1d
Spring Pillar Terminals 2½d.
Nuts, 2, 4, 5, 6 B.A. doz. 2d.
Washers (Brass) 12 a 1d.

DETECTORS, &c.

Enclosed Brass, Large 1/3
Ditte, Nickel or Brass, Large 1/6
Small Brass .. .. 9½d.
Ebonite, Enclosed .. 1/-
Burndept 5/-
Easi-Fix Cups 1d. & 1½d.
Gold Spearpoint .. 3d.
Neutron Crystal .. 1/6
Hertzite (Shaw's) 8d. & 1/-
Midite .. .. 6d.

VALVES.

Dutch Detector .. 4/9
Dutch "R" 5/-
Phillips "R" 7/6
French "Metal" .. 6/11

TOOLS.

Set of Spanners .. 1/4
Taps, 0, 2, 4, 6 B.A. set 2/-
Small Soldering Irons 8½d.
7-Twist Drills 1/4

SHAW'S HERTZITE.

BEATS ALL OTHER "ITES." **1/-**

Impossible to Advertise All the Goods Stocked.

MYERS VALVES.

UNIVERSAL. **12/6** D.E. **21/-**

EXIDE.

D.T 9 Type. 2 Volts. (Glass). (For ·06) 5/-

EBONITE PARTS.

Good Coil Plugs from 4½d.
Edison Bell Shaped .. 1/-
Raymond ditto .. 10½d.
Basket Adapters .. 8½d. Also at 1/- & 1/3
2-way Coil Stands .. 2/6
With Extens. Handle 2/11 Also at 3/6, 4/-, 4/6
3-way .. 4/3, 4/6, 5/-
Goswell Cam Vernier 9/-
Franco " " .. 12/6
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Cut to size ½d. sq. inch. WE STOCK ¼-in. EBONITE.

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GENUINE STAMPED. 4,000 ohms .. **12/11**

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Impregnated Board, Wound D.C.C. and Clips, 200/600 metres 2/6
Very Good Value, Wound D.C.C. and Knob .. 1/6
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Igranic, T.C.B., and all known makes.

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3 ft. long, 1 in. wide. 2½d. per length.

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0 to ¼ chuck Cut Bevel and Gear **5/9**

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BATTERIES 4·5

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RADIOTORIAL.

All Editorial Communications to be addressed The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

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The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All contributions to be addressed to The Editor, POPULAR WIRELESS AND WIRELESS REVIEW, *The Fleetway House, Farringdon Street, London, E.C.4. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.*

Technical queries should be addressed to the Technical Queries Department, and must in all cases be accompanied by a stamped addressed envelope. Not more than two enquiries can be answered in one letter, and telephone calls or personal calls at this office cannot be dealt with. A copy of the questions must be kept, as it is not always possible to reproduce the query when replying. Number the questions 1 and 2, and answers will be given under each number.

The Editor desires to direct the attention of his readers to the fact that, as much of the information given in the columns of this paper is of a technical nature and concerns the most recent developments in the Radio world, some of the arrangements and specialities described may be the subject of Letters Patent, and the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

PATENT ADVICE FOR READERS.

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

Questions and Answers

F. L. J. (Manchester).—I wish to wind a set of coils to cover the different wave-lengths used for broadcasting. Should the gauge of wire be the same for small coils as well as for those covering 2,000 metres or more ?

How many turns are necessary for aerial, anode and reaction coils when used in conjunction with a ·001 variable aerial condenser in parallel, and an anode condenser of ·0005 mfd. ?

I wish to make coils as efficient as possible, and am advised that it is better to fasten off the coil by sewing or tying with thread, rather than by immersing in shellac. Is this correct ?

The list of plug-in coils printed herewith shows the coils necessary to tune between 260 metres and 25,000 metres, when used in conjunction with the standard tuning condensers.

The first column gives the size of wire recommended for use in home-made coils, and the second column shows the approximate tuning range in metres. It will be seen that there is a wide overlap between the ranges, so that, for instance, 500 metres, which is in the top range of the second line, is covered by the middle range of the third line, and by the "bottom" range of the fourth line, which tunes from just below 500 metres up to over 1,000 metres.

This flexible tuning is one of the great advantages of condenser-tuned coils, and it not only enables the wave-length to be changed quickly, but covers a very wide range with a limited number of coils.

Nevertheless it must be remembered that in all cases where parallel condensers are used for tuning, it is invariably advantageous to keep the value of the coil high, and the condenser value as low as possible.

Where the aerial tuning circuit is coupled direct to the receiver the "secondary" column may be ignored, and the number of turns for the aerial coil is that shown under "Primary Turns." When loose-coupled tuning is employed the primary or aerial coil remains unaltered, but is coupled (in a coil holder) to a larger coil of the value shown under "Secondary Turns."

