

A COLPITT'S ONE-VALVE RECEIVER.

Popular Wireless

Every Thursday
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No. 213. Vol. IX.

and Wireless Review

July 3rd, 1926.

Scientific Adviser: SIR OLIVER LODGE, F.R.S., D.Sc.

SPECIAL FEATURES.

- Some Unusual Aerials.
- Government Broadcasting.
- "Ariel" at 2 L O.
- The Progress of the B.B.C.
- The Choice of Coil Sizes.
- The Progress of the Amateur Transmitter.

Our cover photograph this week shows a new American instrument in use which records wireless concerts for gramophone reproduction.



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Co-axial Mounting

The new Constructional System which ensures (a) longer life (b) lower running costs and (c) greater uniformity in results. Used for the first time in this wonderful new Cossor Dull Emitter.

FOUR years ago Cossor astonished the Radio world by evolving a method of valve construction which, for the first time, utilised almost the whole of the electron stream. Two years later this success was followed up by the introduction of a unique triple-coated filament which operated at a phenomenally low temperature.

And now Cossor—in introducing the new Cossor Point One—demonstrates that the same spirit of progress which has always dominated its activities is as vigorous as ever.

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In the new Cossor Point One there is at last available a patented system of mounting which infallibly aligns the filament, grid and anode from top to bottom.

How Co-axial Mounting is achieved

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two elements together at the top by means of a seonite insulator. The grid itself ends in two prongs which are inserted into the base of the seonite insulator. The anode rests on a wide flange provided, and is welded at its base to two stout nickel supports. Even extreme force cannot disturb the exact relative positions of these two elements—once fixed in their places, to a hundredth part of an inch, they are there for all time.

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Through the centre of the seonite tube runs a fine wire which holds the filament in its

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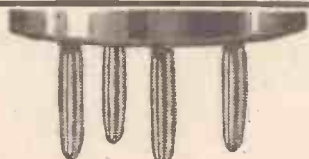
Types and Prices

Cossor Point One	
RED TOP: For H.F. use 1·8 volts	15/6
Consumption 1 amp	
PLAIN TOP: For Detector 1·8 volts	15/6
Consumption 1 amp.	
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—the long-life Dull Emitter with the new 1 amp. filament



Popular Wireless

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RADIO NOTES AND NEWS.

An Unrehearsed Item—Brussels' Higher Wave-length—Forthcoming Exhibitions—Radio at R.A.F. Display—Tracking the "Pirates"—Easy Payment Receivers.

Brussels' Higher Wave-length.

HOW are south-east listeners getting on with Brussels, since that station changed its wave-length from way down below the relays, to right up on 486 metres? Personally, I have not been getting this station so well since the change-over, and of the dozen or so letters I have received upon the subject, half the writers are pleased and the other half disgusted. What is the general experience of those interested in the Belgian programmes?

Noel Coward—Actor.

THE Newcastle station is broadcasting "A Little Fowl Play" on Saturday, and thereby hangs a tale. When this popular one-act farce was first produced, some years ago, the part of the poulterer's boy was originally played by a certain Master Noel Coward. He is now the well-known playwright!

An Unrehearsed Item.

LISTENERS who heard it agree that one of the most amusing unintentional broadcasts was that from Sheffield Relay Station, a few Sundays ago. The wireless service had just concluded when a telephone line somewhere "crossed" the broadcast. All Sheffield was astonished to hear a telephone girl demanding, "Four pennies, please." There was a moment's silence whilst the unknown fumbled for fourpence, and then ponk, ponk, ponk, ponk went the pennies, and immediately afterwards a lady began ticking-off a man friend in right good hearty style!

Fortunately, perhaps, every word could not be followed, but Sheffield's audience was left with the firm belief that when the two overheard conversationalists met again, there was going to be trouble. And the unknown subscriber was going to be in it!

A Surprising Station.

ONE of the queerest stations in America is O A X, Lima (Peru). Before they erected their own, not one of the constructing or operating staff at Lima had ever seen a broadcasting station. Unfortunately the aerial had to be quite a low one—70 feet or so—and the surrounding mountainous country was all against broadcasting, so when the Marconi Q Type

transmitter arrived it was put up more in hope than in confidence.

Yet no sooner were the programmes on the air than the station started reaching out for thousands of miles in a most gratifying manner, and it has now been praised as one of the best stations in the whole of America. Which just shows that you never know till you try!

Rugby Telephony Tests.

SEVERAL correspondents have enquired why Rugby's telephony testing to America is not now heard on the long waves on Sundays. It was announced in the



Dame Nellie Melba, broadcasting from the old Chelmsford Station six years ago.

House of Commons recently that the tests are being curtailed owing to the coal strike.

"Tune-In" This Week.

SATURDAY of this week is quite a big broadcasting day, for which several notable items have been arranged. There is the broadcast from Hendon of the

R.A.F. Air Pageant, to be followed in the evening by the first production of "Tune-In," the new radio revue.

Last, but not least, there is another appearance of that great little broadcaster, Sir Harry Lauder.

A Whale for Wireless.

A WEEK or two ago I referred in these Notes to a Nottingham listener, who is a regular whale for wireless. Morning, noon, and night he listens in to very nearly everything that's broadcast, and I quite thought he was a Non-such! But apparently there are several like him, and one "P.W." reader, Mr. A. Wolfendale, of Wigan, tells me that he has for a long time been doing his 9½ hours per day solid listening-in!

All On the Ultra!

EXPLAINING how it is that he has so much time on his hands, Mr. Wolfendale says: "I am a semi-invalid, and I found I could do odd jobs better when listening. I am very fond of experimenting with my set, and when I decided to have a one-valver, I looked up the jolly old 'P.W.'s' and decided on a 'P.W.' Ultra. I have never regretted it, for although I have often had it to pieces to try out the claims of other circuits, I have always gone back to the Ultra!"

Thirty Years of Radio.

THE city of Bologna has just been honouring its famous citizen, Senatore Guglielmo Marconi, who took out the first patent for wireless telegraphy, just thirty years ago. In his speech at the University, the great inventor disclosed the fact that his researches have taken him across the Atlantic eighty-six times! He paid a great tribute to Adolfo Righi, the Bolognese scientist, who prompted his young pupil, Marconi, to follow up the investigations of Hertz and Lodge. The brilliant results that followed are what we now pay the P.M.G. ten shillings a year to listen to!

A Boost for the B.B.C.

HAVE you noticed how broadcasting always gets a boost about mid-summer? Two years ago there was all the excitement about a new station at

(Continued on next page.)

NOTES AND NEWS.

(Continued from previous page.)

Chelmsford, and then twelve months later, —just at the season when wireless can do with a fillip—the Daventry station was opened. This year the scheme for fewer stations with higher power came along, and all sorts of rumours are now flying round about new stations in Kent and in Essex, and more power for certain provincial stations. Probably we shall get nothing really definite until the Postmaster-General introduces the Broadcasting Bill in the Commons, for which the date has not been fixed at the time of writing.

The Eisteddfod.

THE Royal National Eisteddfod is to be held at Swansea next month, but it is unlikely that the event will be broadcast. The stumbling block which will prevent listeners from hearing the great festival is £ s. d. The promoters of the Eisteddfod are committed to some £17,000 or so expenses, and the only objection to broadcasting is that if it happens to be wet people may choose to stay at home instead of swelling the "gate."

The B.B.C.'s first offer did not run into three figures. I hear, but although this was subsequently increased it still falls short of the Eisteddfod committee's expectations.

Sheffield's Educational Scheme.

SHEFFIELD, which has already done some noteworthy work in educational wireless, is now installing a receiver at the University. The cost is to be defrayed by Mr. F. Lloyd, a well-known local radio pioneer. The full details of the scheme are not settled at the time of writing, but when completed Sheffield should possess a unique wireless educational service, embracing elementary schools and the University alike.

Radio for Egypt.

BROADCASTING in Egypt is now assured by an agreement reached between the Egyptian Government on the one hand, and the Marconi Co. upon the other. According to a statement in "The Times," the agreement is for a period of 30 years, and will be renewable subsequently for periods of ten years.

An Egyptian station of normal power should be received quite well in this country when the conditions happened to be favourable.

Forthcoming Exhibitions.

AS is usual at this time of the year, quite an orgy of Wireless Exhibition arrangements is being announced. I was pleased to note that at the National Radio Exhibition—to be held at Olympia from Sept. 4th to Sept. 18th—no listening or loud-speaker demonstrations by exhibitors will be permitted. Nothing could give a worse impression than rival firms shouting one another down, so in this instance the promoters forbid any public demonstration within a quarter of a mile of the show.

By the way, the "Birmingham Weekly Post" Wireless Exhibition will be held at the Thorpe Street Drill Hall, Birmingham, from Oct. 5th to 16th, and not at Bingley Hall, as previously announced.

Tracking the "Pirates."

THERE is no slackening-off in the Postmaster-General's campaign against pirates. All over the country listeners who have not bothered about the formality of a licence are finding themselves up before the magistrates, and generally the fine is a pretty stiff one!

Amongst the delinquents are many who ought to know better. For instance, I noticed a schoolmaster's name the other week, and recently a Norfolk bench dealt with several farmers, a grocer, and a rector! I notice, too, that the Post Office sleuths are pretty good at nosing out the cases, for in nearly every instance there is a conviction.

Irish Radio Transmitter's Society.

I SEE that the Irish Free State now has a radio society of its own, devoted to the interests of the amateur transmitter. Six of the eight Free State licensed experimenters are members, but there is no need

SHORT WAVES.

"The only sane way to use a broadcast receiving set is to shut it off except when something is on which one wants to hear."—*"Electrical Industries."*

"If a newspaper is at liberty to express its views and to circulate them, provided they are not libellous or seditious, obviously a broadcasting company should be able to do the same."—*"Oxford Magazine."*

"International broadcasting, like the Olympic Games, sounds a first-rate opportunity for international squabbles."—*"Manchester Guardian."*

"From a broadcasting programme: '8.55.—All Stations except Aberdeen, The Week's Good Cause.—*Sunday Paper.* What has the granite city done to deserve these constant insinuations against its generosity?'—*"Punch."*

for applicants to hold transmitting permits, as the society will welcome as members all interested in short-wave experimental work.

The hon. secretary is Mr. W. R. Burne, and communications should be addressed in care of the "Irish Radio Journal," 34, Dame Street, Dublin.

Easy Payment Receivers.

SCOTLAND YARD detectives are looking for two men, one aged 24 and the other 25, who, it is alleged, advertised two-valve sets on the easy payment system, with ten shillings down.

Apparently hundreds of people sent the first 10s., but did not receive their sets in exchange. When further inquiries were made of the Electrical and Radio Service, the offices in Charing Cross Road were found to be closed. Naturally there was a good deal of loud speaking done about it, so Scotland Yard, accustomed to all kinds of detection, will try to rectify the matter.

"Situations Vacant" in the Air.

THE German Government is now using broadcasting as an aid to the unemployed. The Labour Bureau at Frankfurt-on-the-Main has arranged for the local station to broadcast reports, stating where there are opportunities to find work in various branches of the labour market.

At present there is no intention of broadcasting details of individual vacancies. But instead places where there is a demand for labour are indicated, as, for instance, where new buildings are going up, or where factories are specially busy.

Radio at R.A.F. Display.

TWENTY or more Marconiphone loud speakers will be distributed throughout the grounds at Hendon on July 3rd, when the great Royal Air Force display takes place. They will be used to make announcements to the crowd, and also to relay the R.A.F. band music to all parts of the ground.

Moreover, when the planes are manoeuvring by wireless-transmitted orders, all the instructions from the ground and the replies from the air will be repeated by the loud speakers. To prevent the interference that marred last year's show, four separate receiving stations will be used, each one acting independently, and connected to a common control room.

The "Liberty" Super Het.

MY attention has been drawn to the photograph of the crowd on the Horse Guards' Parade, which was published on page 567, "P.W." No. 211 (June 19th issue). The set shown was inadvertently described as "a large experimental receiver," whereas actually the big loud speaker depicted there was being operated by the well-known "Liberty" Supersonic Heterodyne Receiver manufactured by the Radi-Arc Electrical Co., Ltd. It is hardly necessary to say that the "Liberty" has long since passed the experimental stage!

Many Inventions.

DETAILS of one more forthcoming exhibition have just been published. The Institute of Patentees (Inc.) announce the Second International Exhibition of Inventions, which is to be held in the Central Hall, Westminster, from October 13th to October 23rd, 1926.

There is a special wireless and electrical section, and the noteworthy feature of this exhibition is the fact that both inventions that are already on the market and inventions that are not upon the market may be seen. Full particulars may be obtained from the promoters, 39, Victoria Street, London, S.W.1.

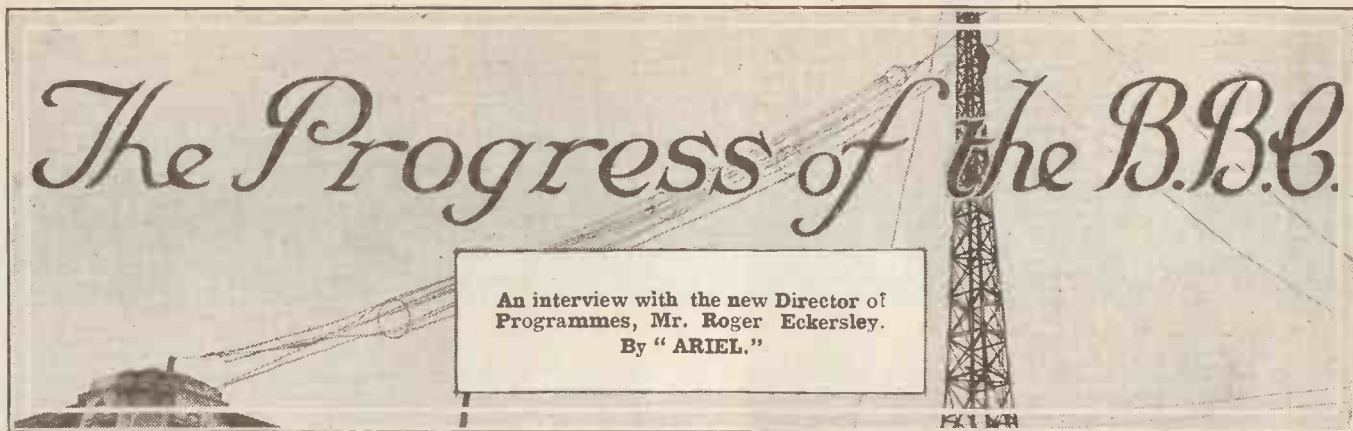
Why not Britain Too?

THE U.S. Department of Commerce has consistently pointed out to all and sundry the importance of directional wireless as an aid to navigation. As a consequence the coasts of America now have 24 radio-beacons in operation, sending out signals so that all vessels equipped with direction-finders may take bearings, whatever the weather and visibility. Recently there have been some notable proofs of the value of these radio-bearings in navigation and life-saving. When is the Board of Trade going to provide British shipping with an equally comprehensive scheme of safeguards?

This Week's Great Valve Thought.

BRIGHT emitters are not all base, and every dull emitter has a silver lining.

ARIEL.



A ROOM high up in a vast building. Above the tinkling of telephone bells ringing peremptorily and terrifyingly, above the important clicking of typewriters, the busy rustle of paper and manuscript, the ceaseless talk of many voices—above everything you could hear the noisy hum of the traffic below, the harsh symphony of the road traffic in the Strand, the melodious cacophony of sound from the river traffic on the Thames.

One could imagine what the effect must be on the topmost story of the Woolworth Building in New York. In a corner of the room by the window a desk with three telephones handled dexterously and unmercifully—the silhouette of a man immersed in his work.

When I called on Mr. Eckersley, the new Head of the Programme Department of the B.B.C., and congratulated him on his promotion, I asked him if he proposed to initiate any completely new policy with regard to programmes. To this he replied that he had no such intention. "As a matter of fact, I can tell you that there will be no change—for the present, at all events—in the way that the broadcasting programmes are arranged. We shall continue in our efforts to improve them, and to please our vast and varied audience."

The B.B.C. and the Theatres.

Speaking of the great volume of correspondence received from listeners at Savoy Hill every day, Mr. Eckersley remarked on the preponderance of those of a favourable nature. He also mentioned that nearly every kind of item in the programme had its special following. For instance, for every letter applauding dance music, there would be a corresponding letter equally enthusiastic about pianoforte solos or the works of old masters.

I asked Mr. Eckersley whether he thought the B.B.C. Programme Budget was adequate.

"I think we manage to get fairly good results by our present rate of expenditure, but it should be remembered that in this kind of entertainment it is not easy to reach the saturation point of productive expenditure. Every penny counts, and we naturally turn with longing eyes to the reserve of licence money now being retained by the Post Office."

Referring to the position of the B.B.C. in relation to the theatres, Mr. Eckersley remarked that the previous spirit of antagonism had been replaced for the most part by an admirable atmosphere of

co-operation. "The stage is now doing its best to help. Several famous managers have told me on various occasions that they welcome broadcasting."

There are still some who believe that the British Broadcasting Company will become a purely Civil Service concern at the end of this year. Mr. Eckersley does not hold with this view. As he sees it, although the B.B.C. will become a Commission on January 1st, 1927, its internal organisation will remain much the same as at present.

The British Broadcasting Company will enjoy the same liberty of action as in the past. One of the reasons why the programmes have been distinctive is that the British station is an independent organisation, whereas in America, alas! all the stations have to serve a supreme power

tainments. While some entertainments are very pleasing when given in public in halls and at the theatre, they are not always the same over the wireless.

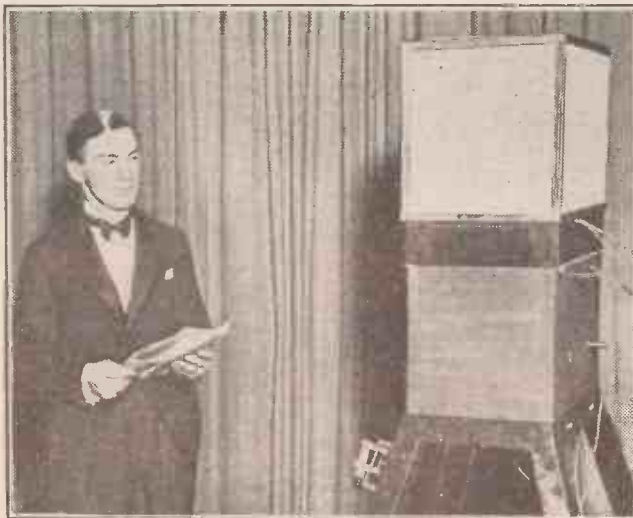
Great discrimination is used at the B.B.C. in the choice of programmes, and experts' advice is considered before each item is finally chosen and included in the programme.

A Helpful Audience.

Mr. Eckersley emphasised the importance of the new system of distribution under which the B.B.C. will be able to provide adequate alternative programmes. Although the scheme had yet to be sanctioned, he hoped that there would not be much further delay, and he indicated the possibility of certain stations broadcasting on two different wave-lengths.

Among many other interesting things Mr. Eckersley told me was that the programmes of all stations are prepared six weeks in advance.

Mr. Eckersley was appreciative of his large listening audience. "A broadcasting audience is a most useful, helpful, and informative one," he said. "It is criticism in its most perfect form—the voice of the public. Careful scrutiny is given to each letter that comes in. We find the advice offered most helpful, and as far as possible we follow this advice."



Steve Donoghue, the famous jockey, broadcasting from the London station.

relying on their revenue solely from advertising.

The result, as can be imagined, is not as desirable as some may think. Apart from dance bands, broadcasts are composed mainly from amateur talent.

Task Necessitating Discrimination.

It is not an easy matter to compose really popular broadcasting programmes. The vast public of the ether like a good thing, but they would be the first to tire of too much of a good thing.

Arranging a B.B.C. programme is a task demanding a perfect knowledge of the trend of public opinion with regard to enter-

In conclusion Mr. R. H. Eckersley painted a very bright picture indeed of the future of the B.B.C.; 1926 for the B.B.C. should be a very prosperous year indeed. The last few months have seen vast improvements in the programmes. Awkward pauses and irritating waits seem to have disappeared. News is more concise and more interestingly served up; the musical part of the programme is satisfying in its variety to suit both the highbrow and the "no-brow." And the great thing now is the knowledge that improvement is to continue. The spirit of restless energy that pervades Savoy Hill is an excellent augury for the future.

PRE-OCCUPATION with more urgent public business has resulted in the shelving of legislation defining the future constitution of British broadcasting. There is now little probability of any concrete proposals being brought forward until the middle of November. In the interval, the B.B.C. will continue to carry on, although with increasing difficulty because of the uncertainties of the future. There is, on the one hand, evidence of an increasingly rigorous application of the terms of the licence by the Postmaster-General. On the other hand, various influences hostile to broadcasting are trying to take advantage of the interval by preparing the way for securing the adhesion of Parliament to constitutional restrictions which will fetter and perhaps permanently disable the development of the new medium.

Entertainment of Primary Importance.

With the deliberate intrusion of so many side issues and complications, it is increasingly important that the main considerations be kept clearly in mind. The only thing that really matters is that the programmes themselves should continue uninterrupted, and should be developed primarily as entertainment, and secondly as a means of enlightenment. The development of programmes necessarily involves the reconstruction of the present system of distribution. It also involves the carrying out of programme-building plans, the evolution of the new technique in radio drama, and the presentation of music by radio—all of which have been begun and advanced considerably by the B.B.C.

That all this work should go on without interruption or decline is vital to the

GOVERNMENT BROADCASTING.

A SAFEGUARD WANTED.

FROM A SPECIAL CORRESPONDENT.

We publish below the comments of a very well-informed student of British broadcasting which should be carefully read by listeners, amateurs, traders, and all interested in British broadcasting. As our correspondent points out, given certain guarantees, listeners need have no fear for the future of broadcasting in this country.—THE EDITOR.

interests of the listeners and the public generally. Theoretical considerations, constitutional practice, dignity, and so forth, are of practically no concern to the average licence holder. What he wants is better programmes and more of them. He feels instinctively that the B.B.C. is on the right lines and that its executive side should go forward undisturbed. Apart, then, from the trimmings, such as status and dignity, the important considerations can be defined as follows:

1. All licence money over and above the actual cost of collection, which is round about 1s. 1d. per licence, should be handed over to the broadcasting authority for a period of at least three years. At the present time the broadcasting authority is deprived of hundreds of thousands of pounds of licence money. This is, in fact, a breach of contract as between the Post Office and nearly half of the people who have paid their 10s. licence fees throughout the country for the sole purpose of being provided with the best available programmes.

The Executive Control.

2. That, so far as its relations with other interests and organisations are concerned, the future broadcasting authority should be given no privileges and should have no restrictions imposed on it. It should be enabled thus to work out its own salvation in co-operation with other interests.

3. That the present executive control of the broadcasting service should be undisturbed, and that the new Commission, while determining the broad lines of policy, should not interfere with details of programmes or purely administrative and technical affairs.

Termination of Contracts?

4. That in addition to the present managing-director, who, as executive commissioner should become ex-officio vice-chairman of the new board, at least one other manufacturing member of the present board should be included on the new board.

5. That it be clearly understood that the new broadcasting authority will be allowed to exercise wide discretion in the choice of programme material and in the inclusion of controversial subjects, and that in this connection the new authority would not be subject to the control of departmental officials in the Post Office.

6. That all questions relating to broadcasting, except those on wave-lengths, should be answered in Parliament by a member of the new Commission, who will be chosen specifically for this purpose. Given guarantees of the application of the above points, listeners need have no anxiety as to the future of the British broadcasting service. It will go forward steadily. But there is need for increasing vigilance during the next few months if these points are to be adequately safeguarded. The future staff problem also wants watching. In view of the moves being made by American broadcasters, immediate steps should be taken to indicate that existing contracts of service with the B.B.C. will not terminate automatically on December 31st.

EVERY valve receiver has to handle four different kinds of electrical currents and each of these requires to be dealt with differently to the others. First of all, there are the H.F. currents which exist in the aerial system, aerial tuning circuit, and in the stages of H.F. amplification, if such are employed. Then we have the L.F. impulses of the anode circuit of the detector valve and grid and anode circuits of the L.F. valves, if such are used. Thirdly, there is the low voltage direct current of the L.T. battery and, finally, the high voltage direct current of the H.T. battery.

H.F. Leakage.

A rubber-covered wire carrying the current from the L.T. battery can be led past all sorts of other leads and objects without fear of appreciable leakage occurring, but a wire surrounded with a covering of $\frac{1}{8}$ -in. thickness of pure rubber will not, in certain circumstances, prevent H.F. leakages. Here we have to deal with what are known as capacity leaks and these can cause considerable losses of signal strength. They are liable to occur when the down lead from the aerial is allowed to come into contact with the walls of a house or with the branches and leaves of trees. Just because the actual metal of the aerial wire is not touching anything else of a metallic or conductive nature it does not mean to say

NOTES ON INSULATION.

From a Correspondent.

that energy is not escaping. Therefore aerial insulation embraces something more than insulation as applied to low-tension wiring insulation. Isolation would be a better word to use in this case, for the farther the aerial, down lead and lead-in are away from everything else except the aerial terminal of the set, the less the energy loss through capacity leaks.

The earth lead, on the other hand, need neither be insulated or isolated from anything except from the other leads that run to the set. It can be nailed on to bare walls or passed through holes in floor boards without fear of signal strength diminishments.

Isolating the H.T.

H.T. batteries should be kept well insulated from earth. Some makes are, of course, above suspicion in the following respect, but many cheap and especially foreign H.T. batteries will give positive readings on their cases. To prevent leakage doubtful H.T.'s should be stood on sheets of rubber or glass or ebonite. One terminal of the H.T. battery, the negative, is

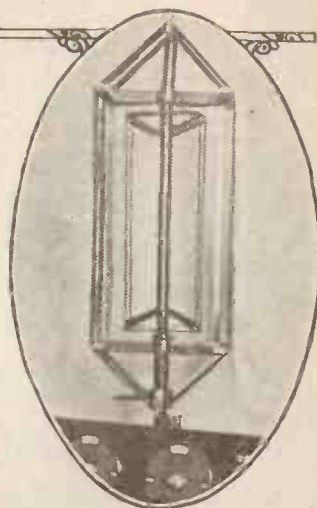
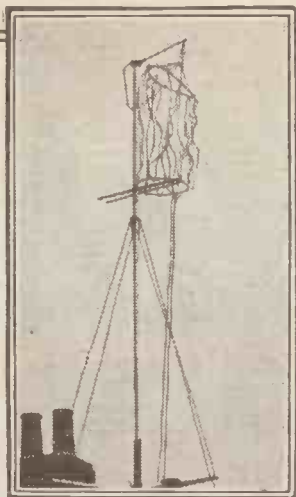
invariably earthed through L.T., etc., so that the H.T. leads, and especially the positive H.T. lead, should be very well insulated.

The cells of both H.T. and L.T. accumulators must be well insulated from one another and the tops of these should be kept free from both acid and dust. It is unnecessary to add that metal objects such as penknives, scissors, pliers, etc. should not be laid down on the unprotected tops of batteries of any kind!

Dielectric Absorption.

Insulation is just as important inside a receiver as outside, and in this respect as well as in any other respect it is as well to remember that the best insulator of all is air. Losses can be caused by a superabundance of insulation as well as by an insufficiency. Dielectric absorption is the technical term for this. H.F. components and wiring surrounded with ebonite, rubber, mica or other such substances will be less efficient than those surrounded by nothing but air. Naturally, few things except aeroplanes and balloons can be absolutely surrounded by air, but there are many instances in radio work where a compromise between the reduction of solid dielectric and the retention of mechanical strength must be made if real "low loss" conditions are to be obtained.

Some Unusual Aerials



Since Marconi experimented with aerials in his Bologna garden, many and weird have been the variations on that first system. In this article Mr. Sexton O'Connor deals briefly with some of the more unusual types in use to-day.

THE ordinary outside aerial, as used for broadcast reception, differs very little from the arrangement employed by Marconi in his early experiments in wireless signalling. Considering the progress that has been made in other directions since the

amount of energy they pick up is very small compared with an elevated aerial, and this deficiency can only be made good, within certain limits, by using more valve-amplifiers than would otherwise be necessary.

or Hertzian oscillator—some five or six feet long, supported conveniently from the chimney or mounted inconspicuously on the roof.

The real difficulty lies in the fact that an efficient aerial must essentially be of a size comparable at least with that of the actual signal wave it is receiving. So long as the broadcast range of wave-lengths lies between 300 and 500 metres the present standard P.O. dimensions cannot be seriously curtailed without giving rise to a corresponding loss in efficiency. It may be, however, that at some not far-distant date broadcasting will be carried out on wave-lengths of the order of 20 metres or less, in which case the present cumbrous and unsightly garden line will give place to a thin metal rod—

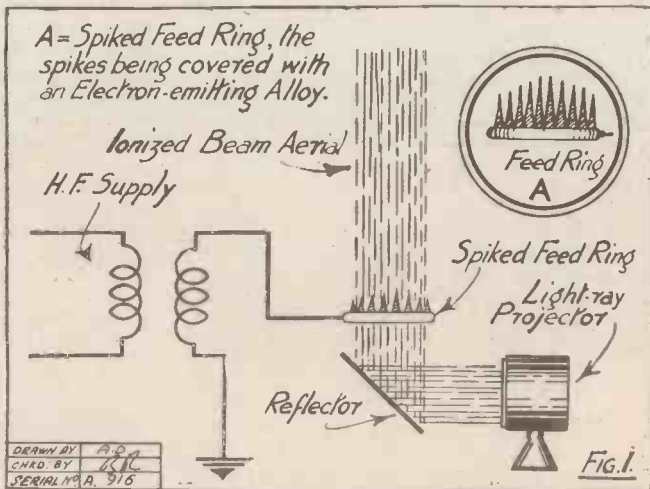
One ingenious suggestion for an entirely novel type of aerial is that of using an ionized column of air. In the ordinary way, air is, of course, an almost perfect insulator, but when it is ionized, say, by the action of sunlight, it becomes more or less conductive. When ether waves pass through such an ionized zone of the atmosphere, some of their energy is dissipated in the form of swirl currents set up in the partly-conducting air, and the resultant loss of signal strength at the receiving end is known as "fading."

Ionized Air.

If a column of air is ionized by some artificial means to such an extent that it becomes appreciably conductive, it could then be used as an aerial, either for the reception or transmission of wireless signals. Fig. 1 shows an arrangement designed for this purpose.

An intense ray of ultra-violet light (which has strong ionizing properties) is projected from a suitable arc-lamp, so that it is reflected vertically upward as shown. At a short distance from the reflecting mirror, a spiked ring is interposed in the

(Continued on next page.)

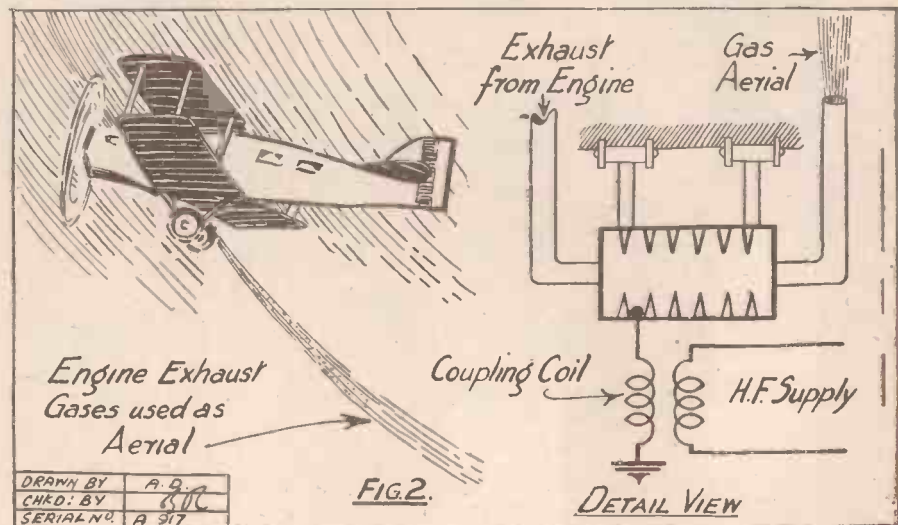


days of the coherer, it is a somewhat astonishing fact that no equally efficient substitute has yet been found for the awkward and ungainly garden line.

It is true that Marconi's first aerial was simply a vertical conductor suspended from a post—or sometimes from a kite or balloon—and that the inverted L- and T-shaped constructions came later; but these represent but little advance, in fact, as the vertical portion of the ordinary broadcast receiving aerial is still the most effective part of the system so far as collecting energy is concerned. The horizontal "top" is relatively unimportant, unless it is made several times longer than the vertical height, in which case it imparts a useful directional effect to the aerial system as a whole.

Frame Aerials.

It must also be admitted that the introduction of the valve has made it possible to use comparatively small and convenient frame windings to collect the signal wave energy. Loop aerials are, however, at best only a compromise with efficiency. The



SOME UNUSUAL AERIALS.

(Continued from previous page.)

path of the ray. The spikes are coated with rubidium, or an alloy of sodium and potassium, which has the property of emitting streams of free electrons under the action of light, and so intensifies the ionization.

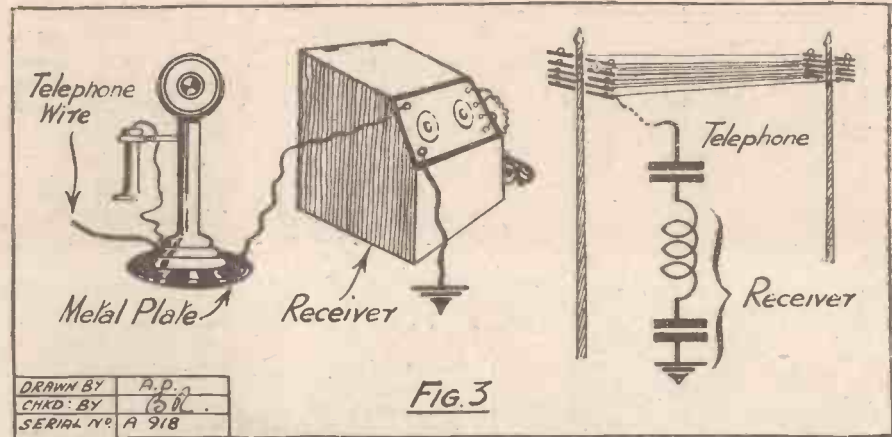
The ring is connected to a transformer, coupled in turn either to a source of H.F. oscillations or to the grid of a receiving valve. The other end of the coupling coil is earthed. In order to prevent the aerial currents from being diverted through the lower part of the light-beam, and so shorted to earth through the arc-lamp, an alternating electrostatic field may be applied across the path of the ray, below the ring, thereby lessening the conductivity of this part of the air column.

A Novel Aerial.

The difficulty in practice is that it is impossible, with the means at present at our disposal, to ionize a sufficiently long column of air to act as an efficient collector or radiator. Otherwise, such a system would have many obvious advantages. The whole equipment being portable, it could be set up at any desired spot, whilst the ultra-violet rays are themselves quite invisible.

A somewhat similar suggestion has been made to utilise the exhaust gases from an aeroplane engine, in place of the usual trailing wire employed in aircraft wireless. Exhaust gases are largely made up of minute carbon particles, and when these are sufficiently dense they form a conducting medium which could be used to receive or radiate signal currents.

In order to facilitate the electrification of the stream of gas, it is first passed through a spiked chamber (somewhat similar to the



spiked ring in the previous arrangement) before it issues into the air. A coupling coil is connected to the chamber and serves to feed H.F. currents into the emerging gas-trail.

For comparatively close-range reception it is possible to use some very unorthodox types of aerials. For instance, a connection made to a spring mattress or an iron bedstead will often prove sufficient to give quite clear headphone reception on a crystal set within a mile or so of the local transmitting station.

Ingenious Arrangements.

There are also many ingenious ways of disguising a small frame aerial, or "sheet" collector, open to listeners located at comparatively short range, or who possess powerful amplifying sets to make up for a small energy-input. For instance, the loop windings may be made of flexible wire ribbon and incorporated in a roll-up window-blind; or they may be laid in the form of insulated wire under the carpet of an upper room; or an ordinary metal fire-screen can be pressed into service as a receiving aerial.

