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POPULAR WIRELESS REVIEW

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and Wireless Review

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

October 4th, 1924.



64
Pages

Bringing radio cheer to the inmates of a hospital ward.

FEATURES IN THIS ISSUE.

Bearings and Distances Between B.B.C. Stations.

Capacity Measurement.

Simple Apparatus for Coil Winding.

Coupling H.F. Valves.

A Simple Super Circuit.

Changes for 5 X X.

MORE ABOUT THE EXHIBITION.

A THREE-VALVE DUAL AMPLIFICATION SET.

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POPULAR WIRELESS

AND WIRELESS REVIEW.

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

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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 Pittsburgh.

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 'Oajah' 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 Bodendstedt, 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.

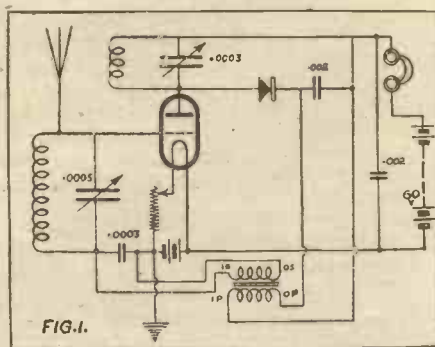
HOW TO CONSTRUCT AN EFFICIENT THREE-VALVE RECEIVER EMPLOYING DUAL AMPLIFICATION.

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.

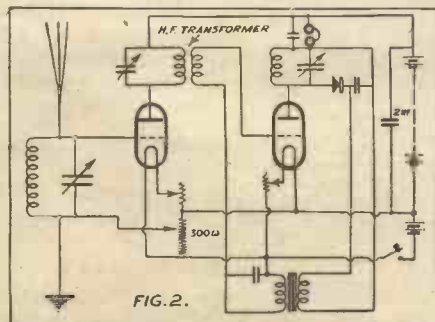
The first dual amplification circuit tried



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.I. 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.

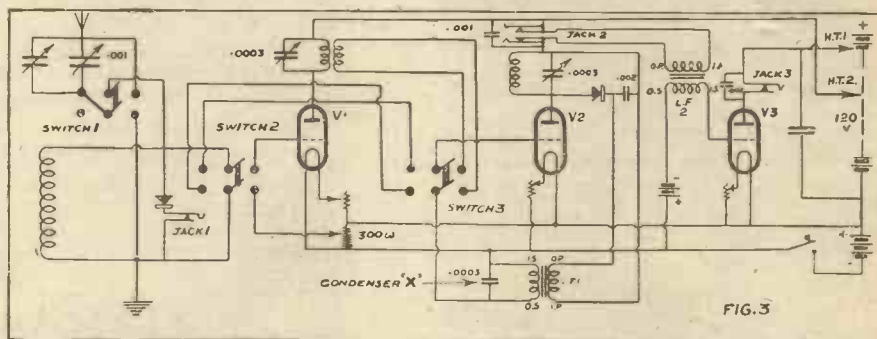
The next stage in the series of experiments was to try out circuits employing one valve as a high-frequency amplifier, followed by one valve dual with crystal detector. For coupling the high-frequency and dual valves the tuned anode method was first tried, and good results were obtained in this way. 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

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



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.

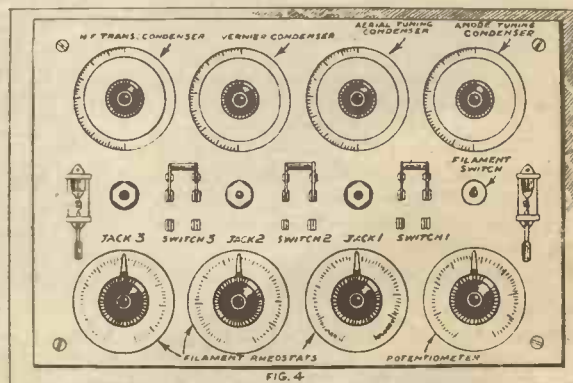
The next step was to add a stage of note magnification, and this brought in all the above stations on the loud speaker, London, Glasgow, Bournemouth, and Paris coming through with remarkable strength.

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

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

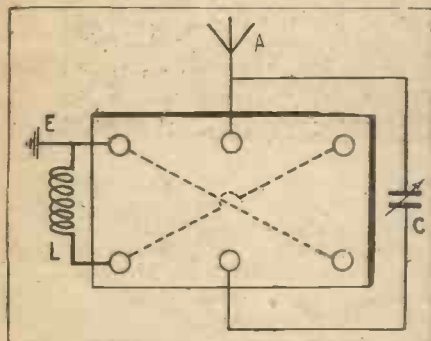


by the writer is given in Fig. 4. This is drawn to scale, the panel being 15 in. long by 10 in. wide. All terminals are carried on (Continued on page 228).

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

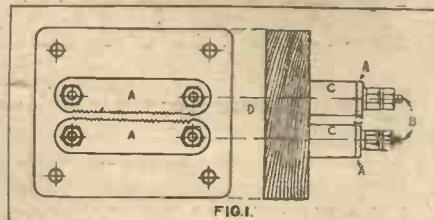


FIG. 1.

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.

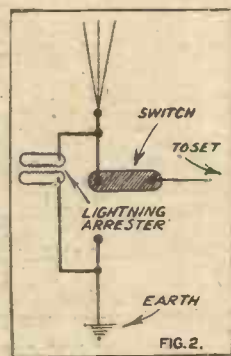


FIG. 2.

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

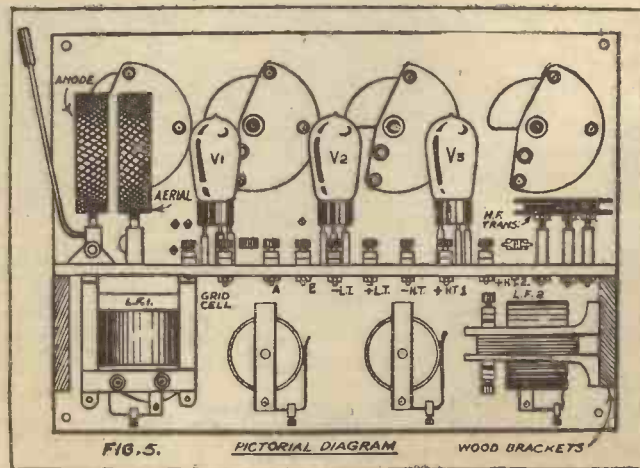
indicated in the diagram, but if a howl is heard as soon as the note magnifier is switched in, the primary or secondary connections to this transformer should be reversed. If this is not effective a larger condenser should be substituted for that marked "X," which is in the grid circuit of the dual valve.

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.



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

And now—

Brandes

The Name to Know in Radio

Introduce the Table-Talker

Trade Mark.

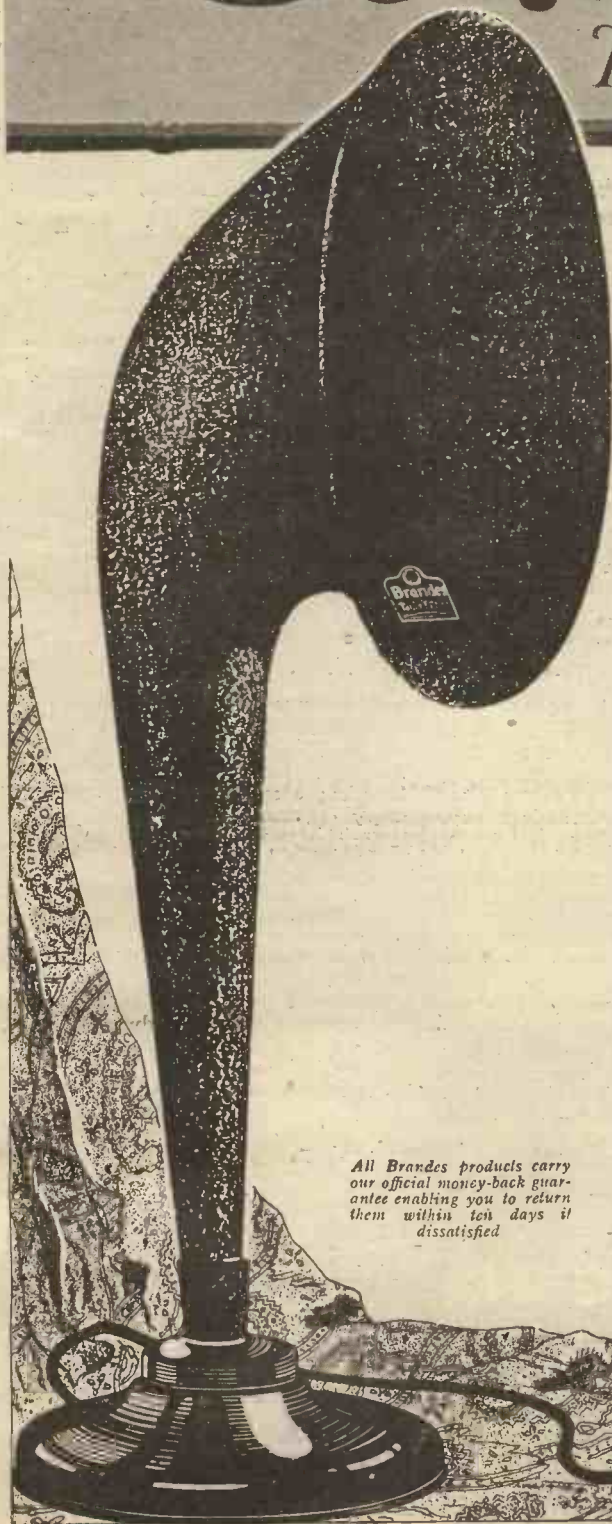
Original in the real beauty of its performance, original in its ingenious construction, original in its remarkable price. The horn is so contrived that every note registered is encompassed and emitted with absolute purity—there is no discordant echo from its walls. The full-toned accuracy of reproduction is consistent with the mellow note which is the chief characteristic of the famous Brandes Superior “Matched Tone” Radio Headphones.

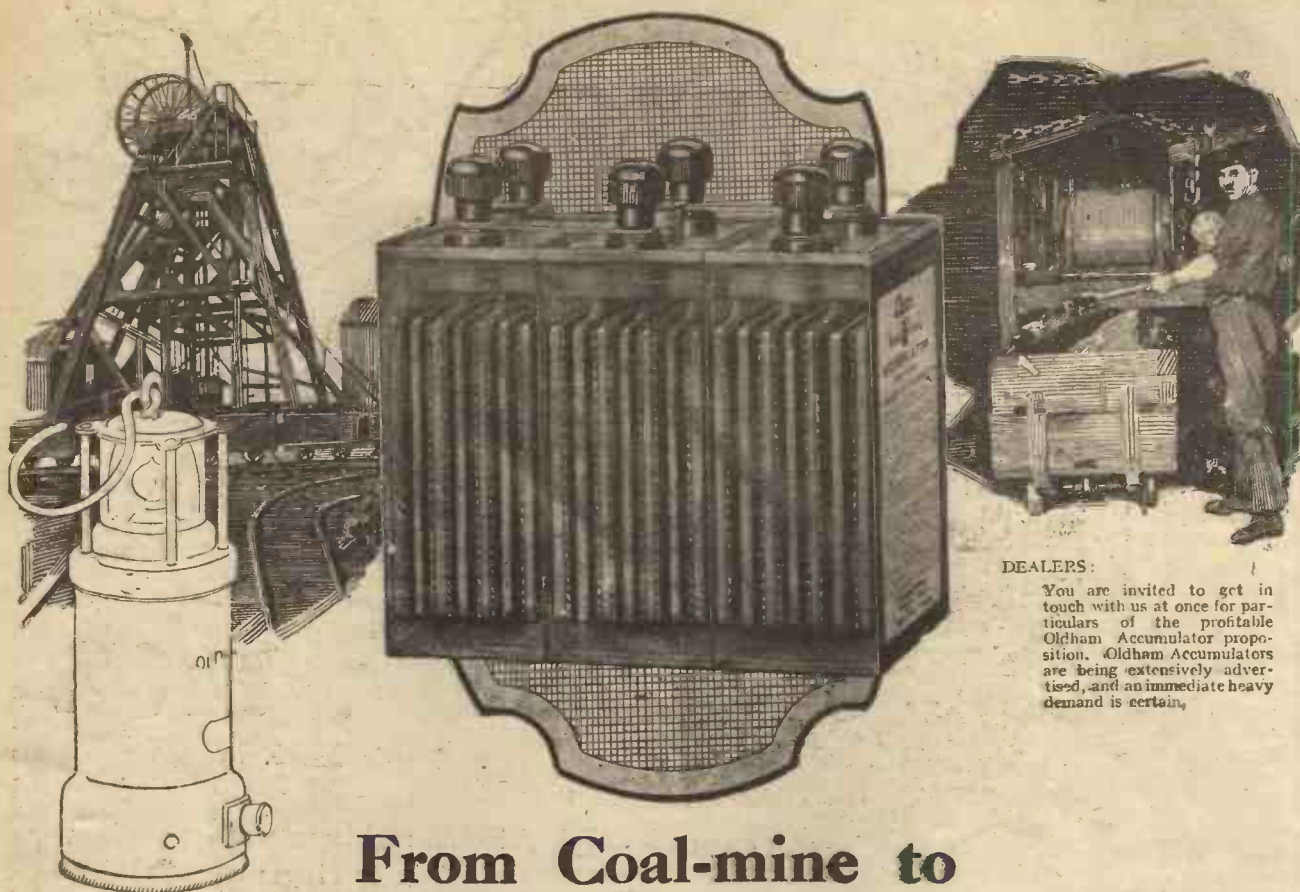
The horn is matched to the unit so that the air resistance produced will exactly balance the mechanical power of the diaphragm. It has a self-adjusting diaphragm, is twenty-one inches high, with a ten-inch bell, and felt-covered base. Simple lines and a neutral brown finish make it a tasteful and effective addition to your set.

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All Brandes products carry our official money-back guarantee enabling you to return them within ten days if dissatisfied

*Tune with Brandes
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Then listen with
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DEALERS:

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.