The use of shellac to strengthen the coils is very convenient, and it has been widely used for this purpose by manufacturers; but it is really undesirable and should either be used very sparingly, or else avoided altogether. Fastening with thread is decidedly less inefficient, and is especially recommended for the smaller coils, which can be securely fixed in this way.

For those who wish to make their own basket coils, a correction factor is given below the table which shows how the wave-length alters when this type of coil is employed.

It should be noted that the reaction coil values are only approximate, and generally it is best to experiment with the different coils on hand until the best combination is found.

PLUG-IN COILS.

Wire for Primary	Wave-length with average aerial	Primary Turns	Secondary Turns	Anode Turns	Reaction Turns (approx.)
24	260–375	25	35	35–50	35–50
24	310–515	35	50	50–75	50–75
26	370–730	50	75	75–100	50–75
26	460–1030	75	100	100–120	75
26	580–1460	100	150	150–200	75
26	790–2200	150	200	200–250	75
26	1060–2850	200	250	250–300	75
26	1430–4000	250	300	300–400	75–100
28	1680–4800	300	400	400–500	75–100
28	2180–6300	400	500	500–600	100
30	3130–8500	500	600	600–700	100
30	4100–12000	600	700	700–800	100
32	5100–15000	750	850	800–900	100
32	6300–19000	1000	1100	1100–1200	100–150
34	7100–21000	1250	1350	1350–1450	100–150
36	8300–25000	1500	1600	1600–1700	100–150
		·001 mfd. in parallel	·0005 mfd. in parallel	·0002–·0003 mfd. in parallel	

For basket coils allow about 20 per cent. off the maximum wave-length. Wind on a former of 11 slots, with centre diameter of 1½ in. For a ·0005 mfd. condenser instead of ·001 mfd. allow 35 per cent. off. Many well-known coils are subject to letters patent, and the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

A. N. (Oundle, Northants).—What is meant by the term "permeability" ?

Permeability is the capability of a material for conducting magnetic flux. The permeability of air is taken as unity, so that the permeability of any

(*Continued on page* 478.)

The Spirit of Progress.

WUNCELL DULL EMITTERS.

W.1 for Detector and L.F. use **21/-**
W.2. (with red top) for H.F. use, operating at 1·8 volts **21/-**
Types W.R.1. and W.R.2. as above, but with resistance incorporated to operate off 2-,4- or 6-volt accumulator **23/6**

THE same spirit of progress which was responsible for the design of the Cossor Valve still dominates the research workers responsible for the new Wuncell—the Cossor Dull Emitter.

Instead of merely producing another Valve of similar characteristics to any already on the market, the Cossor Research Staff went boldly to the root of the problem and succeeded in producing a Valve which will be as popular in its class as the wonderful P-type Cossor Bright Emitter.

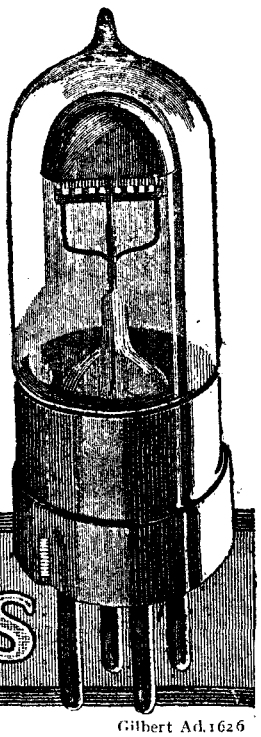
Operating at a temperature of only 800 degrees (as against the ·06 type of Valve operating at 2,000 degrees) its filament glow is barely noticeable in daylight. And owing to its extremely low current consumption and robust filament design (in diameter the Wuncell filament is approximately the same as the standard bright Valve) its life should be almost indefinite.

But true progress does not end with Valve design—service counts for something, too. In the new Cossor packing scheme every Valve will be finally packed in its wrapping of cotton wool and sealed in its carton. Your Dealer will not find it necessary to break the seal to prove to you that the filament is intact. His Cossor Showcard will prove it by a flash when the carton is placed in contact with it.

Thus every Cossor user is guaranteed an absolutely new and unused valve.

BRIGHT EMITTERS.

P.1. The standard Detector and L.F. Valve **12/6**
P.2. (with red top). The standard H.F. Valve **12/6**
Now packed in new sealed Cartons



Cossor Valves

RADIOTORIAL QUESTIONS & ANSWERS.