One ingenious combination already on the market is in the form of an electric lamp-stand, the frame windings being incorporated with the lamp-shade, which also serves as the "horn" of a loud speaker. If bright emitters are used the valves may also function as a source of illumination.

Another device which will give satisfactory headphone reception on two valves within a ten to fifteen mile range is to utilise the telephone line as a collecting medium. The instrument is placed on a metal plate (a thin iron dish such as is used for cooking purposes will do), and a connection taken from it to the aerial terminal on the set, the ground lead being taken to a separate earth as shown.

"Telephone" Aerial.

The telephone instrument and plate form a series condenser, as shown in the corresponding circuit diagram, which passes the

H.F. radio currents into the receiving set without interfering in any way with the ordinary speech currents normally flowing in the telephone line.

The Mauborgne aerial is another unusual type, which consists simply of a closely-wound spiral wire along which one or more adjustable sliders, A, B, are mounted and connected to the set. The sliders may make direct metallic contact with the wire, or they may form a capacity coupling only.

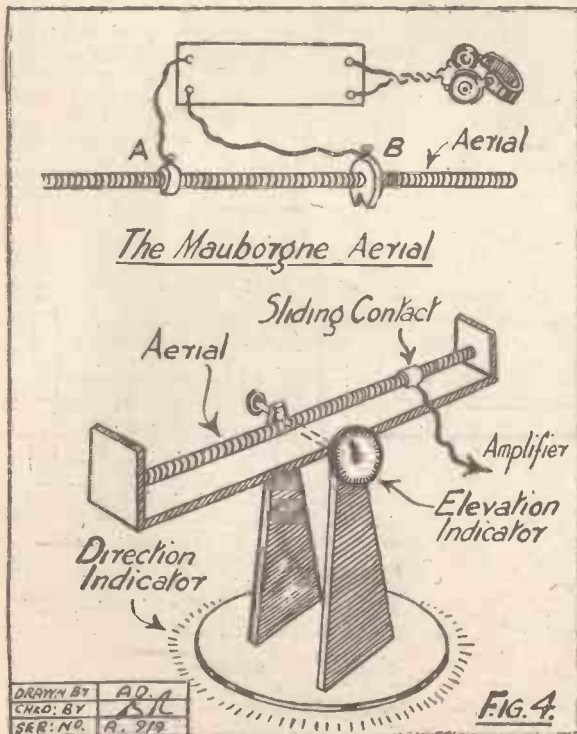
The theory of the action of the aerial is that the received signal energy sets up a "standing" or stationary-wave system along the length of the helix. This means that at certain definite points along the coil there will be antinodes or points of potential variation, whilst at other points there will be nodes or points of fixed potential.

Accurate Direction Finding.

The slider is moved along the coil until it reaches a potential antinode or "loop," the resulting fluctuations being applied to the grid of the amplifier. Only one connection, B, is necessary, though two may be used, as shown, the second slider, A, being adjusted to a potential "node," where it takes the place of the ordinary earth connection.

Such a receiving coil has pronounced directional properties, and if mounted on a rotating stand, as shown, it can be used to determine not only the horizontal direction of the incoming signals, but also their inclination to the horizon.

Helix or coil aerials of this type can be made to radiate quite remarkable amounts of electromagnetic energy when fed with H.F. currents, so that by using a bank or number of units arranged in parallel, a powerful "beam" of short-wave energy can be transmitted in any given direction.



NEXT WEEK

How to Make

A "P.W." POWER AMPLIFIER.

Just the instrument required to boost up signals for loud-speaker work in the garden or to increase volume for dancing purposes. It is both simple and inexpensive to build and can be attached to any valve set.

ORDER YOUR COPY NOW!

A Colpitt's One Valve Receiver



THERE are two ways of applying reaction to a valve set, magnetic and capacity. In the former a coil in the plate circuit of the valve is coupled magnetically to one in its grid circuit, while in the other method the plate or output circuit is linked to the grid circuit by means of a small condenser or other electrostatic coupling.

This latter method is often used on the small one-valve sets when ease of control together with selectivity and maximum signal strength are required. Such a valve set is known as the Colpitt's, which is really an adaptation of an ordinary straight one-valver incorporating parallel aerial tuning and capacity reaction to the aerial from the plate of the valve.

In order to make this reaction as effective as possible an H.F. choke has to be inserted between the plate of the valve and the

 * The Set Designed, Constructed and Described by the "P.W." Technical Staff. *

be seen that the ordinary aerial tuning condenser is not placed across the whole of the aerial coil by itself as is usual in the ordinary straight circuit, but is connected in series with the reaction condenser, the both being placed across the aerial coil. The grid circuit then, is completed through the reaction condenser, while the aerial coil has one end joined to the plate of the valve so that a certain amount of magnetic reaction is obtained as well as capacity reaction between the plate of the valve and its grid circuit.

The back-feed from the plate to the input thus passes from the plate through the coupling

and has operated very well, but care should be taken that the rheostat is in perfect condition and that there is no chance of it packing.

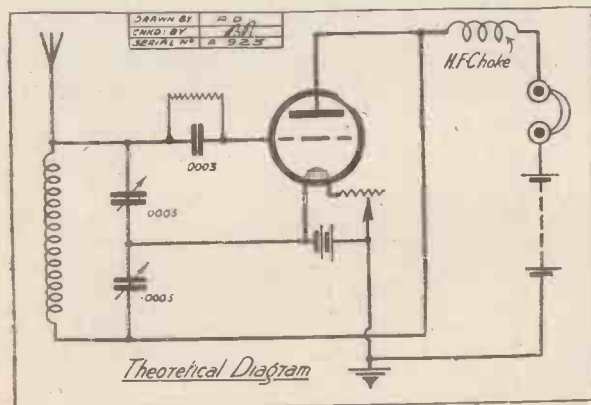
The construction of the set is a very simple matter, well within the scope of any reader of this paper. It is most conveniently laid out on a flat panel about 10 in. by 8 in. and $\frac{1}{4}$ in. thick. The exact dimensions and drilling positions for the various components will be seen on the panel diagram on the next page.

Though a list of components is included in these pages and the makers' names are given, there is no reason why apparatus of different manufacture should not be used provided the values stated for the variable condenser are kept to, and that vernier control is available. Owing to the lively nature of the circuit and the fact that both variable condensers have to control to some extent the tuning of the grid circuit, this vernier control is an absolute necessity not only for the reception of distant stations but also if good results are to be obtained from local broadcasting.

Trimming the Panel.

It is advisable for the constructor when buying his parts to purchase the panel and case together so as to avoid the tedious task of trimming down the panel to make it fit the latter. If the panel has to be bought separately he should endeavour to have it cut and trimmed to the exact dimensions before taking it home.

If he has to trim it himself this should be done by means of a hack-saw blade and a



phone or high-tension battery. This concentrates all the H.F. energy on to the coupling condenser, which in turn transfers it via the aerial to the grid of the valve.

How Reaction is Obtained.

Such is the case of the standard one-valve set which has the ordinary type of capacity

coupling condenser (reaction condenser), the choke preventing this energy from being bi-passed through the phones and H.T. battery. The other condenser tunes the input circuit as a whole and has nothing to do with the reaction part of the circuit.

Construction.

Control is carried out by means of the two variable condensers which have to be varied simultaneously, and the filament rheostat which is used as a final adjustment for reaction. This rheostat must be capable of exceedingly fine variation if the set is to work satisfactorily. The one used in the receiver photographed is of the carbon compression type

LIST OF COMPONENTS.

Panel, 10 in. by 8 in. by $\frac{1}{4}$ in. (Paragon) with cabinet ..	11	0
2 .0005 variable condensers with verniers (Peto-Scott) ..	1	1 0
1 H.F. choke (Lissen) ..	10	0
1 Grid condenser and leak (.0003, 2 meg.) (Lissen) ..	3	8
1 Single coil holder ..	1	0
1 Atlas filament control ..	5	6
1 Set security valve sockets ..	1	0
8 Terminals ..	1	0
Wire, screws, transfers, etc.	3	0

reaction. This circuit, however, can be modified into the form shown in the theoretical diagram on this page. Here it will



(Continued on next page.)

The handy disposition of the three controls can be clearly seen in the above photo of the finished receiver.

A COLPITT'S ONE-VALVE RECEIVER.

(Continued from previous page.)

rough file or rasp. When it has been roughly cut to size it should be smoothed at the edges by means of coarse sand-paper, taking care that the four corners are perfectly square.

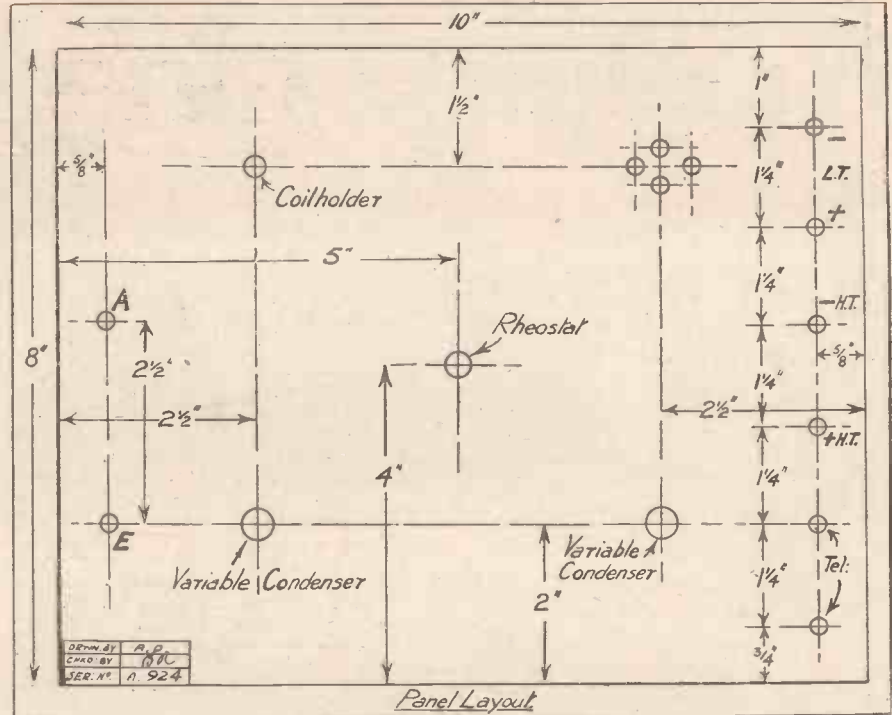
The panel is now ready for drilling, which should be carried out by means of metal working drills according to the diagram on this page. It will be noted that the choke incorporated in the set photographed is one of the Lissen H.F. chokes, but this may be substituted if desired by a coil holder and a 300-400 turn coil.

Avoid "Dry" Joints.

When all components have been mounted and the terminals securely fixed in place the wiring should be undertaken. In order to make the job as neat as possible 16 gauge square tinned copper wire should be used and preferably all connections should be soldered. Care should also be taken that every trace of flux is wiped off each joint while it is still hot, for if the flux is allowed to set it will be very much more difficult to remove. Furthermore, each joint should be thoroughly tested by giving it a sharp pull as soon as it is cool, and this will eliminate the possibility of dry joints escaping notice.

When all the wiring has been completed the whole set should be thoroughly cleaned, care being taken that no loose beads of solder are left hidden between such places as the condenser vanes, etc.

As regards accessories, the only things required are the usual batteries, aerial and earth, plug-in coil to suit the wave-length



required, and a good detector valve. Regarding this latter, one having a moderate impedance should be used, as if a large impedance is employed it will tend to render the set too lively to enable it to be operated successfully.

Suitable Coils.

For the reception of ordinary broadcast wave-lengths, a 50-turn coil will cover the middle band of about 400 metres, while a rather larger one than usual, namely, 250-turn coil, will be needed for 5 X X. A 60

volt H.T. battery should be available, and the whole of this can be used to advantage, though the H.T. adjustment is not critical. What is critical is the filament voltage, and the operator will find that he has to vary the filament rheostat quite as much and quite as delicately as either of the variable condensers. Especially is this the case when distant stations are to be tuned in, for like very many of what may be known as one-valve supers, this set is so sharp in its tuning that one is liable to miss the station altogether if the condenser dials are not rotated very slowly.

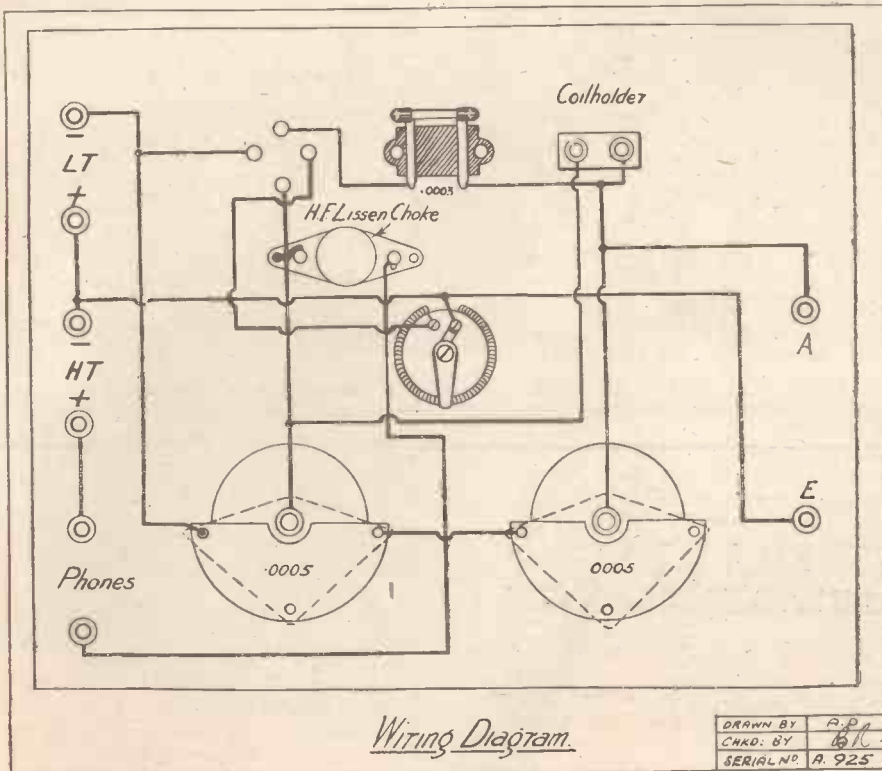
Results to be Expected.

When used within a few miles of a main broadcasting station it is not too much to expect the set to operate a small loud speaker at quite comfortable strength, though the adjustments will have to be just right in order to obtain this result. The set is not intended for loud-speaker work, and this is only an indication of its efficiency. High resistance telephones should be used on the set, and as a receiver for the reception of local and DX broadcasting on telephones it will give extremely satisfactory results.

There is nothing really difficult about the handling of the set, and in a very short time the listener should be able, given average conditions and an efficient aerial and earth, to go the round of most of the B.B.C. stations and obtain comfortable 'phone reception.

One point should not be overlooked when the variable condensers for this set are chosen, and that is the action of the moving plates and spindle. The latter should make good contact with the terminal from which connection to the choke is to be made, preferably by means of a "pig-tail" connection. Failing this the spindle should be well tested to see that it makes a continuous contact with the bush from which the connection is taken, as in the

(Continued on next page.)



Wiring Diagram.

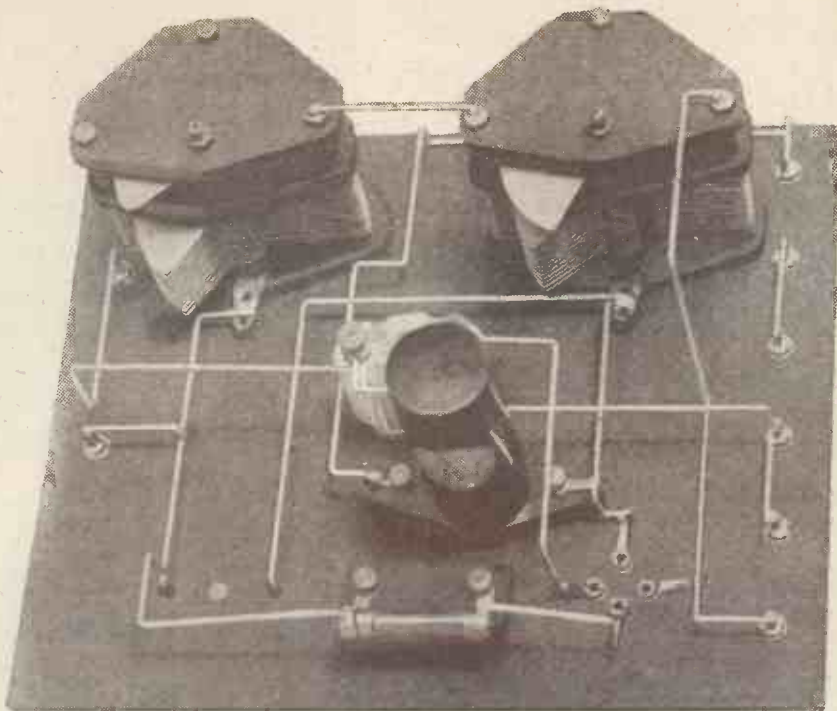
DRAWN BY	A.P.
CHKD. BY	B.L.
SERIAL NO.	A. 925

**A COLPITT'S
ONE-VALVE RECEIVER.**
(Continued from previous page.)

case of the condensers used in the set photographed. This is an important point, for so many condensers make only intermittent contact, and thus give rise to noisy reception and sometimes to complete failure to make the set operate at all.

The Variable Condensers.

Another important feature about these condensers is their mounting. By this is meant the method of mounting the moving and fixed vanes, for there must be no possibility of these vanes touching after the condenser has been in use for some time. Should this occur, it will be found that the H.T. battery will be shorted via



This photograph gives a clear idea of the wiring underneath the panel of the Colpitt's one-valver.

POINT-TO-POINT CONNECTIONS.

Aerial terminal to moving plates of the A.T.C., plug of coil holder, and to one side of grid condenser and leak, other side of which goes to the grid socket of the valve holder.

Earth terminal to L.T. positive, which is also connected to one side of the rheostat and to H.T. negative. The other connection from the rheostat is taken to one filament socket of the valve holder, the other filament socket going direct to L.T. negative, which is joined to the fixed plates of the A.T.C. and reaction condenser.

Moving plates of the reaction condenser are connected to the socket of the coil holder, one side of H.F. choke, and to plate-socket of the valve holder. Other side of H.F. choke to one 'phone terminal, other 'phone terminal to H.T. positive.

the 'phones, choke and the condenser—one or other of them, for both have their fixed vanes connected to L.T. Such an occurrence would ruin the battery and possibly injure the 'phones or choke, so that the utmost care in mounting the condensers should be taken to make sure that the spindle is not pulled out of truth when tightening up the centre hole fixing nut. If this is tightened the spindle is often drawn towards the panel, throwing it out of centre and making the likelihood of the fixed and moving vanes touching much more probable.

CONCERNING EARTHS.

THE fact that most wireless sets have to be provided with "earths" is one of those things which have to be borne rather than enjoyed, but even so this is no excuse for the "earthing" to be done badly. If one has to be provided, as it has, then it should be as good an earth as it is possible to obtain.

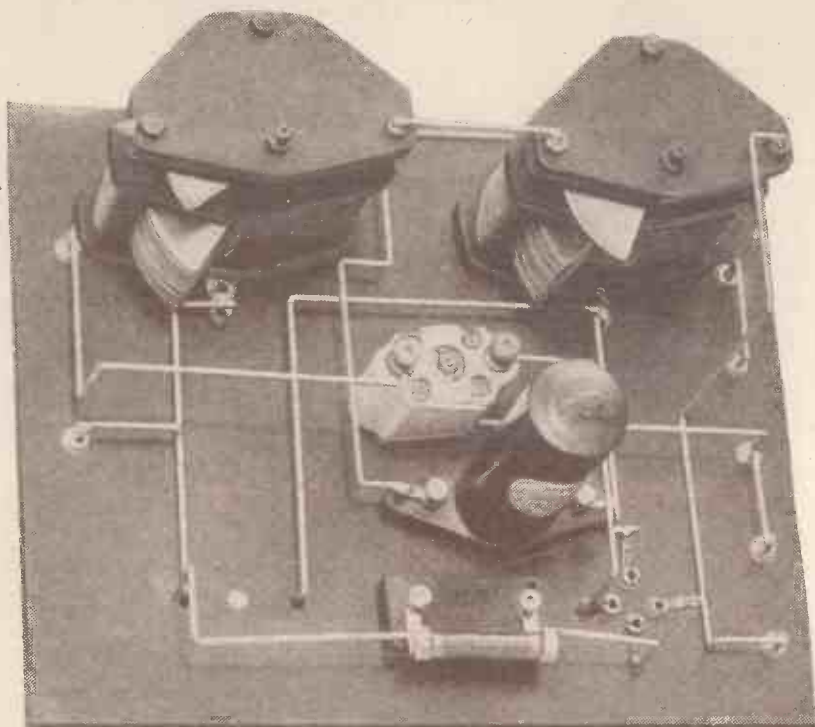
This should take the form of a good, big plate or earth pin buried three or four feet down, and surrounded with coke and soil mixed and kept well-watered, or else a direct water pipe should be used.

Unsuitable Earths.

A great number of people use a water pipe, but they go to the nearest one, whether it be hot or cold, and it is not unknown for an amateur to hitch his earth lead to a waste pipe. Results may be good under these conditions, but it is far more likely that they will be exceedingly poor.

Similarly a gas pipe has been known to give good results; the writer himself has often used it with success, but more often than not as an aerial and not as an earth. The reason for this is obvious. The piping wanders all over the place before going "under" and even then the jointing in it is not usually of such material as is conducive to the easy conduction of weak H.F. impulses.

Finally, the writer has seen the water pipe from the roof guttering used before now, and then the listener who used it wondered why his set was unstable and the results poor. This "earth" is the most useless of all, for it is not only made of iron, but rarely goes really into the earth, and in any case is so rusty as to form no contact with the ground. In some cases it goes into a china conduit—the last thing required for earthing purposes.



The H.F. choke (shown in the foreground) can be replaced by a plug-in coil of suitable dimensions if desired, the lay-out of the set remaining the same.

"ARIEL" AT 2LO.

How the B.B.C. Faced the Strike.

By "ARIEL."

FLEET STREET was singularly deserted on that early morning when the British public had begun to realise the seriousness of the general strike. I thought how empty the world seemed when I entered our offices in Farringdon Street. There was no cheery greeting from the hall porter; both lifts were not working; a deep silence pervaded the whole building.

When we had realised that the strike was likely to last a few days we lost no time in trying to make ourselves useful. It was the Editor of POPULAR WIRELESS' idea that I should offer my services to the British Broadcasting Company, and this I did.

A few hours later saw me at the Admiralty before the powers that be, and after a quick cross-examination, "Ariel" was given the task of searching for news for a vast public left without newspapers, their only hope of authentic strike news—the B.B.C.



Reading displayed wireless news bulletins during the general strike.

How the B.B.C. was run through the arduous period of the strike is a story of a record of which every British wireless enthusiast might be proud.

It is six o'clock in the morning in Kensington, where I live. There is unusual activity in my abode; the telephone is already being busily utilised. I am getting ready my share of the news bulletin for ten o'clock.

Doubly Censored.

It is no easy task to write for the B.B.C. My news must be as interesting to listeners at John o' Groats as well as those at the Stock Exchange and the West End clubs. It must not be wearisome in its narrative; it has to be concise, explicit and authentic.

At nine o'clock a motor-car horn is being subjected to rather violent handling. I gather up my sheaf of papers, and away I go in a volunteer-driven and volunteer-owned Vauxhall.

In twelve minutes I am at the Admiralty, where my stuff is handed over to Major Gladstone Murray, head of the news department of the B.B.C. After censorship by Mr. Murray the news is passed by a

committee of Civil Commissioners and is again censored. Finally, at ten o'clock, the aeriels at Oxford Street announce to the world that the first news bulletin of the day is ready to be broadcast. But it is not so easy as it sounds.

Searching for News.

Savoy Hill during the strike was more like the Stock Exchange. Never have I seen such bustle and activity in one building. Everywhere bells ringing, lifts clanging, voices shouting, red and blue lights signalling, as studios were changed over, every minute a collision on the stairs of two hurried bodies flying into opposite objectives.

A huge staff is at work sorting out the news. The number of callers per day have increased to thousands. A special transport office has been opened; the building is full of police, plain, special and uniformed.

But the really admirable thing about it all is the fact that the organisation, thanks to the remarkable energy of its permanent staff, aided by volunteers, was not crippled by the emergency.

The B.B.C. had become a huge newspaper. There was hardly an item that was not covered by the bulletins, which were regularly broadcast at ten o'clock, one o'clock, four o'clock, seven o'clock, nine and eleven o'clock, and sometimes at midnight to cover the latest events.

A fast car sped all over London, taking "Ariel" to various points where good news might be picked up. An early run to the Stock Exchange to see how the markets were faring was probably followed by a visit to Scotland Yard, then to Hyde Park, back to Savoy Hill, then the House of Commons, round the railway stations, the big hotels, even the closed-down newspapers, where some news might be gleaned. No time, expense or energy was spared.

It meant keeping in touch with things from six in the morning till almost midnight, but it was well worth it.

Everything in the way of news was censored, even the critique of a new play, the first night of which took place during the strike, was included.

It was with great regret that "Ariel" left the B.B.C. after contributing his small share of the good work.

He was made very welcome both at Savoy Hill and the Admiralty, and pleasant are the memories of a few days spent in one of the most perfect broadcasting stations in the world.

LEADS & CONNECTIONS.

WHEN a valve set is being disconnected the leads should be removed from the batteries first and not from the receiver, as, otherwise, there is a risk of shorts occurring among the disconnected wires. Similarly, when a set is being connected up the leads should be secured to the terminals on the set before they are joined to the batteries, for the self-same reason.

Obviously, to reverse H.T. and L.T. connections is dangerous, and, although this is frequently pointed out, the number of listeners and amateurs who burn out their valves in this manner shows little sign of diminishing. Multiple leads in which all the wires are neatly bunched together and provided with terminals and plugs are very tidy, but care must be taken when they are used that the right wires go to the right points.

Insulation of Battery Leads.

Bunched leads and twin flexes are very neat, but are not in all cases to be advised. For instance, unless a set is provided with a telephone transformer or choke-capacity by-pass device, long loud-speaker flexible leads are apt to cause considerable losses of efficiency.

Battery leads should be kept as short as possible and, if they can be widely separated, so much the better. The same applies to aerial and earth leads, and all should be of stout gauge wire and all except the earth lead should be well insulated. Frequently insufficient attention is paid to the insulation of battery leads. Single cotton covering is not sufficient; nor for that matter is double cotton covering, or even double silk covering. Battery leads should have a rubber instead of, or additionally to, a fabric covering. Rubber-covered high-tension wire, such as is used for motor-car ignition wiring is excellent material for the purpose, and can be obtained at any electrician's.

Aerial and earth leads should not be allowed to wander around the house; it is far better to have properly arranged loud-speaker or telephone extension leads.

The Use of Terminals.

Telephone or loud-speaker leads of the usual type should be kept free from kinks and strains. When signals become intermittent—i.e. fade right away at intervals—it is probable that the 'phone leads have developed a fault. Certainly is this the case if the intermittency occurs when the head is moved or the leads are gently pulled.

It is always worth while fixing proper plugs, pin terminals and spade terminals on the ends of leads; endless annoyance and trouble can be avoided by so doing.

If fabric (i.e. silk or cotton) covered wire is used for the accumulator leads, the ends nearer the battery should be well soaked in paraffin wax for a couple or so inches to prevent acid creeping and corrosion. It is not worth while purchasing pure paraffin wax for such a small job if a piece of white candle is available, as such will serve quite as well.

Leads should never be longer than is necessary, for the longer the leads the greater the wasteful resistance in circuit, and the greater the risk of "kinks," "shorts," and other dangers.

THE PROGRESS OF THE AMATEUR TRANSMITTER.

Rapid Developments.

By E. J. SIMMONDS, F.R.S.A., M.I.R.E.
(Staff Consultant.)

This article is based on the talk broadcast by Mr. Simmonds from 2 L O on June 7th, on behalf of the Radio Society of Great Britain.

IT is my intention in the short space at my disposal, to consider briefly the progress of amateur developments during the last few years, in the art of world-wide two-way wireless communication, with small powers, and especially to refer to the short-wave work, both with telegraphy and telephony, which has been engaging the attention of private experimenters for some considerable period.

Previous to 1923 many organised attempts had been made by amateurs under the auspices of the Radio Society of Great Britain, to establish two-way transatlantic radio communication, using waves of the order of 200 metres, and while none of these tests was successful in this respect, many amateur stations from both sides of the Atlantic were successful in bridging the ocean. The special station erected by the Radio Society of Great Britain at Wandsworth, operating under the call sign 5 W S, was the first British station on 200 metres to be definitely heard in U.S.A., and code word verified.

This took place in the latter part of 1922, during the special transatlantic Tests arranged by the Radio Society of Great Britain.

First Across.

In the spring of 1923, Mr. L. Deloy, operating an amateur station at Nice under the call sign 8 A B, commenced experiments on waves of the order of 100 metres and, from the good long-distance reports he received on these transmissions, he formed the opinion that such waves could "render immense and unsuspected service in long-distance work."

As a preliminary to transatlantic work, and also in order to obtain the most favourable transmitter adjustments on 100 metres, Mr. Deloy arranged tests during 1923 with my experimental station situated at Gerrard's Cross, Buckinghamshire, and we spent many weeks testing various circuits, aerials, etc. These tests gave such favourable results that in the middle of November, 1923, Mr. Deloy decided to make arrangements with the American Amateur Radio League to listen for his signals on 100 metres.

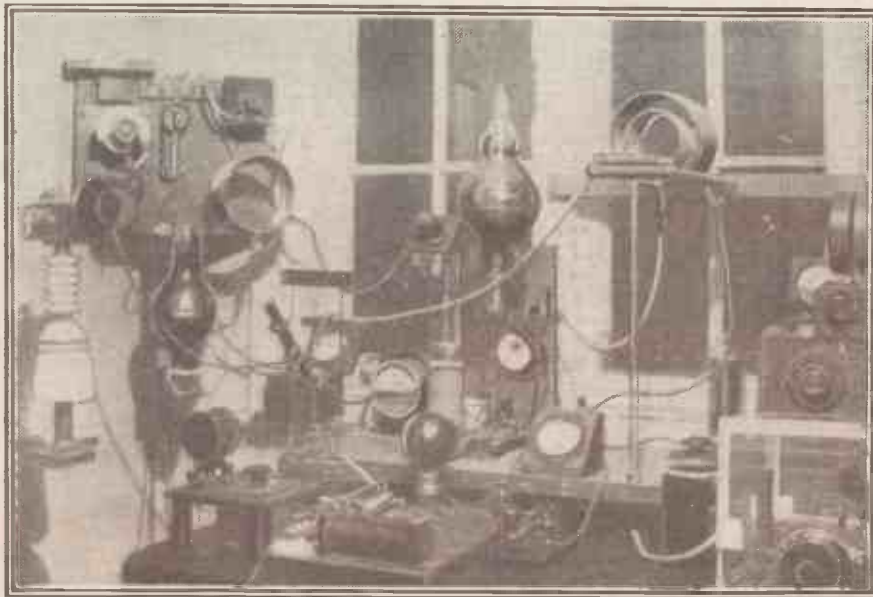
This course was entirely successful, and telegraphic signals from Mr. Deloy's station were strongly received in Hartford, U.S.A., on November 27th and 28th, 1923. Two-way 100-metre transatlantic communication was established the next night between American 1 M O, situated at Hartford, and Mr. Deloy's station.

Next after Mr. Deloy's great achievement came the report from Mr. J. A. Partridge, of Merton, London, in reference to two-way working on 100 metres with

American 1 M O. Mr. Partridge's station call sign 2 K F first got into touch with the American station on the morning of December 8th, 1923, and was thus the first British station to effect direct communication with the United States on 100 metres.

There is every reason to believe that these tests were the first of their kind, and that it is from their publication that widespread attention was directed to the immense value of short waves; certainly from that date

Zealand, and this and other factors seemed to indicate the possibility of a concentration of radio energy at the antipodes from short-wave transmissions from Great Britain, and it also seemed reasonable to suppose that the received signal strength would rise to peak values during the sunrise and sunset periods. It had therefore been the practice of several British experimental stations to transmit daily during the sunrise period on approximately 95 metres, using a codeword



Some of [the] [early] apparatus used by the author at 2 O D.

the development of these waves has proceeded with great rapidity.

These experiments first took place with American stations situated comparatively close to the Atlantic seaboard, but gradually the ranges were extended until by March, 1924, British amateur stations using less than 250 watts in-put, had been received on the Pacific Coast of America, nearly 6,000 miles away.

Two-Way Communication.

In amateur circles, October, 1924, will long be remembered as marking the culminating achievement in amateur long-distance working, when two-way short-wave communication was established with New Zealand for the first time in history. It may be of interest to detail the circumstances which surrounded this important development.

There is a difference in time of practically 12 hours between Great Britain and New

Zealand for identification purposes, which was changed daily.

Further Successes.

These experiments were entirely successful, and a cable was received on October 18th, 1924, from Mr. Bell, operating radio station 4 A A at Waehemo, New Zealand, reporting the reception of strong signals from British station 2 O D, and verifying the code word which had been sent out from that station at 6 a.m. the previous day, October 17th, 1924.

Two-way communication between many New Zealand and British stations followed in the course of a few days, all taking place on wave-lengths below 100 metres, and with powers of under 250 watts. This was undoubtedly an event of outstanding importance which astonished the scientific world, and provided valuable data and evidence of the efficiency of short-wave

(Continued on next page.)

CHOOSING A SUITABLE CIRCUIT.

By G. V. COLLE.

PERHAPS the hardest thing a would-be wireless listener is called upon to do is to choose a set or circuit suitable for his needs. In case he may not know exactly what kind of circuit to look for the following considerations are the main ones he has to weigh up.

(a) The number of valves required to operate either a loud speaker or 'phones from the station or stations he desires to listen to.

(b) The type of circuit capable of best giving the above results.

(c) On what type of aerial the set is to be used. This point is important, because if he is living in a flat or crowded neighbourhood he may not always be able to use an outdoor aerial and may have to resort to the frame. In this event a more powerful set would be necessary to give the same results. Most listeners will probably be content to listen to their local station and 5 X X to begin with, and as their knowledge increases to extend their activities farther afield.

Long Range Reception.

If the local station is within twenty miles or so a crystal or one-valve set will be O.K. for 'phone reception or with the addition of one or two note magnifiers to work a loud speaker. At greater distances the crystal will not be available, and above 40 miles it would be desirable to use an H.F. valve in front of a detector.

A four-valve receiver, consisting of an H.F., Det. and two L.F. valves, should be capable on an outdoor aerial of picking up at least two stations besides 5 X X on the

loud speaker. With an indoor aerial or a frame a more sensitive circuit would be necessary with its increased difficulty of operation.

Long-distance reception requires a set that will give selective and sensitive results without being too difficult to handle. It is advisable, however, for the newcomer to wireless not to attempt long-range reception until he is familiar with the operation of a fairly representative valve set.

In conclusion, the writer would like to advise listeners to take nothing for granted as regards results claimed, as these vary considerably with the local conditions under which the sets are operated. If possible, they should arrange a demonstration or listen to a friend's set in the same neighbourhood, and having a circuit similar to the one they intend to employ.

Information on the properties and behaviour of 20-metre waves had been accumulated in consequence of the very useful tests which had taken place between N K F, the United States Naval Research Station at Anacosta, U.S.A., working on 20.8 metres, and several amateur stations in this country. In view of the results of these tests, there appeared the possibility of establishing direct two-way communication with Australia with low power, using the 20-metre band, at certain hours during the day.

20-Metre Tests.

As experimental proof of this assumption, special arrangements were made for a well-known experimenter in Australia (Mr. Maclurean, of Sydney) to construct a 20-metre transmitter and receiver, and commence 20-metre tests at definite times with my station.

These experiments were crowned with success, and two-way communication was effected at 6 a.m. on May 2nd, 1925, when greetings and congratulations were passed to mark the important event. It should be noted that the success of these experi-



A shepherd in Wyoming listening-in to New York after his day's work.

THE SIMPLEST FIXED CONDENSER.