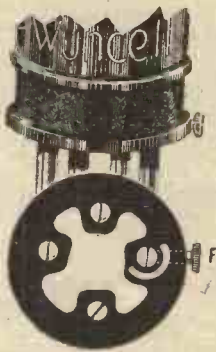
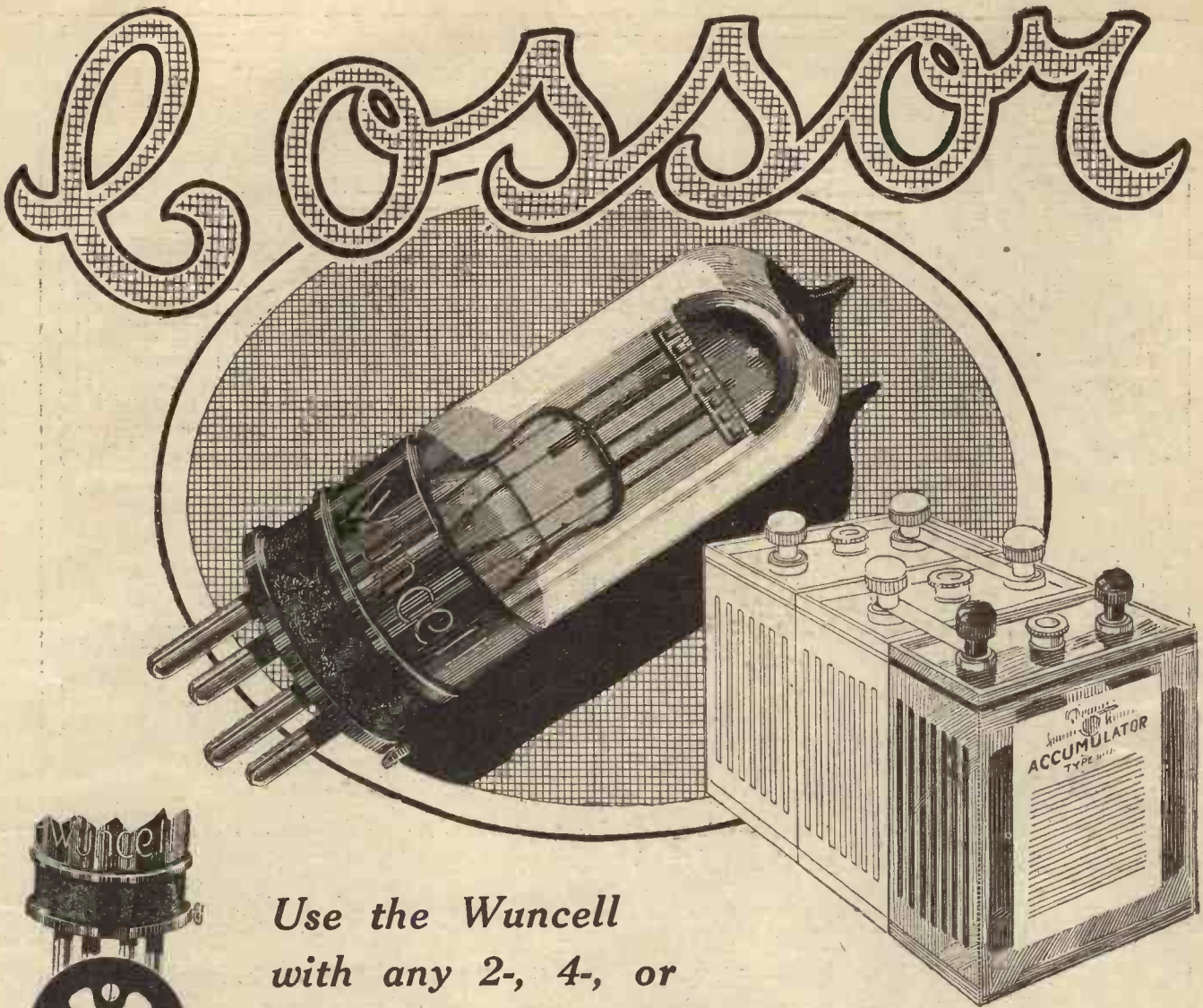
This same special activation process is now being applied to Accumulators for Wireless use. As every amateur appreciates, he expects from his accumulator a two-fold service; a constant and absolutely unvarying supply of current, and a long life between charges. This work devolves entirely upon the plate; 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 discriminate. 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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Special Activation Process
OLDHAM
 ACCUMULATORS



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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.

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/-

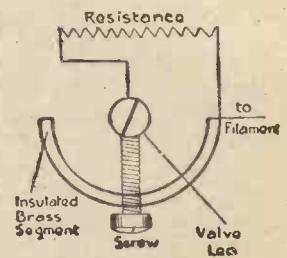
MOST Valve Receivers to-day use more than one Valve and when a wireless enthusiast wants to change over to Dull Emitters he has two alternatives: firstly to scrap all his existing valves and put in a complete set of Dull Emitters; or, secondly to readapt his Set so that his one new Dull Emitter will 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.



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.

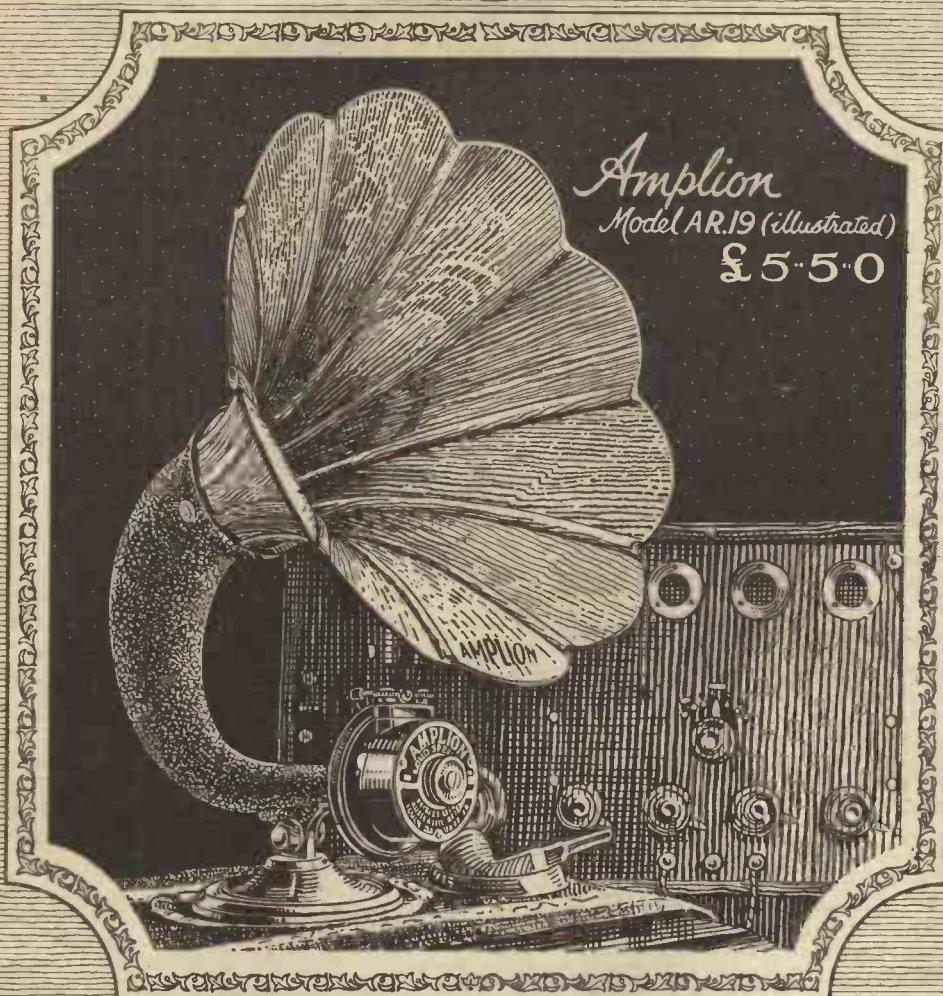
Large interesting Folder on the Wuncell sent free on application.

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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,

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

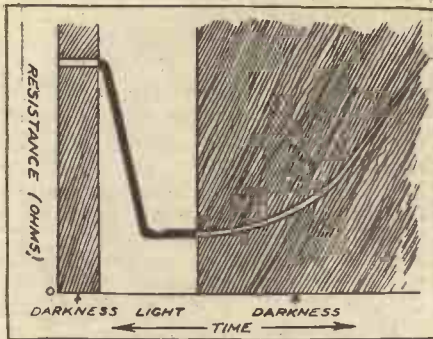
pyrites, and, generally speaking, it constitutes the material which is worked up to produce commercial selenium.

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).



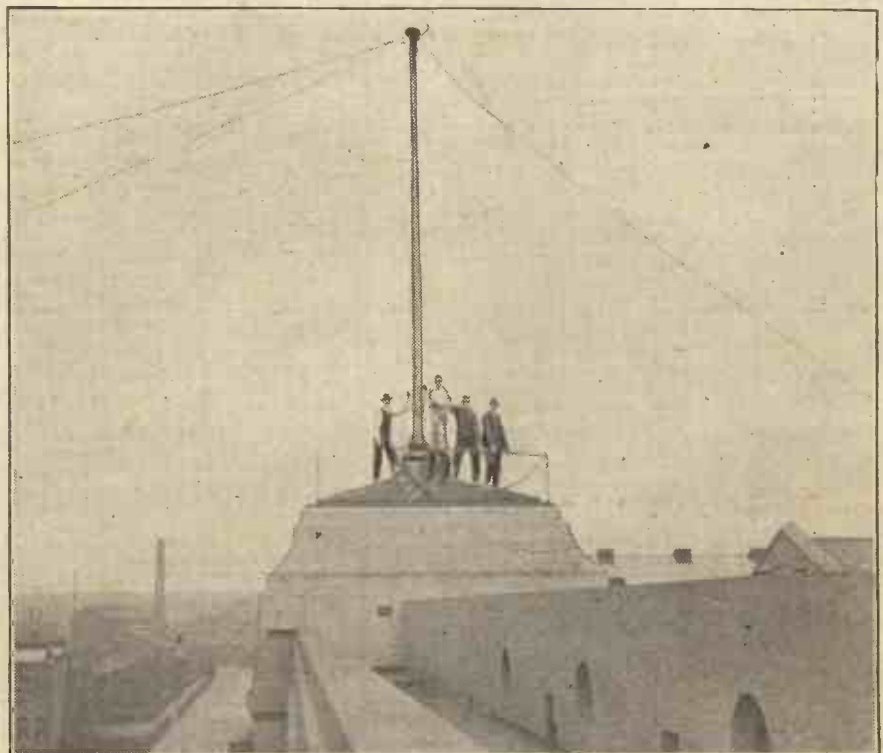
may very feasibly be perfected by the agency of selenium, and it is because of the direct possibility of this fact that the material presents such a good deal of interest to the radio experimenter.

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



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.

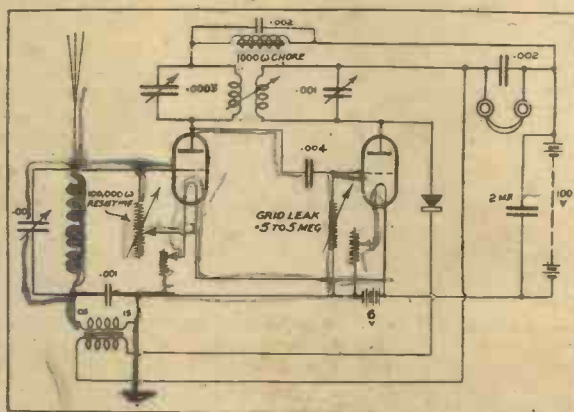
The incoming signals are impressed on the grid of the first valve, which acts as an H.F. amplifier. The high-frequency potentials are communicated to the grid of the second valve via the grid condenser and further amplified before being rectified by the crystal. The grid leak is shunted across the grid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

duced 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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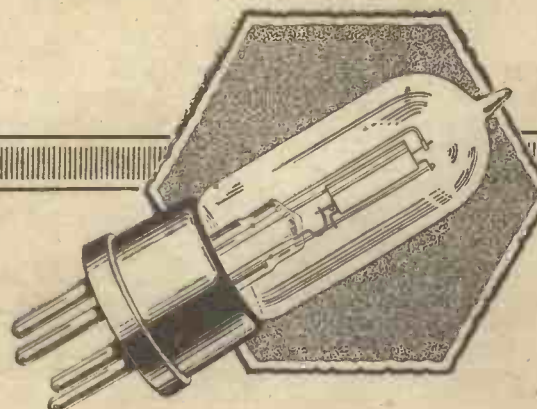
You observed the neat manner in which the change
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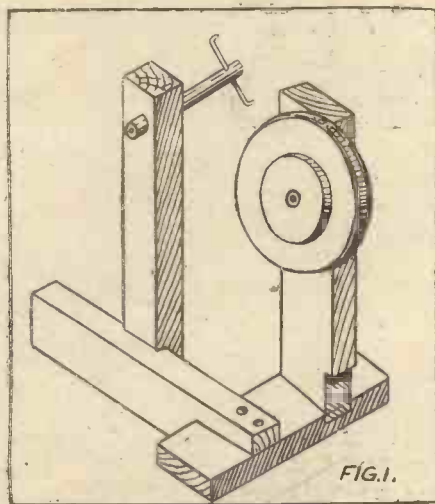


SIMPLE APPARATUS FOR COIL WINDING.

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 $\frac{1}{2}$ 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.

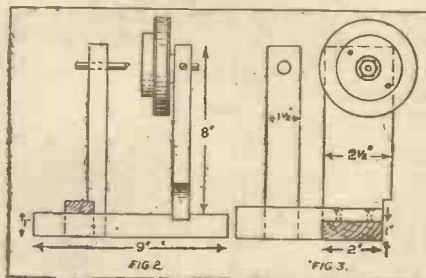
Two and a half inches from the standard a supporting bearer, notched out on the edge, as in Fig. 6, was screwed across the width of base, to enable it to stand erect, while the coil reel support, 8 in. by $1\frac{1}{2}$ in. by 1 in., similarly notched out across its width, was screwed in position as 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 $\frac{1}{8}$ 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.



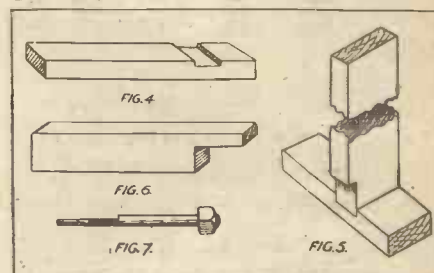
A hole was next drilled for the rod through the wood standard, $7\frac{1}{2}$ in. from the lower edge of the base, and $\frac{1}{8}$ in. from the edge, the rod inserted through the pulley's plates and into the standard, where it was held by an ordinary wood screw, with the point filed off, turned in 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 $\frac{1}{8}$ 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 clamp.

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 shelledacked, 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.

NOTES FROM LEEDS.

From Our Own Correspondent.

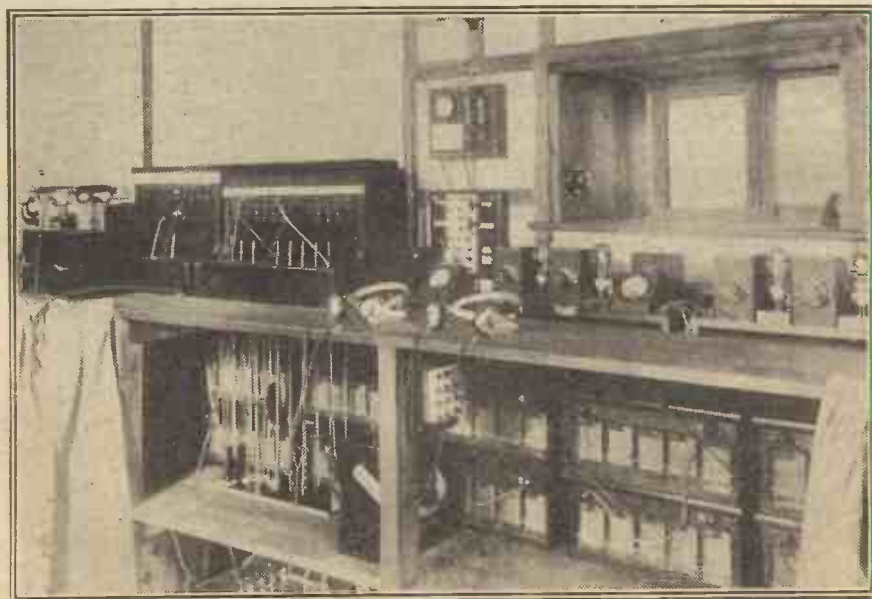
THERE are two lines from London to the Leeds-Bradford control-room in Leeds, and these, together with three lines to each transmitter and the business lines to the B.B.C. offices on the premises, terminate at the switchboard shown on the bench to the left-hand side of the photograph of the control room. 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:—

"My salary has increased over 200 per cent. during the last 18 months."—**SALESMAN (H.16,540).**

"I am in a much better financial position, having had several increases in salary. All this I attribute to Pelmanism."—**SHOP ASSISTANT (C.27,529).**

"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).**

Every reader who wishes to make the fullest use of the powers waiting to be developed in his or her mind should get a copy of "The Efficient Mind."

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.

Hundreds of such cases could be quoted from the reports received by the Pelman Institute. Some will be found in the book you can obtain free of charge to-day.

Practise Pelmanism for half an hour every evening—or on three nights a week—and you will develop just those qualities which will mark you out for speedy promotion.

You will develop Self-Confidence, Initiative, Concentration, Judgment, Originality, Organising Power, a Strong Will, Observation, Resourcefulness, Directive Ability, Personality, and a Reliable Memory; you will banish those failings which handicap so many; you will double your efficiency, and consequently your EARNING POWER.