(*Continued from page* 476.)

material is the ratio of the flux density produced in the material by a given magneto-motive force to the flux density that would be produced in an air path of the same length, by the same magneto-motive force. The permeability of magnetic substances decreases as the flux density increases; for instance, at a flux density of 10,000 lines per square cm., the permeability of transformer stampings is about 2,000, while it is only 200 at a flux density of 17,500.

* * *

N. B. (Lockwood, Huddersfield) and others.—What size of coils should be used in order to get the different B.B.C. stations? Should the aerial coil be smaller than the secondary or other closed circuit coil used in conjunction with it? I notice that in the instructions for making sets the coil in the aerial circuit is always given smaller in size than the other coils, but I am not certain as to whether this difference always applies, or only in the first instance before the set is "loaded." Is there a table showing the correct number of turns on coils to use for different wave-lengths?

See reply to F. L. J. (Manchester).

* * *

"NOVICE" (Dukinfield), A. A. R. (Southall), A. E. E. (Mexborough), "A LISTENER" (no address), S. H. P. (Edinburgh), F. T. R. (Tonbridge), C. S. (Baldock), H. A. W. (Hull), H. A. H. (Clerkenwell), H. F. (Bow), A. J. E. (Cardiff), W. C. (Glasgow), J. T. E. (no address), F. E. C. (Salisbury), L. W. (S.W.7), C. D. (Chester Moor), J. A. L. (Clapham Park), W. S. T. (Anfield), T. A. D. (Weston-super-Mare), A. E. C. (Willesden), W. A. (Keighley), F. S. (Lausanne), C. J. M. (Swindon), G. H. V. C. (Godalming), R. W. F. (Harrow), J. B. (Bishop Auckland), J. H. (Bingley), A. S. B. (Blyth).

READERS' QUERIES.

IMPORTANT ANNOUNCEMENT.

Owing to continued heavy pressure upon the Technical Queries Department a revision of the Rules has recently been made.

The number of queries which can be submitted in one letter is now limited to TWO only. These two queries should be stated briefly and concisely, and they must relate to genuine technical difficulties.

The Query Department cannot undertake the design of switching arrangements such as can be solved by reference to any good book of circuits; nor can they enter into long theoretical explanations, which can be found by readers in any textbook on wireless.

Diagrams and layout of components should NOT be submitted for wiring-up, but, of course, any particular difficulty which arises can be accompanied by a sketch to illustrate it.

Remember—

(1) DO NOT ASK UNNECESSARY QUESTIONS.

(The queries you raise may be dealt with on the next page, and by raising them again you are only delaying answers to other queries.)

(2) Two questions only are allowed, which should be numbered, and stated as briefly and concisely as possible.

In sending your queries unaccompanied by a stamped addressed envelope you disregarded the rules of the Query Department. As the questions are not of sufficient general interest to answer through these columns (or else have already been dealt with) replies can only be sent through the post. For this purpose a stamped and addressed envelope should be enclosed.

Foreign readers—whose postage stamps cannot be used for prepayment of letters to be posted in this country—can send "Reply Coupons," which are obtainable at their local post-offices, and can be exchanged here for British stamps. The queries should be repeated, and should in all cases be numbered. Replies to each question will then be given under the appropriate numeral.

(*Continued on page* 479.)

RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 478.)

J. B. (Hounslow).—I am very interested in wireless, but quite a novice, and should like to get all the information I can upon it. Is there any book, such as an Encyclopedia of Wireless, and if so, where can it be obtained ?

The "Harmsworth's Wireless Encyclopedia" has just been completed. It was published in 24 parts, which can now be obtained bound in three volumes, price 16s. 6d. per volume.. Inquiries should be addressed to The Amalgamated Press (1922), Ltd. Back Number Dept., Bear Alley, Farringdon Street, London, E.C.4.

* * *

"TWO READERS" (Beckenham, Kent).—When anyone is oscillating is it possible to obtain clear reception ? We have a single-valve receiver with reaction, and we notice that the receiver does not appear to oscillate during 2 L O's transmissions, although the coils are very close together, but when 2 L O is not sending the set appears to oscillate very easily.

When a receiver is oscillating, clear and loud reception of music and speech is impossible. If your signals are pure you may rest assured that you are not causing interference.

* * *

J. G. (Radlett).—I believe that experiments with the Unidyne took place in my village and that certain results were obtained. Can you let me know whether loud-speaker results from London were ever obtained on one valve ?

No, the capabilities of the Unidyne do not exceed those of ordinary "straight" circuits.

I have never constructed a valve set before. Would the reflex Unidyne present any great difficulties ?

To you it would; in view of the fact that you have no previous valve experience, we would not advise you to tackle anything more ambitious than the single-valve Unidyne.