WHEN a condenser is required experimentally for use outside the set, such as a small condenser in the aerial lead, or a condenser across the loud speaker, one may be constructed very simply by inserting two pieces of tinfoil in a book, with one or more pages between them. Leads may be soldered to the metal sheets (if these will stand the process), or fairly thin wires may be threaded through the foil at the edges nearest to the binding, and taken to the appropriate terminals.

The value of the condenser may be varied by increasing or decreasing the area of the "overlap" of the metal sheets, or by varying the number of pages of the book that intervene. If reasonably stout sheets of foil are used, it is possible to use the device as a variable condenser. The book should be a moderately heavy one, with pages of good thin paper.

More than two sheets of foil may, of course, be used, if desired, in order to build up a condenser of larger capacity, but it is not recommended that a condenser of this type should be used, for example, across the H.T. battery.

THE PROGRESS OF THE AMATEUR TRANSMITTER.

(Continued from previous page.)

transmissions which necessitated modifications of the existing theories relating to short-wave propagation.

Two-way direct communication quickly followed with Australia on November 13th, 1925, when messages were taken for H.M. the King from the Wireless Institute of Australia.

Another development of great interest was the first direct two-way communication, on 20 metres, between Great Britain and Australia, which took place on May 2nd, 1925.

ments was assured not because of chance contact between the two stations, but because the time and wave-length were chosen only after careful consideration of the many factors which had become apparent in consequence of the N K F 20.8 metres transatlantic transmissions before mentioned.

Recent Developments.

During recent months the development of apparatus for the transmission and reception of telephony on wave-lengths between 20 and 100 metres has received attention from many amateur workers with the necessary facilities, and much research has been directed to the difficult problems associated with speech distortion and fading so apparent on the reception of short-wave telephony. The quartz crystal control has successfully been employed to minimise the trouble.



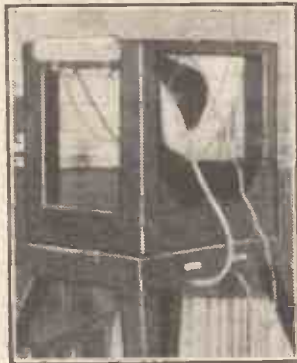
The MICROPHONE

An Interesting Article about various kinds of "Mikes."



"MIKE" in his time, has played many parts. In the early days of broadcasting he was content to hang on a length of flex and record the voices of Uncle Arthur, Uncle Caractacus, Auntie Sophie, and all the other favourites in the days gone by. Later he sprouted wheels, took on a most formidable aspect and was referred to as the "soap-box"! Now he stands erect in the studio on a large four-legged support. His "internals" have been changed many times, and has been accordingly blamed by both crystal and valve users for "blasting" or under-modulating a transmission.

For the benefit of listeners he has reproduced the beautiful intonations of Chaliapine and the melodies of Paderewski; and the Savoy Orpheans. He has hidden under the hedgerow while Miss Beatrice Harrison coaxed the nightingales; he has listened with due respect to the voice of H.M. the King; he has heard John Henry callin'.



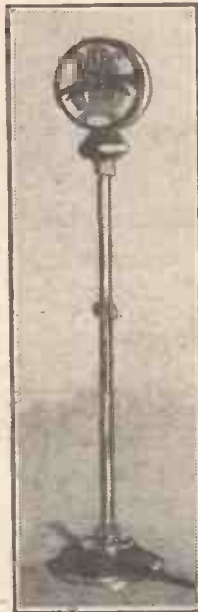
The "Soap-Box"; an early type of B.B.C. microphone.

In the Early Days.

The internal construction of the microphone has been changed many times since its use in the early days of broadcasting. A carbon-granule microphone, very similar to that used on the ordinary Post Office telephones, was first used in conjunction with the old transmitter at Marconi House. A number of microphones were hung from the roof of the studio—one for the announcer, one over the piano, one near the well-known tubular "bells"—and, be it mentioned, many of the crackling sounds and so-called atmospherics that came through our loud speaker were caused by various Uncles and Aunts coming unexpectedly in contact with a microphone hanging on its length of flex.

"Mike" has always been rather a nuisance in the studio. In the later days of broadcasting he was mounted on a sort of movable trolley, and the length of cable which connected this to a wall-plug has been the cause of the downfall of many an artiste. Nowadays it is only on very rare

occasions that more than one microphone is used at a time, and the art of dodging the cable is not so difficult. It was found, however, that the slight vibration caused by people walking about in the studio was sufficient to upset the delicate working of the microphone, and the little sound-recorder was placed on a resilient bed of sponge rubber. Now that the microphone has been made so sensitive this protection from vibration is absolutely essential.



The microphone at W J Z.

Microphones in Disguise.

Although the carbon microphone is remarkably sensitive to sound vibrations and is, even now, used where only moderate amplification is necessary, the need was felt for a microphone which would respond equally well to sounds of any pitch originating, either 100 ft. or 10 in. from its diaphragm. The Marconi-Sykes magneto-

microphone fulfils these conditions in a manner suitable enough for all practical purposes. The magneto-microphone will bear an almost unlimited range of amplification, and is suitable for broadcasting the notes of the nightingale or the Savoy Havana in full blast, the harpsichord, or the great organ. There is no intermittent contact in this type of sound recorder, the action being entirely magnetic. The essential parts of the microphone consist of a flat coil of very fine wire supported in the field of an electro-magnet. A thick support of sponge rubber renders it immune from the effects of vibration, and for outside use wind shields of copper gauze and silk are also fitted.

In America they are very particular about the external appearance of the microphone, and some very artistic decorations are employed to disguise the disgraceful fact that the microphone is a microphone! It is probable, however, that a microphone disguised as a harp (as is done at W J Z), or as a lamp-shade (as at K F R B and numerous Canadian stations) does not have such a terrifying effect on the newcomer

to broadcasting as does the plain and undisguised "mike."

Outside Broadcast Difficulties.

It would not be right to conclude without mention of the ingenuity displayed by the B.B.C. engineers when arranging the microphones for an outside broadcast.



The modern Marconi-Sykes type.

In the studio the control of volume and modulation are easy matters, for the engineer is there working on fixed ground. The grouping of the various members of an orchestra, for instance, around the microphone can be arranged to a nicety, and even if there is any doubt about the matter it is always possible to make a short trial with the microphone and amplifiers disconnected from the main transmitter. This is usually done when an artiste is given an audition. Not so with an outside broadcast, however. The position of the microphone must be worked out in the first instance, and experience alone can tell where the correct position should be. In the case of the broadcasting of an actual event it is obviously not possible to arrange a "rehearsal." Think, for an instant, of the various cases with which the engineers are faced.

Last year, when the broadcast of the nightingale's song was conducted, it was

(Continued on next page.)



Arranging the microphone for an outside broadcast.

VARIABLE CONDENSER AND VARIOMETER CONTACTS.

FROM A CORRESPONDENT.

SINCE wireless receivers have been brought to something nearing perfection in their performances, and since the element of uncertainty regarding the latter has been, in a large degree, removed, it has become the growing tendency to devote more and more attention to the elimination of those losses which occur even in the best regulated instruments and to secure reproduction against a background of silence.

The Inefficiency of Pressure Contacts.

Since every effort in this direction must commend itself to the discriminating amateur, here is a point—often overlooked or disregarded as of no great moment in the make-up of a receiver—which should engage

Substituting short lengths of flexible wire for these movable contacts is well worth the trouble. To be flexible the wire must be stranded, and need not be of the insulated variety unless likely to interfere with other leads in the set. The two ends should, of course be soldered, and it is essential that the solder penetrate the strands thoroughly to make a good joint.

This gives us a perfect electrical contact, but some mechanical considerations are also necessary. It is obvious that the flexible connections are liable to be twisted off if the rotor is moved too far. To prevent this the motion of the dial should be limited to not more than one complete revolution; a half-revolution of 180 degrees is the more usual and often simpler to obtain. While it

pedient but care is necessary to prevent cracking the dial.

4. A dial with a semi-circular groove cut into the underside, the ends of which strike a hidden stop-pin in the track of the groove.

5. Special forms of dials, such as some of the geared vernier dials, which have other desirable features.

Spoiling a Good Component.

Of course, there can be a very great difference between a friction and a pressure contact. A friction contact made between two rubbing metallic surfaces is to some extent "self-cleaning," but a pressure contact where neither surface moves is not. But the variable condensers in a "household" receiver which is left "set" on the local station for lengthy periods cannot enjoy the "self cleaning" process, and without positive connections across their spindle-terminal points they remain provided with very inefficient forms of pressure contacts and oxidation gradually causes the deterioration which eventually causes trouble.

The flexible connection, under the name of a "pigtail," has been widely incorporated into American radio practice for some considerable time, but English manufacturers do not appear quite so unanimous in its use. Quite a number of otherwise highly-efficient components are spoiled by the unsatisfactory friction contact.

"A small thing!"—you say? Well, perhaps so; but radio is a science of small things that matter.

THE MICROPHONE.

(Continued from previous page.)

not possible to bring the microphone nearer than 100 ft. to the spot where the birds were likely to sing. The calculation necessary to determine the precise degree of amplification necessary is not that which any one would care to tackle. Great care has to be taken when a broadcast is conducted from a hall which is known to possess a pronounced echo. The microphone has to be arranged in the position which gives the maximum volume, consistent with freedom from echo, which would tend to cause a peculiar form of distortion.

A Difficult Proposition.

A certain amount of echo is permissible as it gives a "body" and reality to the transmission, but if carried to excess the sounds and resounds become so intermingled that the broadcast would be totally unintelligible. Perhaps the most difficult feat of all, and one that the B.B.C. engineers seem to have overcome with a marked degree of success, is the broadcast of the organ. It may truthfully be said that all the difficulties of outside relaying are combined in the organ. The volume is variable from a mere whisper in the choir organ to a full blast with all stops coupled, the sound covers nearly the whole range of audible frequencies, innumerable harmonics and over-tones are present which must faithfully be reproduced, and finally the pipes are situated at greatly varying distances from the listener. Truly the broadcast of the organ is the triumph of the B.B.C. engineers.



The transmitting apparatus at the new Rome broadcasting station.

the attention of every striver after radio efficiency.

The majority of variable condensers, variometers, and other components having rotary or movable members depend upon friction or pressure for contact between the stationary and moving elements. Though this means of contact may appear quite stable and satisfactory when the new component is purchased, there ultimately arrives a time when movements of the tuning dials awaken responsive scratchings and raspings from loose or corroded contacts.

Oxidation, and the inevitable wear and tear, do not improve friction contacts; whilst apart from the introduction of extraneous noises—of which there is a sufficiency in any receiver—the high resistance so engendered represents a decided loss in efficiency, particularly when distant stations are being sought.

is possible to rely on one's memory and simply form the habit of never going beyond the numbered portion of the dial, it is not the safest way, especially in the average family. Positive stops are better, and may take the following forms:

The Provision of Stop-Pins.

1. A projection on the shaft which strikes one or two stop-pins mounted on the instrument. This is the usual commercial practice, but the average amateur does not possess adequate tools for the purpose, as the projection is usually a small pin driven into the metal shaft.

2. A projection on the shaft striking stop-pins attached to the underside of the panel.

3. A small pin driven into the edge of the dial and limited by stop-pins on the front of the panel. This is a simple ex-

CURRENT TOPICS.

By THE EDITOR.

Government Broadcasting—Late Objections—Foredoomed to Failure—
Fears and Forebodings.

IN certain quarters of the broadcasting industry it has been realised—rather late in the day, we think—that before many months have passed the recommendations of the Broadcasting Committee will be put into practice and broadcasting will therefore become a Government department.

Civil Service Regime.

We wondered months ago, when the Broadcasting Committee set up by Mr. Baldwin was hearing evidence, why the N.A.R.M.A.T., and all others interested in the radio industry, did not adopt a stronger policy in objecting to the Government taking control of broadcasting. We wondered, and expressed our wonder in print, at the attitude of members of the Broadcasting Company—that is the trading members—in not fighting for the extension of the licence for another three or more years. They had public sympathy and public support on their side, and certainly they would have been justified in putting up a very strong fight for the extension of the licence; but they did not. They adopted a policy which, to put it bluntly, was neither one thing nor the other, and now, when we fear the fat is really in the fire, they wish to obstruct the passage of legislation in the House of Commons which will make broadcasting a Civil Service régime.

No Hope.

Such a hope of obstructing the recommendations of the Government Committee is foredoomed to failure. It has not the slightest chance of success. We may not like the idea of a Government department handling broadcasting, but whether we like it or not, events have gone too fast and too far for any success of altering the policy.

The fact is that people are beginning to wake up and realise that the present broadcasting concern has done wonderfully well. It may not be perfect—nothing is; but people are now comparing its work with the work of a possible Government department, and are being influenced by extraneous things, such as the fact that high B.B.C. officials have been offered lucrative appointments by American broadcasting organisations. There is nothing like another offer from a broadcasting concern to make listeners appreciate what they have been accustomed to deprecate.

An Analogy.

If Jones is getting £5 a week from one firm and is lucky enough to get an offer of £10 a week—and in writing—from another firm, and takes it down to his own chief, the chances are that Jones is kept on in his own firm and at a salary offered by the rival firm. This is somewhat analogous to the broadcasting case.

Certain important personages in the broadcasting world are beginning to realise—and again we stress the fact that they

are beginning to realise it far too late—that the B.B.C. as at present constituted has numerous advantages over the B.B.C. constitution as recommended by the Broadcasting Committee.

Those Commissioners.

The new authority, it will be remembered, will have Commissioners appointed by the Crown, and these Commissioners are to be paid very substantial salaries.

This recommendation has aroused no little hostility and no little trepidation. What will these Commissioners do? And will they try the "new broom" policy? Broadcasting may not be satisfactory in the minds of many to-day, but there is the fear that it may be considerably worse when these Commissioners of the Crown

nice in theory, but in practice writing to your M.P. seldom leads you anywhere. No doubt some enthusiastic critic of broadcasting will even suggest that a plebiscite of listeners should be taken, but time is flying, and although the idea of a plebiscite is rather fantastic, there is just a possibility that if one were taken and the voting showed an overwhelming support for the present B.B.C., the Government might stay their hand as regards the Broadcasting Committee's report being put into practice.

The Listener Pays.

There is no doubt that something very much like a panic is being bred at the moment. Listeners and traders are beginning to realise that the Government can appoint any number of Civil Commissioners in connection with broadcasting, and this, of course, means more money out of the licence fees; the listener will pay.

The P.M.G., parliamentary chief of broadcasting in this country, will have extensive powers. The Post Office record in connection with broadcasting and wireless generally is not a good one. Every experimenter has a grievance, and a legitimate grievance, against the Post Office. He knows too well how difficult it is to make the Post Office officials realise that they are public



Examining some of the 225 sets so far received at the National Institute for the Blind as a result of a recent appeal.

are let loose at 2, Savoy Hill. We agree; it may; but what's to be done about it? Nothing!

We have been making very careful inquiries with regard to the possibility of obstructionist methods succeeding even at the eleventh hour, and the possibility of the B.B.C. continuing as it is at present constituted for another three or more years. We have sounded influential Government and other sources, and we have come to the conclusion, rightly or wrongly (but we firmly believe rightly), that nothing can now stop the Government controlling broadcasting.

Suggestions have been made that listeners should write to their M.P.'s. This is very

servants and not bureaucrats with an *idée fixe* in their minds that they are beneficent, omnipotent gods, specially created for the benefit of all those interested in wireless.

Spilt Milk.

There are hectic times ahead, but we would point out to readers and to traders who read these notes, that it is no good crying over spilt milk and raising objections at the last moment. All this should have been done months ago; which we urged in our columns time after time. We must hope for the best; we do not suggest a policy of *laissez-faire* through indolence or ignorance; we face facts and hope that the radio industry will not spend money on propagandist schemes which can only lead to failure, with a loss of money and prestige.



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

Technical Notes

Methods of H.F. Coupling.

FOLLOWING the remarks which I recently made in these notes on the subject of tuned and aperiodic aerials, I have had a number of letters from readers on the question of the comparative advantages of the tuned-anode system of H.F. amplification and the resistance-capacity, or, as it is sometimes called, the "aperiodic" system. Both these methods for H.F. amplification are so well known and have been so extensively used that at first sight it might seem surprising that their respective advantages and disadvantages should not be thoroughly well known, but as there are newcomers continually coming forward, questions which may seem simple to the majority of my readers are not necessarily so to all.

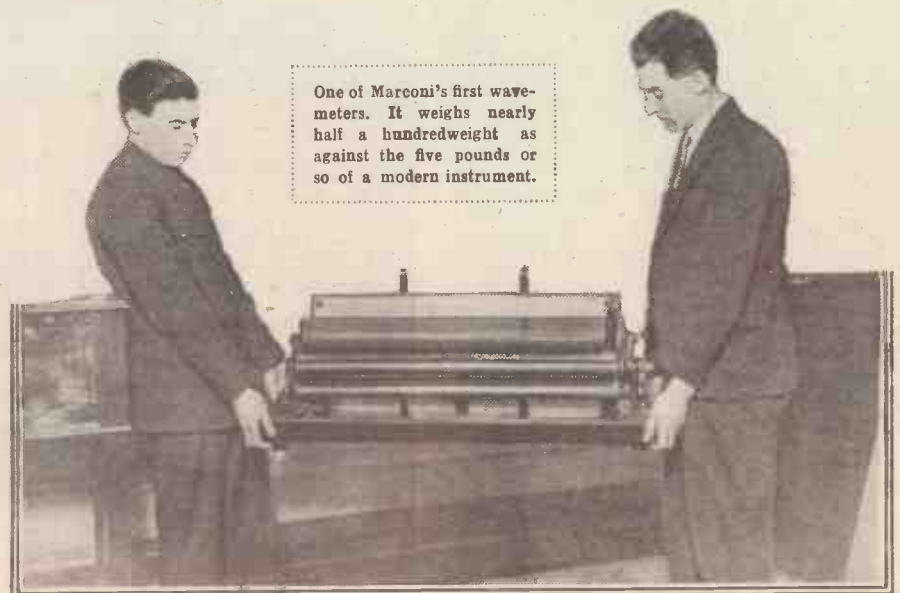
The resistance method of H.F. amplification is probably the most suitable for beginners, in that it is simpler to manipulate as there is no adjustment necessary for wave-length variation. This method functions practically equally well at different wave-lengths, and it is for this reason that it is sometimes referred to as aperiodic. It has the disadvantage, however, that a very high H.T. battery voltage is necessary; this is required owing to the high resistance used in the amplifier, which may be of the order of 100,000 ohms. The employment of 150 to 200 volts H.T. battery naturally entails certain additional expense, and this disadvantage to some extent offsets the advantage mentioned above of simplicity of control. In passing, it should be mentioned that the resistance-capacity system of H.F. amplification is unsuitable for short wave-lengths, below about 200 metres.

The Tuned-Anode System.

The 100,000 ohm resistors are, of course, obtainable commercially in the small cartridge form, similar to a fixed grid leak. The tuned-anode system has the particular merit that it renders the set very selective, and if a number of tuned circuits are included in the circuit the selectivity is increased at every stage. This advantage, however, necessarily brings with it the disadvantage that the circuit is more troublesome to tune, although once the dial settings are obtained for any particular station they can easily be jotted down and kept for reference.

The tuned-anode system does not entail the necessity for any unduly high H.T. battery voltage. The reason for this is quite simple, for practically the only

resistance involved through which the H.T. battery has to drive the anode current is the impedance of the valve itself, which may be perhaps 20,000 to 30,000 ohms. In the case of the resistance method this 30,000 ohms has to be added to the 100,000 ohms introduced, so that the total resistance or impedance may be something like three or four times as great as in the case of the tuned-anode system.



One of Marconi's first wave-meters. It weighs nearly half a hundredweight as against the five pounds or so of a modern instrument.

With the tuned-anode method, the coil in the anode circuit may also be employed as a reaction coil by mounting it in such a way that it can be moved in relation to the aerial or secondary coil, care of course being taken to avoid oscillation and its attendant well-known consequences. The coil in the tuned anode should be about the same value as the secondary coil, and it is preferable to employ in conjunction with it a variable condenser of about .0002 or .0003 mfd. capacity. Different coils may, of course, be used on the plug-in system for different wave-length ranges.

Decreasing Aerial Resistance.

Whilst on the subject of tuning, I might mention a letter which I have from a correspondent which, although it describes something which is comparatively well known may be useful to some readers. This is that the tuning may be sharpened by

increasing the capacity of the aerial by running a second aerial wire parallel to the first and not less than about 3 or 4 feet away from it. This allows the use of a smaller coil in the aerial circuit which decreases the resistance and permits of closer coupling.

Filament Current Supplies.

The subject of filament batteries is continually cropping up, and I suppose I receive more letters on this (and on the allied subject of battery elimination generally) than on any other. In spite of arguments in its support, the dry-cell system of filament heating never seems to be really in favour. I am convinced that by far the majority of experimenters and listeners who have electric supply available make use of accumulators, and those who are in out-of-the-way parts, whilst they may in some cases be obliged to use dry batteries are always dissatisfied with the same. I have frequently urged the claims of the wet primary battery in such cases, and it is interesting to note that several types of liquid primary battery have recently appeared on the market, designed especially for this purpose. The ordinary Leclanché cell, provided it is made up with sac elements, gives quite good results, particularly with the low-consumption low-

voltage valves now available. Like all cells of this type, however, its terminal voltage tends to fall steadily in use and, what is still more disadvantageous, tends to rise or recuperate when the cell is left idle for a time. If after the cells have recuperated the set is switched on, there is a danger of the valve filaments being badly overrun.

An Interesting Battery.

I have lately had some experience of the "Darimont" cell, which my readers may know is a primary liquid cell, somewhat similar in general construction to the Leclanché cell, but depending upon the use of two different solutions. This cell has the merit that it will give a comparatively heavy discharge, at any rate heavy compared with that which can usually be drawn from a Leclanché cell. For example, the

(Continued on page 656.)

THE general feeling of relief about the reduction in talks during the summer will be considerably increased by the knowledge that the B.B.C. will not revert in the autumn to the same proportion of talks as was the practice last season. At long last the priority of entertainment value over purely educational value has been conceded in regard to all talks. This does not mean any abdication of the functions of enlightenment on which the B.B.C. has placed such store. On the contrary, the education will be much more widespread and much more real under the revised policy.

Among the practical results that will follow this revision the following may be mentioned as typical—the periodical talks provided by the various societies of listeners and amateurs will be reduced to four a year per society, and then only if the talk is up to the standard of interest demanded by its place in the programmes. The 7.40 talk period will only be used for talk if there is available some “red-hot” topical material. In the absence of good stuff of this kind, the period will revert automatically to music.

Another result of interest will be the breaking up of the long period of talk that now goes on round about ten o'clock. The big talk of the day (Sir Oliver Lodge, Professor Gilbert Murray, etc.) will be given at 9.30. Then at 9.45 there will be an appropriate interlude, which will normally take the form of a special musical recital such as now given at 7.25. The news and notices will follow, and the decks will be clear by 10.15 for the resumption of the main evening programme, discontinued at 9.30. I am glad to see plans of this kind going forward. The suspension of Parliamentary action on the Broadcasting Report has its disadvantages, but it also has its advantages in that it dispenses with the threatened “Shadow Cabinet.” Thus the B.B.C. will have a clear run on programme building and planning certainly until November 15th.

Sir Harry Lauder Intervenes.

There are strong hopes that one of Serge Diaghileff's ballets will be broadcast during the present special season at His Majesty's Theatre, Haymarket.

A new programme plan in process of development is to fill once a month the entire period between four and six p.m. with All-Star Matinée Concert material. This is an excellent idea, and I hope that the Savoy Hill people get the scheme under way without delay.

Listeners are shortly to have a repeat performance from that very able pair of French pianists, Weiner and Doucet.

Miss Ffrangcon Davies is to appear in a special series of “post-ten” recitals on her own.

M. Pouishnoff's historical musical recitals will begin late in July.

Sir Harry Lauder is intervening in the revived conflict between the music-halls and the B.B.C. I understand that a statement from the great Scots singer, which will shortly be released, will create a first-call sensation. Sir Harry comes down very definitely and with characteristic energy on the side of broadcasting. He has some

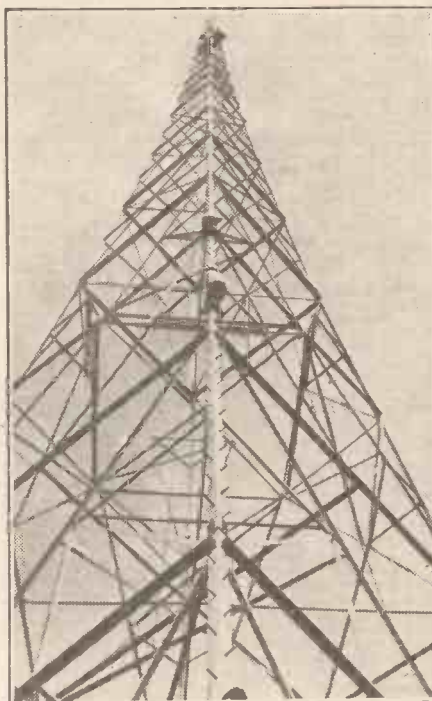
BROADCAST NOTES.

By O. H. M.

Broadcast Talks — Sir Harry Lauder Intervenes—America's Day—Extending the Licence—The Limiting Factor.

sound advice for both parties, but he makes short work of the argument that the vaudeville interests can either cripple broadcasting or help their own cause by their present attitude.

Following its special Canadian programme on July 1st, the B.B.C. has been trying to get together an appropriate programme for America's Day, July 4th. But I gather that the American community in London are apathetic. The B.B.C. will therefore put on



An unconventional view of one of the 300 ft. masts at the New York broadcasting station, W.G.Y.

a suitable programme of its own, and will not feature the occasion in the way originally planned. After all, there is no particular reason why a purely British institution should go out of its way to celebrate an act of rebellion against the British Empire.

Extending the Licence.

Fleet Street friends tell me that there is a new move on the part of a group of wireless manufacturers to secure an extension for three or five years of the licence of the B.B.C. This move probably arises out of the postponement of the legislation necessary to define the future form and constitution of the British broadcasting authority. Until a few days ago it was the intention of the Government to dispose of Broad-

casting about the middle of July. But the exigencies of the prolonged coal stoppage have ruled out this possibility, and it looks as if we shall hear nothing about the future of broadcasting so far as Parliament is concerned until November or even December. This being the case, some of the manufacturers are quite naturally considering ways and means to bring about a continuance of the present state of affairs for a further period after the end of this year. While I can sympathise with their point of view, and while I would like very much to see one or two of them on the new Board, I do not see that the present campaign can succeed.

The point, of course, is that it is a year too late. The policy of the future form of the broadcasting authority was referred by the Government to the Crawford Committee, which took a vast amount of evidence, including that of the manufacturers through the Chairman of the “Narmat.” The latter did not ask for the continuance of manufacturers' control. On the contrary, he advocated the setting up of a new public body on which would be represented a wide variety of interests, including the manufacturers, but not in a majority position. If the manufacturers had been really anxious to perpetuate the B.B.C. I think they could have done so; but most people got the impression that they were not particular whether they went on or not. This attitude strengthened the hands of those who were exploiting the obvious disadvantages of manufacturing control. I hope, therefore, that the present campaign will not lose a sense of proper perspective, and will recognise that the best that can be expected is that the official evidence of the “Narmat” to the Committee will be acted upon to the extent of securing adequate representation for the manufacturers as one of the interests involved.

The Limiting Factor.

The Chenil Galleries Symphony Concerts are now completed, and the B.B.C. has added considerably to its musical reputation thereby. In fact this series has marked the beginning of the serious consideration of broadcasting by the “high-brow” critics. There is no doubt also that listeners have greatly enjoyed the programmes of symphony music from Chelsea. The B.B.C. should try to do something like this at least every six months. The fact that next autumn and winter a big series of classical concerts will be given does not relieve the B.B.C. from the responsibility of repeating such a series as that which has just concluded at the Chenil Galleries. But here, again, the limiting factor will be money, and in this the delay of the Government is a disadvantage. A Post Office official told me the other day that his department had given the B.B.C. a considerable amount of money for capital expenditure over and above the £500,000 rationed for current expenditure this year. But he was quite definite that, in the opinion of his department, the latter sum was ample to provide “good enough” programmes, and that normally all licence revenue beyond the £500,000 a year should accrue to the Treasury. This would mean that if there were three million listeners instead of the two millions at present, one million pounds sterling a year of licence money would be unauthorised taxation. Surely a *reductio ad absurdum*.

WORK AT 2DA.

Rebuilding the "P.W." Transmitting Station—Keying Methods—More "N" Circuit Experiments—Reducing X's—Aerial Sparks.

By THE ENGINEER-IN-CHARGE OF 2DA.
(The "P.W." Transmitting and Experimental Station, Dulwich.)

2DA has not been so active of late, owing to a change being made in the position of the apparatus. Previously the installation was located in the top floor of a building. This gave a short lead-in from the aerial, but necessitated a somewhat long earth-lead; or, if a counterpoise was used, one end of the counterpoise was very much higher than the other.

The set has now been moved down into a special cabin built in the open. The aerial lead-in now comes down to within seven feet of the ground, thereby increasing its capacity and necessitating a small portion being cut off the other end so as to keep the capacity as near to its previous value as before. The earth-lead, however, is now only a few feet long and almost directly underneath the aerial and transmitting apparatus.

Results Improved.

The change appears to be an improvement, both from a reception and a transmission point of view. It may, of course, not be due solely to the change in the aerial system. Possibly the fact that as much metal has been removed from the apparatus as possible has a lot to do with it, particularly as a considerable amount of drainpipe passed close to the old lead-in.

Although a lot of telephony has been done recently, experiments also have been carried out with the idea of obtaining the best method of keying. A favourite method at 2DA—namely, breaking the grid-leak connection—was discarded owing to the heavy "key-clicks" produced, and also it was found that the valve was inclined to be erratic in starting to oscillate, particularly on 90 and 45 metres. Another drawback was that the valve *did* always pass at least a small amount of current when the key was up, consequently energy was wasted and the valve got hot.

Another method of keying, which has much to be said for it, is that of "keying the aerial" or earth-lead, and also the "spacing-wave method." These last two were given up owing to the interference which was caused by the spacing wave.

Eliminating Key-clicks.

After various other positions had been tried, it was found that the best method by far was the simple arrangement of keying the H.T. lead. The oscillations are set up suddenly and the power to the valve is suddenly and completely removed. The terrific "shock effect" of the H.T. being suddenly applied cannot fail to set the valve oscillating. There is, however, one fly in the ointment even here—i.e. "key-clicks."

Perhaps the worst method of keying for producing key-clicks is the new method adopted at 2DA. But the key-clicks have now been almost entirely avoided by the simple method of inserting an "iron core

choke" in the H.T. lead. This choke prevents the sudden rise of the current and consequent violent shocks to the aerial. Contrary to many statements, a condenser across the key contacts intensifies the key clicks.

Reducing X's.

Considerable experiments have been conducted with the new "N" circuit, and results have proved very satisfactory. In the writer's opinion one of the greatest of numerable advantages obtained by the use of this circuit is the almost entire elimination of atmospherics. Severe tests have been made in this direction, and it has been found that only under the most adverse conditions can atmospherics be heard at all in the telephones. As a matter of fact, a two-valve set was in use some time ago whilst a thunderstorm was actually on. Only when brilliant flashes of lightning occurred was anything in the nature of an "X" heard in the loud speaker.

The set was tuned to London and just off the oscillation point. At each flash of lightning a crash occurred in the loud speaker, very similar to the noise which is heard when the loud-speaker diaphragm is

screwed too close to the pole of the magnet, and, consequently, occasionally touched the magnet. Even when the storm was only just over—blue sky above, but the thunder-clouds were still visible in the distance—no trace of atmospherics could be heard in the loud speaker and only a very occasional crackle in the telephones.

An Interesting Phenomenon.

In a normal atmospheric condition, when only the usual "static grinders" are about, nothing in the nature of an atmospheric can be heard on the two-valve "N" receiver. Recently atmospherics have been very bad, but it has not bothered 2DA—an "N" receiver was used.

It would perhaps interest readers to hear of an experience which the operator at 2DA recently had. Whilst testing a new short-wave receiver, heavy rain began to fall and black clouds were seen above. After a little while loud crackles were heard in the 'phones, together with heavy static. The aerial was then switched off, but not earthed. In about half a minute a small but vicious spark crashed across the earth-arrester gap. Thereafter sparks occurred at an increasing frequency until at last they occurred about every three seconds. The gap was only about $\frac{1}{4}$ th of an inch, but one of the electrodes was of springy copper, and so the operator pushed this electrode back. Naturally, he did not allow his hand to come too close to the switch and gap, but used a strip of wood. The gap was lengthened to an inch, and even then sparks occurred regularly at about half-minute intervals. The sparks can be described as "fat and bluish," and they made a loud crack. Here is obvious proof of the necessity of a safety-gap to earth.



Mr. J. L. Baird demonstrating the latest development in his search for a solution to the television problem.

MORE FACTS ABOUT L.F. TRANSFORMERS

It is sometimes advised that a transformer should be used in the second L.F. stage of different type or ratio from that employed in the first.

In regard to type, whilst it is conceivable that the defects of two inferior transformers might cancel out, there is no reason for any difference of type when good transformers are used.

The question of transformer ratio is affected by the fact that the impedance of the transformer primary should exceed that of the valve as much as possible to ensure maximum amplification ratio. If the transformer ratio is high, the impedance of the primary must necessarily be low at low frequencies and the greater step-up of the high ratio transformer will be annulled by the reduced amplification ratio obtained with a high impedance valve, or, if a low impedance valve be used, by its lower amplification factor. Moreover, these low impedance valves are power valves costing more initially and to maintain.

The best results are obtained by using Ferranti A.F.3 transformers in both first and second stages.



**BRITISH MADE
TRANSFORMERS
TYPE AF3**

HAVE THE FOLLOWING IMPEDANCES:

At 100 Periods - - 50,000 OHMS
At 500 Periods - - 410,000 OHMS

**NO BETTER TRANSFORMER
IS AVAILABLE AT ANY PRICE**

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**RATIO 3.5 to 1
FOR USE IN BOTH
FIRST AND SECOND
STAGES.**

RADIO TUTORIAL

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The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

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

Readers' letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers. The envelope should be clearly marked "Patent Advice."

TECHNICAL QUERIES.

Letters should be addressed to: Technical Query Dept., "Popular Wireless," The Fleetway House, Farringdon Street, London, E.C.4.

They should be written on one side of the paper only, and **MUST** be accompanied by a stamped addressed envelope.

Queries should be asked in the form of the numbered questions: (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.

For every question asked a fee of 6d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the numbers. (It is not possible to reproduce the question in the answer.)

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

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

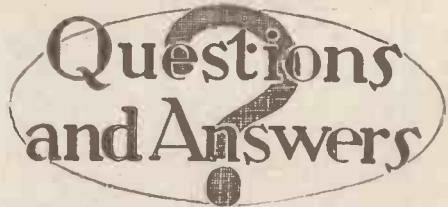
All other back-of-panel diagrams are specially drawn up to suit the requirements of individual readers at the following rates: Crystal Sets, 6d. One-Valve Sets, 6d. One-Valve and Crystal (Reflex), 1s. Two-Valve and Crystal (Reflex), 1s. Two-Valve and Crystal (Reflex), 1s. 6d. Three-Valve and Crystal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

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

Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)

Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1s. per diagram, and these should be large, and as clear as possible.

No questions can be answered by 'phone. Remittances should be in the form of Postal Orders.



INSERTING GRID BIAS.

M. L. E. (Lee-on-Solent, Hants).—I have built up a "P.W." three-valve set (H.F., Det. and L.F.) from the sixpenny Blue Print No. 19. Results have been very good, and I am now going to fit a first-class L.F. transformer instead of the cheap one at present in use. The makers of the new transformer say that it should be worked in conjunction with a

(Continued on page 654.)



Traders and manufacturers are invited to submit wireless sets and components to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." Test room under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

THE PENTON TYPE "A" COIL HOLDER.

A COIL holder of interesting design is the Penton Type "A," a product of the Penton Engineering Co., 15, Cromer Street, London, W.C.1. It is of the geared type, with a ratio of 8 to 1, and is provided with a long handle (4½ in.). Owing to the reduction gearing the moving block moves much more stiffly than the adjusting handle, which operates smoothly and easily, but, nevertheless, a patent locking device is incorporated in order still further to protect the moving block from falling when a particularly heavy coil is in use. The plugs consist each of four sections and make good contact in all coil sockets.