There is nothing difficult about Pelmanism. Indeed, it is a most fascinating mental recreation—just the thing for the evenings when more arduous studies are apt to be distasteful. The fee is small, can be paid, if desired, in instalments, and will be repaid to you over and over again in your increased earning power.

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and the Professions—how it has developed their speaking powers—how it has increased their Earning Power (even doubled and trebled it), how it has enabled them to realise their aims, dreams, and ambitions.

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Don't stay in the rut! Let Pelmanism show you the way to promotion and successful achievement. Let it increase your efficiency and help you to earn a larger income. It has done this for others; let it help you in the same way. Write in the first place for a copy of "The Efficient Mind." It will be sent you free of cost or obligation, and will tell you just what Pelmanism is and what it will do for you. Send for this book to the Pelman Institute, 97, Pelman House, Bloomsbury Street, London, W.C.1. Use this coupon to-day (or call) and you will receive the book and full particulars by return of post, FREE OF COST.

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London, W.C.1**

SIR,—Please send me, gratis and post free, a copy of "THE EFFICIENT MIND," with full particulars of the New Pelman Course.

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100 ft. 7/22 Copper Aerial Wire, 4 Insulators, 9 inch Ebonite lead in tube, 10 yards lead in wire, One Book "Wireless at Home," one Earth Clip, one Aerial to Earth Switch, One Pair Brown's, Sterling, or Ericsson Head Phones - - - - - £2 0 0

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Carriage Paid to your door 2/6 extra.

We have letters from North Walsham stating CHELMSFORD was received perfectly with this outfit, considerably over 100 miles away.

MAKE NO MISTAKE IN YOUR SELECTION. Do not keep wasting money on crystals of unknown repute. GET A CRYSTAL THAT HAS STOOD THE TEST OF TIME.

DAYZITE REGD.

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FITTED WITH ALUMINIUM END PLATES
AND BOTH SETS OF VANES ADJUSTABLE

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This new 84-strand aerial costs 9/6 and is worth every penny of it, whether you are beginner or expert

50% increase over 7/22s (regular-type aerial wire) both for reception and transmission.

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Now obtainable from most wireless dealers, but if you have any difficulty in getting a Mars, locally please write, enclosing P.O. for 9/6, to

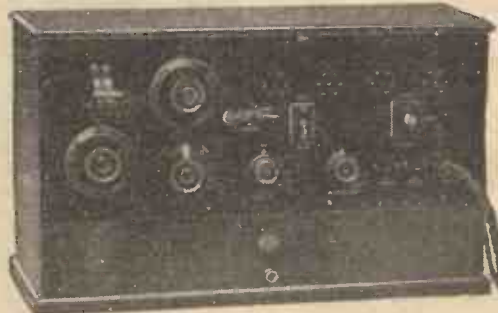
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Artistes of the Aether

By "Ariel"

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 capably represented by the recent performance in the studio at 2 L O of Gounod's "Faust," under the direction of Mr. Stanton Jefferies, while



Miss Esmé Beringer.

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.

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 Boatwain'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 Coburn 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



Mr. Fewlass Llewellyn.

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.

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 Mousorgsky, Scriabin, and Glazounov, a "highbrow" night truly enough, but one that appealed none the less widely.

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."



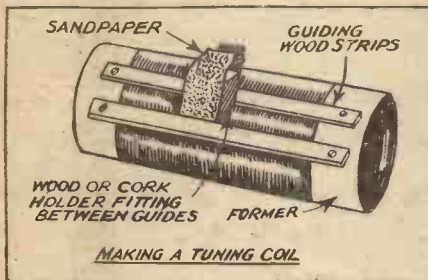
Miss Elsie Cochrane.

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.



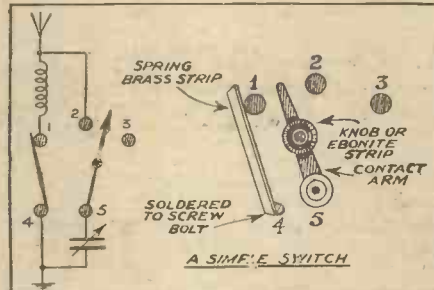
Easily Made Crystal Holder.

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

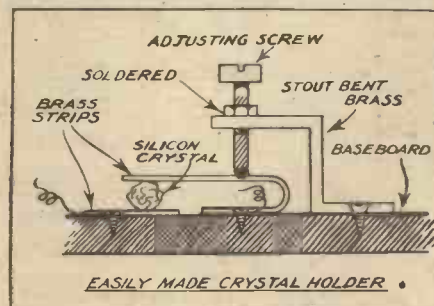
simple, the point of particular interest being the method whereby point 1 of the three-point switch is disconnected from earth when the arm rests on it. A spring connection puts point 1 in contact with point 4,



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—



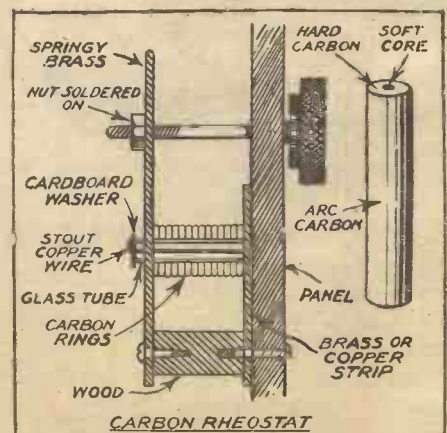
is to take a piece of the inner tube tyre of a cycle or motor-cycle, and use it as a covering for the cell. In order to make the rubber covering fit well, a piece of wood should be cut of the same size and shape as the bottom of the cell, a groove being run round the edge of this wood disc, and the rubber 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.

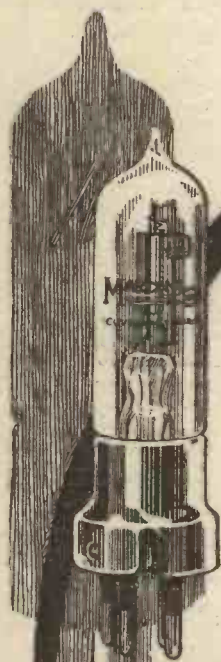
Here is a very simple way of making your own carbon rheostat. You have probably seen the carbon rods which are used for electric arcs. Well, these generally consist of a hard carbon rod with a circular tunnel along the axis, this being filled with soft carbon in order to make the arc burn more steadily. 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.



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The SUPER TONE LOUD SPEAKER, pure and clear in articulation. Called "The Prince of Loud Speakers." 18-in. high, on wood base.



Ericsson Telephones, acknowledged the world's proved best telephones.

K EEN amateurs and experimenters visiting the Exhibition will surely make a bee-line for Ericsson Stands. They know they'll see good "stuff" there.

For long-distance work, whether on the broadcast band or on lower or higher wavelengths, Ericsson 2-, 3- and 4 Valve Receivers excel in strength and purity. As regards their selectivity, one amateur in Glasgow, four miles from the local station, cuts out local broadcast and receives Bournemouth at loud-speaker strength.

For loudspeaker work the "Super Tone" takes some beating. It is the result of drastic experiment, and has been called "The Prince of Loudspeakers." Unsurpassed in clarity and absence of "tin" and blare—every note comes through clear and undistorted.

As regards Ericsson Telephones, one need only say that the Admiralty adopted them as standard in 1909 and the R.A.F. in 1917. Since then immense improvements have been made in them, so that to-day they stand at the head of their class. Made in 120, 2,000 and 4,000 ohms. To avoid Continental imitations look for "Ericsson, Beeston, Notts," stamped on each earpiece.

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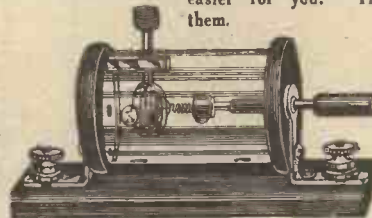
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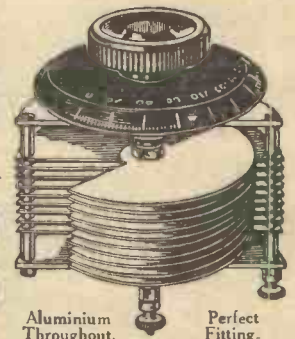
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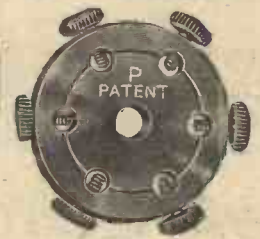
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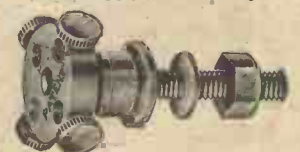
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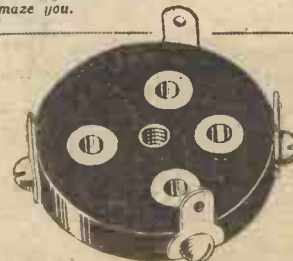
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HOW TO BUILD A FOUR-VALVE RECEIVER.

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

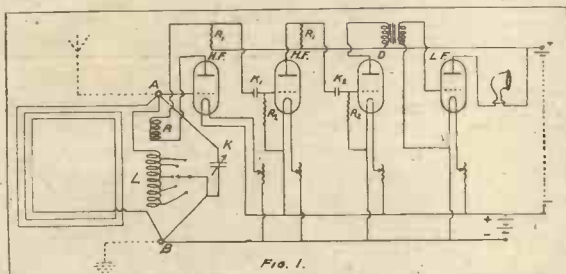
The values of the various components are as follows: The coil L consists of 60 turns of No. 20 D.C.C. wire wound on a cardboard former three inches in diameter, tapings being taken to the five studs as shown. The capacity K consists of a variable condenser of .001 mfd., while K_1 and K_2 are fixed capacities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

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

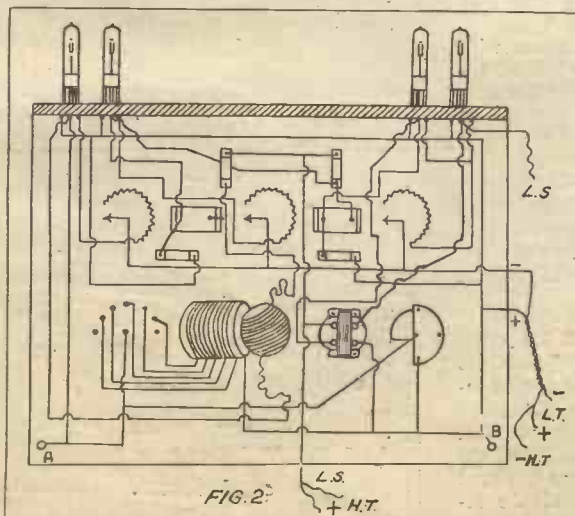


there are no external aerial or earth, and the batteries, loud speaker, valves, and frame aerial are all contained within the cabinet. The receiver has also, if carefully constructed, a good appearance, and, besides being simple to operate, is fairly portable.

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 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.

Size of Cabinet.

The cabinet should now be constructed and the panel fitted in the front. The top portion of the front is made

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.

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)

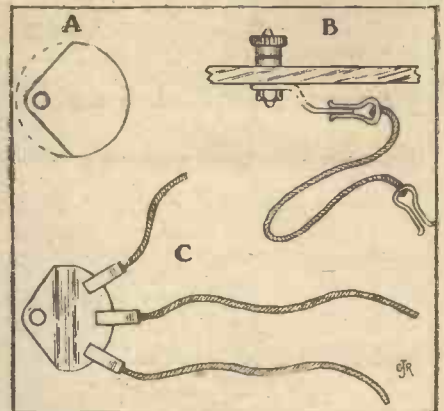
both diagrams. In diagram C, T1 represents the high resistance 'phones and T2 the low resistance 'phones. Alternatively, T1 may be placed in series with the plate lead.

Fixed Condenser Experiments.

In diagram D the high resistance 'phones, T1, 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

minerals of condensers, transformers, and other components in use.

A selection of flexible leads, ranging from about 1½ 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

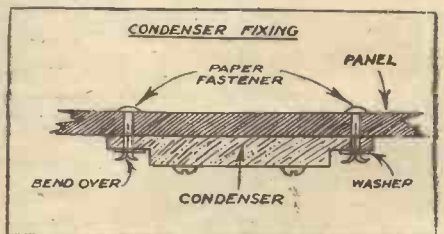


quadrant when pushed on to same in the manner indicated at B and C. If the quadrants are cut out to the given dimensions, each one will comfortably accommodate four or five clips, providing each clip is not more than ⅜ in. in width.

A SIMPLE METHOD OF ATTACHING FIXED CONDENSERS.

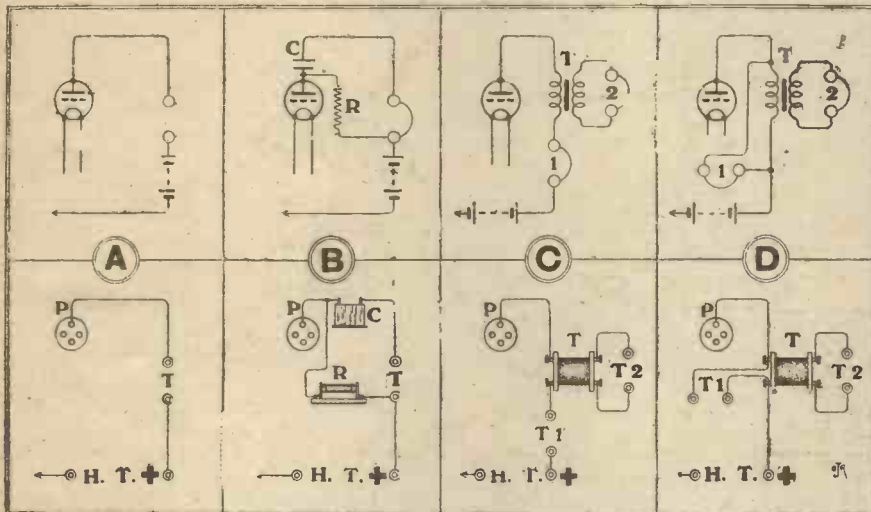
SMALL fixed condensers of the moulded type, or others with fixing lugs, may be very easily attached to the underside of the panel by brass paper fasteners, passing through both, as depicted in sketch.

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.



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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

resistance 'phones, T2, 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 ⅜ in. sheet brass or copper discs, about 1½ 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 ter-

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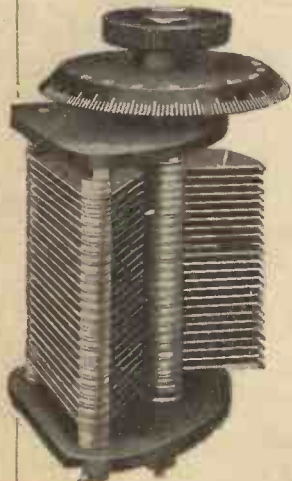
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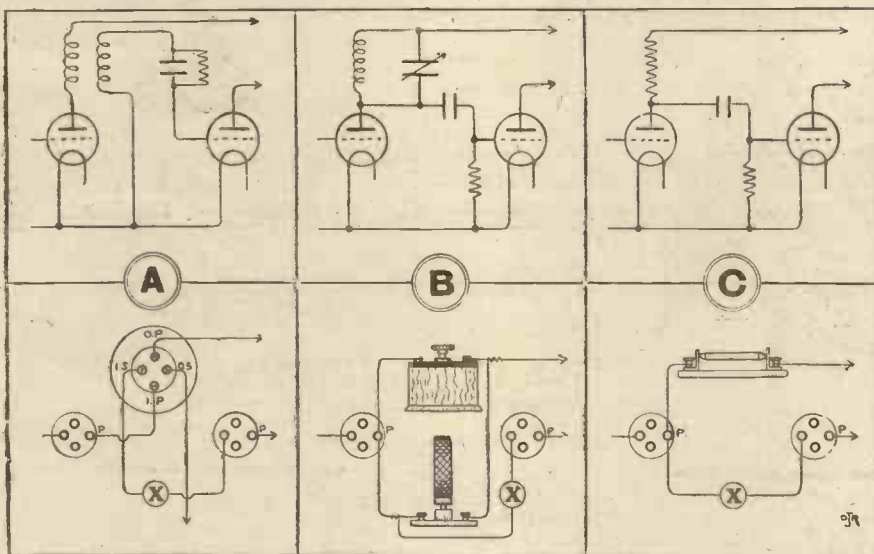
COUPLING HIGH-FREQUENCY VALVES.