* * *

B. E. M. (Herts).—My crystal seems to have gone dead. Is there no way of reviving it so that it can be used as before ?

This can be done in different ways, though none of them can be said to be a certain cure for all crystals. You do not give the name of your crystal, but the galena and treated galena type of crystal (hertzite, permanite, etc.) can generally be improved by soaking for about ten minutes in a saturated solution of alum. About a dessertspoonful of alum (procurable at any chemist's) is placed in a wineglassful or similar quantity of warm water, and left overnight. In the morning a small quantity of alum should be still undissolved. If not, add a little more of the solid. Finally pour off the liquid into a small vessel, and the solution is ready for use.

After soaking the crystal for 10 to 15 minutes, remove it, and allow to dry (not in front of a fire), It will then be seen to be dull instead of bright as is usual. The dulness is due to a thin coating of alum, and this covering should have the effect of providing many more sensitive spots, and in rendering the crystal much more efficient. Avoid touching the crystal with the fingers at any time.

* * *

"LOUDSPEAKER" (Wolverhampton). — I wish to receive loud-speaker signals from several B.B.C. stations, and as the set will be used in a very large room I should like to use a power-valve for the last L.F. stage. What set do you recommend, and could I make it at home ? I have already made an excellent one-valve and crystal set.

A suitable set was recently described in POPULAR WIRELESS 122, under the title, "How to Construct a Power-valve Loud-speaker Set." It is a straightforward circuit, and with previous experience you would probably not find any particular difficulty in construction.

The Back Number describing this set can be obtained from:

The Amalgamated Press (1922), Ltd., Back Number Dept., Bear Alley, Farringdon Street, E.C.4. Price 4d. Post Free.

CORRESPONDENCE.

(Continued from page 466.)

small minority, and I should doubt if the most educated and cultured listener thinks much of the hybrid entertainments frequently arranged.

I hope your "Complimentary and Uncomplimentary" column is going to be introduced, although quite prepared to find that the stolid indifference of the man in the street will not let him take the trouble to express himself—he lays down his 'phones.

So long as there is no competition and music publishers cannot arrange to have their songs and instrumental music broadcast as the finest advertisement they could have, it will be impossible for the B.B.C. to provide for 365 days a year. No one can please everybody, but thousands more could be pleased than are with broadcasted programmes.

Yours faithfully,
GEORGE E. HOLLOWAY.

Wilbury, 71, Sydenham Road, North Croydon.

ROUND THE CONTINENT.

The Editor, POPULAR WIRELESS.

Dear Sir,—With regard to the reception of German and Danish broadcasting, my experiences are as follows. Using a two-valve (H.F. and Det.) set constructed from instructions given in POPULAR WIRELESS, I have received the following stations: Berlin, 430 m.; Breslau, 415 m.; Hamburg, 400 m.; Leipzig, 452 m., at strength sufficient for them to be heard with 'phones five or six feet from the head. Also, I have received Stockholm, Frankfurt-am-Main, Stuttgart, and Madrid at comfortable 'phone strength. The Hamburg and Frankfurt stations end their concerts with an anthem set to the tune of Praise the Lord. Last week I heard a station on about 600 m. quite clearly, but was unable to catch any call sign. This station also finished up with the anthem. Would this be Vienna? With the same set I am able to receive Birmingham (30 miles) and Nottingham (relay) (40 miles), with sufficient strength on speaker to be understood perfectly anywhere in the room. London and Manchester can be heard about six feet from the loud-speaker. If I disconnect the earth lead signals from these stations are just the same, but with the other B.B.C. stations there is a decrease in strength. My aerial is unscreened, except for lead-in, and 30 feet high. I trust that this will be of some interest to your readers.

I remain, Yours sincerely,
M. S. WOODHAMS.

P.S.—I am using B.T.H. B5 valves with 40 volts H.T.

90, Railway Terrace, Rugby.

ALTERNATIVE PROGRAMMES FROM 5 X X.

The Editor, POPULAR WIRELESS.

Dear Sir,—I quite agree with your correspondent with regard to the alternative programme. Capt. Eckersley's promises appear rather like the proverbial pie-crust, and it is a pity he cannot carry out some of them, instead of flitting off to America in search of new ideas.

His excuse that London must be relayed because they give the best programmes is as weak as his argument that 5 X X must be within 40 miles of London to come through properly. Mr. Palmer's "Round the Stations" evenings show clearly that excellent entertainment is provided everywhere, and that as a general rule all come through very well indeed.

It would be a great pleasure to crystal users if 5 X X were to take the stations in turn, wherever an especially good programme is offered, so that they could have their choice of that or their own local station—as many must be able to get both, under good conditions.

Yours faithfully,
Minford Gardens, W. J. THOMSON.