The Penton holder can be mounted on a panel by means of four screws passing through it into the side supports in the very usual manner, and it can be mounted on a baseboard in a similar way. But with

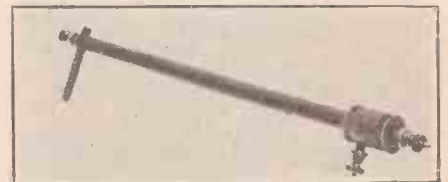
commendable appreciation of the mechanical shortcomings of many listener-constructors, the Penton people supply ebonite bars, which enable the component to be screwed down to a baseboard from the top. Additionally, it must be mentioned, a drilling template is supplied. These sort of things tend to enhance the popularity of a manufacturer. The mechanical action is good, and the price 6s., which, in our opinion, is very reasonable for a first-class geared coil holder.

A PATENT LEAD-IN TUBE.

Mr. W. Crawley, 45, The Crescent, Letchworth, Herts, recently sent us a model of a lead-in tube patented by him, a photograph of which appears on this page. This lead-in tube embodies a lightning arrester and an aerial earthing switch which can be operated from inside the

house. The method of operation is rather neater than in many similar devices. A short ebonite handle projects at right angles to the tube, and when this is turned 90° the aerial is shorted to earth. Turning it back again or forward another 90° breaks the contact, and so on round the full 360°. A positive adjustment is automatically provided.

The device forms a neat and efficient fitment, and can be easily fixed through a window-frame. Its construction is quite straightforward and should not prove difficult to reproduce commercially.



Mr. W. Crawley's Patent Lead-in Tube.

THE NEW COSSOR VALVES.

Undoubtedly one of the most interesting of all recent radio innovations is the new Cossor "Point One" valve. By means of a special method of construction known as "co-axial," the electrodes are so mounted that a definite standard of production is obtainable. This means that individual valves do not vary in characteristics, and a very desirable degree of uniformity is attained. It would be difficult to overrate the importance of this, more especially in these days when super-hets., neutrodyne, and other super sets abound.

(Continued on page 652.)



**Discernment—
not extravagance
—is expressed by
those who buy
this Brown “Q”**

IN the same way as the man who buys a Rolls Royce expresses a desire to possess the *best*, so those who choose the superb Brown Q-Type Loud Speaker are showing their discernment in a desire for the finest Instrument that money can buy.

When you first see this masterpiece of Science you cannot but be impressed by the *extraordinary* beauty of its outline; but *hear it* and you will realise that such unique volume and richness of tone is available on no other Loud Speaker. Hear it and you'll want to possess it.

The most modest requirements, also, are met by one of the eight **Brown Loud Speakers**

Type H.1. 21 ins. high. 120 ohms £5 5 0 2,000 ohms £5 8 0 4,000 ohms £5 10 0	Type H.2. Height 12 ins. 120 ohms £2 5 0 2,000 ohms £2 8 0 4,000 ohms £2 10 0	Type H.3. 15 ins. in height and in resistances of 2,000 or 4,000 ohms £3 0 0	Type H.4. The smallest Brown Loud Speaker. Only 10 ins. high. 2,000 or 4,000 ohms £1 10 0
Type H.Q. 20 ins. high. Resistance: 2,000 or 4,000 ohms £6 0 0	Type Q. 23 ins. high. In resistances of 120, 2,000 or 4,000 ohms £15 15 0	Cabinet Type In Mahogany or Oak Cabi- net, 2,000 or 4,000 ohms £6 6 0	Crystavox The only Loud Speaker which works from a Crystal Set £6 0 0

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Type F. Popular Broad- cast type. Weight only 6 ozs. 2,000 ohms £1 0 0	Type A.2. The new reed- type, un- equalled for sensitiveness. 2,000 ohms £1 10 0
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Type A.
As used by the Ad-
miralty 120; 2,000 or
4,000 ohms £2 10 0,
8,000 ohms £3 0 0
It would be unusual to find a Dealer
who does not stock Brown Instru-
ments and is anxious to demon-
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G.A. 5383.

**TWO NEW
VALVES**

**G.P. 4 GENERAL PURPOSE AND
P.V. 4 POWER VALVES—**
for use with 4-volt accumulator
(or three dry cells).

The salient features of these ideal companion **DULL EMITTERS** are, economy of consumption—a longer lasting accumulator charge and high efficiency—clearer, better reception—with louder volume.

You can identify G.P.4 and P.V.4 by:

- (1) The clear glass Inspection "Window."
- (2) The Wafer Disc—a hallmark.
- (3) The Seal—ensuring the valve being unused after final test in the Ediswan laboratories.

SPECIFICATIONS

<p>EDISWAN G.P. 4 Volts, 3.5-4 Amps., .15 Plate Voltage, 60-120 Amplification Factor, 12 Slope, .55 Ma/v Imped'ce, 22,000 Ohms</p>	<p>EDISWAN P.V. 4 Volts, 3.5-4 Amps., .35 Plate Voltage, 60-120 Amplification Factor, 6 Slope, .65 Ma/v Impedance, 9,500 Ohms</p>
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G.P. 4.—General Purpose dull emitter. Low current consumption. Long Life. Powerful amplification. Elimination of objectionable microphonic effects.

P.V. 4.—Ideal power valve, companion to G.P.4. When used for Loud Speaker work: powerful, distortionless amplification. No microphonic effects.

Price **16/6** Price **22/6**
Obtain from your Dealer the Ediswan
Folder—"2 New Valves"

**EDISWAN
VALVES**

Will improve any set

THE EDISON SWAN ELECTRIC CO. LTD

N.V. 2

APPARATUS TESTED.

(Continued from page 650.)

The familiar hood-shaped type of plate and grid which for so long has been a feature of Cossor valves is retained, although in a form slightly modified to meet the special requirements of the new design. A small insulating element holds the plate and grid together at the top, and at the same time forms one of the anchoring points for the filament. Thus the positions of the three electrodes cannot be varied, and a definite alignment is assured.



The new Igranic Triple Honeycomb Coil.

But in its name this new Cossor valve indicates an even more attractive feature: it takes only point one of an ampere at 1.8 volts. And this, by the way, really is 1.8 volts, for when it is used even on a two-volt accumulator at least a five-ohm filament resistance is required.

"Point Ones" are available in two types (H.F., and Detector and L.F.), and a range

is completed by what is known as the "Stentor Two," a 1.8-volt power valve which consumes the small current of 1.5 amperes. The characteristics of the three valves are as follows:

Type	Filament.		Purpose	Impedance	Amp. Factor	Price.
	Volts	Amps				
Point One (Red Top)	1.8	.1	H.F. Reflex or Resistance Capacity coupling	Ohms 42,000	13	s. d. 15 6
Point One (Plain Top)	1.8	.1	Detector or L.F.	22,000	9	15 6
Stentor Two (Green Top)	1.8	.15	Power amplification	8,000	8	18 6

We have tested several samples of each type, and undoubtedly their characteristics are exceptionally constant. The Stentor Two is a wonderful little power valve, and has a punch out of all proportion to its diminutive wattage. Used in either first or second stages of L.F. amplification with appropriate H.T. and grid bias, it delivers an excellent volume with a mellowness and purity of tone of outstanding merit for its class.

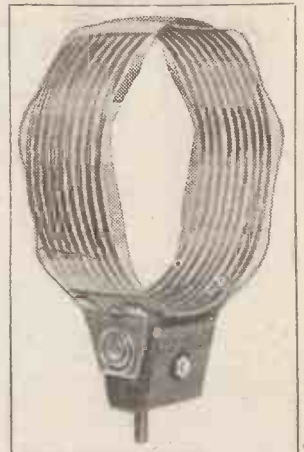
The H.F. "Point One" is both sensitive and stable, and operates most efficiently in all H.F. positions. The L.F. "Point One" (plain top) makes a very good detector indeed, and is both "lively" and "controllable." In first stage L.F. positions it gives good results, but, personally, we prefer the Stentor here, whatever the form of coupling. As a matter of fact, the Stentor makes an excellent detector, and two Stentor Twos in a Det.-L.F. give better results than many six-volters.

Using "Point Ones" and Stentors throughout in a five-valve set (2 H.F., Det., 2 L.F.), a very satisfactory example of really efficient "team work" resulted.

Undoubtedly Messrs. Cossor's new range will rapidly gain as great a popularity as their famous Wuncells.

Among others the following sets, components and accessories are in the process of being tested: Bretwood Auto - Audio Amplifier, Watmel L.F. Auto-Choke, Ediswan Valves, P.V.4 and G.P.4, J. G. Graves, Ltd., One-Valve Set, G. E.

Pearson Transformer for use in H.T. Eliminators, Marconi U.5 Biphas Rectifying Valve. Full reports concerning the operation of these and other interesting devices recently to hand will appear in these columns in due course.



The Igranic Short-Wave Coil

BUILD THE "COLPITT'S" ONE-VALVE SET

Described in this issue.

The "PILOT" service guarantees you good results.

If you are going to build this wonderful little set—or indeed any other set—you cannot do better than follow the lead of thousands of other "P.W." readers and build it the Pilot way. Full particulars of this well-known scheme, which saves you time and money and also makes failure impossible, appear in the Pilot Manual. This handsome book contains 48 pages of valuable information for home constructors and is fully illustrated. Post Free 6d.

The first step—Send 6d. for the PILOT MANUAL.

PETO-SCOTT Co. Ltd. Branches: 82, High Holborn, W.C.1, Liverpool, Plymouth and Walthamstow. Registered Office, Mail Order and Showrooms: 77, CITY ROAD, LONDON, E.C.1

Complete Pilot Kit of components, all of best quality, and fully guaranteed **39/6**

"Red Triangle" Ebonite Panel, drilled and engraved **6/6**
Polished Mahogany Cabinet and Baseboard **8/6**

When a complete kit of components, together with a panel, is ordered a Marconi Royalty of 12/6 must be added to the price quoted above.

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1926-27

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Buy it AT ONCE

Simple, accurate, and easily adjusted

Don't experiment! Get a "Lotus" and be certain of better results.

The vernier movement comprises three sets of enclosed precision machine cut gears and reduces the speed of the moving coil block by eight times.

The moving block moves in the same direction as the knob, which prevents confusion. It also becomes absolutely rigid in any position, holding the heaviest coil securely. No screws required to tighten it.

LOTUS

VERNIER COIL HOLDERS

From all Radio Dealers.

Two Types:

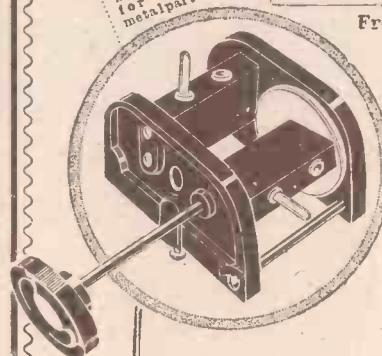
For outside panel mounting:
Two-way 7/-
Three-way 10/6

For inside baseboard mounting, with 6 in. handle:
Two-way 8/-
Three-way 12/6

Garnett, Whiteley & Co., Ltd.,

Lotus Works, Broadgreen Road, Liverpool
Makers of the new improved "LOTUS" Valve Holder.

Bakelite mouldings for the side plates, coil blocks and knobs. Heavy nickel plating for the metal parts.





FILAMENT RHEOSTATS AND POTENTIOMETERS

With the windings carried on a porcelain bobbin and having the contact arm moving on its inner side, the "Cosmos" Filament Rheostat takes up remarkably little space, is strong in construction, and has a very smooth and reliable movement. It is fixed by ONE HOLE, and is provided with a handsome knob and dial. Made in four types, two of which are double wound for Dull OR Bright Valves, and one a Potentiometer, the prices are as given below.

METRO-VICK SUPPLIES, LTD.

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

Metro-Vick House, 145, Charing Cross Rd., London, W.C.2 R.P.O.

Description	Ohms	Carrying Current	Price	
			s.	d.
Single Wound	6·0	1·0 amp.	4	6
Double "	18+2	·4-1·5	5	0
Double "	30+4	·2-1·0	5	0
Potentiometer	300	—	6	0

Cosmos

RADIO COMPONENTS

Visit the Royal Air Force Display at Hendon, 3rd July, 1926.

SCRAP HIGH-TENSION BATTERIES!



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

SAFE! SILENT! SOUND!

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POSTAGE AND PACKING 1/6.
ILLUSTRATED CATALOGUE FREE!
SATISFACTION or CASH RETURNED!
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MODEL	VOLTAGE TAPPINGS.	PRICE
1A	ONE	42/6
2A	TWO	55/-
3	THREE	67/6
V2A	1 VARIABLE, 1 FIXED	£3: 17: 6
V3	2 VARIABLE, 1 FIXED	£4: 17: 6
V3A	THREE VARIABLE	£5: 5: 0
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NOW and experience
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With knob & dial.
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With vernier, 1/- each extra.
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"BRUNET," stood the test of
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Fresh 60-v. H.T. Batteries, 5/8. 4-5 Flash Lamp, 3
for 1/- 63-v. Battery Cases and Clips, 3/6; 108-v.
do., 6/11. Best Nickel Terminals, large, 1/1 dozen.
Real good screw Wander Plugs, 2d, 3d, pair. Port-
able Copper Aerials, ready to fix up, 3/11. Aerial
Wire, 100 ft., 7/22, 1/9; 100 ft., 7/22 enamel.
3/3. Fine Bulbseye bulbs, 2 1/2 d. N. & K. standard
pattern, 4,000 ohms 8/11. Double leather bands.
Drill, highest Sheffield quality, 1/3. Set of 8 drills,
1/2. Ebonite, special Crystal quality, 7 x 5, 1/-;
8 x 6, 1/4; 9 x 6, 1/6. Boxes, 2/6, 2/11, 3/6.
American Type Polished Boxes, open at back, 12 x 7
panel, 8 in., deep, 7/11. Ebonite cut to size while
you wait, 8 in., Grade A, 3/15 in. 4 d. sq. inch, or
1 in., 4 d. Reduction large sizes. **POST LIST, etc., FREE.**

**2-VALVE SETS, COMPLETE WITH VALVES,
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Hours 9-8 Back of Daly's Theatre.
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**RADIOTORIAL
QUESTIONS & ANSWERS.**

(Continued from page 650.)

small grid bias battery. How should this be
fitted to the set in question?

The O.S. terminal of the L.F. transformer is at
present connected to the earth lead. This connection
should be removed, and the positive plug of the grid
bias battery is connected to the earth lead, whilst the
negative plug goes direct to the transformer by
means of another flexible lead. All the other trans-
former connections are unaffected.

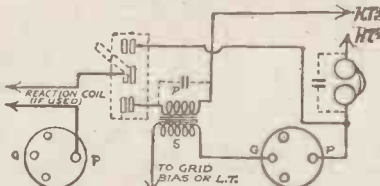
Two-valve Chitos.

E. G. (Southampton).—I have built a two-
valve Chitos, but am unable to get anything
but a humming noise, as of a dynamo, increas-
ing as the rheostats (Woodhall) are pulled out.
Can you put me in communication with a
reader who has successfully built this circuit?

We regret that we cannot give the names of other
readers without their permission, but your trouble is
probably due to a simple L.F. howl (in which case the
usual remedies of respacing and grid bias would be
effective), or else to an unsuitable grid leak. If this

For the Constructor

No. 6.—Cutting Out an L.F. Valve.



The method of cutting out the last stage of
low-frequency amplification (transformer-
coupled) by means of an S.P.D.T. switch is
shown above. The plate lead of the pre-
ceding valve is disconnected between the reaction
coil and the L.F. primary. The side nearest
the valve is taken to the centre of the
switch, whilst the primary side goes to the
lower switch contact, so that when the switch
is "Down" this lead is restored.

The top switch contact is joined to a point
between 'phones and the plate of the last
valve, so when the switch is "Up," the trans-
former is put out of circuit and the pre-
ceding valve's plate current flows through the
'phones instead of through the primary.

latter does not cover a sufficiently wide range of
resistances the first valve will set up a howl of the
kind you mention.

By replacing the primary of the L.F. transformer
with the telephones it will be possible to ascertain
whether it is the first or second valve that is howling
(if the set is not fitted at present with a switch for
one or two valves).

LOADING FOR DAVENTRY.

W. J. S. (Cambridge).—I have recently
constructed an ordinary single-valve receiver
employing reaction.

Although working quite satisfactorily on
the usual B.B.C. band of wave-lengths, I find it
impossible to tune in 5 X X, except for a
barely audible murmur when the coils are
tightly coupled and the set oscillating. I have
tried several "Daventry" coils and altered
winding of reaction. How can this be
remedied?

Apparently your tuning condenser is at present
connected "in series," whilst the average "Daventry
coil" for loading to 1,000 metres is intended for use
with a tuning condenser that is placed "in parallel."

You can either alter the connections of the con-
denser or use a larger 5 X X coil of approximately
300 turns.

BASKET COILS.

T. S. (Wandsworth).—Are basket coils
efficient?

Yes, very efficient, providing they are of the single
layer type.

Owing to the large sizes required for high wave-
lengths they are chiefly used for reception on low
wave-lengths, as coils of the honeycomb type can be
used with equal success on the lower bands of
frequencies, and they are far less bulky than the
basket coils.

Anodon

The name that
stands for all that
IS BEST

in Coils, Rheostats, H.T.
Batteries & Grid Leaks

Ask your dealer by Brand Name.

ANODON LIMITED

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WET H.T. BATTERIES

British made miniature square Leclanché Glass Jars,
2 1/2 x 1 1/2 x 1 1/2, for wet H.T. Units. Waxed, 1/3
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Phones and Loud Speakers reconditioned, 4/6 & 5/-.
The H.E.P. Co., 46, St. Mary's Road, Leyton, E.10.

HEADPHONES REPAIRED

Re-wound & re-magnetised 5/- per pair. Loud Speaker
repaired 5/-. Transformers re-wound 5/- each. All work
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please mention "Popular
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Building made easy. Zincs with special connectors,
slip on carbon. **NO SOLDERING.** Build in
half-hour 1/- doz., plain; 1/3 doz., pitched.
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near Whipps Cross, Walthamstow, E.17.

TRIOTRON VALVES Why pay 14/- for Dull
14-day offer of the wonderful Triotron Dull Emitter
Valves. 2 amp. 2 volts, 5/6. .06 amp. 4 volts, 6/6.
Power Valves, 10/6. Post free. Cash refunded if not
satisfied.—**H. E. NICHOLLS, 29-30, Trinity
Square, London, E.C.3.**

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in getting orders fulfilled, or
should the goods supplied not be
as advertised, information should
be sent to the Advertisement
Manager, "Popular Wireless,"
4, Ludgate Circus, London, E.C.4



Where there's a child there should be cocoa

CHILDREN are brain-workers and manual workers too, and many overgrow their strength at school and play. Now Cocoa is food, and gives the children extra strength to keep pace with their growing bodies. It is the children's idea of a really delicious drink for breakfast and supper.

"Keep fit on cocoa"

BOURNVILLE
By test the best

See the name "Cadbury" on every piece of chocolate

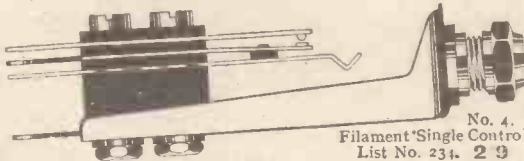
A NEW BOWYER-LOWE

product, embodying all Bowyer-Lowe Refinements and Craftsmanship

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THE design of Bowyer-Lowe Jacks was evolved to obviate faults usually apparent in Jacks adapted from telephone uses. The following details indicate the superiority of these Components:

1. Girder Frame, ensuring rigidity.
2. Hard phosphor bronze springs (tinned).
3. Silver contacts accurately positioned.
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5. No loose panel washers.
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| No. 1. Single circuit open | List No. 231 | 2 2 |
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Tested Components They are Guaranteed

The Bowyer-Lowe Co. Ltd., Letchworth, Herts.

On Guard!

There is no leakage with a "Lotus" Buoyancy Valve Holder on guard.

Immediate and lasting connection made when valve pins enter valve sockets. The leg socket expands and automatically locks.

Absorbs shock, protects the valves and eliminates all microphonic noises.



Made from best bakelite moulding with springs of nickel silver and phosphor bronze valve sockets.

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Lotus Works, Broadgreen Road, LIVERPOOL.

Makers of the famous "Lotus" Vernier Coil Holder.



Without Terminals

2/3

With Terminals

2/6

To get pure EBONITE, ask for



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QUALITY EBONITE

RODS, TUBES, SHEETS, PANELS, MOULDINGS

Ask your dealer for "BECOL"

THE BRITISH EBONITE CO., Ltd., HANWELL, LONDON, W.7.

It is made from finest rubber and sulphur and is guaranteed free from surface leakage.

It proves its quality in every test. Its polish will also please you—ask to see it.



Two in One!

Here's a splendid little component, the Watmel combined Grid Condenser and Fixed Grid Leak. Saves space, time and money. Built to allow the Grid Leak to be connected either across the condenser or direct to the filament of the detector valve.

Price 2/6 each.

Send a postcard for full details of the various Watmel products.

The Watmel Wireless Co., Ltd., 332a, Goswell Rd., London, E.C.1

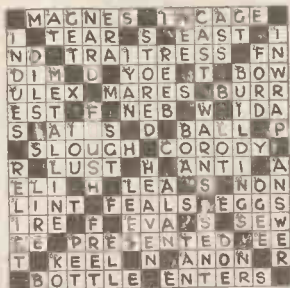
Representative for Lancashire and Cheshire:

Mr. J. B. Levee, 23, Hartley Street, Levenshulme, Manchester.

For trouble-free condenser efficiency always specify the famous round Watmel fixed condenser.

Sizes up to .002 - - 2/-
Sizes .0025 to .006 . 2/6

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OF THE
H.M.H. HEADPHONE
CROSSWORD PUZZLE**



The following three competitors were correct:
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 2. Mrs. N. HEURTSOON, "Shammar," Church Road, Richmond, Surrey.
 3. F. LAND, 1005, 3, Coventry Road, Birmingham and each receive £28 Gs. 3d. The following 25, with one mistake, win a consolation prize of a pair of H.M.H. Headphones: H. Robbins, "Hunston," Chatsworth Road, Parkstone, Dorset; E. Turner, 6, Bryngwyn Road, Abertillery, Mon.; M. Hall, 6, Nightingale Place, Woolwich, S.E.18; Mrs. A. E. Case, 71, Gillott Road, Birmingham; C. Richmond, 21, Colville Terrace, London, W.11; W. F. Lee, 2, Jolls Cottage, Devonport; W. E. Pugh, Ashton Road, Birkdale, Southport; Frank E. B. Blane, 25, Rutland Square, Edinburgh; Mrs. I. Robinson, Darwin House, Mountfields, Shrewsbury; P. G. Carvey, Moor House, East Hanningfield, near Chelmsford, Essex; Mr. Woolnough, 11, Beahlton Gardens, Sutton, Surrey; H. Williams, 25, Cemetery Road, Beeston Hill, Leeds; E. J. B. Carpenter, 16, Southfield Place, Portobello; C. A. Hoggett, 19, Flamsted Avenue, Wembley, Middlesex; William McKee, 6, Lansdown Road, Canterbury; Frank S. Downs, 14, Harold Terrace, Dover, Kent; W. G. Gosson, 1, Victoria Street, Aylesbury, Bucks; H. Robbins, "Hunston," Chatsworth Road, Parkstone, Dorset; Mrs. M. E. Wells, 9, Glenmore Avenue, Stoke-Plymouth, Devonshire; A. S. Driscay, Station House, Kew, Middlesex; Arthur Fredk. Lewis, 24, Caversham Road, London, N.W.5; D. Heatley, 17, Rolls Street, Canton, Cardiff, S. Wales; O. J. Bolton, "Garden Reach," St. Anthony's Drive, Newcastle, Staffs; O. P. Lawrence, 100, High Road, Balham, S.W.12; O. H. Cronbie, 137, Elm Park Mansions, Park Walk, Chelsea, S.W.10.

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**LUDGATE RADIO CO.,
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**H.T. Accumulators —
60 Volts
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77, Great Portland Street, London, W.1.**
 Trade Supplied. Telephone 1304.

TECHNICAL NOTES.

(Continued from page 646.)

40-ampere-hour capacity type has a normal maximum discharge rate of about $\frac{1}{2}$ ampere, which is amply sufficient to operate several of the .06 or .08 type of valve. Moreover, the terminal voltage remains fairly constant in use, and there is little rise in voltage on leaving the cell idle.

The internal resistance of the cell is quite low—not more than about 1 ohm in the case of the smaller types and only about one-third of an ohm in the case of the larger types. This means that the terminal voltage does not vary very much with the current drawn from the cell, so that if a number of valves are working in parallel and one is withdrawn from its holder, the voltage applied to the remainder does not jump up to any appreciable extent. All these points are important when considering the cell from the point of view of filament lighting.

The Darimont cell has carbon positive plates and a zinc negative plate. The cell is activated by pouring in solutions which are made up from chemicals supplied in dry form. After the cell is run down it is only necessary to clean it out and to make up fresh solutions, when it is again as new. It represents in my opinion an important step forward towards the solution of the problems of wireless users in parts of the country which are out of reach of ordinary electric supply.

Efficient Aerial Masts.

For the benefit of those who are desirous of erecting an outdoor aerial and who have difficulty in finding a suitable mast, I should mention that I have recently inspected one or two of the tubular steel masts manufactured by Hildick & Hildick, and these appear to me to supply a need. They are available in two types—the plain type, which must be erected as a whole, and the telescopic type, which, as its name implies, can be raised from the lower section whilst in position.

The masts are supplied with galvanised steel wire stays and undoubtedly make a first-class mechanical job. The only thing possibly against them is their price, which may at first seem a little high, but if the alternative be adopted of erecting a corresponding wooden pole it is surprising how the cost mounts up when the pole is efficiently erected and properly stayed. The steel masts referred to are not only easy to erect, but once erected they are made to last.

"Second" or "First" Stage?

A reader from Hull, Mr. T. A. Bryant, gives me an account of his experiments with different types of L.F. transformers of different ratios and placed in different stages in the set. He points out that, contrary to popular opinion, he has found that the putting of a so-called "second stage" L.F. transformer, ratio 1 to 3, in the first stage, and the placing of the so-called "first stage" transformers, 1 to 5, in the second stage, has given him much better results on Continental reception, although British reception was unaltered. This, I may say, has been the experience of many constructors, and in fact it has been argued, both theoretically and practically, that quite low ratio transformers are preferable at all stages. Some experimenters do not

believe in using any higher ratio than 1 to 2 at any stage.

These observations, together with the various discussions which have taken place in the press recently on the subject of L.F. transformer ratios, only tend to show that, inasmuch as theory in this subject is frequently at variance with practice, the present-day accepted theories must be, if not in error, at any rate incomplete.

**SHORT-WAVE
JOTTINGS.**

By **E. J. SIMMONDS, M.I.R.E.**
 (Staff Consultant.)

IN my Short-Wave Notes a few weeks ago, I mentioned that special short-wave tests on 32.1 metres had been undertaken at my experimental station, and that a new master oscillator drive transmitter had been constructed and every possible care had been exercised to minimise the unavoidable high frequency losses in this set. The transmitting valves used on this set are of new design, constructed especially for short-wave work, and represent some of the latest developments in valve construction for high frequencies.

The use of these valves makes it possible to obtain a much greater over-all efficiency, and the stability of operation is also much improved.

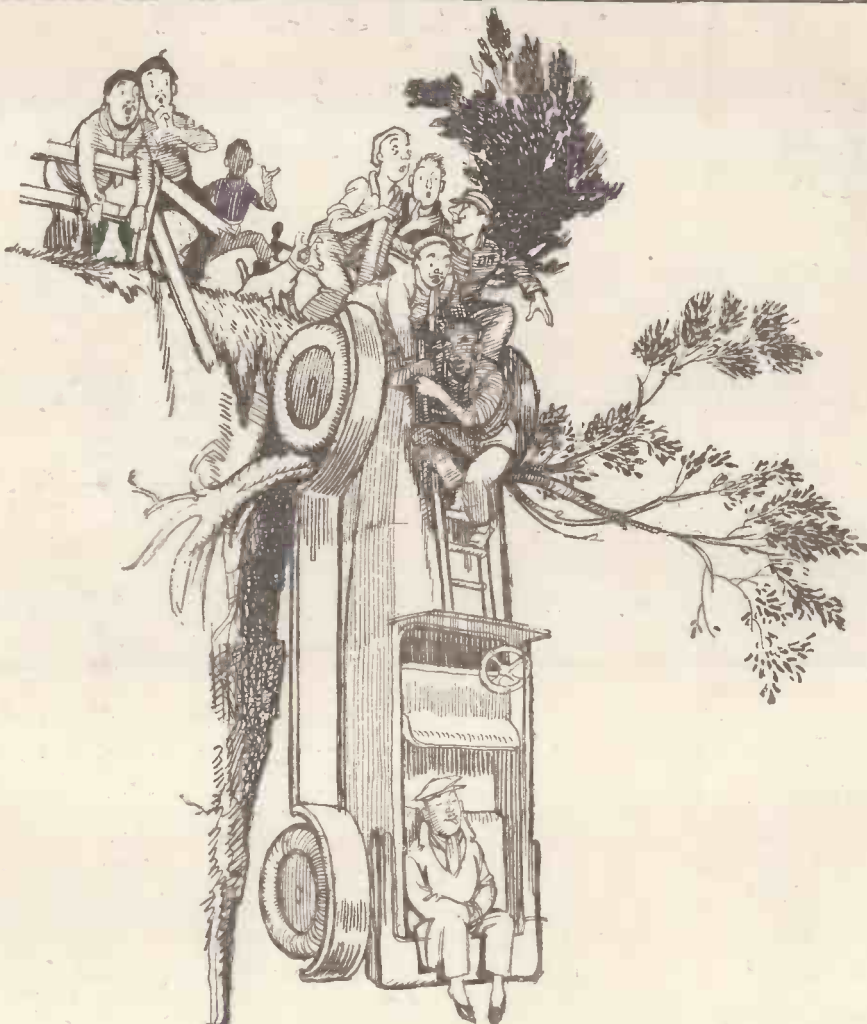
The initial tests with this transmitting apparatus, and using an outside antenna, gave results far exceeding expectations, and during the peak reception period gave signals at the receiver of Australian 2 L M, readable on a loud-speaker using three valves for reception. The scope of the tests was then extended to find the useful range of an indoor antenna, coupled to the transmitter mentioned above. The type of antenna chosen, after consideration of the conditions, consists of a horizontal symmetrical oscillator, the horizontal length being $\frac{1}{2}$ wave-length, viz., 16 metres. This oscillating and radiating system is fed by two parallel radio-frequency feeders about 10 yards long.

Indoor Aerial Success.

As, however, these feeders are very close together, the resultant fields caused by the oscillating energy in the feeders (which at any instant are of opposite sign) will mutually cancel out, and practically have no effect on the fields produced by the useful horizontal and radiating component of the antenna. This arrangement is a very convenient one, inasmuch as it allows the antenna to be placed some considerable distance from the source of oscillatory energy, and fed by the radio-frequency feeders. The indoor antenna used in these experiments is directly under the main roof of the house, about two feet from the tiles, and consistent reports have been received of R 4 to R 5 signals in Australia using input powers of approximately 100 watts, the receiver being an ordinary two valves (detector and L.F.).

We regret that the second and concluding part of the article "How to Use Valve Curves" has been unavoidably held over and will appear in next week's issue.

PLAYER'S "MEDIUM" NAVY CUT CIGARETTES WITH OR WITHOUT CORK TIPS



Arthur
Watts
26

for
Cool
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REGD. NO. 154018.

PLAYER'S

Navy Cut

CIGARETTES

10 for 6d. 20 for 11½d.
50 for 2/5 100 for 4/8



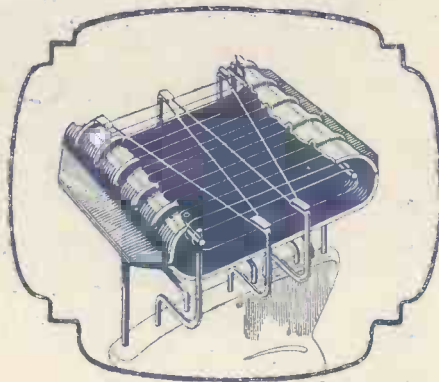
46 *Good*

Do you know

that the factors controlling the volume of pure reproduction from your receiver are based on the design of the filaments of your valves

Everybody

who knows about valves will tell you that a filament that is up to 3 times greater in length and has an increased emission surface up to 5½ times that of the ordinary filament will mean a 33% increase in your results.



There is no mystery in the construction of a valve. Any anode and grid will operate with any filament but it is the filament that counts, and this is what you pay for.



Now look at The Mullard P.M. Filament

Its increased length completely within the field of the anode and grid is obviously greater than that of any other valve on the market. It is supported by five strong but resilient hooks. It has a large core of a special ductile metal that prevents it from breaking except by the very roughest handling.

It consumes **ONLY ONE TENTH AMPERE** and is so economical that no sign of glow can be discerned. Will give you consistent powerful results during a long life.

- For 4-volt accumulator or 3 dry cells
 - THE P.M.3 (General Purpose) 0.1 amp. 16/6
 - THE P.M.4 (Power) 0.1 amp. 22/6
- For 6-volt accumulator or 4 dry cells
 - THE P.M.5 (General Purpose) 0.1 amp. 22/6
 - THE P.M.6 (Power) 0.1 amp. 22/6
- For 2-volt accumulator
 - THE P.M.1 (General Purpose) 0.1 amp. 15/6
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for the Valves with the P.M. Filament



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OSCILLATION AND THE "N" CIRCUIT.

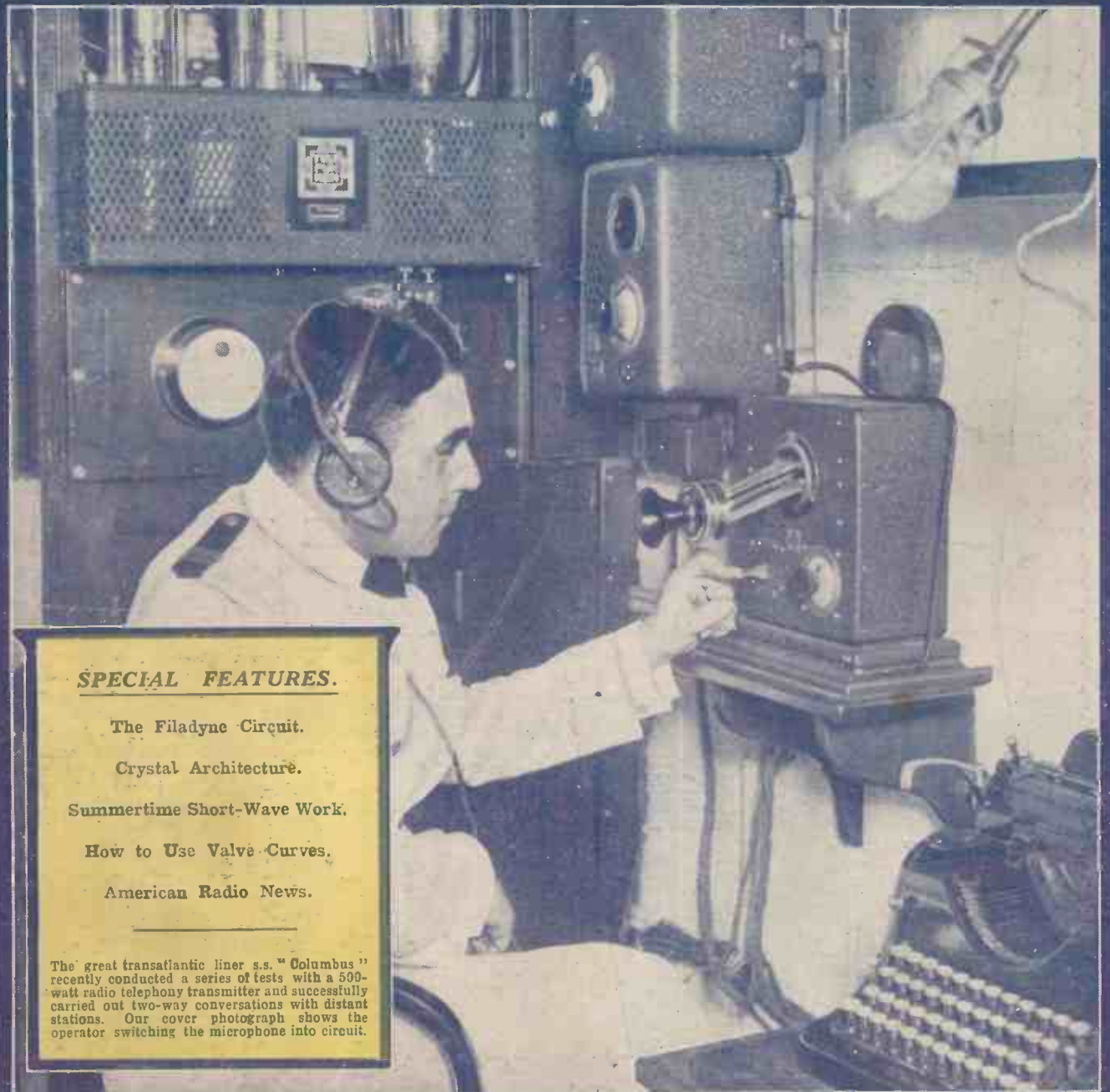
Popular Wireless

Every Thursday
PRICE
3d.