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,

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



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 takingappings 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

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.

NEXT WEEK'S "P.W."

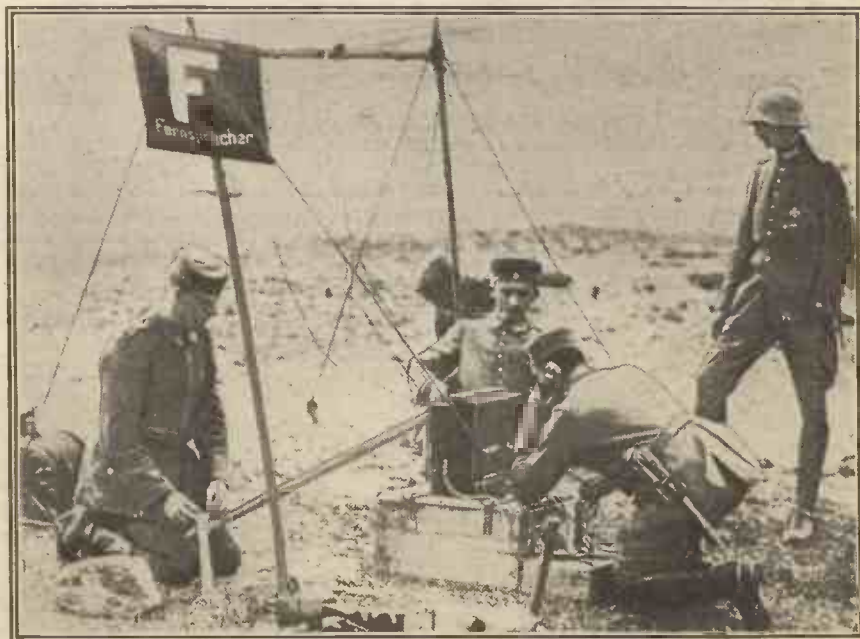
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Military activities in Germany. An army wireless field station in "action."

Technical Notes

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

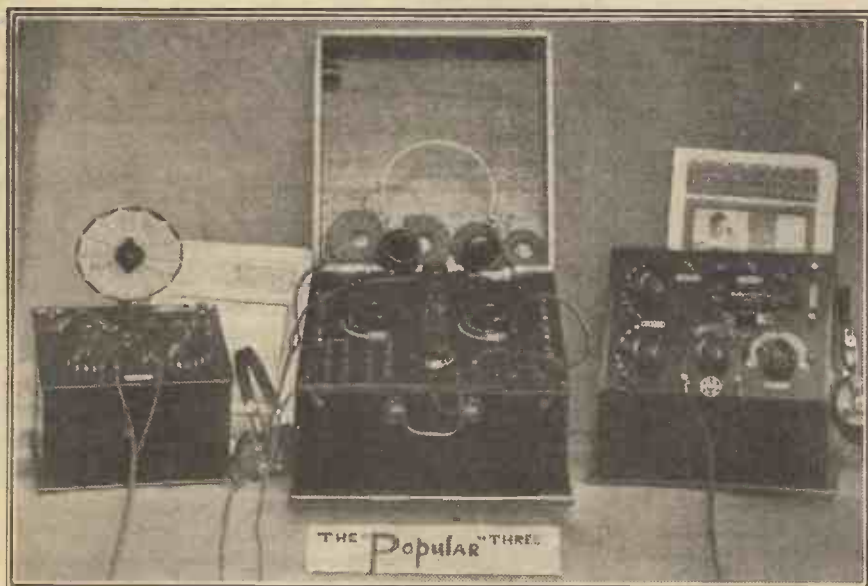
Telephone as Aerial.

"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

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



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

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 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

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.

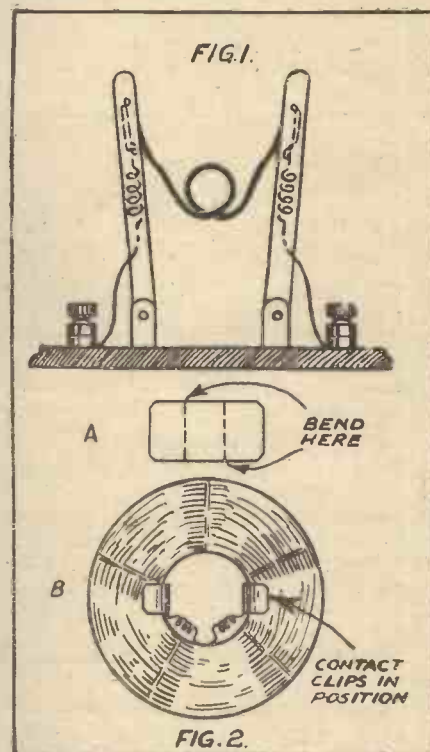
It is a simple matter to reverse the filament current in a single-valve set, and in a multi-valve set where potentiometers are employed it will only be necessary to

(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.



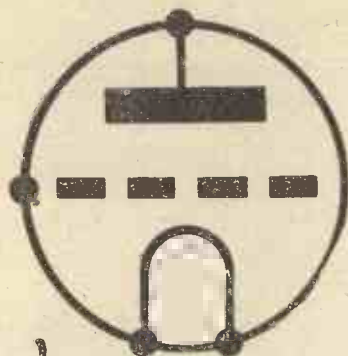
The Coil Clips.

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.

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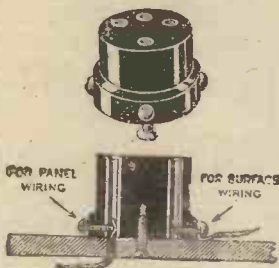
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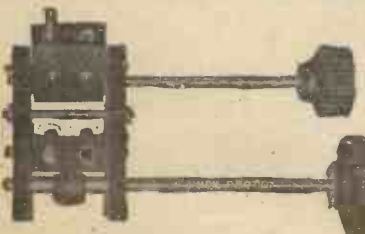
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is fixed by a single screw in centre, the holder itself acts as a jig for drilling the holes for panel wiring. For surface wiring clamp the wires under the heads of screws. Has safety insulated plate socket. (Prov. Protd.)

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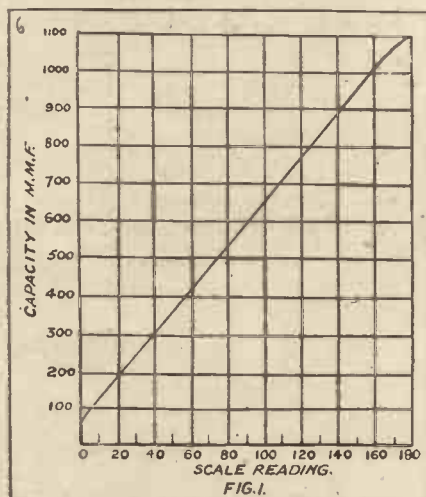
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HOW TO OBTAIN CAPACITY MEASUREMENT OF SMALL FIXED AND VARIABLE CONDENSERS.

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



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 he 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 abscissae the reading of the scale or dial.

Calibrating the Condenser.

Let us suppose we possess a condenser with a calibration curve, and it is desirable 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.

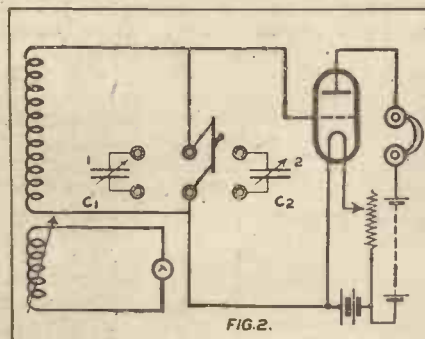
Plotting the Curve.

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.

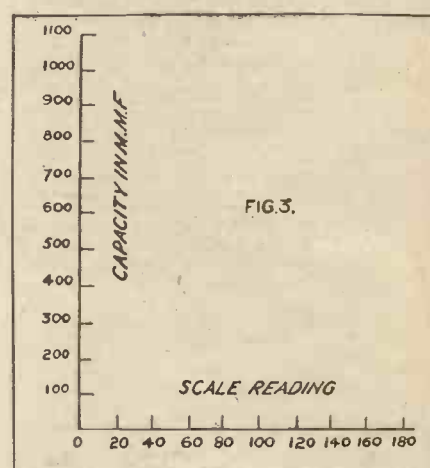
Suppose the standard dial reading is 40° and the capacity at this setting is 300 m.mfd. If the dial reading of the unknown



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,



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 .000195 mfd. Quite large condensers may be calibrated by the above method, providing a large enough standard is procurable.

THREE FREE BOOKLETS

For P.W. Readers.

Commencing with next week's issue, the first booklet will be given away with P.W. It is entitled "The P.W. Fault-Finder." Booklets will also be given away with the next two issues.

The issue of P.W. on sale next Friday will also contain many special features, including an exclusive article by Captain Eckersley, on 5XX, and a special article on "Wireless and the Police" by Ex-Chief Detective Inspector E. Haigh. Order your copy of P.W. NOW! and do not miss next week's special and enlarged number.

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 school-master 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 Hammer-smith 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,



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

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.

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 paper-weight. 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 Nansen, and referred to us as 'clutter.' An innumerable Amazon! Jones was a real stayer, and did good work with me, despite my slanting plate. But for his all-too-discursive pre-occupations—he collected stamps, preached Ruskinism, did frotwork, 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 eboulitis, 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 banded 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 vases, 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.

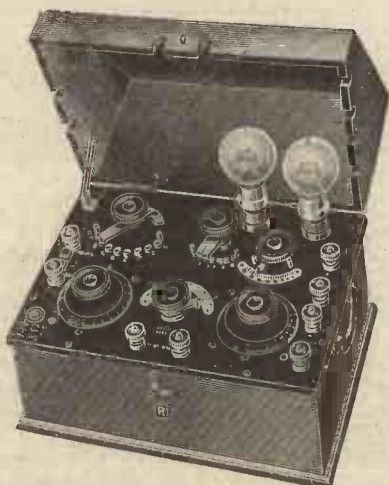
"But I live in hopes of settling down where I am and slowly accumulating enough dust to short circuit even an Augmented Orchestra. Hope I don't bore you. Here! Shift round to 47 quick. Big Ben's beginning."



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.



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.

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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**

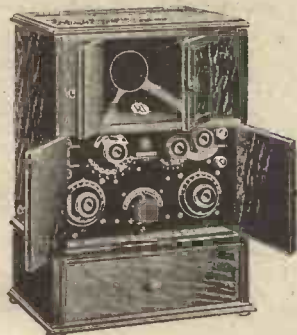
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4-Valve Lyrian Set complete with Loud Speaker, D.E.
Valves and batteries **£44 3 6**
Without accessories **£37 18 0**
Wave-length range 300-4,000 metres.



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

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CHANGES FOR 5XX.

How the Amateur Can Make Them.

By OSWALD J. RANKIN.

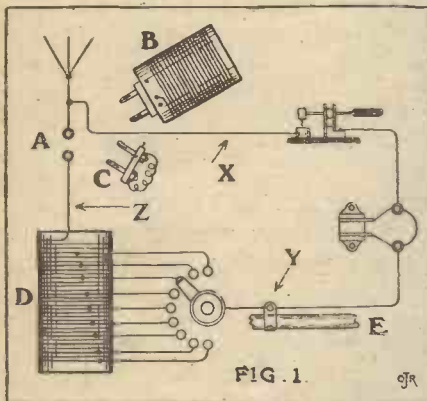
IN consequence of the opening of the new high-power broadcasting station, which works on a wave-length of 1,600 metres, many enthusiasts are asking how they may adopt their present broadcast receivers to this comparatively high wave-length without scrapping the existing tuning arrangements.

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

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."

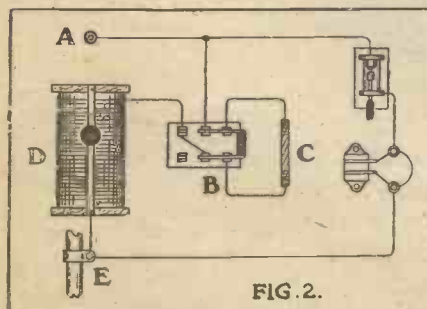
The ends of the winding are preferably connected to the plugs inside the former. Should a series tuning condenser be fitted to the set, this will remain in the original position, but if a parallel condenser is used, then this should be connected between



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.

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



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



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.

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 POCKET FAULT-FINDER.

This 24-page Booklet will be given away with every issue of P.W., on sale Next Friday.

Order **YOUR** Copy **NOW!**

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 goliwog 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 Königswusterhausen, 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 wirelessly 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.

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."

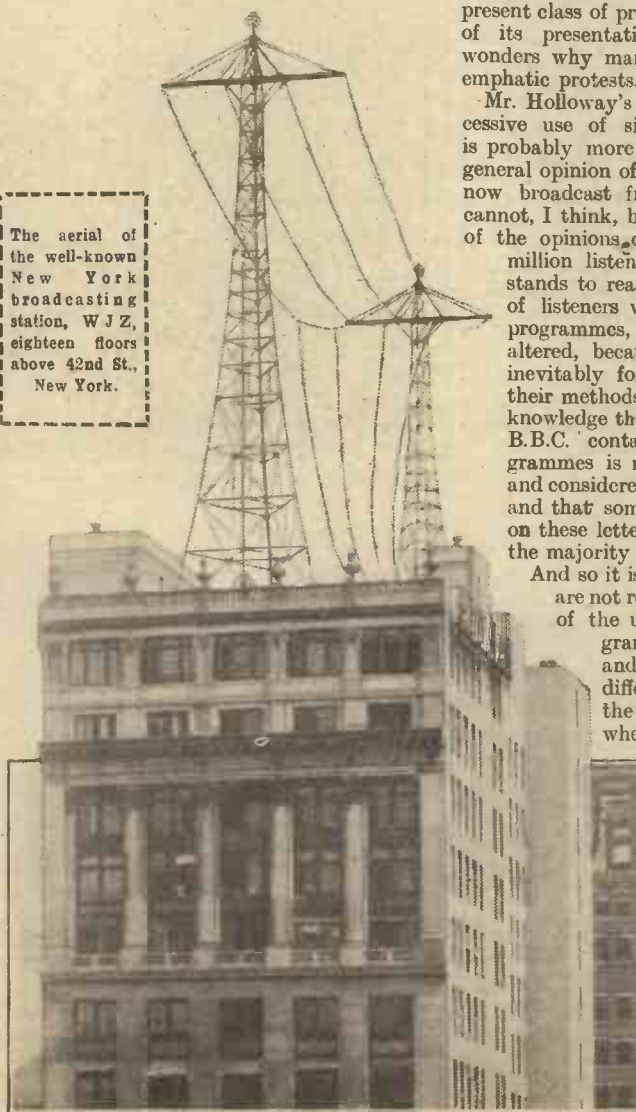
Mr. Holloway further complains that manufacturers, many of them presumably members of the B.B.C., fail to realise the injury to wireless that is being done by the present class of programme and the manner of its presentation, and Mr. Holloway wonders why manufacturers do not make emphatic protests.

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.

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

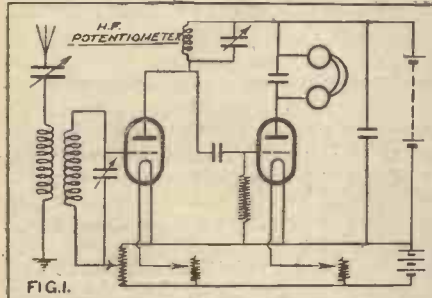


AN EASILY MADE POTENTIOMETER

By R. H. WATSON.