CRYSTAL RESULTS EXTRAORDINARY.

The Editor, POPULAR WIRELESS.

Dear Sir,—Re above, if Mr. Blackwood is not leg-pulling, then I consider he has a most marvellous set. The thing that I cannot understand is how he manages to cut out Belfast. Now, if he is not leg-pulling, I think it would be of great interest to you and your readers to know the circuit he employs to get nine stations and one of the Continental stations. Really, these results make one think!

Yours truly,
L. I. EWIN.

35, The Close, Newcastle-on-Tyne.

SIX AMERICAN STATIONS RECEIVED.

The Editor, POPULAR WIRELESS.

Dear Sir,—It may interest you to know that on the morning of Oct. 4th I received the following six American broadcasting stations on five valves, 2 H.F., 1 Det., 2 L.F.

W G Y, Schenectady, N.Y.; W J Z, New York, N.Y.; W E A F, New York, N.Y.; W B Z, Springfield, Mass.; W D A R, Philadelphia, Pa.; K D K A, Pittsburg, Pa. I have also received W G Y on your excellent simplified one-valve "Unidyne."

Wishing your paper every success,
Yours faithfully,
H. A. MAXWELL WHYTE.

Burtleigh, Church Road, Forest Hill, S.E.

THE ONE-VALVE UNIDYNE.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have just been trying a one-valve Unidyne set, eliminating the transformer, and hasten to congratulate the inventor for his great achievement. I have attained splendid results, having heard all the B.B.C. stations and also Radiola and Ecole Supérieure very loudly.

I am yours truly,
J. ENGLEHEART.

St. Edmund's College,
Challoner House,
Old Hall,
Ware, Herts.

MORE UNIDYNE RESULTS.

To the Editor, POPULAR WIRELESS.

Dear Sir,—I am writing to thank you for information received regarding my one-valve "Unidyne" set, from which I am receiving good results. I have received a number of distant stations, but last night I was listening to a station from which music and speech was coming in quite clear on 'phones, and was surprised to find it was the Manchester station, which closed down about 10.35 p.m.

It might be of interest to you to know that I am using a ·002 fixed condenser attached to the earth wire one side to wire, and other side to earth terminal, which greatly improves the reception of the set.

I am still using the 10–1 ratio transformer in the set, and could you kindly inform me if I could use this transformer in any other two-valve set (Unidyne)? (Afraid not.—Tech. Ed.)

You may use this letter or any part for publication if you wish. Wishing POPULAR WIRELESS and inventors every success.

Yours faithfully,
W. DUTCH.

43a, Hammond Road East, Southall, Middlesex.

CONCERNING TELEPHONE CONNECTIONS.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have just read in the current issue the excellent remarks by Mr. Rankin on the above subject, in which he urges the importance of correctly connecting the 'phones to the proper pole terminals on the panel. It would, however, in many cases, puzzle a new hand at the wireless game to fix upon the positives and negatives of his set. The following method is, however, so simple that no one could easily make a mistake in applying it.

Procure from your dealer a book of polarity paper, price twopence. Attach a short piece of wire to each panel 'phone terminal, take a small piece of the paper, moisten it with water, and apply the free ends of the wire to it, of course, not touching each other, but about half an inch apart. In a few seconds the paper turns red where it is in contact with the current from the negative pole.

All that remains to be done is to make a little cross near the terminal which carries the positive current and the usual little dash near the other.

I should advise my readers to test the paper by the H.T. battery so as to make sure it is the right sort, as dealers sometimes are apt to give one the ordinary chemical litmus paper, which will answer the purpose in experienced hands only. I advise readers to peruse Mr. Rankin's remarks in No. 123, page 246, and they cannot very well go wrong with their connections when that new set comes along.

Yours faithfully,
GEORGE E. COX.

14, Jesse Road, Leyton.

(Continued on page 481.)

CORRESPONDENCE.

(*Continued from page 480.*)

THE ONE-VALVE UNIDYNE UNDER ADVERSE CONDITIONS.

The Editor, POPULAR WIRELESS.

Dear Sir,—In conjunction with an aerial of 100 ft. (Electron) 20 ft. high, I am able to get all B.B.C. stations, including a few relays, France, Spain, and two other foreign stations (unknown to me) any night; 6 B M, 5 W A, 2 L O, and Manchester in daylight. All the above stations were brought in on one valve without any earth connection whatever. The set is situated at the base of a hill 600 ft. high, which screens all stations except Belfast. Aerial directional to America. The down lead comes right through a large pear-tree. Every word could be understood using three pairs of 'phones in series. Perhaps this may be of interest to readers of "P.W."

Wishing your valuable paper continued success.