No. 214. Vol. IX.

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

July 10th, 1926.



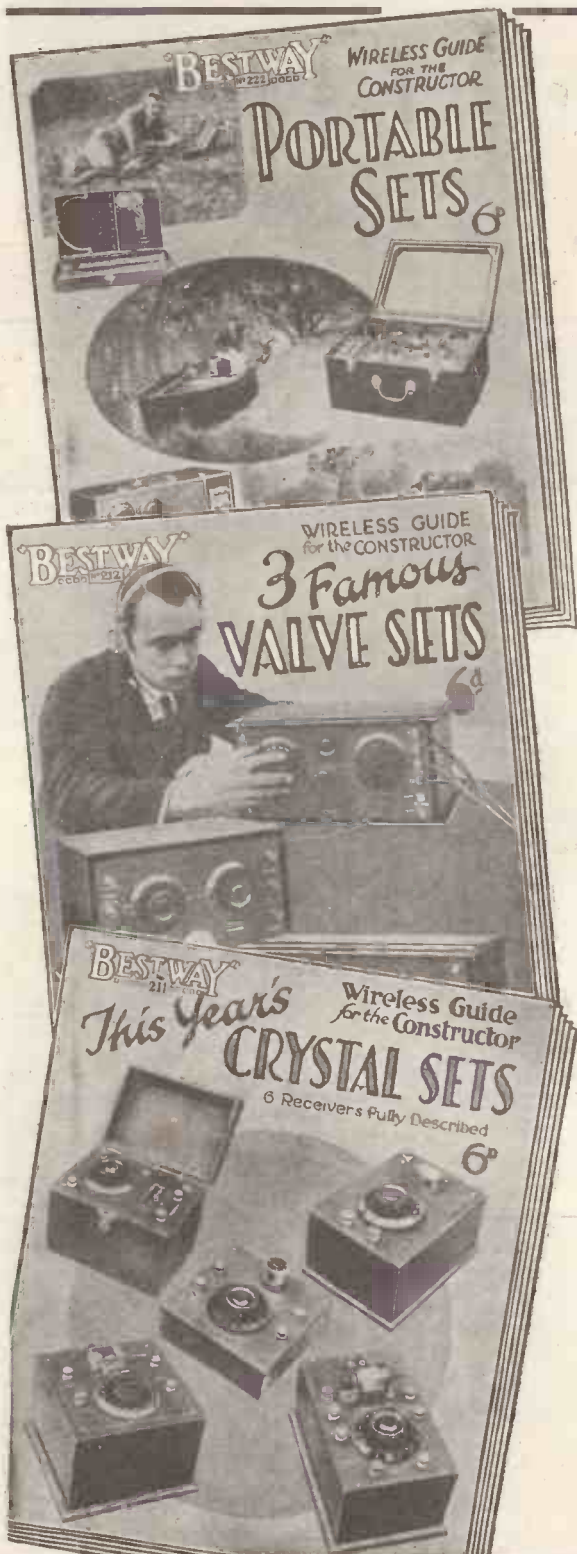
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- How to Use Valve Curves.
- American Radio News.

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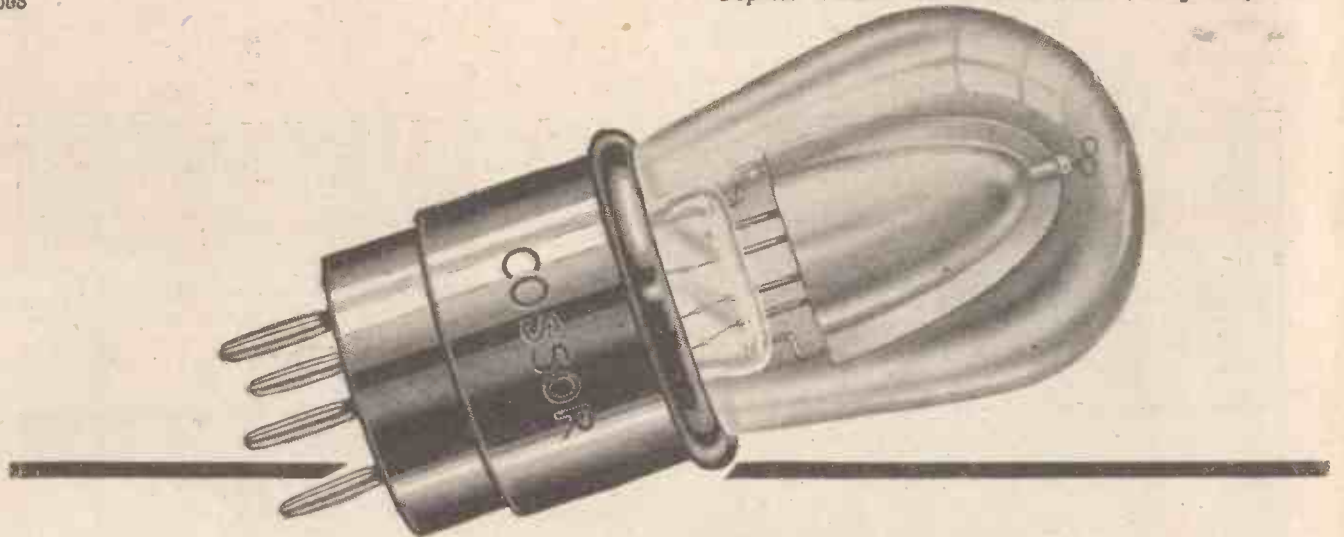


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At last the shockproof Valve

THERE is little need to ask "Which is the most vulnerable part of any valve?" Even a man who had never owned a Wireless Set would be able to guess the answer! Ever since Edison ransacked the world for filament material for his first electric lamp, the glowing thread within its crystal globe has been an object of special regard.

The wireless valve is first cousin to the electric lamp—but year by year the relationship is getting more remote. Whereas in the latter, efficiency is measured by the amount of light it gives, the whole resources of Science have been enlisted to obtain in the valve the maximum of efficiency with the minimum of light.

And now that a new Cossor Valve has been evolved with a special filament which operates at a glow almost indiscernible we appear to be within a reasonable distance of a valve which will never wear out.

But filament glow has been only one of the problems which Cossor has faced—and conquered. Another—almost equally as important—has been the perfection of a system of filament suspension which would successfully withstand the thousand and one shocks which every valve must encounter in use.

The Cossor Point One, now being placed on the market, is the

first valve in which the new system of Co-axial Mounting has been utilised. For the first time there is available a method which enables the three elements—the Filament, the Grid and the Anode—to be securely united together at the top as well as at the bottom.

How this is effected can be readily understood from the illustration above. At the top of the Anode will be seen a seonite insulator which—projecting downward—is firmly secured to the top of the Grid. Through the centre of this seonite tube is threaded a fine wire which acts as the third support to the fila-

ment. Thus it has been found possible to evolve a system of construction which will resist without harm the hardest of shocks. Even if the elements in this Cossor Point One should be displaced through an accidental blow they *must* always be in the same relative positions.

Co-axial Mounting is destined to be one of the most important developments of the year. In this brief announcement it is obviously impossible to enlarge in detail upon its many advantages.

Try out this astonishing new Valve now. Remember its current consumption is barely one-tenth of an ampere. One super-heterodyne fitted with seven of them actually takes less current than a single valve Set using one ordinary valve.

The new COSSOR Point One

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Red Top	Plain Top	Green Top
For H.F. use	For Detector	Power Valve
18 volts	18 volts	18 volts
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—fitted with the new 1 amp. filament

Popular Wireless

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RADIO NOTES AND NEWS.

The Radio Call-Boy—Programme Sleuths—New Zealand Gets Going—Panama Hats Off—
Judge Listens In—More Stations Coming.

The Radio Call-Boy.

WHEN "Yvonne" was broadcast from Daly's Theatre recently, wireless was acting the part of call-boy. Miss Ivy Tresmand, the leading lady, had a receiving set placed in her dressing-room, and whilst off the stage she was able to follow every word of the play, thus timing her own entrances perfectly, and dispensing with the services of a call-boy.

Salzedo to Broadcast Again:

SALZEDO, who is generally considered the greatest living virtuoso on the harp, is to broadcast again from the London station. His recital is timed to commence on Tuesday next (July 13th) at 10 p.m.

B.B.C.'s Wave-length Check.

IN future each of the B.B.C. relay stations will have a ten-minutes' test trip on the air every morning, just before or just after its morning programme. These transmissions will be in Morse (half the time on tonic train, and the other half on C.W.), and the purpose of the tests is wave-length checking. Hayes experimental station has been finding—what most of us know all too well—that it is very difficult to pick out one relay from another at night, when they are all pushing out the 2 L O programme, so these morning tests will enable the stations to be checked up more accurately.

Death of Famous Radio Inventor.

IT is with great regret that I have to chronicle the untimely death of Mr. Alfred Graham, of "Amplion" fame, who died suddenly in a London nursing home, at the early age of forty-five.

Programme Sleuths.

DID you know that the B.B.C. has a sort of secret service of its own? It is composed of members of the outside public, who have from time to time forwarded helpful criticisms of the programmes.

When the B.B.C. discover amongst these correspondents one whose opinions are of real assistance, they appoint him as a sort of spare-time critic. Being entirely unhampered, some of the criticisms from this source are extremely breezy and refreshing!

Results from Rugby.

RECENTLY prominence was given in the Press to some sharp criticisms of the Rugby station. But when the liner "Corinthic" arrived at Southampton

Mrs. S. G. Brown.

READERS interested in the development of the telephone should read the brief history of Mrs. S. G. Brown, which is now appearing in the "Brown Budget." This spirited lady has been in the news twice lately—first for her courageous handling of the general strike situation at the Acton works of the firm, and later for the loss of a very valuable diamond. The latter, which fell from its setting in a ring, is thought to be the only pure green diamond in existence.

Billet-Doux from B.B.C.

THERE'S one thing I will say about the B.B.C.—and thousands of correspondents up and down the country will vouch for it—they do write charming letters. After the general strike had all blown over, and I had almost forgotten doing my bit, they sent me the following little love-letter (which I am going to place with the others, that I keep tied up with blue ribbon, in my ties-and-hankies drawer).

Emergency Broadcasting.

"DEAR SIR," it said, "Please accept our thanks for the help you have given us during the Emergency.

"As you probably realise, the maintenance of the Broadcasting Service was of paramount public importance, and we feel sure that the knowledge that you contributed considerably to this end will be a source of gratification to you.

"Yours faithfully,

"(Signed) J. C. W. REITH,
"Managing Director."



STAGE STARS LISTEN IN.
Evelyn Laye and Sonnie Hale, tuned-in to 2 L O, with an A.J.S. Receiver.

from her New Zealand voyage she reported receiving the news of the general strike quite comfortably, the Rugby signals being picked up direct whilst the vessel was in New Zealand waters.

A passenger who handed in a midnight message near Colon also had no adverse criticisms to make, for to his astonishment he had his reply before he had his next morning's breakfast!

The National Radio Show.

THIS year's Olympia Radio Exhibition is going to be—as well as show—the goods! Opinions gathered from the wireless trade show that everywhere there is great satisfaction at the prospect of a really National Show for Wireless at last.

"To be able, for the first time, to bring together every phase of the trade appears
(Continued on next page.)

NOTES AND NEWS.

(Continued from previous page.)

to me to be a most valuable work," says one prominent manufacturer; and the beauty of it is that with the trade in a healthy state of activity, we purchasers are sure to have a terribly tempting time before we have spent out!

New Zealand Gets Going.

NEW ZEALAND'S broadcasting scheme should be "well away" by the time these lines are in print. The authority responsible is the Radio Broadcasting Co. of New Zealand, and the Auckland and Christchurch stations were due on the air on July 1st.

Panama Hats Off.

THERE was great excitement in Balboa (Panama Canal Zone) the other day. Crowds cheered, people rushed about, guns were fired, and there was a general air of clap-hands-here-comes-Charlie about the old home town.

But it was not another revolution, or anything of that kind—it was simply due to the opening of a broadcasting station there, and the rush was for crystal sets!

10-Metre Aeroplane Sets.

AN interesting attempt is being made to utilise ultra-short waves for aeroplane inter-communication. Tests below 10 metres have been carried out recently in the Croydon area, and a success has been scored from transmitters on the ground to aeroplanes in flight. The next step, plane-to-plane, will be watched with eagerness by aviation experts the world over, for the necessary diminutive transmitters would be just the things for high altitudes.

Returned to Life.

AMERICA'S great radio-evangelist, Mrs. Aimee McPherson, whose "death" was reported a few weeks ago, is still alive. She has been found in a hospital at Douglas, Arizona, whence she fled from Mexican bandits, who had captured her to hold to ransom. She had gone to California for the sea-bathing, and had not been heard of for weeks, until she staggered over the frontier into a friendly house, fifteen miles from the mountains to which the robbers had carried her. Listeners all over America are rejoicing at her escape, for she is one of the greatest microphone personalities of the day.

Judge Listens-In.

A NOVEL wireless test was made in the Birmingham County Court recently by Judge Dobb. To test whether a set could or could not receive Continental stations, the judge had an aerial erected and tried out the instrument.

Only Birmingham and Nottingham were tuned in, and this failure will cost the radio company concerned £21.

Results without H.T.

SOME months ago, in "P.W." No. 193, I cited the case of a Warminster reader who got so peeved with H.T. troubles that he reduced his anode voltage to vanishing point, and eventually got 5 X X, Radio-Paris, and 2 L O without any H.T. at all. (He was using ordinary Loudon valves, not the four-electrode Unidyne

type, which, as everybody knows, easily rope in Continentals without H.T.)

In a recent letter this reader tells me it is no here-to-day-and-gone-to-morrow reception, for he is still doing it, using no H.T. at all and only just sufficient L.T. to light the valves.

"The volume of sound," he says, "is splendid, and very free from outside noises." Lucky man!

"How does your Garden Grow?"

ACCORDING to a recently published Press report, Mr. Wm. Boot, an amateur gardener of West Bridgford, Notts, has discovered a new way of using wireless. He found that his cucumbers and tomatoes were "drawing energy from his aerial," so he began experiments which he claims have increased fertilisation by about 30 per cent. One wireless-nurtured cucumber plant, 16 ft. long, has yielded 35 cucumbers, some of which are 2 ft. long!

Mr. Boot predicts that in a few years stations will be sending out special crottickling wireless waves. But won't it be awful if they tickle up the weeds as well?

More Stations Coming.

THERE are plenty of new stations in the news this week. Several well-known wireless firms are tendering contracts for a high-power Danish broadcasting station, and the Swedish Telegraph

SHORT WAVES.

"An amateur gardener of Notts claims to have increased the yield of his garden by 30 per cent, by means of power drawn from his wireless aerial.

"Come into the garden, Maud!

And watch the spinach grow.

It puts on an inch per day

By the use of radio.

John Henry's plaintive voice

Brings on the cabbage grand!

While for these cucumbers fine

I tap the Orpheus Band.

My celery sticks all blanch

When the wireless "Aunties" sing,

And the scarlet runners—well,

They run like anything!

G. B., in the "Yorkshire Observer."

Board has concluded a contract with Marconi's Wireless Telegraph Co., Ltd., regarding equipment for a Swedish super-station. Both of these transmitters should be picked up easily by British listeners, and all over the world there are indications that the 1927 crop of broadcasting stations will be an exceptionally heavy one.

Dame Clara Butt's Proposal.

"I SHOULD love to broadcast, but cannot because it would be a bad thing financially for me to do so," said Dame Clara Butt, in an interview recently. The famous singer went on to suggest that to enable the B.B.C. to pay high fees to great artistes, the licence fee should be increased to £1.

Personally, I think a better plan would be to make the P.O. disgorge some of the surplus licence-money, which they are now diverting from the programmes to Civil Service channels.

International Radio Exhibition.

AN International Exhibition of Broadcasting is to be held in connection with the Vienna Autumn Fair, which is fixed to take place from September 3rd

to 11th. The broadcasting section will remain open for a week after the main Fair has closed down.

Programmes in Pairs.

LISTENERS in the London area had their first taste of choose-which-you-like programmes on June 28th, when Marconi House and Oxford Street transmitters took the air simultaneously, on equal power and neighbouring wave-length.

Reports on the test are still being sifted and considered, but the general impression is that the first taste was very good! It was certainly a great advantage to be able to switch over on the dials, without having to plug in different coils, transformers and what-nots.

2 L O to Go?

APROPOS of the new high-power scheme for the British stations, one of the London dailies came out with an "authentic outline" of the B.B.C.'s plans, which indicates amongst other things the probable abolition of the Oxford Street 2 L O. According to this account, the Daventry transmitter is to be duplicated, and London is to have two stations of its own, one north of the Thames and one south. Cardiff, Manchester, Newcastle, Glasgow and Aberdeen will possess high-power stations, and the consequent overlapping of transmissions will give every listener the choice of two—or more—different programmes, all the time.

No sooner had this account been published than the B.B.C. denied its authenticity—but they admitted that "certain plans" have been submitted for approval.

Cynthia Calling.

THE Savoy Hill studios were the scene of a miniature tragedy recently, when the first mosquito to face the microphone—as a performer—died at a trial audition. She belonged to Mr. Moore Hogarth, who trained her to hum, so that she could illustrate his lecture on "The Peril of the Mosquito." This hum, and the sound of her steps on the microphone, would have been heard all over Britain, but apparently the excitement of the test was too much for poor "Cynthia," for during the test the buzz ceased. Examination showed that she had turned up her toes, and buzzed off for ever and ever!

London and Daventry Calling.

I RUBBED my eyes over the letter of a London reader the other day, who asked "Why don't the B.B.C. transmit 'London and Daventry Calling'?"

It isn't such a silly question as it sounds, either, for he meant the gramophone record of that title!

Where Jamming Comes From.

SOME instructive figures regarding Post Office wireless, as distinct from the B.B.C. variety, were given in the House of Commons recently, by the Postmaster-General.

He stated that during the year ending March 31st, 1926, the number of wireless telegrams between ships at sea and British coast stations was 223,600. In the same period, the P.O. radio stations had handled 228,000 messages to foreign countries.

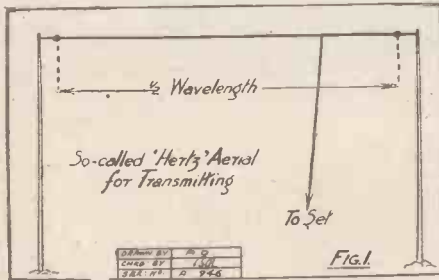
ARIEL.



SUMMERTIME SHORT WAVE WORK

WITH the theoretical approach of summer one hears many forecasts that long-distance work on short waves will become impossible. As a matter of fact, I think this view is quite wrong, bearing in mind what happened last summer. Waves of about 45 metres became popular right at the beginning of last summer, in fact, about this time of year.

A SPECIAL ARTICLE
By
F. L. HOGG.
(The Well-known Amateur.)



Now all through the summer satisfactory two-way work could be done with the States on this wave, but on the approach of winter signals became certainly louder, but very unreliable.

In the summer results were consistent from day to day, but in the winter one never knew whether one was going to hear anything or nothing. Right through the summer signals will probably not be quite so strong as a rule, but most likely reception of W G Y round about 35 metres will be very

satisfactory. In these few notes I propose to describe a quite new method of greatly improving short-wave reception generally, including the reduction of atmospherics. It is due to Greenleaf W. Pickard, the well-known American radio engineer, and is called "horizontal reception."

The Hertz Aerial.

There is no need for the average reader to worry about the theory of the principle. Let it suffice to say for the few who may be interested, that this principle is as follows: Assuming a radio wave, which is of necessity polarised, in some way or other, to be analysed at the receiver into its horizontal-vertical components, then the shorter the wave the greater the horizontal component. This is, of course, subject to many conditions and limitations, but is good enough for present purposes.

So much for theory.

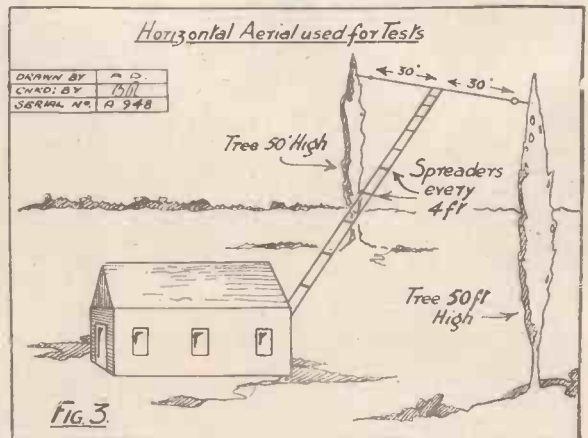
The practice consists of using a special type of aerial.

Normally one makes the aerial as nearly vertical as possible, but to make use of this principle one needs quite a different type of affair. But, fortunately, the "horizontal" aerial can be used just as well for reception on other longer waves such as for broadcasting. Most readers will be familiar with the so-called Hertz aerial, used by many transmitters for 45 metres, Fig. 1. This consists of a horizontal wire half a wave-length long with a single down lead taken from a point approximately a quarter of the length of the wire from one end.

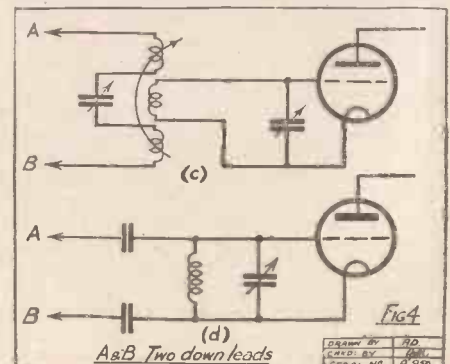
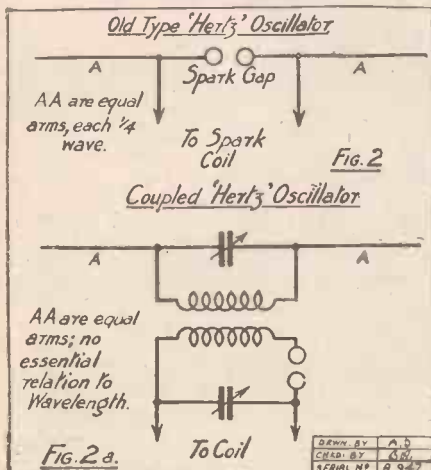
True Oscillator Type.

Thus it consists of a "T" aerial with unequal horizontal portions, which every listener knows is very unsatisfactory for

ordinary reception. In using this transmission, the wave is fixed within very small limits, and no earth is used. Why this type of aerial is called a "Hertz" is quite a mystery, for it bears no resemblance to Hertz's original, Fig. 2 and 2a. As a matter of fact, the system is not even a straight half-wave oscillator, but a "plain freak."



By using a true horizontal Hertz aerial we get all the advantages of the freak Hertz in transmitting, and at the same time a fine aerial for horizontal reception and also a perfectly good long-wave aerial. I can see that the discerning reader will now be saying to himself that a Hertz oscillator type of aerial would be fine, except that the apparatus has to be in the middle of the aerial. Quite
(Continued on next page.)



SUMMER TIME SHORT-WAVE WORK.

(Continued from previous page.)

right, but we get over that by using a radio-frequency transmission line.

This sounds very impressive and high-brow, but simply means that we use a twin wire lead in from the aerial! Then what we have to do to get an aerial of this type is to fit up a T aerial split in the middle of the flat top by an insulator, and bring a down lead from the inside end of each half. This is quite a simple matter, although it does not sound so.

Indoor Aerial Suitable.

The lead-in wire should be carefully spaced every three or four feet by strips of heavy ebonite rod, about $\frac{3}{4}$ in. diameter and 4 in. long. The wires can be slipped through holes in the rods only just large enough, and then wedged. It is very important that the leads should be exactly the same length, as should both halves of the flat top. The leads must also be kept taut so that the two wires cannot foul each other, at the same time they must be as close to one another as possible.

The fitting up of such an aerial is not difficult, in practice details must be left to individuals to settle for themselves. The methods of using the aerial are as follows:

For short-wave transmission and reception a tuned coil is connected between the two leads, and no earth is used.

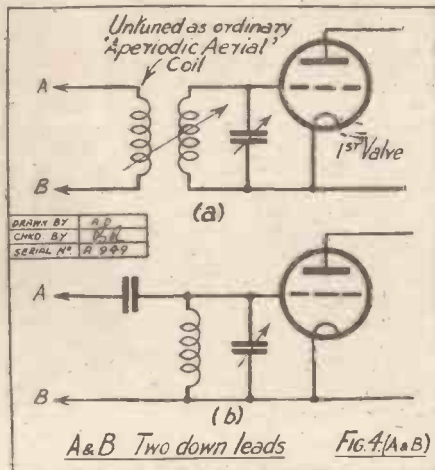
Alternative methods will be mentioned later.

For long waves both down leads are connected together and the set is used as if with an ordinary aerial and earth. Many listeners will be thinking that they would like to try this, but shirk the job of altering the aerial. These can try the effect by putting up a miniature indoor or outdoor aerial of this type as a test. For the benefit of these, I would say that on 45 metres a general experience is that the same signal strength is obtained from a horizontal aerial with 10-foot "arms" as from an average large aerial. Thus there is no need to take the plunge until tests have been made.

The Coupling Coils.

Various points now remain to be dealt with. Firstly, as to the length of the flat tops. These should be as great as possible, considering regulations and space restrictions. No alteration in receivers is necessary, as perfectly normal sets can be used. As to cases where the lead in is normally taken from one end, the Hertz system leads to a T which returns on itself, which is not very good, but two cases are shown which I have tested, and found that very little indeed is lost on the long waves. In cases of this kind, the thing to see to is that the returning leads should drop down as far as possible in a vertical direction first. Finally, as to methods of coupling the receiver, a number of methods are shown, Fig. 4. Coils will be of normal sizes, but should be the subject of experiment as local conditions vary so greatly. The condenser-coupled circuits are generally the best, although there is really not much in it. The condensers for coupling the aerial in these cases should be of the usual neodyne size, they are not at all critical.

As to my own practical results, using an aerial about 50 ft. high and unscreened, with 40-ft. arms, I find a wonderful improvement, Fig. 3. First the aerial was used as a T, and then as a Hertz on the same



signals, from a large number of stations. The result was always an improvement of from 50 per cent to 200 or 300 per cent in strength. Also on a number of occasions when no signals could be heard from any distance on the normal arrangement, quite good signals were obtained by the other



An early type of home-made valve set with which one of our readers is still obtaining good results.

method. I strongly recommend all listeners who are interested in short-wave work to try this for themselves. It is a very new development, and they will have the satisfaction of experimenting with something about which very little is yet known, and so they may help to add very considerably to our present knowledge of the subject.

Correspondence

Letters from readers discussing interesting and technical wireless events or recording unusual experiences are always welcomed, but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—Editor.

BROADCASTING FROM THEATRES.

The Editor, POPULAR WIRELESS.

Dear Sir,—I notice in POPULAR WIRELESS that Mr. Geo. Grossmith states that, following a broadcast of excerpts from plays, many applications for seats are received from distances, and that generally the booking is heavier, the inference being that this is consequent upon the broadcast having taken place.

I would suggest that where seats are booked in this way the individual concerned shall notify the box office of the fact that the primary cause of booking is broadcasting.

This could be done:

- (1) Verbally.
- (2) By a definite statement in a written application.
- (3) By some agreed sign, e.g. a heading, "Broadcasted."

This should rapidly persuade the profession generally of the value of the broadcasting advertisement, and thus expedite the harmonious co-ordination which must eventually exist—greatly to the advantage of the listeners.

The idea of this, of course, is the usual "key" method of advertising, and I make the suggestion for what it is worth.

Yours truly,

"GEE."
32, South Road,
Stourbridge, Worcs.

GAS-PIPE EARTHS.

The Editor,
POPULAR WIRELESS.

Dear Sir,—In a recent issue you warn readers of the inefficiency of the gas-pipe earth, apart from possible danger. This is by no means always correct. I have a very good buried earth, and also use a counterpoise and a "tubular" earth, but for real long-distance work or full volume from the L.S., I invariably make my earth connection to the nearest gas-point. The distance from this point to the gas-main itself must be something like 50 ft., with countless red-lead joints in between. Nevertheless the difference in favour of the gas-pipe earth compared with the most efficient outside earth I have been able to construct is at the very least 25 per cent.

This is a fairly large house, and there is a plug for a gas-stove in practically every room. The aerial lead-in is at a corner of the house, and in my own opinion is that the large mass of more or less insulated piping acts like a glorified counterpoise. At any rate, this arrangement seems to merit the attention of "DX-hounds" as I have had some rather remarkable long-distance results. Common-sense precautions should, of course be taken against static discharges when using such an earth.

(Continued on page 688.)

IN our issue dated the week ending June 26th we referred at some length to the growing problem of the oscillation evil. We suggested very strongly that the B.B.C. should get in touch with Sir Oliver Lodge, and that they should urge their engineers to investigate the "N" circuit which, as our readers know, is Sir Oliver Lodge's latest invention—a receiver which will not oscillate even in the hands of the veriest novice. We said that this was the type of circuit which we knew to be admirably suited to the needs of the ordinary listener in this country.

We suggested that the B.B.C. should investigate this receiver, because we understood that they had been planning a campaign for the reduction of oscillation. We said further that reiterated cries of "Please don't do it!" in connection with howling would never cure the nuisance. We said "Talk will not help; get on with the job."

The above is a succinct summary of our remarks in connection with the oscillation evil, and they seem to have been closely read by many readers of "P.W."—but not so closely that some readers have not quite grasped our meaning. We have before us, as an example, one letter from a reader in Leyton, who says in connection with the Lodge "N" circuit:

"With all respects to 'P.W.'—whose work I always admire—I say 'Get on with the job yourselves.' I have read Sir Oliver Lodge's articles, which to my self-instructed radio mind are very technical, and only bring me to the edge of beyond. Am I to scrap all my apparatus and buy the new set complete (the 'N' set) when it is released? Never! I shall wait until I can copy one. Perhaps the reward which is due to Sir Oliver Lodge for his invention must be ensured. Very well, cannot I pay my royalties like any other honest Britisher? Do not wait for the B.B.C. Grind the axe yourselves, and reap the just reward."

A Reader's Views.

Before dealing with the above extract from a reader's letter, we will quote from one more letter we have received. A reader in Huddersfield says:

"Why should the B.B.C. take up the 'N' circuit at all? It is the listener who is in need of such apparatus, not the B.B.C. If the 'N' circuit is such a fine one, and will give such fine results, and at the same time stopping all the nuisance of oscillation, why does 'P.W.' hang about so long before publishing constructional details of such a wonderful receiver, and living up to its reputation of giving its readers all the best? If the B.B.C. did acquire the rights of the circuit they could not force any reader to instal such a system, of which they had the sole rights, so I cannot see 'P.W.'s' idea of recommending the B.B.C. to take it up. If the whole problem of the delay is a royalty on each set, please impose it at once and cut further delay. There are no doubt thousands of your readers only waiting for further particulars, and they would immediately instal such a set, and 'P.W.' would rid the wireless world of its greatest trouble. It is up to 'P.W.' now."

We are sorry that our remarks have not been understood by some of our readers. First, we would point out that the "N" circuit is not our property; it is the property of its inventor, Sir Oliver Lodge, who, we now understand, has entered into a business arrangement with a certain firm. This firm has acquired the world rights for the manufacture and sale and distribution of the Lodge "N" circuit receivers. We think our readers will appreciate the fact that we have no control whatsoever over

OSCILLATION & THE "N" CIRCUIT. THE QUESTION OF PATENT RIGHTS.

By THE EDITOR.

Amateurs anxious to construct a receiver on the "N" principle should carefully read this article, in which an explanation of the situation regarding Sir Oliver Lodge's new invention is made clear.

the sale of Lodge "N" circuit receivers. Furthermore, we are not permitted to publish constructional details of this receiver. There are, of course, details available in the published patent, but we have not had permission from the inventor, or from his business colleagues, to publish an article in the usual constructional form, giving photographs, diagrams, and detailed instructions for building the set.

But we can assure readers that these details will be given in due course. At the moment it is only right that the inventor should be allowed time to complete his business arrangements for the manufacture and sale of the "N" circuit receiver. It is not as though we have devised this circuit ourselves in our own test room. We have devised many of our own circuits, and have presented the result of our work to our readers free of any charge. We would cite,

readers that the growing evil of oscillation would probably impose upon amateurs in this country a prohibition with regard to the use of reaction on the aerial, unless something drastic was done to reduce oscillation troubles.

A Special Case.

The B.B.C. has a vast organisation and a splendid medium for disseminating advice to listeners. In suggesting that the B.B.C. should investigate the "N" circuit we felt that this was a special circumstance which demanded special measures. If the B.B.C. are really concerned about the growing evil of oscillation, and if they really want to help the listener to adopt some practical plan whereby oscillation can be, if not eliminated, at least considerably reduced, then it is up to them to offer practical advice and not the mere reiteration of a request

A question has already been asked in Parliament by Mr. Harry Day, M.P., with regard to the growing evil of oscillation, and whether or not the P.M.G. will consider the advisability of prohibiting the use of reaction on the aerial.

We have forecast this and have warned

couched in a way with which we are all familiar, and which has become a catch phrase with the words "Please don't do it!" followed by technical advice as to how not to do it.

Technical Advice.

But what is the good of technical advice to a non-technical man, and how can a non-technical man who purchases a complicated set with reaction on the aerial be expected to control his set in such a way

that he will never oscillate? It is asking too much.

The amateur with experience can be relied upon to do his best to control his set, and, to do him justice, he does control it very well—but the average man in the street who knows nothing about wireless buys a set, instals it, and then starts to learn how to operate it; is bound to cause it to oscillate. That man, in all probability, is most anxious not to interfere with his neighbours. He reads about oscillation in the newspapers and the radio journals, and finds that unless he takes certain precautions he is bound to interfere with his neighbours' sets.

He probably receives one of the B.B.C.'s pamphlets. They are admirable for those who can understand them, but the newcomer to wireless does not understand them. He does his best to assimilate the information given, and he does his best to put it into practice. In time he gets to know his set, and acquires a knowledge of the theory and practice of wireless, and in the end



A Photo of a Two-Valve "N" Circuit Receiver.

for instance, the Unidyne circuit, which was invented by Mr. Dowding and Mr. Rogers of this journal, and of which we acquired the rights to publish the full details in connection with the construction of Unidyne sets.

But with the Lodge "N" circuit it is a different matter. We have to take into consideration the contract which Sir Oliver Lodge has entered into with the business firm. We understand that this firm will have some Lodge "N" receivers ready for sale in September, and we have been unofficially informed that there will be no objection to our publishing constructional details of the receiver then.

The B.B.C. Can Help.

With regard to our remarks in connection with the B.B.C., we suggested that the B.B.C. should investigate the "N" circuit receiver because, although the B.B.C. cannot take up this set and sell it to the public, it is within their province to advise listeners and to recommend to listeners methods which will not cause interference.

(Continued on next page.)

A SIMPLE CONDENSER CALIBRATING SET.

BY A CORRESPONDENT.