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

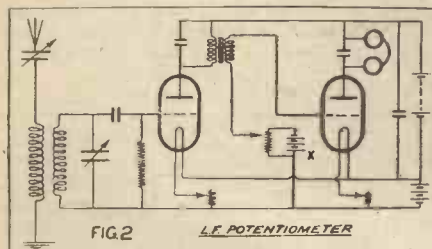
THE potentiometer has several uses in a set. It is most commonly employed to control high-frequency valves, regulating the grid potential in the way shown in Fig. 1. Here, by making the grid of the high-frequency valve a little positive,



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 grid 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.



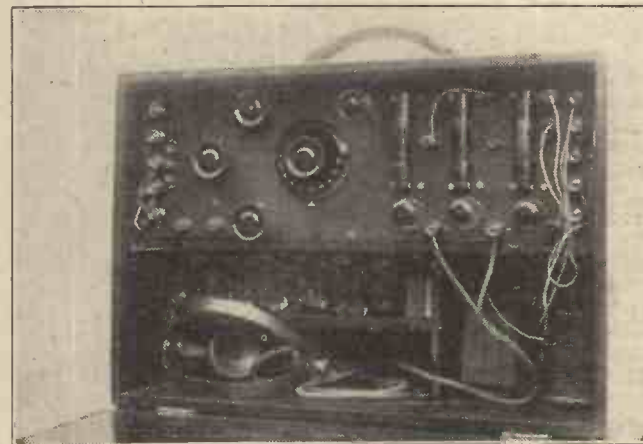
The easiest and least expensive way of constructing a 300-ohm potentiometer is to make it up on the lines of a single-slide tuning inductance in the way shown in Fig. 3. If this method is used, the total outlay will be as follows:

	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 $1\frac{1}{2}$ inches in diameter and $6\frac{1}{2}$ 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 $1\frac{1}{2}$ 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, $5\frac{1}{2}$ inches in length, will



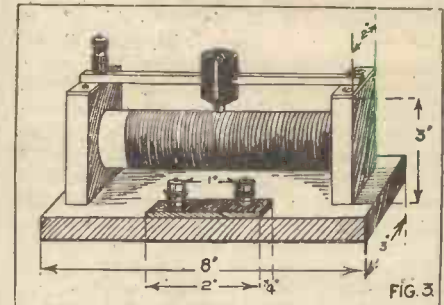
An interesting portable three-valve receiver using Myers valves.

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 $5\frac{1}{2}$ 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 $\frac{1}{2}$ or $\frac{3}{4}$ -inch wood 8 inches long by 3 inches wide. Upon this fix, by means of screws driven up from below, two end-pieces of $\frac{1}{2}$ -inch wood, each 3 inches high by 2 inches wide. These should be $6\frac{1}{2}$ 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 $\frac{1}{4}$ -inch ebonite 2 inches in length and $\frac{1}{2}$ 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



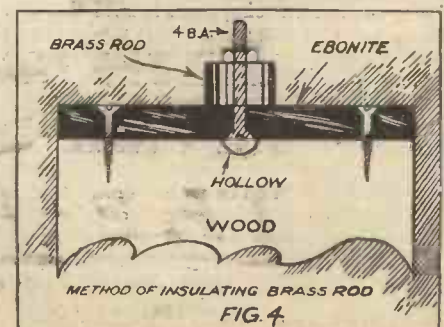
contact with the turns of wire upon the tube. One end of the square rod is secured to the ebonite with a $\frac{1}{4}$ -inch bolt, the other with a bolt $1\frac{1}{4}$ inches long, upon which are placed the two round nuts of a 4.B.A. terminal.

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 $\frac{1}{4}$ 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 $\frac{1}{2}$ 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.



Mullard Service

Gift to all valve users

The Mullard Radio Valve Co. Ltd. have always endeavoured to give the highest standard of production accompanied by a service that will enable all wireless enthusiasts to obtain perfect reception. The enclosed safety disc will save all valve users time and money. These discs can only be obtained from The Mullard Radio Valve Co. Ltd.

Mullard
THE MASTER VALVE

MULLARD SAFETY DISC for Mullard Master Valves

To prevent filament burn out by H. T. Battery short circuit.
Strip linen from back. Press adhesive surface firmly to the face of the Valve holder, taking care that holes in disc correspond with holes in holder.

PATENT APPLIED FOR.

There is a Gift for You at Stand 52.

The Mullard Service for valve users has always endeavoured to ensure perfect broadcasting reception not only by Master design and workmanship in their productions but also in reliable and useful information. Here is a token of Mullard Service.

An envelope will be given to all visitors to Stand 52 at the Exhibition in which will be found a Mullard SAFETY DISC. You will find out all about this disc when you receive the gift envelope.

Come early. Only a limited number of this patented production are available for distribution and these safety discs can be obtained only from The Mullard Radio Valve Co., Ltd.

Those who are unable to attend the Exhibition should apply to their Wireless Dealers to whom a supply of Mullard safety discs will be given for distribution.

The Master Achievement of 1924 is undoubtedly the production of Mullard H.F. and L.F. Master Valves. In the field of general purpose bright filament valves, they stand alone for giant strength, giant results, and giant life. You will be astounded by the tests they will undergo at the Wireless Exhibition, and delighted with the splendid results these valves will give you.

REMEMBER Stand 52.

Mullard Weco, 1 volt ORA and D.F. ORA valves are now only 25/- each.

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THE N.A.R.M. EXHIBITION.

A RAPID REVIEW OF THE EXHIBITS.

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

PART II.

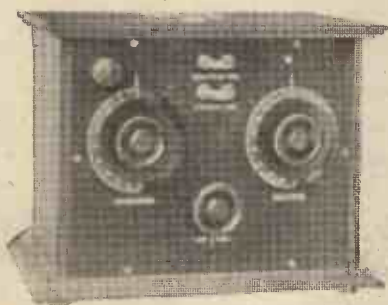
STAND No. 75.

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.

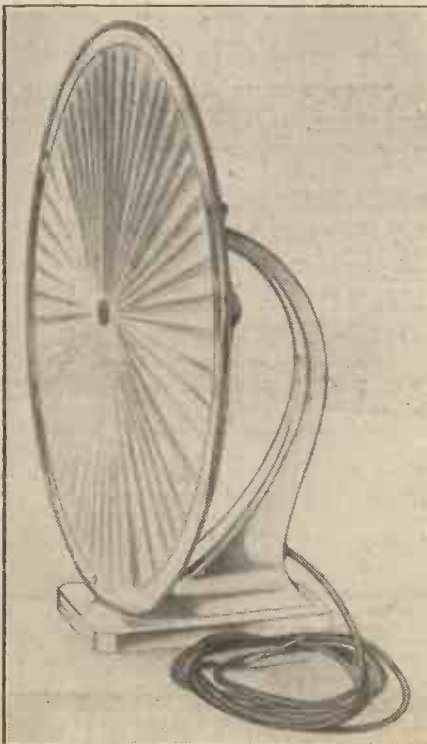
A. C. Cossor, Ltd., Highbury Grove, N.

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 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.

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. Eastich & 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.

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).



A "Gecophone" Set.



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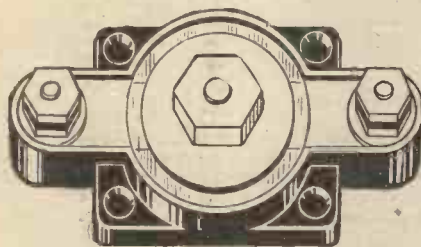
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'0002 mfd. ... 3/- '0003 mfd. ... 4/-
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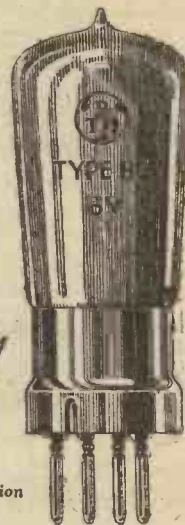
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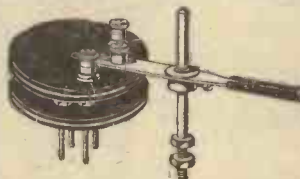
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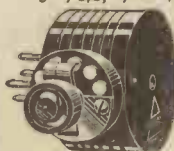
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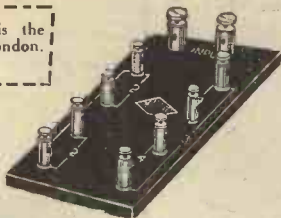
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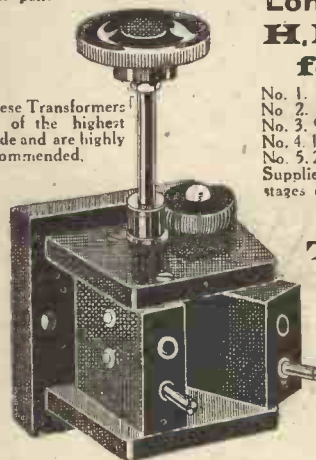
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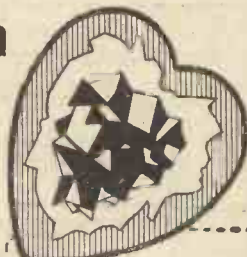
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The SOLDO COMPANY, Sicilian House, Southampton Row, London, W.C.1.



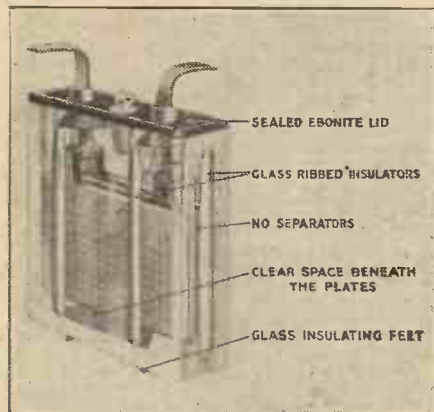
THE N.A.R.M. EXHIBITION.

(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 hobbin 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.

Radiac, 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 "Bijou-phone" 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 11s. 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" I.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.

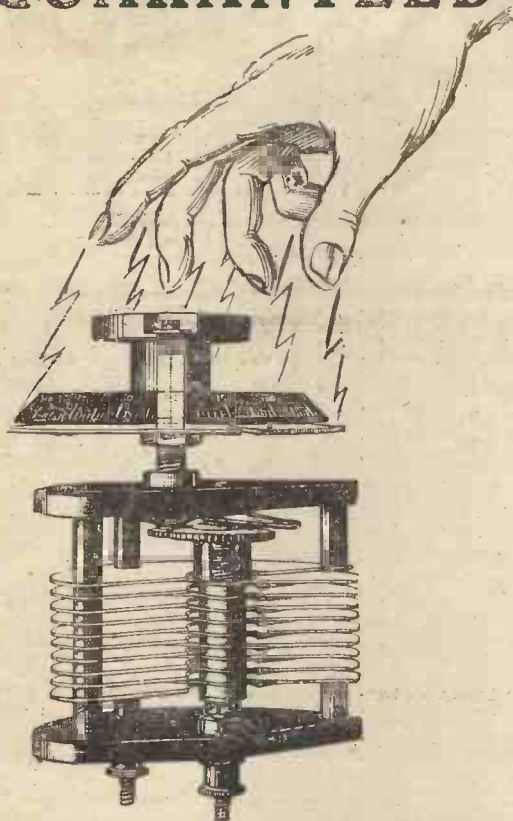
Another component is the anode capacity reaction unit.

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" Earthareal lead-in-switch. "Success" Vernier coil-holder. Specimens of gears and worms applicable to wireless.

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The Naylor "Fulstop" Condenser is the only Condenser which entirely eliminates hand capacity effects. That irritating distortion you hear every time your hand approaches the operating knob cannot exist if you have a 'Fulstop' Condenser.

The abolition of hand capacity effects is *guaranteed unconditionally* by the makers and money will be refunded if any instrument does not give absolute satisfaction. Get the best out of your set by getting a

'Fulstop' Square Law Principle Condenser

Prices	.C01.....13/6	.0003.....10/3
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"PAY AS YOU LISTEN"

This New "ARMAC MAJOR" is the finest loud speaker ever produced. **AND THIS IS HOW WE SUBSTANTIATE OUR CLAIM, WITH YOU AS THE JUDGE.**

Send us a deposit of **15/-**

We send you this Speaker to test on your own set, in your own home and at your convenience

If you are quite satisfied you pay us 12/6 per month for 6 months, making £4:10:0 in all. If for any reason you think the speaker is not satisfactory, send it back to us in the same condition, within three days after receiving it, and we will gladly refund your deposit. *That's fair, isn't it!*

Height 20 in. Trumpet of cast aluminium and compressed wood pulp. Takes 30-300 volts on the plate.

Cash Price £4:0:0

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.0003 ..	9/6	With Vernier .073
.0005 ..	10/-	spaces, complete with
.001 ..	11/-	knobs and dials.
		Postage 1. 4d. 2 6d.

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40, Shaftesbury Avenue, LONDON, W.1.
Established 1913. Gerrard 8782.

R.A.F. TRANSMITTING SETS containing 1" Sterling Spark Coil, mica dielectric condenser, tuning helix, spark gap, etc. These sets are all good, only cases are damaged and can be repaired without cost and are the last batch of ex-Government stock to be offered. Price, to clear .. each **8/6** Post 1/3

MICROPHONES for crystal amplifying or transmission of speech .. each **2/6**

MICROPHONE TRANSFORMERS wound to suit above microphones. Price .. each **3/6**

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MORSE KEYS for buzzer or practise work .. each **2/-**

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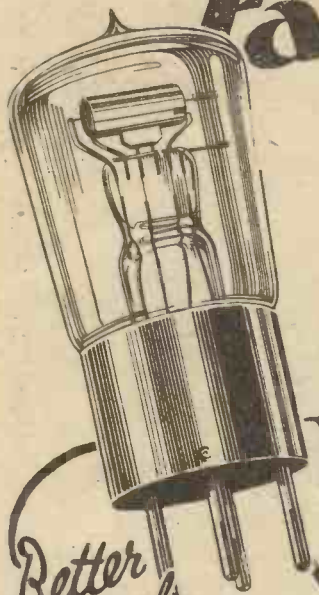
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DESIGNED with every care to ensure the greatest comfort and utmost efficiency, Ediswan headphones are constructed with double headbands, aluminium cases and moulded earcaps. They have a total resistance of 4,000 ohms and are fitted with 6 ft. long cord—a great advantage allowing more freedom of movement.

With "Ediswan" Headphones you may be sure of getting the finest results, provided the rest of your set is efficient. The cost is but **24/-**



THE 'TELEVOX' LOUD SPEAKER

A perfectly made instrument of solid, rigid construction which eliminates resonance effects. The amplifying horn has been very carefully designed with a new device to simplify the finest adjustment. **£5 : 5s.**

THE EDISON SWAN ELECTRIC CO. LTD.,
123/5, Queen Victoria Street, London, E.C.4.

C.F.H.

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

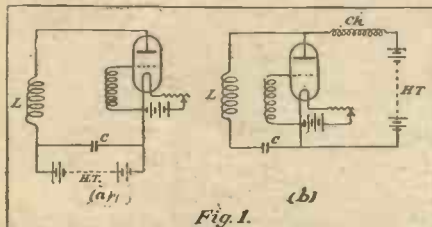


Fig. 1.