Yours faithfully,
D. J. JENKINS.

Gellinudd, Pontardawe, Swansea.

P.S.—The H.T. batteries seem to find a liking for the rubbish heap in this district lately.—D. J. J.

WIRELESS SOCIETY TESTS UNIDYNE.

The Editor, POPULAR WIRELESS.

Dear Sir,—It may interest some of your readers to know the results obtained with a single-valve Unidyne set tested at a recent meeting of this society. I would mention that the set in question was roughly made, and only an experimental set, but the results were a surprise, I think, to most of us.

Bournemouth was received with wonderful clearness, also Cardiff. London was quite good, considering it fades badly here. Manchester and Birmingham were very clear, and Newcastle was particularly good. Glasgow also came in well, and some foreign stations. When one considers everything this is very satisfactory, especially with four pairs of 'phones in use. With one pair of 'phones the circuit equals some of the single-valve H.T. sets. It may not be quite so loud in some stations, but the advantage is the very quiet working. We found that the condenser across the 'phones is of very great importance and critical, in fact, to obtain the best results it requires careful adjustment generally. During the evening we tried the effect of connecting up the loud speaker in place of the four pairs of 'phones, and music could be heard clearly several yards away. What we should like to test now is a two- or three-valve Unidyne set.

Yours faithfully,
LEONARD CUTBUSH,
Hon. Sec., The Jersey Radio Society.

54, David Place, St. Helier, Jersey.

THE "P.W." ULTRA-CRYSTAL SET.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have just completed the original Ultra-Crystal set, as described recently in POPULAR WIRELESS. On Tuesday, the 2nd, I donned 'phones for the first time, and I was surprised to be able to tune-in Glasgow, though very faintly. The vocal items were unreadable, but the band of the Gleneagle Hotel was clear.

At first I thought this was due to reradiation, but I have tuned-in this station every night this week at the same strength, and I now consider it is due to the efficiency of the circuit.

My aerial is 55 feet long and 35 feet high, and I have two earths, waterpipe, and a plate sunk in the soil.

Thanking you and your staff, and wishing POPULAR WIRELESS the best of luck.

I remain,
Yours sincerely,
D. L. CAMPBELL.

99, Duncairn Gardens,
Belfast.

A NEW INDOOR AERIAL.

The Editor, POPULAR WIRELESS.

Dear Sir,—With reference to Mr. O. J. Rankin's article on a novel aerial in this week's number of your paper, I take this opportunity of informing you that in June, 1923, I submitted the idea of crimping metal by means of gear-wheels to Mr. F. O. Read, and some months later, between us, we produced what is now on the market and known as the "True-wave Form" aerial. This is being sold by Mr. Read's firm, Mead and Morris, 31, East Castle Street, W.1. The provisional patent for the idea was taken out several months ago by Mr. Read on our behalf, and I have written evidence in my possession to substantiate the whole of the above.

Possibly Mr. Rankin was unaware of the provisionally patented copper wire corrugated aerial, the joint invention of Mr. F. O. Read and myself. As a matter of fact, so long ago as last May or June, I presented some of these aerials to several staff editors of a contemporary paper, and also to Captain Eckersley, of the B.B.C., for private use.

Yours faithfully,
W. P. AVELING.

34, Putney Park Lane,
S.W. 15.

SOME NOTES ON TRANSFORMERS.

(*Continued from page 465.*)

of energy, but there would be distortion. The resistance of the wire would be practically increased by the complicated reaction effects of the core.

It is rather surprising that these effects are not deleterious even in the case of audio-frequencies. It must have some bad effect, though it appears not to matter in practice. At the same time, the cores of all transformers should be very carefully made, and these bad effects kept to a minimum by special selection of the quality of iron and by thoroughly subdividing it in the lateral direction.

On these considerations is based the familiar fact that high-frequency coils are made without iron; though in low-frequency coils the use of iron is permitted, and on the whole found advantageous, though it should always be used with circumspection; and it seems to me possible that sets and the articulation of loud speakers might be improved by dispensing with it, for instance, by using moving coils in a steady magnetic field. Permanently magnetised iron does no harm at all. All the effects spoken of are characteristic of varying magnetism under the influence of fluctuating currents.

SATISFYING A NATION.

(*Continued from page 423.*)

a special degree of understanding is expected of them.

The thing is far too big and too involved and too far-reaching to meet the views of any individual or any group of individuals all the time. I submit that commonsense demands that all sides be reviewed, and criticism directed only when one is sure of the ground. There are many more profitable ways of dealing with such a service than by criticism, though I quite admit that it is at times required, and at times a great help as well.