NO doubt many amateur experimenters have found to their dismay that after having carefully made a condenser the capacity of the instrument is not in accordance with his laborious calculations. Suppose he has made a fixed condenser out of tinfoil, interleaved with mica, and has calculated its capacity by means of a reliable formula, and then does not get the results he expects.

Perhaps the mica is not of the same thickness throughout, or possibly he has clamped the pile too tightly. Perhaps he has hastily constructed an emergency condenser by winding wire on a brass tube covered with some insulating material—a useful tip, by the way, because the capacity can be varied by unwinding the wire. In any case, he needs a simple and quick method of finding out what is the actual capacity of the finished article.

The Calibrating Board.

Refer to the diagram. A and B are two ordinary terminals screwed on a baseboard, and between these is connected a resistance wire, G, three feet long. C is an ordinary buzzer, and D a battery powerful enough to work it. A condenser of known capacity, C_1 , is connected to terminals EE, and the condenser under test, C_2 , to terminals FF. A simple switch, S, is inserted in the buzzer circuit. From the diagram it will be seen that the buzzer and battery, and the two condensers have the resistance wire, G, as a common part of their circuits.

From the middle of the connection between the two condensers a lead is taken to the telephone terminal T_1 . The other telephone terminal is connected to the slider H, which consists of a piece of stout (and clean) copper wire fitted with an ebonite holder.

A Simple Formula.

The resistance wire, G, must be scaled off (on the baseboard) in inches, and the resistance per inch must be known. A suitable wire of known resistance per inch can be purchased easily. For example, No. 26 Chromel A resistance wire has a resistance of 0.201 ohm per inch. If preferred, the scale can be marked off in resistances instead of inches.

Now, to find the capacity of the condenser C_2 , close the buzzer switch S, and move the slider along the wire G until signals of minimum strength are heard in the telephones. Note the point on the scale corresponding to the position of the slider. The capacity of the condenser can then be easily worked out by the following formula:

$$\frac{C_1 R_2}{C_2 R_1}$$

where C_1 = Condenser of known capacity,
 C_2 = Condenser of unknown capacity,
 R_2 = the resistance of the wire G

between B and the slider (= inches \times 0.201, in the case of the particular wire mentioned),

R_1 = the resistance of the wire G, between A and the slider.

The formula can be resolved into

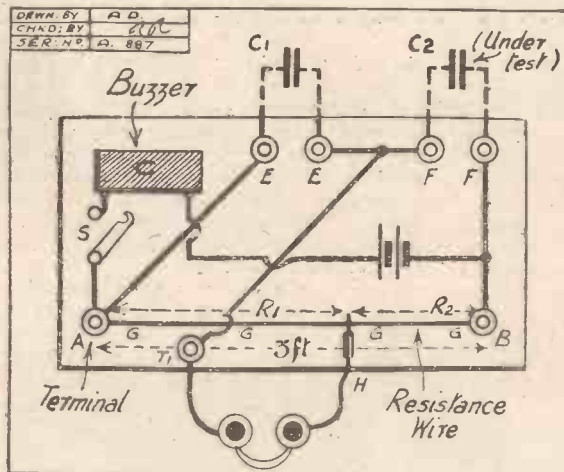
$$C_2 = \frac{C_1 \times R_1}{R_2}$$

It is advisable to procure a fixed condenser of accurately known capacity, for

C_1 . Either fixed or variable condensers can be calibrated by this method, and in the case of variable condensers readers may like to test their capacity at various settings.

Plotting Condenser Curves.

Interesting curves may be drawn by plotting condenser scale points against the capacity at those points as ascertained by this method, and the method is specially useful for finding the minimum capacity of a variable condenser, thus giving the range of capacities it covers. Such a measuring instrument is well worth building, and will prove a valuable addition to any amateur's bench.



OSCILLATION AND THE "N" CIRCUIT.

(Continued from previous page.)

learns to control his set properly; but in the meantime he is causing interference, and the only remedy offered, for all practical purposes, is—"Please don't do it!"

A Difficult Task.

It is no good, and that is why we advised the B.B.C. to get on with the job and to think of something more practical. It is difficult; we appreciate that as much as anybody, and we offered the B.B.C., in all friendliness, the suggestion that they should investigate the Lodge "N" circuit.

For all we know it might be worth their while to get in touch with Sir Oliver Lodge and his business colleagues to see if some arrangement cannot be arrived at for the construction of sets on the "N" circuit lines—to be made available for public use at once. Although September is not very far off, every week means a lot in the delay, and in the increase in the danger that the P.M.G. will take drastic steps, and that amateurs will find themselves hindered by the passing of a law which will prohibit the use of reaction on the aerial.

The Patent Situation.

We have done our best in this matter, but we cannot do more at the moment. One of the correspondents we have quoted above said: "It is up to 'P.W.' now." We beg to differ; it is up to the B.B.C. We can think of no one else who can take the next practical step in providing an efficacious remedy for oscillation.

The first correspondent we quoted from says: "Am I to scrap all my apparatus

and buy the new set complete, when it is released? Never!"

No doubt many thousands of readers will echo his remarks, but we do not think this will be necessary. As we have already said, we have been told unofficially that we shall be given permission to publish constructional details of the "N" circuit receiver in due course; in all probability in September, at the opening of the wireless season. Until then we cannot publish these details, otherwise we should be infringing the law of copyright and the patent law.

A Possibility.

As our readers know, the law will not permit a wireless journal to publish details in certain ways about an invention patented, and to publish a constructional article, giving working details of the set, would undoubtedly constitute an incitement to infringe.

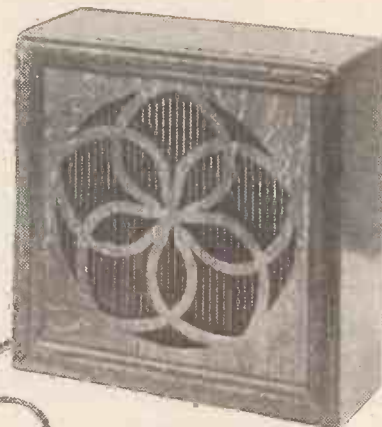
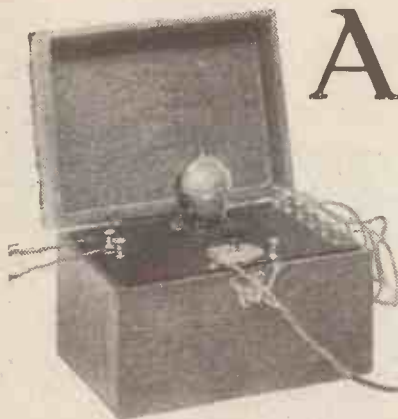
We wish to make ourselves quite clear on this point, and to let our readers know that we sympathise with their eagerness to obtain the full details of the "N" circuit, but our hands are tied at the moment, and until September we regret to say we cannot publish constructional details of the Lodge "N" circuit receiver.

The only possibility we can see for this set to be brought at once to the notice of the public is for the B.B.C. to investigate the matter, and to help on and popularise the circuit, which in itself constitutes the best remedy we have come across for the oscillation evil.

PHOTOGRAPHS.

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 copy.

A "P.W." Power AMPLIFIER



EVERY loud-speaker enthusiast must at some time or another require a volume of sound in excess of that required for an ordinary medium-sized living-room. Especially must this be the case in the summer, when the loud speaker does service out of doors, for an ample signal strength in confined spaces becomes but "weak signals" in the garden—that is, of course, comparatively speaking.

Now, there is only one form of L.F. coupling that will safely follow two stages of transformer coupling, or that can be tacked on to one stage of transformer coupling and with little or no trouble give good results, and that is resistance-capacity. But an amplifier designed on these principles is a "power" amplifier in the true sense of the word, and is of little use for magnifying the output of a crystal set or even a valve detector set. It should follow at least one stage of ordinary L.F. amplification and, of course, it matters little whether the

The Amplifier Designed, Described
and Constructed by the "P.W."
Technical Staff.

LIST OF COMPONENTS.	
1 Panel, 6 in. by 8 in. by 1/4 in. (to fit Cabinet as illustrated)	s. d. 5 6
1 Lissen 80,000-ohm Anode Resistance	10 0
1 Precision Rheostat	3 0
1 .25 meg. Grid Leak (with holder)	3 0
1 T.C.C. fixed Condenser (.01)	2 4
1 Harlie "Pot Holder" Valve Holder	

previous stage is transformer coupled or choke or resistance.

The one-valve amplifier described in this article should, therefore, be used only for making loud-speaker signals louder, or for bringing up "all-but" loud-speaker signals to full strength. Providing it is used in the manner indicated it will give every satisfaction.

No Complications.

A one-valve amplifier of any type is very easy to build, and that one under consideration is the easiest of the lot. It is as plain and straightforward as can be. There are no "variable factors" such as reaction connections, transformer connections, etc., at all, and providing good components are used, it is merely a matter of making this, that and the other connection correctly, clearly and efficiently and the instrument cannot fail to work.

The theoretical circuit employed is given on this page, and this almost makes it unnecessary to provide a wiring diagram, point-

to-point check list, and back of panel photographs. But with the addition of these latter it should be impossible for the constructor to go wrong.

Pure Reproduction.

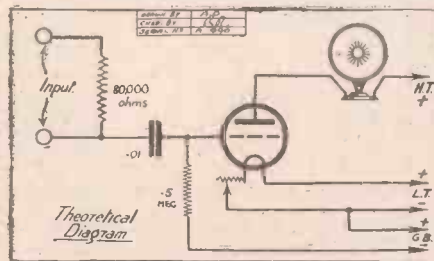
In principle, it will be seen by the theoretical circuit, resistance-capacity coupling bears many points of similarity to choke-capacity coupling and even to tuned-anode H.F. coupling. It scores over transformer coupling in that although it does not provide as great an amplification it magnifies varying frequencies with greater evenness. High and low notes are all amplified to a similar intensity to the medium notes and very pure reproduction results.

The instrument, besides being simple, is fairly inexpensive. It could be made cheaper by employing a carbon type of resistance, but we advocate the wire-wound type as it is more likely to prove consistent in operation. A good wire-wound resistance such as the Lissen will give unvarying service for an indefinite period, and will not develop noises or alter in value with variations in atmospheric conditions. Not that all carbon types do, but, generally speaking, the majority are not to be trusted in this respect.

Of course, it is not essential that the Harlie "Pot Holder" type of valve holder be used, but this device lends a neat appear-



The complete amplifier neatly fitted into a case with a lid.



ance to the panel and tends to protect the valve. It is not a difficult matter to cut a circle out of the panel to take this component.

The Valve Holder.

The task can be accomplished by using an expanding bit in a brace, or by drilling a circle of small holes and bringing a fine hacksaw or fretsaw into service. As previously indicated, if the constructor cannot tackle this job, or has neither the time nor inclination to do so, any ordinary

(Continued on next page.)

A "P.W." POWER AMPLIFIER.

(Continued from previous page.)

valve holder or four valve sockets of the usual pattern can be mounted in a similar position on the panel.

The terminal holes should be drilled in the positions marked on the panel drilling diagram. In this connection, as well as in the whole task of construction, the amateur is referred to the feature, "For the Constructor," which appears weekly in our "Radiatorial" columns for some useful detailed hints.

An Easy Mounting System.

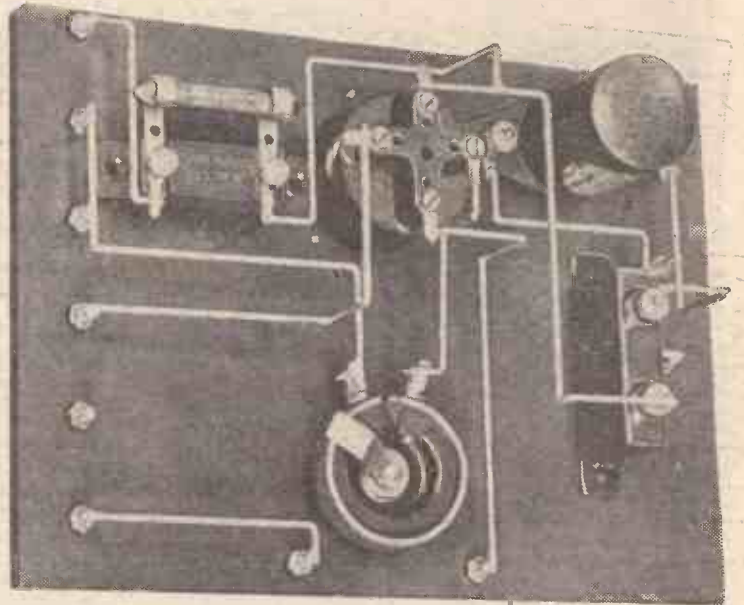
The filament resistance, valve holder and terminals can be mounted, and then attention can be paid to the under-panel components. These, consisting of the resistance, condenser and grid leak (with clips), can be secured by means of screws tapped into the panel, but there is an alternative method which will appeal to the less mechanical constructor, although it must be admitted it is one that would not be adopted by an engineer! It consists of using Chatterton's Compound, which is an easily procurable substance somewhat similar to sealing-wax, but with much greater adhesive properties. We use a great deal of it and find it very satisfactory indeed for such purposes. It should, however, only be used for mounting small and light components.

The H.T. Minus Terminal.

In the case in point, as square section copper wire is to be employed for the wiring, there is little that can be said against the method, as the connections to the components will in themselves provide a modicum of anchorage.

The wiring of this amplifier is quite straightforward, and needs but little com-

This photograph clearly shows the lay-out of components on the back of the panel and the wiring. The grid leak, it should be noted, is fixed on clips provided with a base, which looks rather like a fixed condenser. Only one fixed condenser figures in the circuit, and this can be clearly seen on the extreme right just below the Lissen resistance.



ment. It will be noted that an H.T. minus terminal is provided and that no internal connections are made to it. Now when this amplifier is connected to a valve set of the usual type, no H.T. minus connection will be necessary, for H.T. minus will be joined to L.T. in the set. But circumstances may arise when an H.T. minus connection is required on the amplifier; for example, a separate H.T. battery might be used for the amplifier. In this case it could be connected up to the H.T. plus and minus terminals and the circuit completed by joining the H.T. minus to L.T. minus externally.

Final Constructional Details

Having completed the wiring and cleaned off all traces of surplus flux and all traces of dust, the panel transfers can be affixed.

The panel can be fitted into any type of case. One with a lid is recommended, as

such makes the amplifier a very neat dust-protected instrument which can be stored away safely during periods when its services are not required.

It can be connected to any valve set by joining the input terminals to 'phones (or loud speaker) terminals of the receiver. Two leads can be taken from the L.T. terminals to the L.T. battery in use, and another lead from the H.T. plus to the existing H.T. battery. But it must be taken to a high point on this, as anything up to 100 volts or more H.T. will be required. If insufficient H.T. is available another H.T. battery can be connected in series with the existing H.T. battery. Supposing a 60-volt H.T. battery is in use on the set to which the amplifier is connected. This will not be enough for the purpose, but without disturbing the battery's negative a 72 or so volt H.T. battery can be connected by its minus (negative) end to the plus of the 60-volter. The plus H.T. lead from the receiver and amplifier can then be plugged in on suitable points of the new battery.

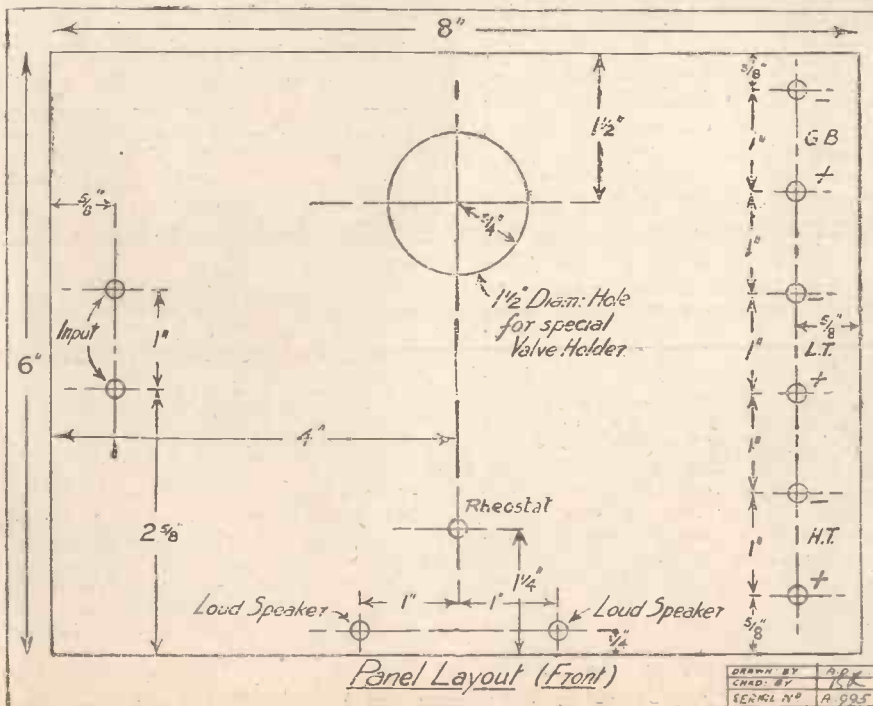
The Valve to Use

There are numerous valves available, designed specially for resistance amplification, and no difficulty will be met with in securing one suitable for use with the existing L.T. supply. Among the '06's is the Osram D.E.3B., then for use with 2-volt accumulators there is the Cossor W.2, while Mullard's range includes the D.F.A. 4, a 6-volter of merit which takes the low current of .2 amps.

But it must not be forgotten that the last valve of any loud-speaker receiving system must be of the power type. Therefore, as this "Power" amplifier will naturally be the last stage, it is necessary to use with it a valve of this type. A valve of the resistance-capacity type referred to above should precede this amplifier—that is, it should take the place of your present last valve. This latter should be inserted in the amplifier sockets so that it still remains in the last stage. Grid bias and H.T. throughout the L.T. portions of the system must be readjusted to suit the new conditions.

Grid bias is a very important feature of an amplifier of this type, and to the terminal

(Continued on next page.)



A "P.W." POWER AMPLIFIER.

(Continued from previous page.)

marked "G.B." must be connected a small dry battery of 7½ to 9 volts, provided with socket tappings similarly to an H.T. battery. Special grid bias batteries are made and are sold by all wireless stores. The amount of grid bias necessary will vary with the valve and amount of H.T. used. Failing the provision of grid bias, distortion will almost inevitably be present. The grid bias should be varied while the amplifier is in operation until purest reproduction is obtained.

POINT-TO-POINT CONNECTIONS.

One input terminal to one side of the anode resistance and to one side of the fixed condenser. Other input terminal to other side of resistance. Other side of condenser to grid socket of valve holder and to one side of grid leak, other side of which goes to grid bias negative.

Grid bias positive to L.T. negative, which also goes to one side of the rheostat, other side of which goes to one filament socket of the valve holder.

The other filament socket goes direct to L.T. positive.

Plate socket of valve holder to one loud-speaker terminal, other loud-speaker terminal to H.T. positive. There is no internal connection to H.T. negative.

OBSERVATION PERIODS.

From a Correspondent.

REACTION adjustment lag is useful within limits. It enables very close control to be obtained and is handy for DX work. When there seems to be no intermediate condition between no reaction at all and fierce oscillation, and the receiver breaks into the latter and out of it again with a pronounced click, it is impossible to obtain that sensitivity possible when a certain amount of lag is present. But too much lag is aggravating. Over a movement of perhaps one inch of vernier reaction adjustment, signal strength builds up and up until suddenly there is a collapse into oscillation. The reaction adjustment must then be back-pedalled some two inches before a calm ether results. Besides causing interference with other listeners, the presence of a lag of this sort is proof that the receiver is inefficient.

Reaction Lag.

By means of varying the H.T. and L.T. and size of reaction coil an ideal lag can be obtained. Generally speaking, the larger the reaction and the higher the H.T. voltage the less lag will be present. A compromise between the economical measures of reducing these two values is well worth making at all times. DX reception results depend a great deal upon this, and it must be remembered that fierce reaction does not necessarily mean a high degree of sensitivity.

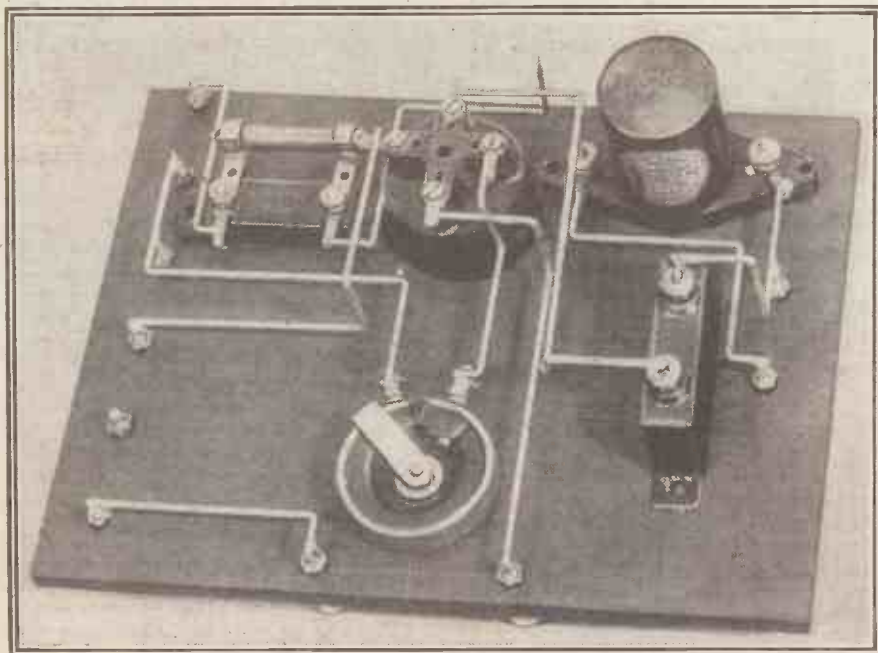
Naturally, endeavours should never be made to work on the edge of reaction, and if a certain movement, say 5 degrees, covers the sensitive building up period, then, as a matter of course, only 3 or so degrees should be employed.

"Building Up" Processes.

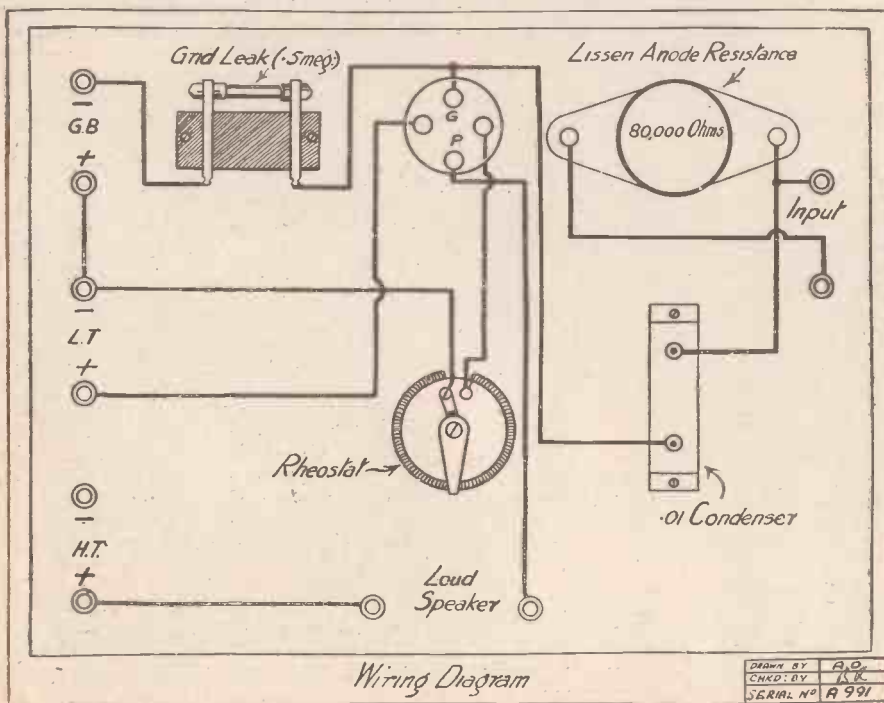
Filament lag is sometimes very misleading, especially with certain types of dull emitters. It frequently leads amateurs into the error of overrunning valve filaments. When filament rheostats are adjusted an appreciable pause should be allowed at intervals, so that the filament can have time to respond to the different current flow. They should not be continuously turned until the apparently correct points are reached. When considerable filament lag is evinced, filament rheostats should be very slowly turned back from the apparent best settings, and invariably it will be found that less current is really needed than at first was indicated.

The adjustments of grid bias batteries should always be followed by short but definite periods of observation. There appears to be a general idea that every electrical action is simultaneous and that no sooner is a contact made in a circuit than that circuit responds to new conditions. This is by no means the case. Many are the building up and slowing down processes that occupy matters of even seconds in a wireless set.

Therefore, time should be allowed for careful aural observations after every new adjustment, and the various knobs and dials and plugs should not be twiddled about continuously until what are considered to be the best results are obtained.



Another under-panel view, showing the wiring and disposition of components.



DRAWN BY A.C.
 CHKD. BY R.R.
 SERIAL NO. A 991

BROADCAST NOTES.

By O. H. M.

Appointment of Commissioners—The Welsh Festival—I.O.'s Dance Band—Intensive Criticism—Offers from America—Broadcasting and the Press in Australia.

THERE is as yet no indication of the broadcasting position becoming dull or commonplace. Its intricacies take a good deal of following. Before the General Strike, the Government had decided to implement the Report of the Broadcasting Committee by the middle of July, in order that the "Shadow Cabinet" might get to work at once. The dislocation to parliamentary business caused by the prolonged coal stoppage resulted in the shelving of the measure, and ten days ago nothing was to be done until November or December.

The reaction to this was a revival of intrigue, to which I have called attention on this page. The most important moves were made by the entertainment industry on the music-hall side, and by a group of the wireless trade. The object of the former was to cripple broadcasting under its new constitution: the object of the latter was to retain control over the broadcasting machine. And now the latest development promises to make both moves and others like them still-born. For I gather from a friend in the Post Office that most of the commissioners, including the chairman, have just been appointed.

Appointment of Commissioners.

My informant tells me that the Government has secured the acquiescence of the Party leaders to this unusual course, in order to head off the various intrigues in progress. I have been unable to discover the names of those appointed to the commission; but, so far as the chairman is concerned, I have eliminated any of the present board of the B.B.C., or any other representative of the wireless trade, or of any special interest for that matter.

The Government are emphatically against the representation on the Commission of any special interests. It would appear, therefore, that the search for the super-men recommended in the Report has progressed rather better than most people expected. This process has perhaps not been impeded by the generous emoluments that are attached to the new posts. The new commissioners will shortly commence to advise the B.B.C. I hope they will include the Post Office in this advice, particularly on finance.

There is a good deal of feeling aroused by the decision of the Eisteddfod authorities to turn down the offer of the B.B.C. for the broadcasting of excerpts of the great Welsh festival from Swansea this year. I gather that the offer was quite generous, but the organisers of the festival were afraid that they would not get a big enough attendance if parts of the show were broadcast.

Meanwhile, the organisers of the Eisteddfod for 1927 and for 1928 in other parts of Wales have already applied anxiously to get their shows broadcast. Well-informed opinion in Wales is agreed that the Swansea rejection is a great mistake, and that Wales

really cannot afford to disregard broadcasting, particularly in connection with its world-renowned festival.

Many listeners will be glad to hear that the London Radio Dance Band, the great improvement of which has been a pleasing feature of recent broadcasting, is to be retained and strengthened. There was quite a chance that the B.B.C. would decide on financial grounds to dispense with this band, but arrangements have been made to overcome the difficulties in the way of its retention. Incidentally, I heard that the band will shortly be available for outside engagements.

The organisation of the broadcasts of serial stories by eminent authors, a pro-

COMING SHORTLY

Listeners who wish to take a set away with them on a holiday or picnic or to listen to broadcasting in the garden should not miss the full constructional details of

The "P.W." DAVENTRY PORTABLE RECEIVER

to be published in a forthcoming issue of "Popular Wireless." This interesting receiver is completely self-contained, including aerial, loud-speaker, and batteries, and using only four valves is capable of efficient reception anywhere in the country.

Place a **REGULAR ORDER** for "P.W." NOW.

mised feature of the summer season, is proving a good deal more difficult than was anticipated. Most suitable writers are much too shy to appear before the microphone, and they are all a little anxious about the effect of broadcasting on their work. It is good news, however, that there is a chance that Mr. A. E. W. Mason will make a special version of "At the Villa Rose" for serial broadcasting in the week beginning July 25th.

An interesting future event in process of evolution is a special song-recital by Mr. Frederick Ranalow of "Beggars Opera" fame.

Military tattoos seem to become more and more popular with listeners. The excerpts from the recent show at Aldershot attracted much favourable comment. And now plans are in hand to lift parts of the Royal Marine Tattoo from Deal from August 3rd to 7th.

Destructive Criticism.

I have already given an account on this page of the B.B.C. system of intensive criticism. There is a corps of writers and critically disposed persons who devote part

of their time to listening and commenting thereon. Major Corbett Smith, Capt. C. A. Lewis and Mr. Walter C. Smith, three former employees of the B.B.C., are the most active of this corps of critics. I was particularly interested during a recent visit to Savoy Hill to see a summary of one week's criticism from these three.

I was surprised to note how readily even the ex-employee falls into the habit of destructive criticism. To put it mildly, the tone of the criticism was acid and unpromising. If one were to form an opinion of the broadcast programme entirely on the basis of the critiques I saw summarised, one would certainly believe that the B.B.C. was about the most unenterprising, dull and block-headed show on the face of the earth.

American Offers.

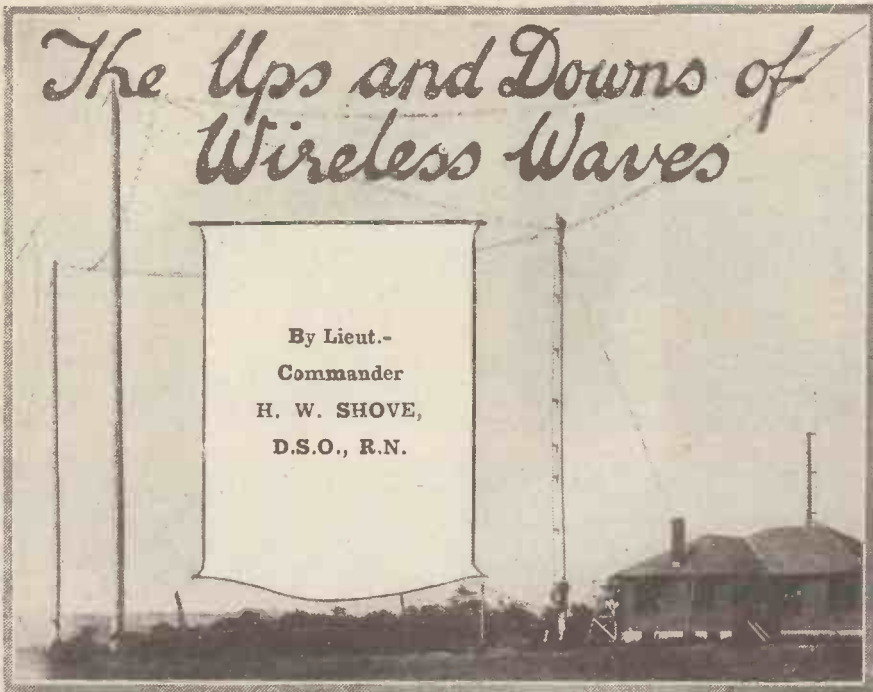
Nevertheless, even allowing for the shortcomings of these critiques, it is a remarkably healthy sign that an organisation such as the B.C.C. deliberately encourages candid criticism, and gives careful consideration to the most violent denunciation. I profoundly hope that this service of candid criticism will not be discontinued under the new regime.

The offers from America to British broadcasters to which I referred some weeks ago were declined. But they have been revived in a much more attractive form. Apparently the American interests concerned regard the first turn-down as simply a matter of business tactics, and they are now returning to the charge with more determination and money than ever.

I saw one of the American representatives the other day, and he told me in confidence the names of three members of the B.B.C. staff that he already regarded as virtually on the other side of the Atlantic for a period of at least ten years. I was amazed at the financial rewards that they were prepared to offer. They had graded their three "objectives" so that the best man was to get twice as much as the third, even then the latter was to get more than double the present salary of the managing-director of the B.B.C., and that free of all tax charges, with generous expenses thrown in, and a complete ten years' guarantee with yearly increases of 10 per cent. My American informant was so confident that he offered me ten to one up to any amount that he would succeed in his mission. I took him in sovereigns, much to his disgust at my alleged meanness.

The Australian Method.

A newspaper man just over from Australia told me the other day how surprised he was to find that the Press over here had not yet secured broadcasting as an ally to circulation. He could not understand the attitude that broadcasting could be inimical to the success of newspapers. He told me that in Sydney, for instance, the newspapers organise the broadcasting of running accounts of all the big sporting events, solely with a view to increasing the sales of the editions of their journals that follow the broadcasts. This view is so definitely opposed in England that one wonders if there is some psychological difference in the attitude of the Australians to their newspapers. I should doubt it, and my own opinion is that the British Press as a whole will ultimately come round to the Australian view.



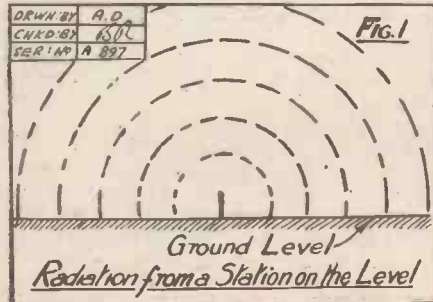
fronts passing overhead. And (as witness the mine experiments already referred to) it is not unlikely that there will be a small proportion coming upward out of the ground owing to the re-emergence of waves which have passed through the hill. It would be interesting and instructive to experiment in such an area with different types and directions of aerial, but the present writer has never been in a position to do so.

Relative Height Effects.

At R_4 we have a station clear of the "shadow" and the waves have here assumed what may be considered as their normal method of propagation, practically at right-angles to the local surface. Except for the losses by absorption in the hill P_2 , the conditions are now similar to those at a corresponding distance from a station of equal radiating power situated on the same level (as in Fig. 1). We thus pass out of the area of purely local conditions.

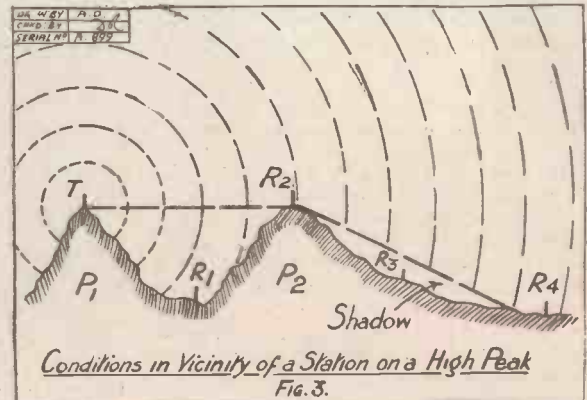
So far, we have considered transmission from a station on an isolated peak, with sides sloping rapidly away from the transmitter. But if, instead of this, the station is surrounded by a level plateau (however elevated), the local conditions will approximate to those of Fig. 1, and the power radiated into the atmosphere will not exceed that of the hemispherical "shell" there shown.

ACCORDING to generally accepted theory, the waves radiated from a transmitting station situated on level ground comprise a roughly hemispherical shell (Fig. 1). The other half of the sphere being cut off by the earth. If radiated from an aeroplane at a sufficient height,



transmitting station situated on the summit of a high, steep peak. This will evidently partake of the nature of a compromise between Fig. 1 and Fig. 2, the waves coming down the sides of the peak more or less at right-angles to the mean slope. A receiving aerial at R will, therefore, be best directed with a slight tilt upward towards the transmitting station.

This situation can, of course, only arise in the case of strictly local reception, when the transmitter is above the horizon of the receiver and the curvature of the earth has no appreciable effect. But, under such circumstances, the absolute maximum of results should be obtained with an aerial whose free end is directed away from the transmitting station and is slightly lower than the lead-in end. If the free end has to point towards the transmitter it should be a little higher than the lead-in end.



however (Fig. 2), there is a truly spherical "shell" of radiation. It is rather doubtful how far we are justified in regarding the waves which pass into the earth as really "cut off," for experiments in reception at the bottom of mines, etc., have shown that they do, in fact, penetrate to quite an appreciable depth. But this point may be left in abeyance for the moment, while we consider a few aspects of the behaviour of the waves actually radiated through the atmosphere.