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 intervalve 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-

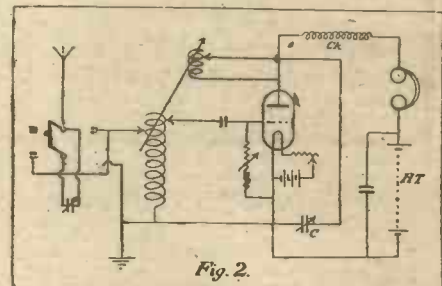


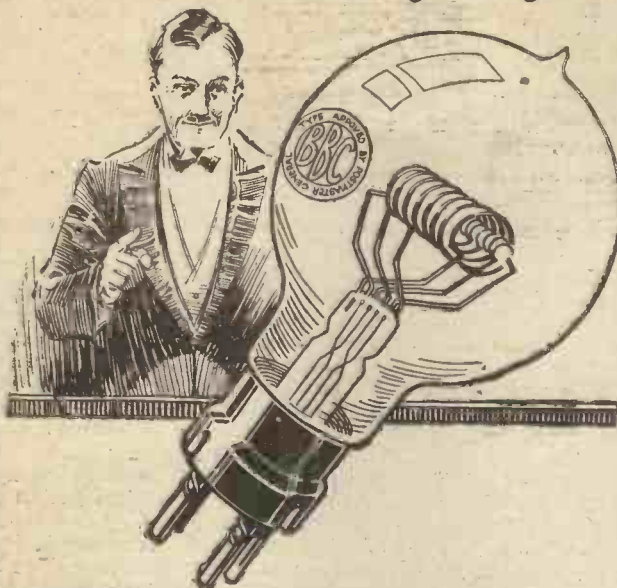
Fig. 2.

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.



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And the cost of the charge is **2/-**

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Thus you clearly save the cost of eight charges—a saving of **16/-**

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Type H.E.4. for 6-volt. accumulators. Plate voltage 40.
Filament current '15 amp. Filament volts. 5.

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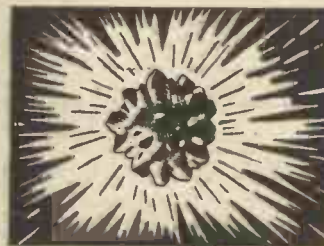
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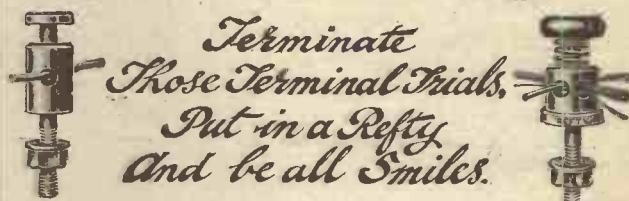
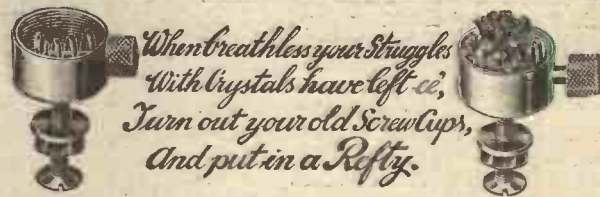
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WATMEL VARIABLE GRID LEAK

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Continuously Variable.
Silent in operation.
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The Colvern is presented as a really convenient, sound and neat unit, suitable for easily attaching to existing sets (one hole fixing), and should be included in all sets in course of construction.



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The use of a vernier for final tuning is strongly advised. Its use demonstrates utmost tuning efficiency by giving COMPLETE control of the set, with greater selectivity and pure reception entirely free from the extraneous noises which follow the inaccurate tuning of large capacity condensers.

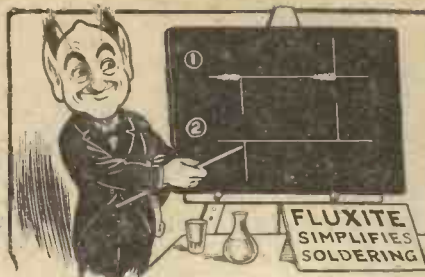
If your local dealer does not stock the Colvern Tuning Condenser, kindly send his name and address when ordering. PRICE - 2/6

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PHONE: WALTHAMSTOW 532.

THE GREAT DIFFERENCE



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"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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Ditto, Mounted on Base, ea. 10/4d.

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CHELMSFORD, 150 Turns, ea. 9d.

Ditto, Mounted on Std. Plug, ea. 2/2

TAPPED COILS (20 Tap-
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FILAMENT RESISTANCE,
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EBONITE VALVE HOLDERS,
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ALL POST FREE. DIRECT FROM ACTUAL MANUFACTURER.
SATISFACTION GUARANTEED.

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WIRELESS VALVES

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Have your Burnt-out Valves repaired by the pioneers of the Renewal Industry. During the past two years we have renewed many thousands of Thermionic Valves of all makes and have received hundreds of testimonials and many favourable Technical Press reports.

Valves after repair are guaranteed to be equal in all respects to the original.

Owing to Patent restrictions Dull Emitters cannot be repaired.

**THE ABC
RADIO VALVE REPAIRING
ALLEN-BELL CO**

WELL LANE WORKS, EARL ST.,
SHEFFIELD.



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 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, Königs-wusterhausen 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 wave-meter 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 what-



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

ever 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!

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 base-board, 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 nicked 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.

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.



The "Success" L.F. Intervalve Transformer.



The "Success" Anode Capacity Reactance.



ALL-BRITISH

WIRELESS EXHIBITION

AT THE
ROYAL ALBERT HALL
SEPT. 27TH - OCT. 8TH
1924

LATEST RADIO DEVELOPMENTS

Housed appropriately in one of the famous Halls of the Metropolis of the Empire, this Exhibition, the greatest yet held, marks another stage on the path of "WIRELESS" progress.

Organised by the National Association of Radio Manufacturers (including Companies of World-wide reputation), the products shown are mainly the manufactures of Members of the Association, and are thoroughly representative of every department of "Radio" and of the latest developments in that Industry. In addition, the "lay-out" of the Hall, with its decorative setting, gives a distinctive character to the Exhibition.

During the Exhibition the 2 L O Military Band will play daily, and on certain evenings its performance will be transmitted from the Royal Albert Hall as part of the 2 L O Broadcasting Programme.

Daily demonstrations of reception will be given by the British Broadcasting Company.

Admission 1/6 (including tax),

10.30 a.m. to 10.0 p.m. daily.

Organised by

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OF RADIO MANUFACTURERS
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2,000 "	£1	4	0
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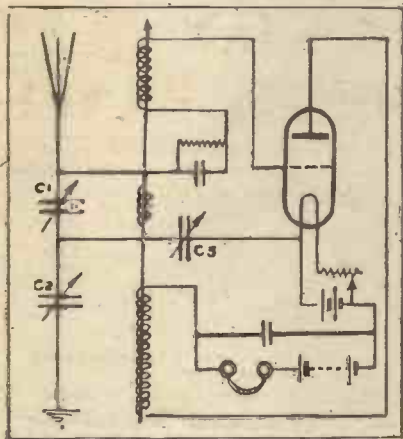
A SIMPLE SUPER CIRCUIT.

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.

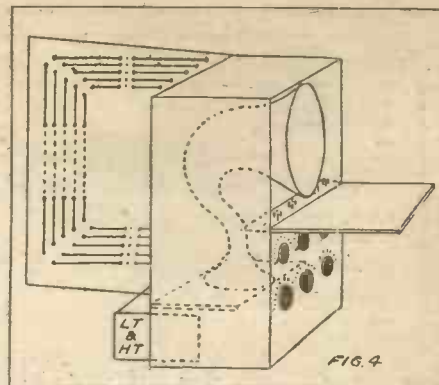
A large number of amateurs have been received, some being at considerable distances. Amateur stations as far away as Croydon (130 miles) have been heard at loud-speaker strength. Perhaps the most remarkable achievement is the reception of speech from French aeroplanes at a distance of over 500 miles.

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 24.)

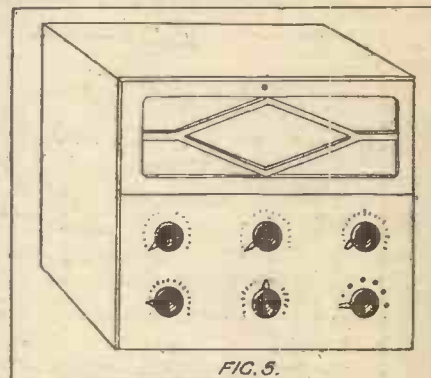
from the diagram, and 30 feet of No. 18 D.C.C. wire is threaded in and out so as to form a large square coil having an outside measurement of about 18 by 18 inches. This coil forms the frame aerial, and each



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.

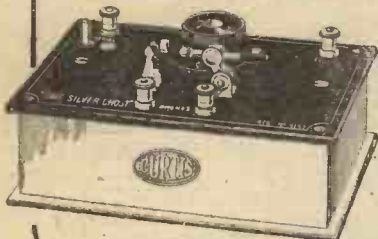


Captain Smith, of U.S.A., who broadcast a "talk" upon the sea-bed a few weeks ago.

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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PALACE OF ENGINEERING
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The SILVER GHOST CRYSTAL RECEIVER



With its richly engraved panel and plated fittings mounted on a polished aluminium casket, combines the exclusive efficiency and elegance of a Curtis Radio Instrument.

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If You BUILD

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of professional finish and of
**GUARANTEED Professional
Efficiency.**

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



UNWIRED			
2 Valves	..	£8	0 0
3 Valves	..	£9	0 0
4 Valves	..	£11	0 0
2 Valves S.T. 100	..	£9	10 0

WIRED & TESTED			
2 Valves	..	£7	10 0
3 Valves	..	£12	0 0
4 Valves	..	£14	0 0
2 Valves S.T. 100	..	£12	10 0

Latest models fitted in natural walnut finished Cabinet with plated Fittings.
Wavelength 200-25,000 metres

A CURTIS PRODUCTION

The RADIONETTE "POPULAR" 20/-

Latest models only with
plated fittings are for
200/1850 metres.

No extra coils required
for high-powered station.
For local broadcasting

The RADIONETTE "JUNIOR" 15/-

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

In radio efficiency they are guaranteed to yield the maximum results obtainable, while in appearance they suggest a pleasing effect of compact and elegant neatness.



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TESTED, RECOMMENDED and USED by
all leading Electrical and Wireless Authorities.

Paragon Radio-Quality Ebonite, manufactured to exclusive specification, is the accepted standard of perfect electrical and mechanical quality: non-hygroscopic, of maximum resistance, and entirely free from all surface metal (extracted by special process), while the uniform quality of material and process of manufacture guarantee a high degree of machineability; in fact, it is no idle claim that machining speed can be increased by 25 per cent. without the least fear of chipping or cracking.

PARAGON Radio Quality Post Office Specification. "The Best Made" EBNITE PANELS

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6x6x $\frac{1}{2}$	1/9	9x6x $\frac{1}{4}$	3/3	18x9x $\frac{1}{2}$	9/6
6x6x $\frac{1}{4}$	2/-	10x8x $\frac{1}{2}$	5/3	18x12x $\frac{1}{2}$	13/-
6x5x $\frac{1}{2}$	1/9	12x6x $\frac{1}{2}$	4/3	24x10x $\frac{1}{2}$	14/6
6x5x $\frac{1}{4}$	2/-	12x10x $\frac{1}{2}$	7/3	24x12x $\frac{1}{2}$	17/6
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T1 Transformers	30/-
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Coils: 25, 4/10; 30, 35,	
40, 4/10; 50, 5/-; 60,	
5/4; 75, 5/4; 100, 6/8	
POST 3d. each.	

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.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	
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on stand complete	5/6
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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,	
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Fl. Rheostat	4/8
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Vernier Rheostat	7/6
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POST 3d. each.	

STERLING SQUARE LAW VARIABLE CONDENSERS.

with Vernier.	
.001	30/-
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.0003	23/6
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.0001 to .0005 Fixed	1/3
.002 to .003	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)	
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Extra value do.	2/8
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Silvertown	21/-

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McMichael, 300/600	7/-
Diitto 1100/2000	7/-
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Raymond, 300/600	2/9
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Special valve holder above panel	1/9
Diitto, for under panel	1/6

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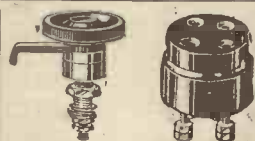
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Coil Holder	11/-

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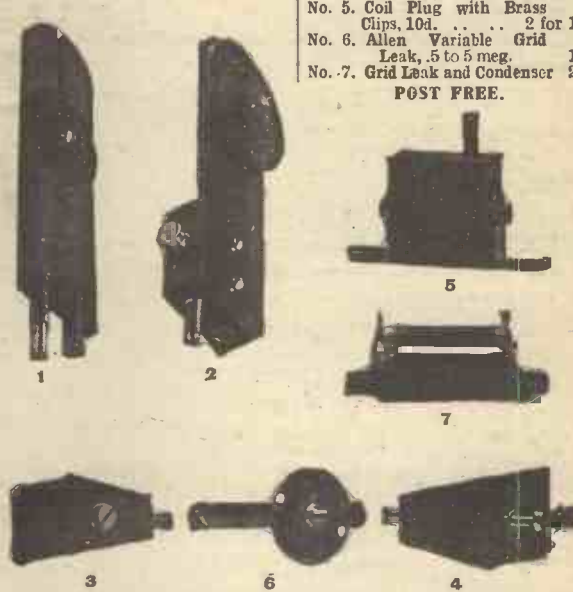
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42/-	JUNIOR DE LUKE Oak Trumpet
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- FITS IN ANY CORNER
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- STOUT VANES
- PERFECT EFFICIENCY
- WONDERFUL FOR PORTABLES, ETC.



AS SHOWN, WITH
DIAL, KNOB
and BUSH.

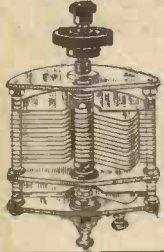
•001 - 7/3
•0005 - 5/11
•0003 - 5/4
•0002 - 4/11

POST 6d. SET.

John Blair, Esq.,
Rexall Pharmacy,
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."

UNSURPASSED FOR FINE TUNING.



NEW MODEL
with VERNIER
COMPLETE with
2 KNOBS and
DIAL.

Post 6d. set.

Post 6d. set.

•001 - 9/3
•0005 - 7/3
•0003 - 6/9

SQUARE LAW

•0005 - 7/11
•0003 - 7/6
•0002 - 7/-

Postage 6d. set.

SUNDRIES

Post free

Terminals (complete with Nut and Washer).
Pillar type, 4BA .. doz. 1/3
Telephone type, 4BA .. 1/1
Telephone type, Wood Screw .. doz. 1/-
W.O. type, 4BA .. doz. 1/3
Small Pillar, 4BA .. doz. 1/1
Screw Spade Terminals .. doz. 1/-
Pin Screw Terminals .. doz. 10d.
Spade Tags .. doz. 5d.
Empire Tape, 1/2 in. .. 12 yds 9d.
Insulating Sleeveing .. 6 yds. 2/-
Ebonite Coil Plugs .. 2 for 1/6
Best quality ditto .. 2 for 1/10
Ebonite Knobs, 1 1/2 in. 2 B.A. .. 6d.
Moulded Knobs 1 1/2 in. .. 2 for 8d.
Knobs 1/2 in. 4 B.A. .. 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 .. 10 yds. 2/6
Lead-in Wire .. 10 yds. 1/8
Twin Flex .. 12 yds. 1/11
100 ft. 7/32 Aerial Wire with four insulators .. 3/9
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 Sleeveing 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
Elwell Perikon Detector .. 5/6
Screw Wander Plugs .. pair 6d.
Skidnerviken Button, Alumin. 5/-
5-1 Transformer .. 11/9
Tapped Inductance Coil, 1,600 3/-
Ebonite Dials .. 8/-
Seven Twist Drills (H.S.) .. 1/11
Taps 0, 2, 4, 6 B.A. .. set 2/-
"Soldo" and Soldering Iron. .. 2/6
Sorbo Ear Pads .. pair 1/-
Neutron Crystal .. 1/6
Blue Tungstallite .. 1/6
Geocite (G.E.C.) .. 1/3
Tumbler Switches (Ebonite) .. 1/9
Valve Sockets, Plain (nut and washer) doz. .. 1/-

Overseas League,
St. James's St., S.W.1.
Aug/24.