This B.B.C. is a public service where everyone concerned is working to the limit of endurance, sometimes beyond it, to make and keep our national broadcast service the best and greatest in the world, and the most useful in every respect. It is too full of "potential" to be ignored or misused on the one hand, or confined on the other. All its functions, entertaining or informing, have to be handled with the same care, although many might like it to be all of one and none of the other.

Perhaps it may be imagined that we have, not only all the money we need, but more than we need. Money enough or too much! If the revenue is doubled it will be needed if we are to keep in sight of all that we have to do—so much still remains—and more still if we are to keep up with the vision of what ought to be done. The broadcasters have not been given to talking about their difficulties or their accomplishments or their expectations. Such is not a national characteristic of ours anyhow. But sometimes I believe they err in the other direction. We shall see what the chief engineer says when he returns from America.

TECHNICAL NOTES.

(*Continued from page 428.*)

manner in which two samples of a substance may be chemically identical and yet physically very different, one being in the crystalline form and the other being in the amorphous form, may be illustrated by the case of carbon: graphite and diamond are both pure carbon, and therefore chemically identical, but graphite is in the amorphous condition and diamond in the crystalline.

In using the "perikon" detector, which consists of zincite opposed to bornite, copper pyrites, or tellurium, it should be borne in mind that the substances are brittle, and when making a contact between two crystals they should not be ground hard together, but should be carefully removed out of contact and replaced in different positions until a sensitive spot is found, the minimum pressure always being employed.

Perforated Diaphragms.

With reference to the note I made on the above subject some time ago, I have received a letter from M. de Brandner, President of the Cercle Belge d'Etudes Radiotelegraphiques et Radio Club de Belgique, in which he says: "The improvement of a telephone receiver by piercing a small hole in the diaphragm has been known for some time. I put perforated diaphragms in my telephones and loud speakers two years ago, and found the results really excellent. A hole $\frac{3}{32}$ of an inch suffices, and I drill it $\frac{1}{2}$ inch or $\frac{1}{4}$ inch from the centre. The tone and quality of reception are distinctly improved."

Non-Interfering Circuit.

The circuit which forms the subject of patent No. 220,765/24 (N. P. Hinton) is so designed that should oscillation take place, no interference is thereby caused. The principle of the circuit is to employ two high-frequency transformers, the primaries being connected together in series in the aerial circuit, whilst the secondaries are connected together in series in the oscillatory circuit. The common point of the secondaries is connected through a reaction coil to the two opposite ends of the secondaries, two similar condensers being introduced into these two return paths.

Detecting Crime.

The finger-print method of identification of suspected criminals was introduced by a Frenchman named Bertillon, and more recently the famous French scientist Belin has succeeded in adapting his well-known method for the transmission of pictures to the transmission of finger-prints by wireless. It is easy to see that the ability to circulate the picture and description of a suspect, together with a facsimile of his finger-prints, within the space of a very few hours, will be a great aid in the apprehension of the fugitive.

Physiological Radiations.

The much-discussed question as to whether living organisms are the source of certain kinds of ether vibrations has been given a new interest by the suggestion of a French physician that it might be possible, if the character of the supposed radiations were properly understood, to employ the

(*Continued on page 484.*)

TECHNICAL NOTES.

(*Continued from page* 483.)

same for the destruction of undesirable organisms, such, for example, as disease germs. It is already known that short waves, such as X-rays and the gamma-rays from radium, have the effect of destroying living tissue, but it is presumable that the supposed characteristic radiations considered above are of a different nature and that their action, if they could be re-directed against the organisms in question, would be of a different, in particular of a more selective kind.

On the general question as to the emission of radiations from living organisms, there is a large amount of presumptive evidence that such radiations exist, for it is known that the vital processes, if not of a chemical nature, are at any rate accompanied by chemical changes, and it is presumable that all chemical changes are accompanied by the production of ether waves. It is probable that in the near future an important and fascinating branch of scientific inquiry will be opened up on the lines indicated above.

Current From A.C. Mains.

In the "Western Wireless" (Perth, W. Australia) is an interesting account of the experiments of an amateur, Mr. T. J. Jewell, in the use of alternating current from the electric mains for the purpose of heating his valve-filaments. This has, of course, already been accomplished in one or two ways. The method adopted by Mr. Jewell is to use an ordinary single-valve tuned anode (H.F.) and crystal detector, the 40-cycle A.C. being applied to the filament by means of a transformer. He has tried many other circuits, but has been unable to attain success when using a valve as detector or L.F. amplifier.