Consider the left-hand part of Fig. 3, which represents the radiation from a

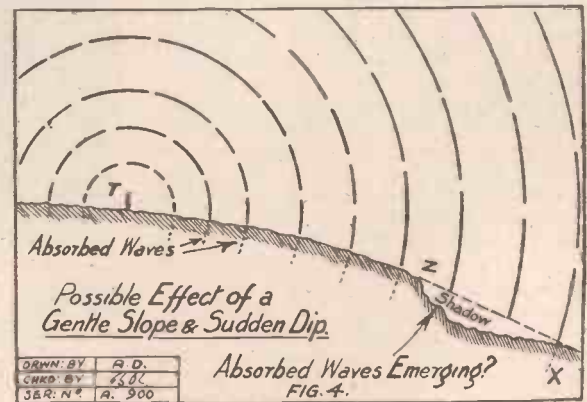


Absorption.

If the valley is bounded by another peak (P_2) the waves striking the face of this will be partly absorbed and partly deflected upward over its summit. So that at R_2 there should be a very favourable position for reception, since an aerial there will receive energy (a) directly, along the path TR_2 , and (b) in a certain degree from deflected waves, travelling up the slope. On the far side of P_2 , however, there will be an area of "shadow," within which reception is likely to be very poor. No direct waves reach an aerial at R_3 .

But there will be a certain amount of energy coming down from above through the "diffraction" (or spreading) of the wave

Once clear of the local conditions, these waves (like those already considered) will more or less follow the line of the ground, if it be free from sudden inequalities and an actual difference of height above sea-level



between the transmitter and receiver should not appreciably affect the reception of the waves radiated into the atmosphere in the first place.

(Continued on next page.)



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

SOME little time ago I mentioned in these Notes a new *dry* rectifier, for the purpose of converting alternating to direct current, and this seemed to arouse quite a deal of interest, judging from the letters I received from readers. Most correspondents wanted, naturally, to know how the thing worked, and how it could be made up experimentally. At the time I was not able to tell them, for the simple reason that I did not know myself, and even now I am not in possession of very much real information, but such as it is I hasten to pass it on.

It might at first be said, with some reason, that an ordinary crystal rectifier was a *dry* rectifier, and that therefore this was nothing new. This is true, but a crystal rectifier has such a high resistance that it is only possible to pass through it, at the applied voltages at which it operates efficiently, an extremely small current—far too small for practical uses such as battery-charging. Again, if a large number of such rectifiers be used in parallel, quite apart from the very large number that would be required, they fail, for some curious reason, to operate properly: this, by the way, is a phenomenon which is familiar with most types of rectifier, even electrolytic, when used in parallel from the same winding of the transformer.

Efficient Rectifier.

The *dry* rectifier is the invention of Samuel Ruben, a well-known American radio engineer, and it has proved so convenient and successful that it has now been incorporated into a commercial trickle-charger, which is on the market. Each rectifying element consists of a disc of magnesium and another of a compound the exact nature of which is kept a secret, but which is known to contain crystals of a copper compound. It thus appears, in a general way, that the action is allied to that of the crystal rectification of signals, but that a low-resistance combination has been found.

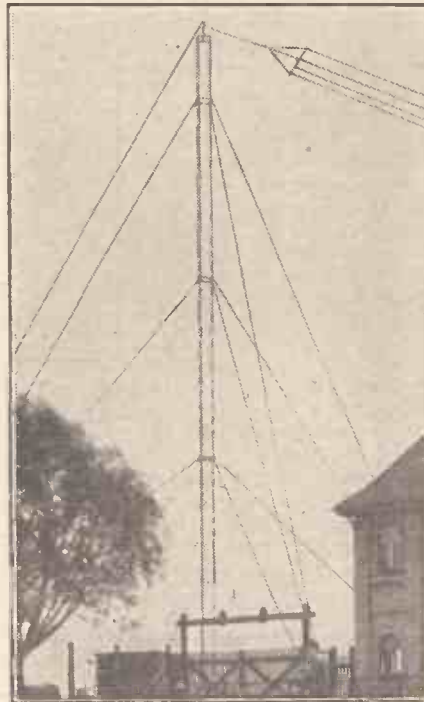
The new rectifier has a maximum safe voltage of about 15 volts and consequently a single combination cannot be used for charging a 6-volt battery. The reason for this is because the applied voltage to the battery during charging must be in the region of 8 to 10 volts, and when the reverse of the voltage occurs, the battery voltage is added to the transformer voltage. It is easily possible, however, by means of a special transformer, to run two or more of these rectifiers in series, when the trouble

referred to above disappears. Full-wave rectification can be obtained by means of opposed rectifiers in bridge formation in a well-known manner.

It is stated that, provided the maximum safe voltage be not exceeded, the life of the elements of this new rectifier is very long indeed—practically infinite. If, however, anything should go wrong with the elements, they can readily be removed from the device and replaced.

"Air" Condensers.

In this country and, indeed, in most parts of the world, it is common to use mica



One of the aerial masts at the new broadcasting station at Königsberg.

or such-like condensers for the fixed variety, principally owing to their greater compactness and comparative cheapness. Some of these small fixed mica condensers have been brought to a great pitch of perfection, and serve their purpose well, but at the same time, there must be a certain amount of loss attributable to the fixed condenser and in these days of "low-loss" components it is not surprising that fixed *air* condensers should eventually gain in popularity. I notice in the U.S. papers advertisements of

a new fixed *air* condenser, for which great claims are made with respect more particularly to its "low-loss" properties. This is built on precisely the same lines as an ordinary variable *air* condenser, except that the "rotor" is fixed, and, of course, there is no knob or spindle. It is made in the usual capacities and has breakdown voltages as high as 2,000 or 3,000 volts. Of course, such condensers are already used in transmitting apparatus, but adapting them for receiving sets is something of a novelty. Although costing a little more than a fixed condenser and taking up considerably more space, an *air*-condenser certainly should represent a marked improvement in performance. It is easy to try the effect of ordinary variable *air* condensers of the appropriate capacities in place of the usual fixed condensers.

Valve Leakage.

My remarks on the leakage across the bases of valves have brought me several letters, one very interesting from a reader who has taken the trouble to measure the leakage in certain valves in his possession by means of a milliammeter. He investigated the leakage current at various applied voltages (up to 100 volts) between filament and plate, filament and grid, and grid and plate—the filament being, of course, cold in all cases. He sends me a table of his

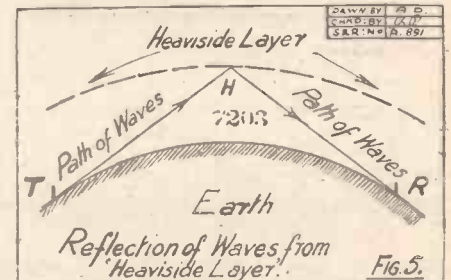
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THE UPS AND DOWNS OF WIRELESS WAVES.

(Continued from previous page.)

But what becomes of the waves radiated into the ground (absorbed)? These will be comparatively weak, but they will be there, as the possibility of subterranean reception shows. Do they ever "come up," by a species of diffraction, similar to that known to exist from above in "shadowed" areas?

There seems to be no collected data on this point, which is illustrated in Fig. 4. If there is any such effect we might find



that reception at X, clear of the local shadow of the sudden dip Y, was better than at Z, on the edge of the dip, though the actual distance from the transmitter is greater. Amongst the many vagaries of wireless reception, this point might well be studied.

It must be understood that we have only considered above the *direct* radiation of waves following the earth's surface. In the case of very distant transmissions the received waves are probably not so propagated, being reflected from the "Heaviside layer," as shown in Fig. 5. Such waves, following the path THR, will be largely independent of intervening conditions.

ONCE upon a time I drew a diagram in great haste to illustrate something or other, and omitted to include 'phones. "That won't work," declared one of my friends with bland finality. This was in the early days of radio telephony, some ten years ago, and, although some of our "hook-ups" were temperamental to the extreme, the particular circuit in question was a straight Det., 3 L.F., all transformer coupled. Therefore I was rash enough to rush into a wager, and then I saw my mistake! But I strung together a number of components exactly as shown in my diagram, including with great cunning in the last L.F. stage a transformer privately labelled by me as "the

THE FILADYNE CIRCUIT.

A Novel Design for the Experimenter.

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

I claim to be worthy of the attention of amateurs as a system that is more logical than grid or plate inputs. I have styled it the Filadyne, and, as dyne means force or power, the name should be quite appropriate.

Filament input, or the control of the electron emission from

1, 2, and 3—in Fig. 1 A. That in a nutshell—or, rather, an evacuated glass bulb!—is the theory of the operation of the valve as used in ordinary present-day circuits.

Fig. 1 shows a straightforward detector valve circuit, reaction being eliminated for the sake of simplicity. Impulses received from the aerial circuit are passed on to the grid, which, by influencing the flow of electrons from the filament to the plate or anode, causes variation in the flow of current from the high-tension battery through the telephones and valve, for the stream of electrons forms, as it were, a bridge over what would otherwise be a break in the H.T.-telephones circuit.

First Steps.

But all the electrons emitted from the filament do not reach the anode, and that is why I employed the reservation "a proportion."

A great number tend to form what is known as a "space charge," and by gathering together in a cloud materially resist the progress of others, for an electron is negative in sign and will repel the approach of another electron.

Readers will remember that the inner grid of a four-electrode valve is employed in the Unidyne for the very purpose of overcoming the effects of the space charge.

Briefly, then, in connection with the ordinary three-electrode valve, it seemed to me that it should be possible to do more with the emitted electrons than is done at present. Obviously, the greater the number that are allowed to bridge the H.T. battery-'phones circuit, and the more they are influenced by the incoming impulses, the more sensitive will be the receiver.

Instead of influencing the electron stream in the middle, as it were, it occurred to me that a far more effective scheme would be to influence them at their source, and to adopt measures to reduce, if not entirely abolish, the space charge. For many years we have regarded the valve as a sort of concrete base upon which to build our circuits. Seemingly, the commencement of every "hook-up" is "take a valve" and then connect to its grid input, and so on. Now and then, it must be admitted, the beaten track is departed from and anode inputs are employed, although for what reason it is difficult to see. There is far more diversity in transmitting than in receiving circuits, although in practice few of the startling diversions are any real value!

But I propose to describe a system of filament input which, with all due modesty,

the filament at the filament by incoming impulses, it might be thought, could be carried out merely by reversing the grid and filament connections from the aerial tuning circuit to the valve, but in practice it could not. In any case, in evolving the Filadyne one of my endeavours was, as previously stated, to reduce the effects of the space charge. This was almost a starting-point, and was achieved by giving the nearest electrode to the filament—i.e. the grid, a very high positive potential by connecting:

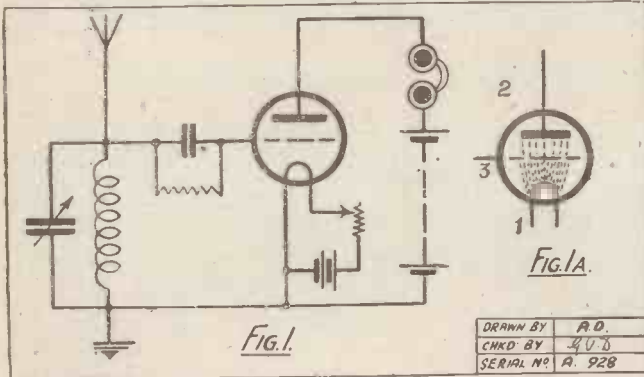


FIG. 1.

DRAWN BY	A. D.
CHKD BY	J. U. D.
SERIAL NO.	A. 928

talker." Its peculiarity was that it had badly assembled laminations, and, given a sufficient input, it would "loud speak," to the complete mystification of all listeners.

Now, I don't want to justify my early artfulness here, but the incident serves to point a moral, and, according to my interpretation, it is to the effect that no one knows how far an electron will go until they take it there, and that no one knows what it will do until it has been made to do it!

The Three-Electrode Valve.

To treat the matter more scientifically, let us take as an example the three-electrode valve. Here we have a filament which when heated emits electrons, an anode or plate to which a proportion of such electrons are attracted by virtue of its positive potential, and a grid which influences this flow of electrons by virtue of either a negative or positive potential, according to circumstances. The three electrodes are shown in the above order—

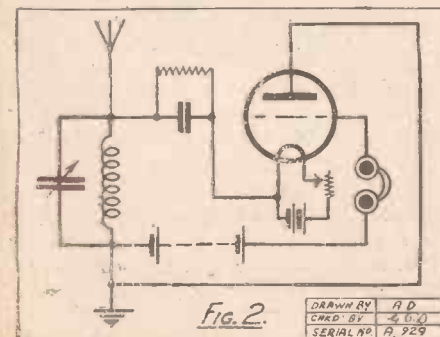


FIG. 2.

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CHKD BY	J. U. D.
SERIAL NO.	A. 929

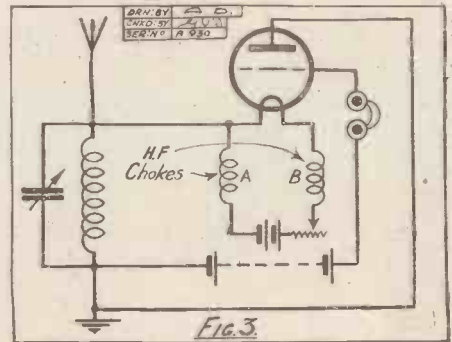


FIG. 3.

the positive of the H.T. to it through the 'phones. Fig. 2 illustrates this, the first step. But as a circuit I did not expect results at this stage.

The filament is, of course, connected to the L.T. battery, and H.F. charges could be expected to spread right through this system, and, indeed, pass to earth capacitively or directly. Therefore I isolated the filament by introducing two H.F. chokes of low ohmic resistance, as at A and B in

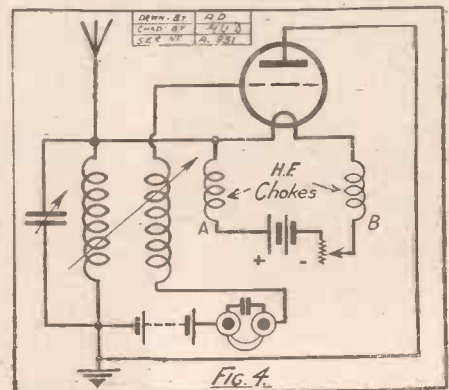


FIG. 4.

Fig. 3. The circuit then functioned very well.

Isolating the Filament.

From this point it was a simple step to introduce reaction, as at Fig. 4. Results then were excellent, and both in loudness and clarity of signals and in DX capabilities it was found to be better than an

(Continued on next page.)

THE CHOICE OF COIL SIZES.

COIL sizes are generally reckoned in turns without reference to mean circumferences or over-all dimensions. Thus a No. 50 coil is one that has wire wound around it fifty times. The method of winding might be honeycomb, spider web, basket, solenoid or something of a particularly low-loss or "anti-cap" nature, or wire of any gauge from 22 to 32 S.W.G. might be used, but for practical wave-length range purposes, none of this matters much.

But aerial systems vary considerably, and, therefore, it is impossible to state that this, that, or the other size of coil will cover a definite range when used in the aerial circuit of a set on an aerial of unknown capacity and inductance. It is possible, however, to recommend series condenser tuning for all wave-length ranges below 500 metres, and parallel for all wave-lengths above 500 when arrangements for series-parallel switching are provided.

Condenser Adjustments.

Sets which have fixed tuning, either series or parallel, are somewhat handicapped unless a very large range of coils is available. Nowadays coils are obtainable in a great many more sizes than a year or two ago, when an amateur would have to wind his own if he required intermediate values. 35, 50, 75 it used to be, but now it is 30, 35, 40, 45, 50, etc. The importance of this is illustrated by 2 L O's wave-length. With parallel aerial tuning a 35-turn coil is generally quite satisfactory, but in the case of short aerials it is not quite large enough. 50 is rather too large, but 40 is excellent. In the case of series condenser tuning, 75 is almost universally satisfactory.

When the loudest signals are received when the variable condenser is at its lowest possible reading (all vanes right out) a size smaller coil should be used. If this condition obtains when the condenser reading is at maximum (all vanes right in) a size larger coil should be tried. The best practice is to bring the tuning of the desired station in to a point about one-third of the way along the condenser scale. This applies to all condenser-tuned circuits. End of scale adjustments are seldom satisfactory, whether they be maximums or minimums.

Reaction Coils.

.0005 mfd. variable condensers are almost universally used for aerial tuning these days, but for parallel tuning smaller values such as .0003 mfd. have much to commend them, even although they cover smaller wave-length ranges. However, throughout this short article we take it for granted that a .0005 mfd. is used in the aerial circuit and a .0003 mfd. in the anode circuit (if any).

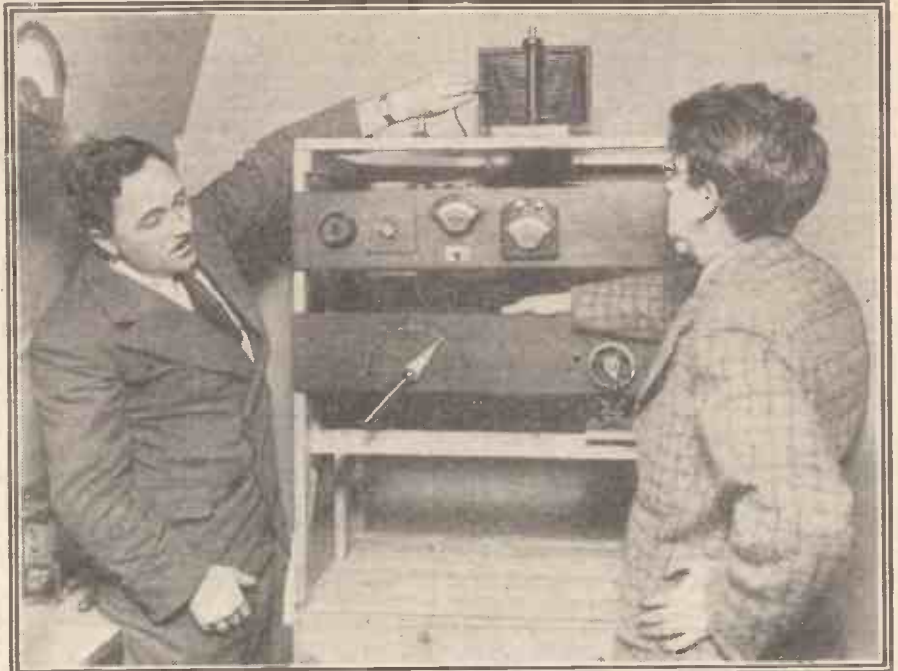
Whatever theory says, practice proves that the smaller the reaction coil it is possible to use, the more flexible will be the tuning. If a set will oscillate nicely on the Daventry wave-length with a 35-turn reaction coil, then this coil should be used for the purpose, and endeavours should not be made to introduce a 100 or 150 turn coil.

Sometimes a set will operate with the same reaction coil on both the lower and the 5 X X ranges. If so, there is no reason why

it should be changed when the aerial coil is changed.

A set that is unstable should employ parallel condenser tuning throughout. 40 turns or so in the aerial for 2 L O, 6 B M, etc., and 200 for 5 X X, with reaction coils of 35 or 50 and 100 or 150 turns. In the case of a stable receiver, one that is not prone to burst into oscillation when the table is touched or a door banged, a 300-turn coil with series condenser tuning frequently gives excellent results on 5 X X.

In tuned anode circuits a 75-turn coil will cover practically all the ordinary broadcast wave-lengths, while a No. 250 will cover the wave-lengths of 5 X X and Radio-Paris. If we were asked to specify the minimum number of coils for ordinary broadcast work with an H.F.-Det.-L.F. three-valve set employing a tuned anode circuit and reaction, we would include the following: 40, 50, 75, 150, 200, 250. With these we would hope to be able to get almost any station up to and including 5 X X.



Mr. Baird and one of his assistants adjusting the wave-length of a new experimental television transmitter.

THE FILADYNE CIRCUIT.

(Continued from previous page.)

ordinary straight circuit. The importance of the isolation of the filament was such that by-passing any one of the chokes by means of a condenser caused complete silence.

Clearly proving that the circuit is abnormal in operation, it was discovered that a grid leak and condenser in any position was not only unnecessary but could not be used.

Interesting Points.

Whether the H.F. impulses can actually effect the emitting properties of the filament of a valve, or whether the shape or disposition of the electrodes effect results, the fact remains that some valves do not operate at all in the Filadyne. The B.5 (B.T.H.) appears to be eminently suitable, and so do one or two others—but not many. Now, the B.5 is a "lively" valve, but in the Filadyne 100 or so volts H.T. can be used with excellent stability of control, although actually between 50 and 60 only are required.

It is interesting to note, too, that the grid and plate connections in the Filadyne cannot be reversed, nor can the L.T. connections, and that the disconnection of the plate causes complete cessation of signals. But the plate is at earth potential! The aerial circuit is—filament—plate and the "anode" circuit—grid—plate.

The foregoing three paragraphs at first sight appear to form a confusing jumble of observations and surmises, but, nevertheless, every statement is highly significant.

For the benefit of amateurs who wish to carry out experiments with Filadyne circuits, it might be as well to mention that the H.F. chokes used consisted each of 250 turns of 24 S.W.G., wound honeycomb-coil fashion. They must not couple—that is, they should be well separated and mounted at right angles to each other. The total ohmic resistance of both chokes together is but a matter of an ohm or two, so that, using a four-volt accumulator with a B.5., a filament resistance with a maximum of at least 15 ohms must be used. Everything else is quite normal.

Volume is excellent, and the purity of reproduction exceptional. Filadyne receivers are remarkably selective, and yet are as easy to handle as ordinary sets.

Finally, it is interesting to note what isolation is provided by an efficient H.F. choke. The filament resistance, as will be seen in Fig. 5, is separated from the filament by a choke. The resistance can be touched with the fingers without affecting reception, but not the other side of the choke. Touching this causes a complete cessation. This is the more interesting in that it proves that the circuit operates as I intended that it should do, and that the filament is indeed the governing element.

Crystal Architecture



IT is really a most significant fact that the majority of ores, mineral deposits, and other natural materials and substances are all crystalline in structure. Even metals tend to crystallise—often to a very pronounced extent—and if a thin bar of cast-iron is broken into two pieces, it will readily be seen how crystalline the interior of the mass of iron really is.

There are very few naturally-occurring materials which do not exhibit some decided tendency to crystallise in one form

A Fascinating Article on how the
Crystal's Secrets are being laid bare.
By J. F. CORRIGAN, M.Sc., A.I.C.
(Staff Consultant.)

way, what is known as a "super-saturated" solution of the hypo will be obtained, and it is only necessary to drop a speck of dirt or a tiny crystal of hypo into the super-saturated liquid in order to effect the immediate crystallisation of the whole solution. Under these conditions the liquid becomes entirely solidified within a few seconds.

Now it will be observed that the liquid does not turn into a solid, shapeless mass. On the contrary, the resulting solid mass exhibits a very definite crystalline formation. The super-saturated solution of hypo has, in fact, suddenly crystallised itself. It has turned into a mass of minute crystals, and if a speck of the resultant solid be examined under the microscope, its very definite crystalline nature will be revealed. The photograph, Fig. 1, illustrates the microscopic appearance of crystals obtained in this way.

Definite Forms.

This is the sort of thing which happened to the earth's minerals, including those particular ones which find so much use as rectifiers. Countless ages ago these minerals were formed from the molten material which then made up the entire bulk of the earth. Unlike the microscopic hypo crystals of the above experiment, they were not formed instantaneously, but their production in crystalline form was a matter which must have occupied many centuries of time. Nevertheless, the same universal law of crystallisation which operated to produce the hypo crystals of our previous experiment was responsible for their growth.

This law of crystallisation is a very mysterious thing, and it is a principle which is full of significance. Why does Nature always tend to produce her solid materials in definite geometrical forms, instead of allowing them to be formed anyhow? What are the forces which operate to produce this almost universal effect of binding atoms and molecules together in geometrical alignment? The problem is, indeed, a very fascinating one, and it is one which has only been looked into within the last ten years or so.

But within this short period it has been possible to get together a large amount of information with regard to the nature of crystallisation and the structure of crystals. A crystal, in brief, is formed by the regular and orderly arrangement

of a very large number of individual atoms which are held together by atomic molecular forces which are at present largely unknown.

Amorphous Substances.

On the other hand, an amorphous or non-crystalline body is composed of atoms which are merely jumbled together in any way and without any definite organisation. In other words, a crystalline substance may be likened to a military squad whose individual units are situated in definite and orderly positions with regard to one another. The constituent atoms of a non-crystalline substance are like an undisciplined crowd. They are merely an atomic mob, held together by mutually attractive forces, but possessing no orderly formation.

If a crystal of rock-salt be placed in a fairly strong solution of the same material, it will begin to grow. Nevertheless, despite its increase in size, it will always retain the same characteristic shape. This is due to the fact that the atoms are deposited from the solution on to the surface of the crystal in regular layers.

Fig. 2 indicates diagrammatically the mode by which a crystal grows. The characteristic shape of any particular

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Fig. 1. A selection of "Hypo" crystals.

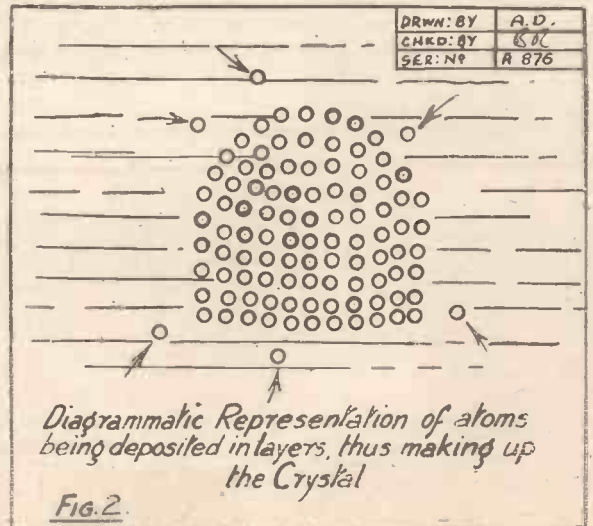
or another. A number of artificially produced substances are, however, entirely non-crystalline, or "amorphous," as the term is, in nature. Probably the best-known amorphous material is glass. Glass of all descriptions and varieties is invariably non-crystalline. Some forms of sulphur are also non-crystalline, as are also many kinds of cements and other similar products.

However, we are not concerned with amorphous materials in this article. What I want to interest my readers in at present is a straightforward description of the methods by means of which modern science is elucidating the many-sided problems of crystal structure, and which are, at the same time, opening up still another means of attack on that problem which is so closely bound up with the theoretical aspect of radio science—to wit, the constitution of matter itself.

How Crystallisation Takes Place.

In order to understand the real nature of crystallisation, let the reader try a very simple and interesting experiment for himself. Dissolve in a few ounces of very hot water as much sodium thiosulphate (the ordinary "hypo" of the photographer) as will go into solution and, while the liquid is still hot, pour it carefully away from the undissolved hypo into another clean vessel. Then allow the liquid to cool without disturbing or shaking it in any way at all.

The vessel should also be provided with a cover in order to prevent particles of dust from falling into the liquid. In this



CRYSTAL ARCHITECTURE.

(Continued from previous page.)

crystal is quite independent of its size. Take, for instance, the photographs shown at Figs. 3 and 4. Fig. 3 indicates a crystal of rock salt possessing a length of over two inches. Fig. 4, on the other hand, illustrates the appearance under the microscope of rock salt crystals whose total length is not more than 1-250th of an inch! Yet in both cases the rock salt crystals still retain their characteristic shape.

We have now seen that a crystal is composed of an orderly and regular arrangement



Fig. 3.—A good specimen of rock salt crystal.

of atoms which are held together by mutually attractive forces, but the question will no doubt arise in the mind of the wireless enthusiast as to how such a statement can be proved. Let us therefore go into the matter a little more closely.

In the first place, it is impossible to see the actual atoms which make up the crystal, even by means of the most powerful microscope which could conceivably be constructed. For the simple reason, of course, that the atoms are much smaller than the wave-length of light. Thus we can never hope to see an atom, or even detect its presence, through the medium of light rays.

The Diffraction Grating.

Modern science, however, has devised methods by means of which the seemingly impossible may be accomplished. Nearly every keen follower of radio science knows that Röntgen or X-rays have an extremely small wave-length. As a matter of fact, the wave-length of X-rays has been measured, and it has been found to be approximately one ten-thousandth of the wave-length of ordinary light.

The reader will also be familiar with the principle of the prism by means of which

white light can be split up into its seven coloured components. It is also possible, however, to split up white light by means of a device known as a "diffraction grating." This instrument consists of a highly-polished

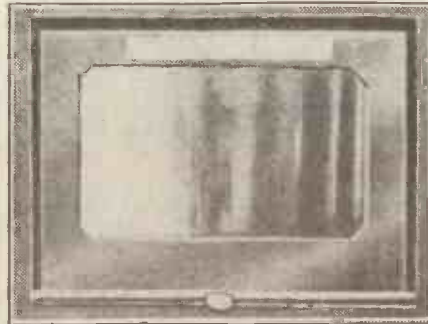
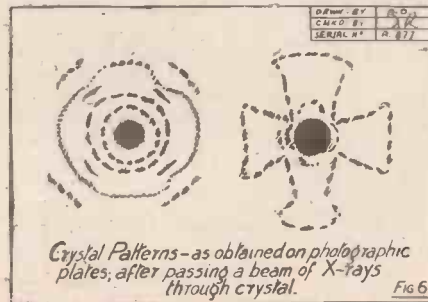


Fig. 5.—A typical diffraction grating, having 12,000 lines to the inch.

metal plate on which have been mechanically-ruled or scratched a very large number of straight lines. On most diffraction gratings there are about 12,000 lines to the inch, whilst on a few there may be as many as 20,000 parallel lines ruled on an inch of surface of the plate.

A typical diffraction grating, containing 12,000 ruled scratches to the inch, is shown at Fig. 5. Such a device splits up the rays of white light just as a prism does, but it is often more convenient to use, for, by altering the angle at which the rays of light strike the surface of the plate, or by varying the degree of "fineness" of the rulings, different spectra can be obtained, these spectra being referred to as being of the first, second, or third order.

We are now in a position to understand



Crystal Patterns—as obtained on photographic plates, after passing a beam of X-rays through crystal. Fig. 6

exactly how the internal structure of a crystal can be determined. The wave-length of the X-rays is so very minute that the atoms of the crystal are able to diffract or deviate from their course the rays which pass through it. Thus, when a pencil of X-rays is passed through a crystal, the layers of atoms in the crystal act in precisely the same way as do the scratches of a diffraction grating, with the result that the rays are diffracted or scattered.

Crystal Structure by X-ray.

The illustration shown at Fig. 6 represents the results which are obtained when a narrow beam of X-rays is passed through a thin section of a crystal, and then allowed to affect a photographic plate.

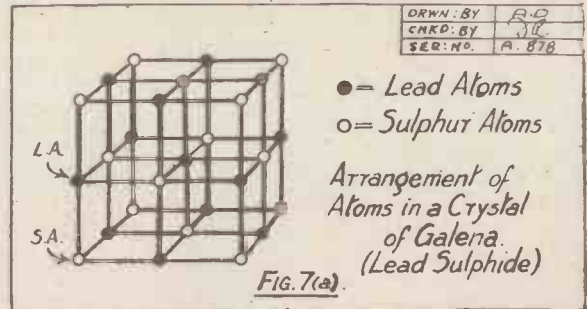
The large, dark spots in the centre of the diagrams are due to the X-rays passing right through the central portions of the crystals without being diffracted out of

their course, but the symmetrical arrangement of black dots which surround the central spots are due to the diffraction of the rays by the actual atoms of the crystal themselves. Thus, although it is not possible to photograph the actual atoms, it is now a comparatively easy matter to photographically record the presence of the atoms in a crystal.

Again, just as it is possible to obtain different spectra of ordinary light by means of a diffraction grating, so also is it possible to obtain a series of different crystal patterns, such as those shown in the illustration, Fig. 6, according to the angle at which the X-rays enter the crystal. Further, by estimating the amount of diffraction which the X-rays undergo, it becomes possible accurately to measure their wave-length.

The Atomic Arrangement.

Now, from the above data, the modern crystal scientist obtains an exact representation of how the "framework," so to speak, of the crystal is built up, and, once this



knowledge is obtained, it is only a matter of accurate calculation in order to determine how the atoms are individually arranged in the crystal framework. The precise method by means of which this feat is accomplished is very highly technical, and for that reason its description would not be of general interest to the radio experimenter.

However, Fig. 7 will give the reader an idea of how the atoms are arranged in some of the varieties of crystalline minerals which are in common use for the purpose of radio rectification.

Diagram A shows the arrangement of atoms in a crystal of ordinary galena. Similarly, the arrangement indicated at B in the diagram, Fig. 7, shows how the atoms are situated in crystals of copper

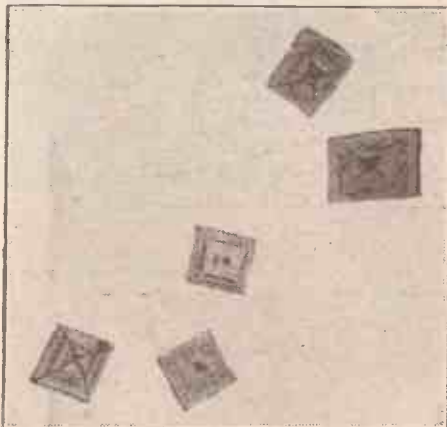
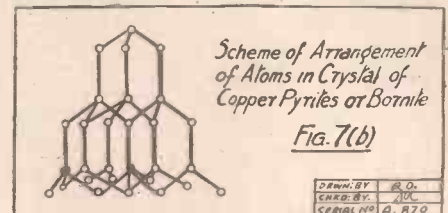
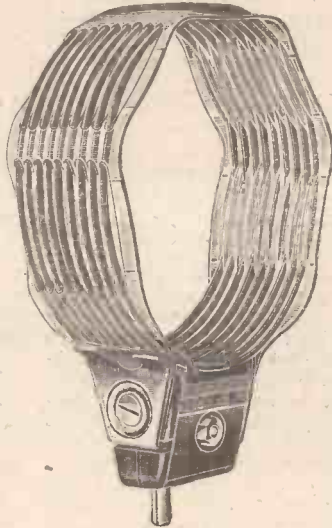


Fig. 4.—Minute crystals of rock salt as seen under the microscope.

pyrites, bornite, and also in a diamond, which latter is, of course, a crystalline form of carbon.

Already many promising discoveries have been made within its realms; and there is no doubt that this line of scientific progress is going to take us into new and untouched fields of electrical physics, with, maybe, many unexpected and startling results.

DOWN TO 10 METRES!



Igranic Short Wave Coils have a wavelength range of approximately 10 to 100 metres.

They are wound with heavy gauge wire, rigidly supported so as to preserve the accuracy of spacing. The H.F. resistance is extremely small, and oscillation is easily obtained.

(Patent applied for.)

Made in four sizes:

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4-turn	2/7
6-turn	2/8
9-turn	2/9

10/- per set of four.

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There is no leakage with a "Lotus" Buoyancy Valve Holder on guard.

Immediate and lasting connection made when valve pins enter valve sockets. The leg socket expands and automatically locks.

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Lotus Works, Broadgreen Road,
LIVERPOOL.

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Without
Terminals

2/3

With
Terminals

2/6



COMPENSATED
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LOW LOSS

NO
BACK LASH

LOW LOSS SQUARE LAW SLOW MOTION

THE "Cosmos" Condenser is a slow motion condenser with absolutely no backlash either when new or after use. This desirable feature is accomplished by the use of a spring belt held in tension, which permits coarse tuning with the large knob, and a 10:1 slow motion with a small knob.

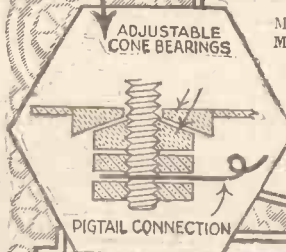
Cone bearings allow for adjustment and the slow motion bracket can be mounted for remote control as shown in the lower illustration.