A few lines to congratulate you on the quality of your "too cheap to be good" wireless stock.

I have no hesitation whatever in advising prospective experimenters and broadcasters to come to you for "cheap—but good—components." (Signed) F.R.S.

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" .. 1/6
valve holders .. 1/6
Lissen Aux Resistance 1/6
Lissen Choke .. 10/8
Tubular Dutch Detec. Valves 5/11
Phillips "R" Valves 8/11
French "R" Valves 7/11
Gamage's Permanite 1/-
Geocite (G.E.C.) .. 1/3
Neutron (very fine) .. 1/6
Blue Tungstallite (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 8/11
(4 inches deep.)

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 .. 12/6
2-way .. 12/6
3-way .. 17/6

POLAR 2-way .. 11/-
(Cam Vernier).

BRUNET (genuine)

4000 ohms 'Phones .. 16/11
Do. De Luxe .. 17/11
Do. Single .. 8/11
2000 Single .. 7/6
Post Free.

EBONITE

Cut to size
at 1d. sq. in.,
1 sq. in., 1d.
Post 3d.

Phillips '04
DULL
EMITTERS
17/11
Post 6d.

APOLOGY. I regret delay in delivery of Condensers, which has been unavoidable owing to being snowed under with orders.

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

SPECIAL VALUE
TRANSFORMERS
ORMOND L.F.
14/11

CONNECTICUT
L.F. (Royal) 17/11
Post 6d. each

ACCUMULATORS
BEST MAKES,
UNDER MY OWN
LABEL
4 v. 40 .. 17/6
4 v. 60 .. 21/-
6 v. 60 .. 28/6
6 v. 80 .. 34/-
6 v. 100 .. 42/-
Carriage 1/6 each.

"BABY" COIL STANDS (EBONITE)

2-way 3/6 2-way 4/11
BRASS FITTINGS. KNOB TYPE.
Post free.

RIGHT OPPOSITE
DALY'S
GALLERY DOOR

K. RAYMOND
27, LISLE STREET,
LEICESTER SQUARE, W.C.2

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'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/-

FRENCH THOMSON- HOUSTON

HAVE YOU TRIED THEM?
You will never use any others.
POST FREE. **14/11**
per pair

TELEFUNKEN 4,000 ohms HEADPHONES

As light as a Feather .. 17/11

**DR. NESPER
HEADPHONES**
Genuine Nesper-
phone, 4,000 ohms.
Fitted with adjust-
able diaphragm, de-
tachable receivers,
double leather-
covered head-
springs, long flex-
ible 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 in-
ferior imitations
which are "clever-
ly" got up to de-
ceive. Make sure of
the genuine article,
the original "N &
K," and avoid dis-
satisfaction. See
that the letters
"N & K"—and no
other—are stamped.
4,000 ohms. 12/11
6,000 ohms. 13/3
Post 6d. pair.

**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 0005 Variable Condenser, with
Vernier .. 7/3
1 Cam Vernier 2-way Coil Holder
Panel, 5 1/2 in. by 1 1/2 in., drilled
to hold 2 5-Pin Valve Holders for
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.

D.G.C. WIRE
S.W.G. per 1 lb.
18 .. 9d.
20 .. 9d.
22 .. 10d.
24 .. 1/-
26 .. 1/1
28 .. 1/3
30 .. 1/8
Post 6d. Reel.
Not sent otherwise.

**POLAR
MICROMETER
CONDENSERS**
5/6 each
POST 6d.

MULLARD THE MASTER VALVE

H.F. RED RING for strong high-frequency
amplification and detection .. 12/6
L.F. GREEN RING for pure low-frequency
amplification, free from distortion .. 12/6
BEST BRIGHT FILAMENT VALVES EVER MADE.
MAKE SURE YOU GET THEM.
POST 6d.

**The
NEW
R.I.
25/-**
Beware of
Imitations.

**STIRLING
"DINKIE"
LOUD
SPEAKER
30/-**

MYERS VALVES.

Universal, 4 volt, .6 amp. **12/6**
Dry Battery, 2 1/2 volt, .25 amp. **21/-**
Plate voltage 2-300 volts.
Post 6d. each.

"J.B." VARIABLE CONDENSERS

	Standard	Super.	Microdenser
.001 ..	8/6	9/8	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 4d. set. Always in Stock. Post 6d. set.

GUIDE FOR CHELMSFORD

On 1,600 Metres
Aerial Reaction
Coil No. 150 200
Tuned Anode 250 or 300

TINNED COPPER

Square 18 or 18
S.W.G. .. 15 ft. 1/-
Round ditto 15 ft. 10d.
1 lb. Reels 16 round 2/6
1 lb. " 18 " 3/-
1 lb. " 20 " 3/3
Post Free.

VALVES

POST 6d. each.
**B.T.H., MARCONI, MULLARD,
COSSOR, EDISWAN, ETC.**
12/6

**D.E.R. Type, MARCONI, D.F., ORA,
EDISWAN.**

21/-
06 Type, B.T.H., MULLARD,
EDISWAN, ETC.
25/-

All Valves Stocked.

VARIOMETERS



**RAYMOND
8/11 OR
FALLON
IGRANIC
EDISON-BELL 10/-**
POST 6d.

The finest Variometer on the mar-
ket at any price. Inside winding,
suitable for broadcast reception on
any P.M.G. Aerial, extraordinary
close coupling, ensuring large tuning
range. On a 30 ft. indoor aerial the
maximum wave-length exceeds 420
metres, and the minimum on a 100
ft. aerial is below 350 metres. The
maximum on a full-size outdoor
aerial is 700 metres, and the mini-
mum on a 30 ft. is 200 metres.
Inductance the highest possible—
9.5 to 1. Metal feet can be adjusted
to four different positions.

FERRANTI

INTERVALVE

TRANS-

FORMER

17/6



IMPORTANT.

Don't forget that
RAYMOND'S
have the goods.
Imitation is the Sincerest Form of Flattery!

**"RAYMOND"
FIXED
CONDENSERS.**
Ebonite Base.
.001, .0001 to 1/2
.0005 .. 1/2
.002 to .004 .. 1/3
.006 .. 1/6
.01 and .02 .. 1/9
.05 .. 3/3
POST FREE.

**FIBRE
STRIP
FOR COILS**
5 lengths a 1/-
1/10 doz.
POST FREE.

RIGHT OPPOSITE
DALY'S
GALLERY DOOR

'Phone: GERRARD 4637.

K. RAYMOND
27, LISLE STREET,
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THIS PAGE IS FOR CALLERS ONLY

ALL POST ORDERS FROM THE OTHER THREE PAGES

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.

**OPEN
WEEKDAYS
9 to 7.45
SUNDAYS
10 to 1**

SWITCHES.

Porcelain D.P.D.T. .. 1/7
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. .. 10/6d.

BATTERIES 4-5

Vulco English 4-5 .. 4d.
B.B.C Red 4-5 .. 5d.
Eveready "London" .. 4 1/2d.

H.T. BATTERIES.

Best Made 30 v. .. 4/8
Best Made 60 v. .. 7/8
Best Made 66 v. .. 9/-
Ever-ready 66 v. .. 13/8
Ever-ready 108 v. .. 22/8
Siemens "Q" 1-5 .. 3/-
Ever-ready ditto .. 1/9
B.B.C. 9 volts .. 3/-
B.B.C. 30 volts .. 10/-
B.B.C. 60 volts .. 5/8
B.B.C. 16 volts. .. 2/6

RHEOSTATS.

Small 5 ohms. .. 1/3
One Hole Fixing .. 1/3
Ormond .. 1/9
Ebonite Former .. 1/8
Ditto and Dial .. 1/10
Igranite, T.C.B., and all known makes.

CRYSTAL

DETECTORS, &c.

Enclosed Brass, Large 1/3
Ditto, Nickel or Brass, Large .. 1/6
Small Brass .. 9/6d.
Ebonite, Enclosed .. 1/-
Micrometer Adjustal .. 1/11
Mic. Met Type .. 2/8
Burndept .. 5/-
Easi-Fix Cups 1d. & 1 1/2d.
Gold Spearpoint .. 3d.
Neutron Crystal .. 1/8
Hertzite (Shaw's) 8d. & 1/-
Midite .. 6d.

VALVES.

Dutch Detector .. 4/9
Dutch "R" .. 5/-
Phillips "R" .. 7/9
French "Metal" .. 6/11
Phillips '04 .. 17/11
Metal '06 .. 17/11
Radion (1 amp.) .. 10/-

TOOLS.

Set of Spanners .. 1/4
Taps, 0, 2, 4, 6 B.A. set 2/-
Small Soldering Irons 8/6d.
7-Twist (H.S.) Drills .. 1/4

**NO POST ORDERS
AT THESE PRICES.**

EBONITE PARTS.

Good Coil Plugs from 4 1/2d.
Edison Bell Shaped .. 1/-
Raymond ditto .. 10/6d.
Basket Adapters .. 8 1/2d.
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.
Coin Plug on Stand .. 1/-
Ditto, Swivel Movement 1/3
Coil Plug and Clips .. 6 1/2d.

BRASS PARTS.

W.O. or Pillar Terminals 1d.
Small Pillar .. 4 for 3 1/2d.
Phone 4 B.A. .. 1d.
Phone 2 B.A., 2 for .. 2 1/2d.
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 1 1/2d.
Spade Tags .. 5 a 1d
Spring Pillar Terminals 2 1/2d.
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 2/8
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
Raymond Inside Wind-
ing .. 8/11

SUNDRIES.

Twin Flex 1. 4 yds. 6d.
D.C.C. Bell Wire, 10 yds. 5d.
(Indiarubber covered)
Sleeving .. yd. 4d.
Wander Plugs pr. 3d.
Coloured Plugs each 1 1/2d.
(All screw pattern)
Electron Aerial .. 1/4
Polished Boxes, 8 by 6 3/6
Tungstaltite .. 1/-
Microstat .. 2/6

SUNDRIES.

Phone Cords (8 feet) 1/5
Nugraving .. 7 1/2d.
Similar Sets (Titles or
Scales) .. 3d.
Good Knobs .. 1 1/2d.
Small Knobs, 2014 B.A. 2d.
Studs, Nuts and Washers
doz. 4 1/2d.
Switch Arms 8d. to 1/-
Copper Foil .. ft. 2 1/2d.
18g. Sq. Tin Copper
15 ft. 5d.
16g. Sq. Tin Copper
15 ft. 6d.

Round Tin Copper, vari-
ous Sizes.
Insulated Staples 5 a 1d.
Insulated Hooks 4 for 3d.
Rubber Lead in, 30 feet 1/3
7/22 Copper Aerial,
100 ft. 1/10 1/2

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, 1/2 in.,
2 yds. .. 1d.
Ditto, 1/2 in. .. 2 yds. 1 1/2d.
6 in. Ebonite Anticap
Handles .. 8d.
Battery Clips 2 a 1d.
Skinderviken But-
tons (Aluminium) 4/8
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 .. 2 1/2d.
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
Tandee .. 1/6
Chelmsford, various, 1/6, 1/9
1 Complete with Adapter 2 3
(To use with variometer.)
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/-
Interval Transformer 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 1 1/2d.
D.C.C. Wire, per 1 lb. —
13 g. .. 9d. 20 g. 9d
22 g. .. 10d. 24 g. 1/-
28 g. .. 1/1 28 g. 1/3
30 g. .. 1/6 Etc., etc.
Solder .. per stick 2d.
2 Color Flex .. yard 2 1/2d.
Shellac .. 5d.
Battery Box .. 4 1/2
(with clips for 36 v.)
Nickel Pillar Terminals 2d.
Nickel Contact Studs
2 for 1 1/2d.
Nickel Switch Arm .. 1/-
(one hole fixing)
Loading Coil and plug
(with ebonite top)
Gamages Permaite .. 1/-
Condenser Brushes .. 6d.
EASI-FIX
ASSEMBLY - - 3/-

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

6,000 ohms .. 13/3

GENUINE STAMPED.

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

NO POST ORDERS.

BEST SWITCH ARM.

12 Studs THE LOT
12 Nuts. 10 1/2d.
12 Washers.

CRYSTAL CALLERS DETECTOR. only.

Similar to the
MIC MET. 2/4

BRASS FORMER (DOUBLE) 23 spokes 3/- each side

Make your own coils.
CALLERS only.

EXIDE.

D.T.9 Type. 2 Volts. (Glass).
(For '06) 5/-

EBONITE 3/16-in. CALLERS' PRICES.

6x6 .. 1/4
7x5 .. 1/4
8x6 .. 1 10
9x6 .. 2/-
10x8 .. 3/-
12x6 .. 3/-
12x9 .. 4/3
12x12 .. 5/6
14x10 .. 5/6

CUT TO SIZE 1d. sq. in.
WE STOCK 1-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. 17/11
20-80 Volt, H.T.

**NO POST ORDERS
FROM THIS PAGE**

NO POST ORDERS FROM THIS PAGE.

RIGHT OPPOSITE
DALY'S
GALLERY DOOR

*Phone: GERRARD 4637.

K. RAYMOND
27, LISLE STREET,
LEICESTER SQUARE, W.C.2

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OF BUSINESS:**
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SUNDAY . 10 to 1

CLIMAX RADIO

GET A BETTER EARTH

The apparent simplicity of earthing your wireless circuit has robbed this necessary operation of due consideration and attention.

A WATER PIPE is bad BECAUSE

it is never where it is wanted: it means a long inefficient earth wire trailing about the house followed by a poor joint to a lead pipe which in turn wanders all over the premises. It involves interference from electric mains and very often from sets earthed to the same system.

A GAS PIPE EARTH is worse

It has all the disadvantages of the water earth with the addition of a bad electrical contact at each joint.

A DIRECT EARTH CONNECTION is best because it means a short, straight earth lead from the receiving set to the ground.

THE CLIMAX EARTH TUBE IS THE BEST FORM OF DIRECT EARTH because

it is ready for immediate use. It is quickly and easily installed without disturbance to your garden. It occupies minimum space and is most unobtrusive. It penetrates well below the dry earth surface. Being dulled and perforated, it quickly conducts water to adjoining earth. Why not make sure of a short, straight, efficient and convenient earth connection by purchasing

THE CLIMAX EARTH TUBE

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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 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 patenters 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 1 P—O P and 1 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.

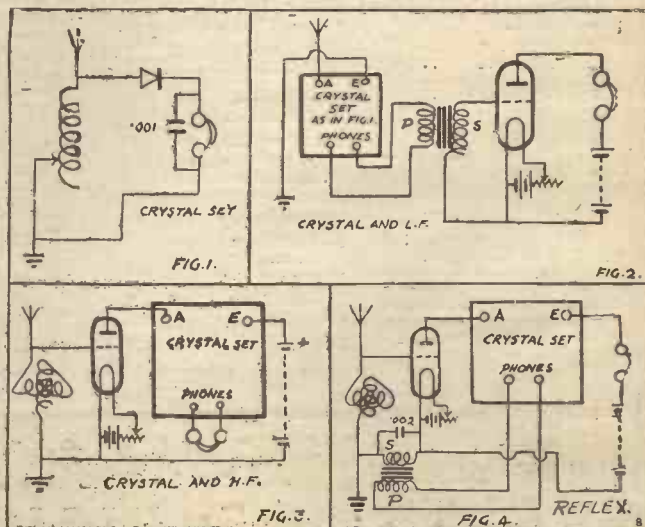
When the 'phones are disconnected and the primary of the L.F. transformer replaces them, the fixed condenser, which is normally across the 'phones, will be connected across the transformer primary, and generally this will be found to give perfectly satisfactory results. When the 'phones are disconnected and the primary of the L.F. transformer takes their place, the 'phone con-

denser 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. (Sidecup), W. R. A. (Caledon), B. D. P. (Tylors-town), C. R. F. (Beeston, near Nottingham), F. P. (Cheshunt), "MEMO" (Leicester), F. H. (New North Road, N.1.), E. B. (Monks-eaton), 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 disregard 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-

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.