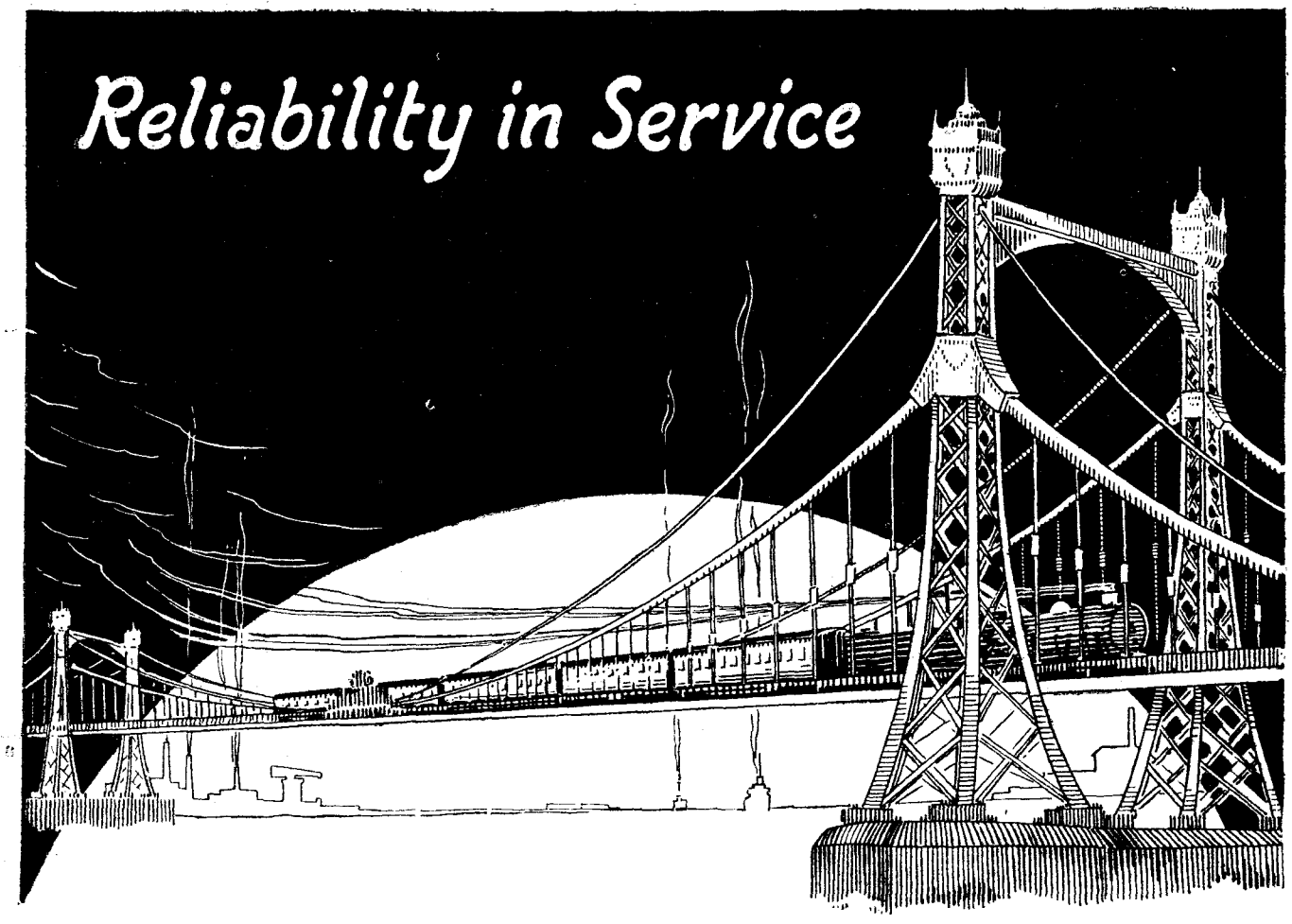
An unusual feature is the position of the filament resistance, this being placed on the transformer secondary side and in circuit before the filament leads commence from the potentiometer. This the inventor considers to be important, and possibly to some extent responsible for the elimination for the A.C. hum. The resistance is used purely for regulating the filament voltage and for obtaining a negative bias for the grid. In order to eliminate the A.C. ripple, it is necessary to find a neutral point on the potentiometer with the grid return. A good deal of detailed information is given in the article referred to, which lack of space prevents our reproducing here. But, according to the editorial remarks, the set has been tried out and found highly satisfactory.

The Unidyne Abroad.

The Unidyne has, of course, created a stir in many different parts of the world, but I must confess to being a little surprised to read an account of it in the "Radio-Bladet" (Stockholm). Quite a considerable amount of space is devoted to the discussion of the theory, and the opinions of eminent scientists thereon.

I also noticed an account of the Unidyne in the "Radio Rundschau" (Vienna) as well as in many other European and foreign journals.

R/R



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