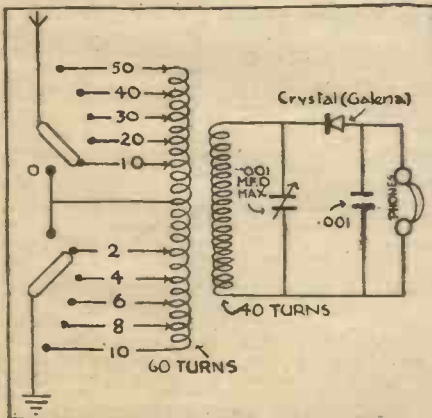
A stamped and addressed envelope must accompany all queries. A copy of the questions asked should be kept by the sender, as it is not always possible to reproduce the original query when replying. Number your queries 1, 2 and 3, and answers will be given to each item.

web form, and are wound over nine nails driven into a cylindrical piece of wood, 2½ in. in diameter.

For the primary 60 turns of 24 S.W.G. should be wound on, tapings 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 ¼ 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 tapings 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.)

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—a stage in Crystavox construction

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tone, because valves are entirely eliminated is wonderfully pure.

For use, the Crystavox is merely connected to the two telephone terminals of the Receiving Set, a small 6-volt dry battery (which will last for months) is coupled to it, and the instrument is ready. But not every Set is sufficiently sensitive to operate a Crystavox. The safe test is to hold the phones 12 inches from the ears and if signals can still be heard the Set will work a Crystavox perfectly.

Try this test to-night and then see your Wireless Dealer. If he is within easy Crystal Range of the nearest B.B.C. Station he will probably be able to give you a demonstration. The price of the Crystavox is £6 15 0

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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.

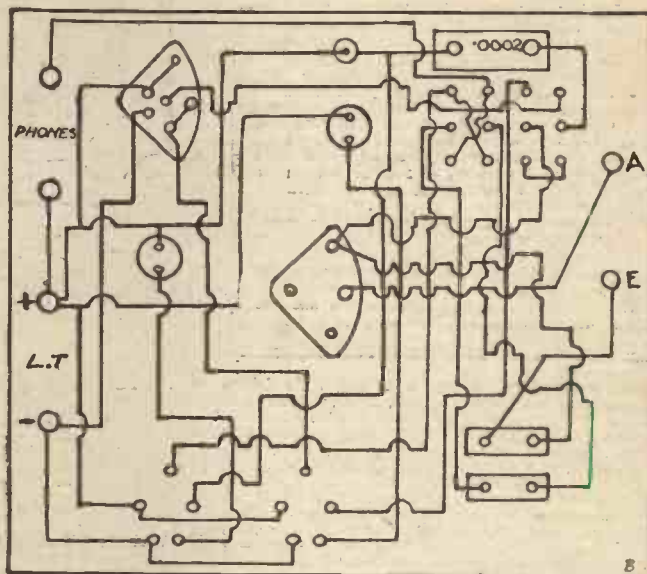
Some confusion appears to remain with regard to transformers in Unidyne sets owing to the different types used at different stages of the inventor's experiments. The matter will be perfectly clear if the following facts are borne in mind.

In the early experiments a 10 to 1 ratio 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 Lissnagon 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.

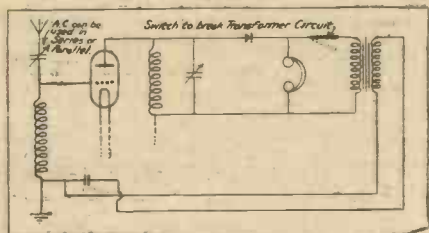
The burning out of the valve is due to keeping the filament burning too brightly, and there is no need to do this to obtain maximum signals. It will be found that a good filament resistance adds a great deal to the smooth operation of a Unidyne, and it will certainly effect a saving if the valve is kept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

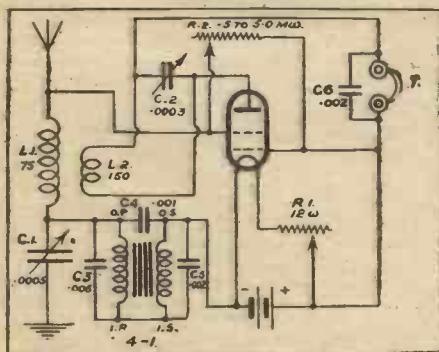
It does not matter how the 'phones are connected in a single-valve Unidyne circuit, but if more than one valve is used the plus tag should be connected to the battery positive.—TECH. ED.

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.)



—the new and better way to buy your Panel

EVERYONE is beginning to realise the tremendous influence exercised upon the working of a Set by the Panel. A man may buy the finest components and build up a Receiver to the exact instructions of the author and yet get poor results—his entire efforts having been nullified by a leaky panel.

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6" x 14"	7/-	8/6	7" x 21"	12/3	15/-	10" x 12"	10/-	12/-
6" x 21"	10/6	12/9	7" x 24"	14/-	17/3	12" x 14"	13/3	16/-
7" x 9"	5/3	6/6	7" x 26"	15/-	18/6	12" x 21"	19/9	24/3
7" x 10"	5/9	7/3	7" x 30"	17/9	21/6	14" x 18"	19/9	24/3
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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 oil board, but it answers with water-pipe earth and either outdoor or gas-bracket aerial.

Yours faithfully,

W. T. TAYLOR.

14, Partrey 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 Road, CHAS. S. THOMSON.
West Norwood, S.E.27.

5 XX 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 XX. Why should not Chelmsford broadcast the other stations as well, and, incidentally, introduce a

friendly rivalry between them? The only thing 5 XX 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-phones 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 out 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 XX.

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, Coudson, Surrey.

(Continued on page 285.)

WOOD POLE MASTS

Norwegian, strongest grown. Bark on, or painted any colour. 6 feet to 50 feet. Straining wires, sockets, finials. Lowest quotations.

TYLER & SWAN,
Timber Merchants, Leighton Buzzard.

THE MASTER ONE-VALVE SET

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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.

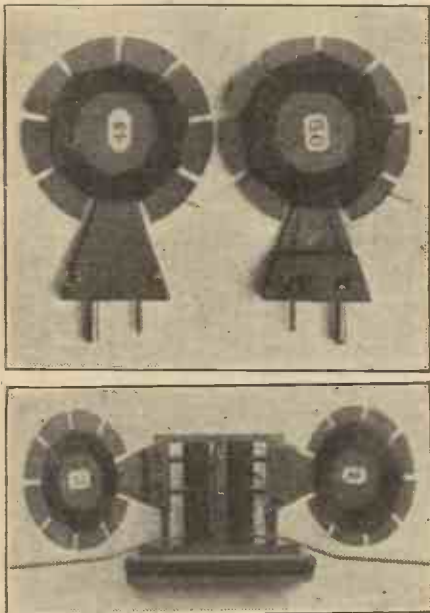
P.S.—The parts were from the Bower Electric Co., Ltd.—H. E. D. B.

"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 $\frac{1}{4}$ in. ebonite held together with



$\frac{1}{4}$ in. Whitworth brass screws, countersunk heads. Coil formers, $\frac{1}{4}$ in. cardboard, waxed, 4 in. diameter, 2 in. centre, $\frac{1}{4}$ in. slots. The extended part of former is fitted with $\frac{1}{4}$ 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 Frankfurt station. May I offer to enlighten Edward Tarpies 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.

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There are very good reasons why the open spiral anode of the Louden enables such clear reception to be obtained, but the best of good proofs is to buy one to-day and fit it to your set.

From the moment you switch on you will notice that your reception is clearer than it was before.

You may have become so accustomed to the "breathing" noise of your set that you do not notice it. When you fit Louden Valves you will most certainly notice its absence.

You will realise why we say that Louden Valves are Silver Clear.

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

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THERE can only be two reasons for the exceptional demand for Eureka Transformers. First, that the general wireless public appreciated truthful and frank explanations of the superiority of their design, and secondly—that they have absolutely lived up to their reputation.

Wireless enthusiasts are always quick to show their appreciation of a good component and to recommend it to all their friends.

That is exactly what has happened with the Eureka. It is such an exceptional Transformer—both for volume and purity—that, in spite of its comparatively high price, it has literally fought its way to the top as Britain's best L. F. Transformer.

And well it might—for certainly no other Transformer has such care lavished upon it during every stage of manufacture—no other Transformer has to undergo successfully such relentless testing. In the Eureka works, a staff of experts are actually paid to "find fault"—so zealous of its reputation are its manufacturers.

The secret of its success lies in its unique construction. For instance, its massive windings contain no less than 24 miles of fine copper wire. Its core is not of stampings, but of a more expensive design which eliminates all possibility of howling. And its coppered steel case offers such a protection against climatic conditions that a Eureka Transformer can be placed below the surface of water and yet the insulation remains quite unaffected. Obviously the Eureka is built to an ideal and not to a price—for low priced Transformers get volume by reducing the amount of wire around the core, and by employing a high "step up" ratio between the primary and secondary windings.

For your next Set specify the Eureka—and get the finest Transformer ever made in this country.

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Made in two types

Concert Grand .. 30/-
Eureka No. 2 .. 22/6

(For second stage.)

Gilbert Ad. 1516.

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.

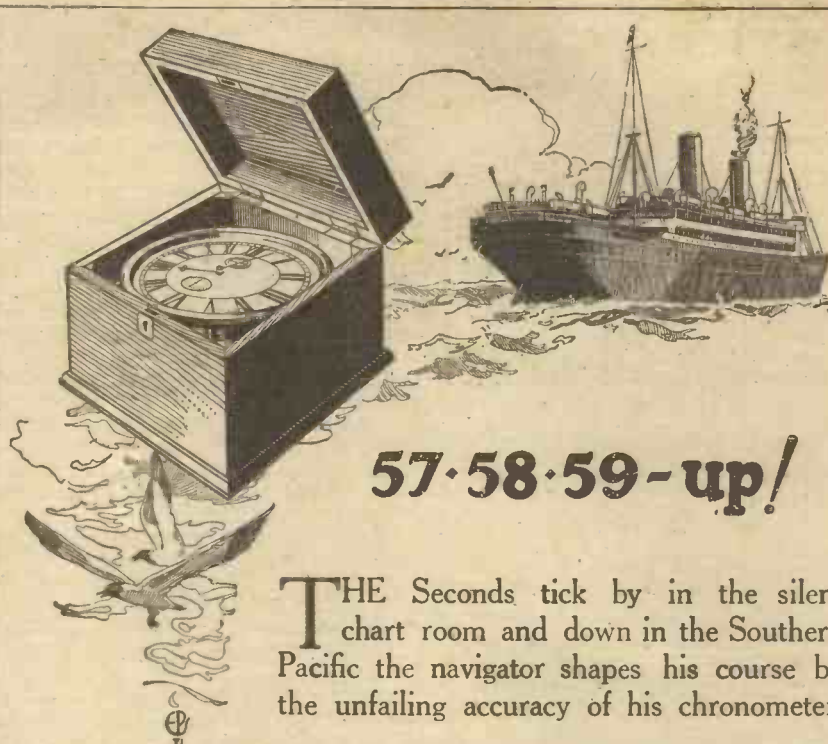
Dissolve a few pieces of shredded india-rubber in naphtha, and then add to the solution two parts by weight of best quality shellac to one part of rubber. The mixture should now be gently heated (taking great care not to ignite the inflammable naphtha) and stirred until the mixture and solution are complete.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



THE Seconds tick by in the silent chart room and down in the Southern Pacific the navigator shapes his course by the unfailing accuracy of his chronometer.

How would he fare if his shipowners had tried to economise by installing cheap alarm clocks in place of chronometers? And yet frequently enough we find instances of people getting inferior results from their wireless sets because they have attempted to economise on condensers.

There is no economy in this really because sooner or later they have to take out the "just as good" and substitute an article of sound manufacture.

We do not say that all cheap condensers are necessarily bad; you may be lucky and get a good one, but if you buy a Dubilier you bet on a certainty—you get a good one *every time*. Naturally, if we are to maintain such a high standard, our products must be slightly more expensive than those which carry no guarantee, but we are convinced that in the interests of true economy you should specify Dubilier.

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"SENSIFONE" 4,000-ohm Double Headphones. The all-British 'Phone. Price 22/6 pair. Posted to your address upon receipt of 5/- deposit. Balance 5/- monthly. Money returned if not satisfied. Crystal Sets, Amplifiers, Valve Sets and Loud Speakers on similar terms. **Townshend's, Ltd., Ernest St., Birmingham.**

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and you get results rivalling a

50/- LOUD SPEAKER

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FOR ONLY 7/6 POST 1/-
Fitted in a second. Send P.O. 3/6 at once and listen in comfort.
Send for free pamphlet
L. JONES & CO. 237, WESTBOURNE GROVE LONDON, W.11

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.

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100 ft. Coil **15/9** Post Free.
Cash with order.
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Black matt finish. 'Rigid. Thoroughly insulated. 7" x 5", 1/-; 8" x 5", 1/2; 9" x 5", 1/5; 10" x 9", 2/4; 12" x 9", 2/10; 14" x 12", 4/-, 3/4" thick. Post free. Callers, panels cut to any size. Exceptional terms to genuine traders **CROXSONIA COMPANY (Dept. A), 10, South St., E.C.2.**

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Sectional Steel Wireless Masts.

The **LIGHTEST, STRONGEST, and CHEAPEST** in the World. Complete with pulley, cleat, wire rope, strainers, insulators, ground anchors, base plate and full instructions. A man and boy can erect a 40-foot mast in an hour.

30-ft., 40/-; 40-ft., 55/-; 52-ft., 90/-.

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Doone Cottage, Weybridge, Surrey.

'PHONE REPAIR SERVICE

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All Components for Unidyne Stocked.

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Best
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Long range, Maximum volume of sound
To use a Loud Speaker or Headphones
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To use Accumulator or Dry Batteries
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
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where the new GECOPHONE Models will be displayed

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NEW
GECOPHONE Models
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Sing. Valve Sets
Two Valve Sets
(Det. & H.F.) in
Table and Cabinet
Models

Two Valve Sets
(Det. & H.F.) in
Table and Cabinet
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Three Valve Sets
in Table and
Cabinet Models

Four Valve
Cabinet Sets de Luxe
Five Valve
Cabinet Sets

For full range of GECO-
PHONE Sets and parti-
culars, enquire of your
local dealer, and ask
for List No. B.C. 3425

LISSENIUM

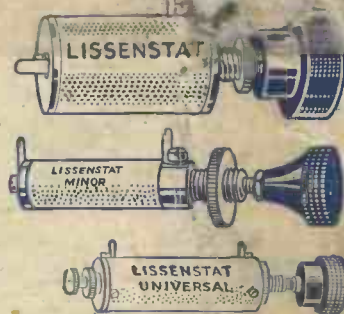
GIVE THE VALVE A CHANCE—after nightfall.

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.



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

LISSENSTAT MINOR
(patent pending)—is replacing many thousands of discorated 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.

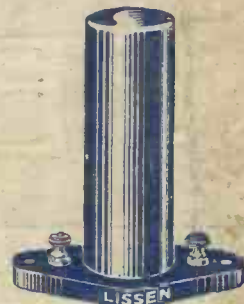
The Resistance Capacity method gives pure amplification, but requires a very high H.T. voltage to make up for the volt drop through the resistance interposed. Not so widely used as it might be, but an interesting method.

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. It is interesting to see how many stages of LISSEN CHOKES can be used in cascade—INTERESTING ALSO TO USE LISSEN CHOKES WITH POWER VALVES. Price **10/-**



DON'T MIX YOUR PARTS—There is a LISSEN Part for every vital place.

PARTS THAT PULL TOGETHER.—When you know that every vital part in your receiver is pulling strongly with each other, you know that you have a receiver which is the best you can ever get. With all LISSEN Parts you will get results which would never be possible with mixed parts.

PARTS WITH A HIDDEN POWER—BUILD WITH THEM

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