The condenser for fine tuning.
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Slow Motion	.00025 mfd.	14/9
"	.0005	15/6
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BLUE PRINTS
of TESTED CIRCUITS

Every wireless amateur and every wireless constructor will find these "POPULAR WIRELESS" Blue Prints absolutely reliable. They have been most accurately drawn, and every circuit has been tested under normal broadcasting conditions by the technical staff of "Popular Wireless." It will be seen from the complete list given below that the series covers a very wide field. The veriest tyro will find each print most straightforward to follow and the receivers most easy to construct.

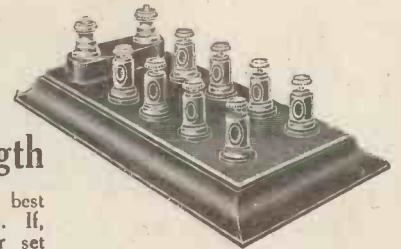
P.W. BLUE PRINT
Number

1. DETECTOR VALVE WITH REACTION.
2. UNIDYNE DETECTOR VALVE WITH REACTION.
3. 1-VALVE L.F. AMPLIFIER.
4. CRYSTAL DETECTOR WITH L.F. AMPLIFIER.
5. H.F. (Tuned Anode) AND CRYSTAL, WITH REACTION.
6. H.F. AND CRYSTAL. (Transformer Coupled, Without Reaction).
7. 1-VALVE REFLEX WITH CRYSTAL DETECTOR (Tuned Anode).
8. 1-VALVE REFLEX AND CRYSTAL DETECTOR (Employing H.F. Transformer, without Reaction).
9. H.F. AND DETECTOR (Tuned Anode Coupling, with Reaction on Anode).
10. H.F. AND DETECTOR. (Transformer Coupled, with Reaction).
11. DETECTOR AND L.F. (With Switch to Cut Out L.F. Valve).
12. DETECTOR AND L.F. UNIDYNE (With Switch to Cut Out L.F. Valve).
13. 2-VALVE REFLEX (Employing Valve Detector).
14. 2-VALVE L.F. AMPLIFIER (Transformer coupled with Switch to Cut Out Last Valve).
15. 2-VALVE L.F. AMPLIFIER (Transformer-Resistance Coupled with Switch for Cutting Out Last Valve).
16. H.F. (Tuned Anode), CRYSTAL DETECTOR AND L.F. (with Switch for Last Valve).
17. CRYSTAL DETECTOR WITH TWO L.F. AMPLIFIERS (with Switching).
18. 1-VALVE REFLEX AND CRYSTAL DETECTOR, with 1-VALVE L.F. AMPLIFIER, Controlled by Switch.
19. H.F. DETECTOR AND L.F. (with Switch to Cut Out the Last Valve).
20. DETECTOR AND 2 L.F. AMPLIFIERS (with Switches for 1, 2, or 3 Valves).

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All orders for these Blue Prints should be sent direct to the "Popular Wireless" Queries Department, Fleetway House, Farringdon Street, E.C.4, enclosing a stamped addressed envelope and a postal order for 6d. for each Blue Print Ordered.

Outdoor wireless
without
loss of
reception strength



**The "Brownie"
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IN CARTON.

A beautifully designed moulding with nickel fittings that can be used with any make or type of receiver.

For Crystal set users the "Brownie Wireless" PERMATECTOR is an absolute essential. It is a very simple but very efficient crystal detector that, once set at the point of loudest signals, remains rigidly fixed for months, no matter to what vibration or shocks it is subjected. And it also only costs 3/-.

If you get a "Brownie" Wireless (No. 2 Crystal Receiver you will have one of the world's most famous Crystal Sets and the biggest bargain in radio. Its cost, complete, is only 10/6.

Every radio set works at its best when close to the aerial lead-in. If, for instance, you move your set outdoors by means of running a wire from the lead-in, loss in reception occurs. But by using the "Brownie" Distribution Board you save trouble and overcome this difficulty. Your headphones or loud speaker can then be taken into the garden or any part of the house without moving your set from its most effective position. All you need is a length of flex run from your set to the "Brownie" Distribution Board and immediate accommodation is provided for four pairs of headphones or a loud speaker without the least loss of efficiency.

For Summer Radio use the "Brownie" Distribution Board.

**THE
BROWNIE WIRELESS Co.**
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Phone: Museum 3747.

1/2d
per day
for keeping your
accumulator charged
For A. C. use only.



ONE halfpenny per day for keeping your accumulator charged—even if you own a five-valve set. That is how little it costs you with a Rectalloy Charger. And here is how it is done. The Rectalloy Charger is coupled permanently (a) to your Set, (b) to your Accumulator. (c) to the electric light socket. When you wish to use your set, the switch on the Charger automatically cuts out the Charger and brings the Accumulator in circuit. After the Broad-

casting is over reversing the switch disconnects the Set and immediately sets the Rectalloy Charger charging up your Accumulator. No mess, no worry, no expense. You can forget your Accumulator exists—for the Rectalloy Charger keeps it perpetually at concert pitch. A new model is now available for charging H.T. Accumulators. It is just as simple to use and has nothing to go wrong. No moving parts, no rectifying valves, nothing to require replacement.

Model A for a.c. voltage between 100 and 120 65/-
Model B for a.c. voltage between 200 and 250 65/-
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All 40 to 60 cycles.
Write for Folder 'P.S.' post free

RECTALLOY
The ideal Battery charger

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SINCE the writer's last article on radio conditions in America, which was printed in POPULAR WIRELESS several months ago, there has been a general trend in New York towards stabilisation in the radio business. This, indeed, applies only to the hardiest of manufacturers, for there has been a general weeding out—and it's now a case of a survival of the fittest. Many of the smaller concerns have become insolvent, and even the larger and more powerful of manufacturers are not afraid to admit that they have suffered badly. The general impression, though, is one of optimism, and great things are predicted for the next season. For one thing, manufacturers will no doubt bend their efforts towards the farmers, for statistics show that only a minute percentage of American farm houses harbour wireless sets. Broadcasting stations all over the country are co-operating in this respect by broadcasting, at regular periods, information of prime use to the agriculturist.

"Cut" Prices.

The casual visitor to New York would still, no doubt, consider radio business conditions as chaotic, especially should he happen to pick up a copy of some newspaper's radio section. Let me quote a few prices from a recent leading New York radio section. Incidentally, let me state that the following prices are taken from one regular advertiser's list. They are more or less general and are not the result of a special sale: Headphones, 4/6 (list price, 25/-); Lightning Arresters, 4/6 (list price, 12/-); Jacks, 10d. (list price, 3/-); Gramophone Unit, 21/- (list price, 35/-); Cone Loud Speaker, 80/- (list nearly double—this cone is identical to a well-known one sold in London); L.F. Transformers, 4/- (list 20/-). These are only a few of the many bargains obtainable at the cut price district.

Another interesting example is found in the advertisement offering for sale a certain well-known valve which was originally sold for 30/-. You can now have as many as you want at 3/6! Sets, too, are selling "dirt cheap." Many quite useful five-"tube" affairs may be picked up for a couple of quid (that would be eight "bucks" or so in American currency). Naturally you cannot expect wonders from such sets, but they will be found quite satisfactory for the average user who does not require a de luxe cabinet to show to his friends.

Multi-Valve Sets Preferred.

Fifteen shillings would be a fair price to pay for a one-valve set. Most dealers would probably be willing to pay you to take such sets away. They only clutter up the store-room, and there's little or no demand for a set employing less than four "tubes" nowadays in the States. As regards condensers, the "fan" won't take anything less than a straight line frequency instrument these days, so you can pick up a 20'-straight-line wave-length or capacity condenser for half-a-crown at most places—a low-loss instrument at that, too.

The valve question is still a bitter one. One would imagine that a net price would prevail in the case of the Radio Corporation's valves at least, for they are usually considered the best and there is always a regular demand for them. However, this is not the case. The most popular general purpose valve at present used in the States is the 201A. It works from a six-volt

**AMERICAN
RADIO NEWS.**
By I. W. CORBETT
(Our Correspondent in New York.)

accumulator and consumes .25 amps. The R.C.A. list their 201A valve at \$2.00 (about 9/-), but it is possible to get at least a two-shilling reduction from many wireless dealers. The fact is that so many concerns have gone bankrupt and have sold out. They have probably been forced to dispose of thousands of valves on stock at prices considerably lower than regular wholesale prices to other dealers, and these latter have been thus able to share their saving with the general public. The Radio Corporation has been powerless to intervene. They don't supply their products directly to the dealers so they cannot threaten to refuse to supply him with any more valves.

They supply through middlemen, and it would be a difficult job to trace down any

NEXT WEEK.

Full constructional details
will be given concerning

A "FILADYNE" ONE-VALVER

An unusually sensitive and
selective receiver which em-
ploys the new method of
filament described in
this issue.

ORDER YOUR COPY NOW!

middleman who was supplying their goods to the dealer at less than the authorised price. The middleman has suffered badly in New York. Last year the general over-production of radio apparatus was extremely heavy, and the middleman bore the brunt of a lot of this. He would purchase a few thousand condensers from a manufacturer for, say, \$2. His job would then be to dispose of them at a price which was agreed upon with the manufacturer, to the dealer. Maybe this figure was \$3.00, so that the dealer would sell the instrument for \$4.50. After the over production question became so acute, the middleman found he was left with perhaps half of his condensers on hand. Naturally, he was unwilling to lose on the bargain, so often the agreement with the manufacturer was clandestinely broken, and he sold his remaining condensers to the dealer for as much as he could get, perhaps less even than he paid.

Rapid Development.

American manufacturers have learned their lesson this last season. They now realise that they must go carefully next

winter. Apparatus becomes obsolete in such a short time that the question of mass production of any one component is a ticklish one. It is so easy for apparatus to become out of date in the States; there are so many manufacturers that there is always something new, and the American "fan" always wants the latest apparatus when he builds his set. If he does not want the latest gadgets on the market he is probably not a true "fan" and probably the manufactured receiver would be more after his liking, and would be cheaper than a home constructed set perhaps.

Inevitable Price Reduction.

One thing that is noticeable regarding conditions in America is that new apparatus, when first placed on the market, is usually priced excessively highly. The existing unsteady circumstances have usually made it a pretty sure thing that a new gadget will soon be obtainable from some dealer or other at a price lower than list price, and with this knowledge, many "fans," requiring a certain piece of new apparatus, are content to wait for a few months until the expected reduction arrives. And arrive it usually does, after a short time. Maybe by next season conditions such as these will have been remedied.

Despite the multiplicity of dealers willing to dispose of overstocked receivers at extremely low prices, there is still a large market for the up-to-the-minute receiver which sells at list price, not a penny off. Such receivers are usually obtainable on the instalment payment plan, 15/- down, perhaps, and 15/- monthly thereafter until the full price has been paid. The manufactured receiver has, as a matter of fact, gained in popularity, and many American wireless dealers are considering selling complete receivers only, to the exclusion of their parts business. In the writer's opinion, this condition will exist only until the American trade has reached its level again—when it will once more be cheaper to buy the parts to assemble a set at home than to buy a factory-built set.

The Super-Het. Patents.

The Radio Corporation holds the super-heterodyne patents and no other manufacturers have been licensed to build this type of set by the R.C.A. unless the writer is very much mistaken. The fan desirous of owning a super-heterodyne, then, has either to buy a Radio Corporation of America set of this type for from fifty to two hundred pounds (even the cut-price stores have failed, apparently, to get hold of many super-heterodynes), or build his own at home. One way to boost the parts business would be to encourage the use of the super-heterodyne, for the majority of prospective users of this type of circuit would be unwilling to pay the high prices asked for the R.C.A. instrument and would therefore build their own.

Conditions in the British radio trade are altogether different to what they always have been in America, but the British manufacturer would be able to glean much useful information by keeping a wary eye on conditions in the U.S.A.

It has been difficult in so short a space to convey more than a fleeting idea of the radio business "as is" in America, but the writer hopes that the above somewhat disjointed remarks will interest its quota of "P.W." readers.

COSMIC X-RAYS.

THE LATEST MARVEL OF THE ETHER.

FROM A SPECIAL CORRESPONDENT.

THE discovery of a new ether wave of extraordinary penetrative power is announced by Dr. R. A. Millikan, of the Pasadena Institute of Technology, California. Dr. Millikan's name is already well-known to radiologists for his previous investigation of the spectrum gap lying between the shortest light waves (ultra-violet) and the so-called Röntgen, or X-rays.

The wave-length of ordinary visible light is measured in millionths of a millimetre. Röntgen rays are some five thousand times shorter, whilst beyond these lie the so-called gamma rays given off by radium. Gamma rays have a wave-length one hundred times shorter than X-rays, and have for long

level. It is clear that they cannot come from the sun because they are equally in evidence at night and in the day time.

The discovery is of unusual interest, and may lead to far-reaching results. The tendency in modern physics is to lay more stress upon the importance of etheric vibrations, both in, and particularly in connection with observed phenomenon involving electronic and molecular activities and reactions, and also to some extent in problems relating to the ultimate construction of matter.

Ionizing Effects.

In the realm of psychic research any intelligent explanation of thought-trans-

WORK AT 2 D A.
(The "P.W." Transmitting Station.)
By The Engineer-in-Charge.

THINGS have slackened off a lot on 90 metres owing to the advent of summer, and interference is very bad on 45 metres, making it very difficult for low-power stations to do any serious work. Owing to this, 2 D A has concentrated a lot on speech. The wave-length used is usually about 150 metres, and tests are carried out quite often with neighbouring stations.

In order to carry out a rapid series of recent tests, the following arrangement was employed: Connected to the telephones which the operator wore was a land-line which ran from the cabin to a neighbouring house. This was fitted with a dry cell and microphone. An operator at the microphone end of the line tuned a 2-valve receiver to 2 D A's wave-length, and listened to the transmission on a loud speaker. If anything went wrong or needed alteration at the transmitter, he simply informed the operator via the land-line. The operator, of course, replied via radio.

Several people who heard 2 D A apparently speaking to no one were rather interested and thought possibly that we were working "duplex," so if they see this report they will understand what it really was.

One night recently it was decided to remain listening all night. Several stations were worked about midnight, and a station in Norway received us at R 6. It was hoped to work the United States, but unfortunately several mild catastrophes occurred. First of all the microphone broke! Whilst pulling the microphone round into position, the operator accidentally knocked the mouthpiece off, and, since it was of vulcanite, it broke on the floor.

A Peculiar "Fault."

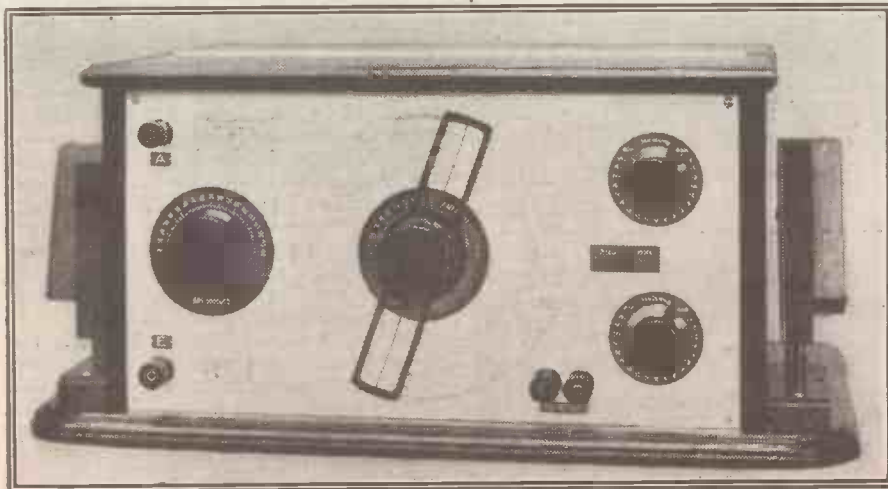
As it was urgent that the transmission should begin at once, and since it was impossible to work properly without the microphone mouth-piece, a substitute had to be found. Eventually a large loud-speaker horn was used!

And amid much mirth the transmission began. Of course, the loud-speaker horn kept slipping, and the transmission was rendered pretty well unintelligible, and little wonder that the station at the other end asked us to use telegraphy in future!

The next event of any importance was of particular interest to the assistant operator, who, whilst changing a choke coil received a "nasty one" (about 800 volts to be exact) which not only removed him to the other side of the cabin, but also (as he said) made him "feel dithery."

It is probable that this shock had some effect on him later on; as at about 5 a.m. he fell asleep with the 'phones on, and the other operator found it necessary to wake him by clicking the H.T. wander-plug!

Another amusing, but at first puzzling, occurrence was the failure of the transmitter to oscillate. Upon investigation of the aerial it was found that a cat was on the roof of the cabin playing with the loose lead-in wire. Active preparations were made to give the "fault" a shock. However, after wasting five minutes (and plenty of "juice") it was discovered that the "fault" had got off the roof and was walking about on the lawn!



A recent type of German four-valve set which operates on both long and short wave-lengths.

been the shortest ether vibrations known to scientists.

Dr. Millikan's discovery opens up an entirely new field. His rays are fifty times shorter than the gamma rays, and have one hundred times the penetrating power of the vibrations used in taking X-ray photographs. Their identification is the outcome of several years' research into the cause of the slow discharge of a screened electroscope, a fact that has previously been noted by Professor Rutherford, but never satisfactorily elucidated.

Inter-stellar Rays.

Dr. Millikan has now shown this effect to be due to a new and strange radiation which curiously enough is not of terrestrial origin. The Cosmic rays invade the earth from inter-stellar space, and are probably the result of atomic disintegration taking place in some far-distant star or nebulae.

This is the only logical conclusion to be drawn from the fact that the activities of the "Cosmic" waves are more pronounced at high altitudes (where the screening action of the atmosphere is lessened) than at sea-

ference, telepathy, and incorporeal "materialisations" would seem to demand the existence of some subtle form of vibration such as the Cosmic ray. Again, there are many mysterious chemical reactions such as that whereby living plants "breathe" through the chlorophyll in their leaves, which may possibly be explained by the stimulating action of similar vibrations upon the ultimate molecules.

Finally, the Cosmic rays have pronounced ionizing properties, and may, therefore, shed new light upon the formation of the Heaviside layer and also go far to account for the peculiar and erratic "fading" effects experienced in wireless reception.

NEXT WEEK!

How to make
A P.W. "FILADYNE" ONE VALVE

A receiver which embodies
the new filament input circuit.

Order Your Copy Now.

HOW TO USE VALVE CURVES

PART II.—FOR THE SELECTION OF VALVES.

By C. E. FIELD, B.Sc.
(Staff Consultant.)

WE considered in a previous article how to ascertain from the characteristic curve of an amplifying valve the most suitable operating conditions for distortionless amplification, and we saw that the valve should be given a negative grid bias of a value indicated by the point on the characteristic midway between the line through zero grid volts, and the

specified; the lower curve representing the performance at a high-tension voltage of 60, and the upper one at a voltage of 100.

We can learn a great deal from these two curves.

For instance, if we draw a horizontal line to cut the two curves in the straight portions, as at X and Y, we obtain two points at which the plate currents are the same, although the plate and grid voltages are different.

In the example shown, the grid voltages are -6 and -2, a difference of 4, whilst the plate voltages are 100 and 60—a difference of 40. Thus, since the plate currents are the same in the two cases (0.85 m.a.), a change of 4 volts on the grid has exactly counteracted a change of 40 volts on the plate. In other words, a change of 4 volts in the input to the valve is equivalent to a change in the output circuit of 40 volts, or ten times as much.

Amplification Factors.

Hence, the valve has the effect of amplifying voltage changes ten times, and we say that the *Amplification Factor* or *Voltage Factor* of the valve is ten.

A high amplification is always desirable, but is particularly important in the case of valves used for high-frequency work, or in resistance or choke coupled circuits. In the latter case there is no step-up in voltage by an intervalve transformer, and so we have to rely upon the valve to carry out all the amplification necessary. Consequently, valves for this purpose usually have a voltage factor of from 15 to 20.

In the case of a low-frequency valve, however, amplification factor has to be sacrificed for another property, which we will now discuss.

Referring again to Fig. 1, let us draw another line to cut the two curves, but this time vertically instead of horizontally. The thick line already drawn through O, grid volts, and cutting the curves at A and B, will serve our purpose.

The points A and B represent 1.8 milliamps on the 60-volt curve, and 3.8 milliamps on the other, the grid voltage being the same (zero) in both cases. Thus, for a given grid voltage, an increase in plate voltage of 40 has raised the plate current from 1.8 to 3.8, an increase of 2 milliamps.

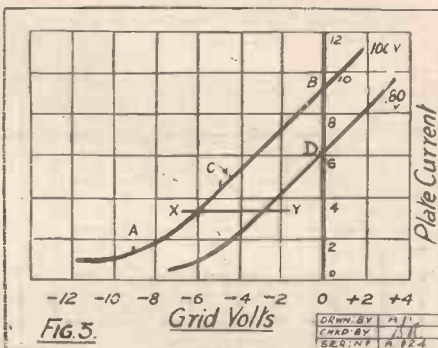
Calculating Impedances.

In short, a change of 2 milliamps requires a change of 40 volts.

Therefore, a change of 1 milliamp would require a voltage change of $\frac{40}{2} = 20$. If the current were expressed in amperes, instead of milliamperes, this figure would have to be multiplied by 1,000, so that we

may say that the change in plate voltage required to alter the plate current by 1 ampere is 20,000.

This is expressed in ohms, and is called the *impedance* of the valve, and gives us an idea of the resistance which the valve offers

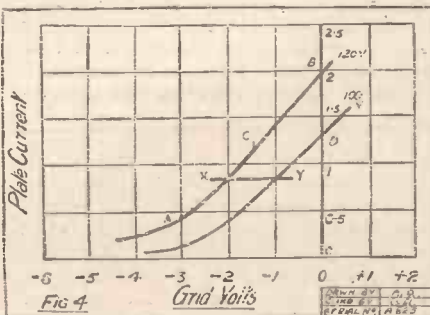


to the passage of signal currents in the plate circuit. A valve with a high impedance will not allow the same output current to flow as will one of which the impedance is lower, if the plate voltage is the same in the two cases.

Primary Considerations.

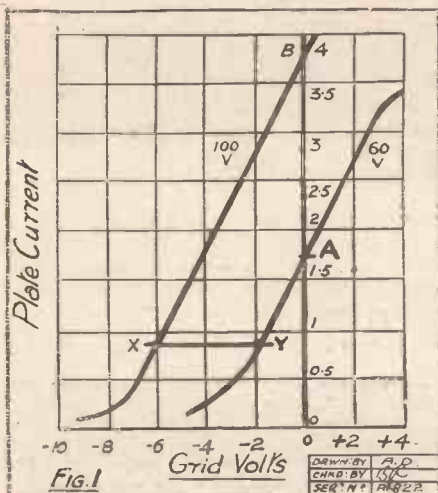
Consequently, a high impedance is in general a disadvantage, but it is unfortunately inseparable from a high amplification factor.

In a low-frequency amplifier we require large plate current variations to operate a loud speaker, or to flow through the primary



winding of an intervalve transformer, and so we employ valves with very low impedance, even though their amplification factor is also low.

A valve suitable for first-stage low-frequency work might have an impedance (Continued on next page.)



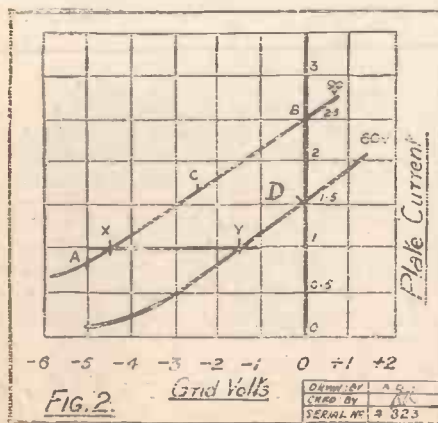
left-hand bend of the curve, which two positions we called the "distortion points."

Let us see now how we can tell from its characteristic curves the functions for which a particular valve is most suited.

In Fig. 1 are shown characteristic curves of an amplifying valve.

A Simple Calculation.

It will be seen that there are two of these, showing the relation between grid voltage and plate current, for the two plate voltages



HOW TO USE VALVE CURVES.

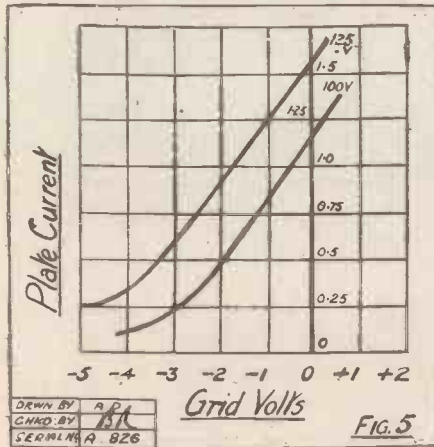
(Continued from previous page.)

of about 15,000 ohms, with a voltage factor of 7 or 8, whilst a power valve capable of giving strong loud-speaker signals might have an impedance of about 5,000 ohms, with an amplification factor of 4 or 5.

On the other hand, the impedance of a high-frequency valve may be anything up to 80,000 ohms, for here we are not concerned with large plate currents, or large signal voltages on the grid, but with obtaining a high voltage amplification.

For Resistance Coupling.

When a valve is required for use before resistance coupling, either H.F. or L.F., a high voltage factor is particularly important, but at the same time the impedance should be as low as possible, for this reason.



the loudest results without distortion, and corresponds with a negative grid voltage (grid bias) of 2½ volts, and a plate current of 1.65 milliamps. Thus the valve can handle signals which change the grid potential by 2½ volts in either direction. This is not sufficient for strong loud-speaker results, but should operate a small speaker at low volume, or give good strong-headphone signals.

If we draw a horizontal line to cut the two curves at X and Y, we see that these points represent a difference of 3 grid volts. Since the two curves are drawn for plate voltages of 60 and 90 respectively, a difference of 3 grid volts is equivalent to a change of 30 volts on the plate. The amplification factor is therefore $\frac{30}{3} = 10$. This is quite a high figure for an L.F. valve, and is high enough to be quite satisfactory for ordinary H.F. work.

Typical Curves.

The vertical line through zero grid volts cuts the curves at D and B. These points represent plate currents of 1.5 and 2.45 milliamps respectively, a difference of 0.95. Therefore an increase in plate voltage of 30 has raised the plate current by 0.95 m.a. The impedance of the valve is then given by $\frac{30}{0.95} \times 1,000 = 31,000$ ohms. This value is too high for a valve used in the last stage before a large speaker, but is quite suitable for a first L.F. stage, or for a detector or ordinary H.F. amplifier. We may say, then, that this would make a good general-purpose valve, but could not be recommended for resistance coupling or for strong loud-speaker signals. Actually, the curves are those of the Burndt H.L. 565 general purpose bright emitter.

In Fig. 3 are shown the curves of another valve.

Putting in the distortion points at A and B gives us a working point at C, with a grid bias of 4½ volts. The plate current can vary between 1½ and 9½ milliamps, a variation sufficient for strong loud-speaker signals.

Further Examples.

The vertical line DB shows that a change of 3.3 m.a. is brought about by a change in plate voltage of 20. The impedance is therefore $\frac{20}{3.3} \times 1,000 = 6,000$ ohms.

The horizontal line XY shows a grid voltage change of 3, corresponding to a plate voltage change of 20. The voltage amplification factor is thus $\frac{20}{3} = 6\frac{2}{3}$.

This is a high figure for a valve with an impedance as low as 6,000 ohms, so that we should expect this to function well as a power valve, handling large volume without distortion. It would not be efficient before resistance coupling, or as an H.F. amplifier. The curves are those of the B.T.-H. B4 dull-emitter power valve.

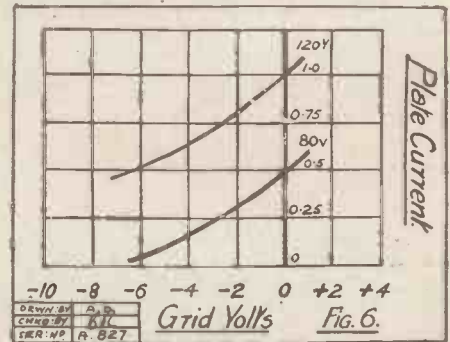
Fig. 4 shows two more curves.

The low plate currents show at once that the valve is not suitable for loud-speaker work, or for strong headphone signals. The line XY shows that the amplification factor is $\frac{20}{1.0} = 20$. The points D and B show that the impedance is $\frac{20}{0.65} = 30,000$ ohms, which is a very low figure in conjunction with a voltage factor as high as 20. Thus,

the valve will evidently be suitable for use before resistance or choke coupling, or as a detector. The curves are those of the Osram D.E.5.B. This valve would also be suitable for transformer or tuned-anode H.F. amplification, but it will be found that valves of this type are more expensive to buy and to run than high-amplification valves of higher impedance, which serve the purpose equally well, and are more stable.

Curves of a good high-frequency amplifier (the Mullard D-06 H.F.) are shown in Fig. 5. If readers carry out the instructions given in this article, they will see that the amplification factor of the valve is 17, and the impedance 60,000 ohms.

As a final example, Fig. 6 shows the characteristics of a bad valve. The impedance is 80,000 ohms, and the voltage factor



about 6. There is practically no straight portion of the curve, and the plate current is very low. Such a valve could only be used as an inefficient detector or high-frequency amplifier.

LESS CRYSTAL SCRATCHING.

IT is a well-known fact that excessive "tickling" of a delicate crystal surface by the cat's-whisker will, more than anything else, result in the rapid deterioration of the crystal's receptive qualities. Some cat's-whiskers, however, are so light and springy in nature that they need constant readjustment in order to maintain the desired standard of reception. The putting into practice of the following idea will result in the cat's-whisker contact acquiring a greater degree of stability; less "tickling" will be required, and therefore the crystal will last longer.

A short distance from the end of the crystal cat's-whisker place a very small blob of sealing wax, paraffin wax, Chatterton's compound, or similar substance. The small weight of this material will suffice to give a greater degree of stability to the whisker as it rests on the crystal surface. More effective reception will, therefore, be obtained.

This idea can only be utilised with detectors which have their cat's-whiskers held in a vertical position, for, in the case of cat's-whiskers held in a horizontal direction, the weight of the wax would tend always to drag the point of the whisker in a downward direction, thus making it difficult to obtain a really satisfactory and stable contact.

In order to obtain the best results, the coupling resistance should have a value at least as great as the impedance of the valve. Now, if the latter is very high, the combined resistance of the two, through which the plate current has to flow, is enormous, and a correspondingly high voltage is required from the H.T. battery.

In the case of a valve used for ordinary high-frequency amplification, a low impedance is not so important, and is in fact, in some cases, a drawback, for the valves specially designed for resistance coupling have their electrodes so close together that they often possess a high self-capacity, and are apt to be unstable in tuned high-frequency circuits.

Detector Valves.

Space will not permit us to consider in detail the requirements of a good detector valve, for that involves the study of a different set of curves, but in general a high amplification factor and low impedance are desirable, and valves suitable for resistance coupling, or high-frequency amplification, generally make good detectors.

A few practical examples will help to illustrate the foregoing explanations.

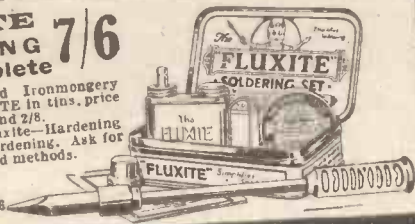
Consider the two curves shown in Fig. 2. First of all, let us put in the two distortion points on the upper curve, at A and B. Point C, midway between these two, represents the working position for obtaining

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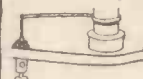
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TWO NEW EDISWAN VALVES.

G.P.4, 3.5-4 fil. volts, .15 fil. amps., 60-120 anode volts, 22,000 ohms impedance. Price 16s. 6d.

P.V.4, 3.5-4 fil. volts, .35 fil. amps., 60-120 anode volts, 9,500 ohms impedance. Price 22s. 6d.

As is indicated, both of these new Ediswan valves are designed to operate with 4-volt accumulators. The G.P.4 is a general purpose valve, and the P.V.4 a power amplifier. They are noteworthy additions to the famous Ediswan range, which is now very comprehensive.

The G.P.4 makes an excellent detector with between 60 and 72 volts on its anode, and it is a very efficient L.F. amplifier. In H.F. stages it is well up to the specialised standard. In fact, it is one of the best H.F. 4-volters we have tested. It appears to be particularly sensitive to weak impulses, and has no tendency to rectify when pro-

perly employed in H.F. capacities. Although its impedance is quite suitable for average H.F. work it is not so high that it does not make a good L.F. amplifier in transformer-coupled first stages. As the makers point out, its amplification factor, 12, and its slope, .55 mav. are such that an admirable compromise has been attained.

The G.P.4 is not at all microphonic.

The P.V.4 is, of course, purely a small power valve, although we discovered that it functions exceedingly well as a detector. In first L.F. stages, with appropriate grid bias and H.T., it produces good volume with an excellent tone quality. It is able to handle the input of second stages with commendable absence of wave distortion. Like the G.P.4, it is quite "anti-pong." The G.P.4 and P.V.4 Ediswan operate very well together, and it would be difficult to find a pair so well matched for Det.-L.F. or H.F.-Det.-L.F. work. Both types are

provided with clear spaces at the tops of their bulbs so that the filaments can be examined through the "getter" deposits. They are sold with sealed filament pins, a guarantee that they have not had current passed through their filaments subsequently to the laboratory tests at the works.

Messrs. Ediswan are to be congratulated on the production of two first-class 4-volters with economical current consumptions.

B.T.-H. INSTRUCTION SHEETS.

The B.T.-H. people recently sent us copies of three instruction sheets dealing respectively with the B.4, B.5, and B.6 valves. One of these is now placed in each valve carton, and shortly other sheets will be available covering the whole range of B.T.-H. valves. The sheets are printed in distinctive colour combinations, and the information provided by them is most comprehensive. Each includes two diagrams and many operational hints and much data of great practical value.

GRAVES' "AUDIO" ONE-VALVE SET.

From Messrs. J. G. Graves, Ltd., we recently received a 1-valve receiver for test. The instrument has been advertised in "P.W." frequently, and, as most readers will probably have noticed, it is sold complete with aerial equipment and all accessories for £6 on very easy instalment terms. As this includes Marconi patents royalties, the price is very reasonable. A 10 per cent discount is allowed for cash.

The set is of the desk type (sloping panel), and is fitted into a substantial polished oak cabinet. On the panel are mounted the

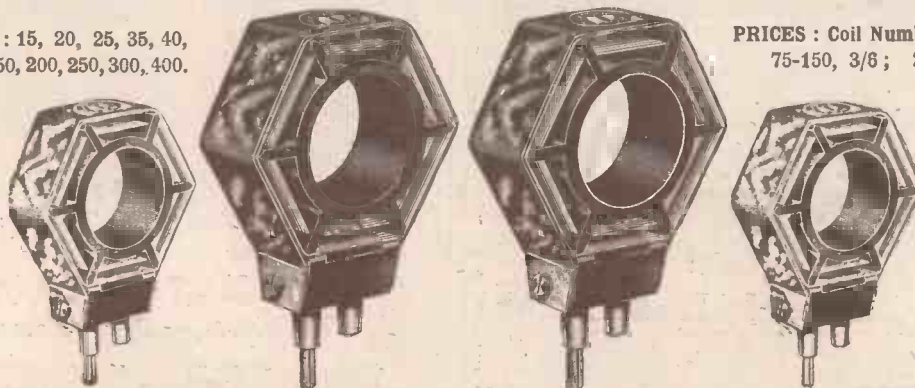
(Continued on page 684.)

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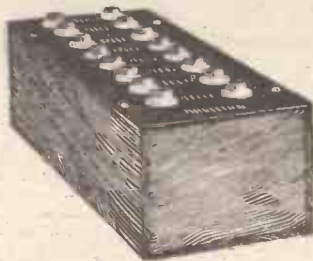
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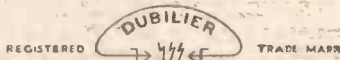
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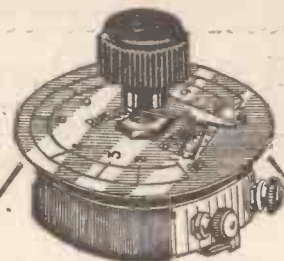
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(Continued from page 632.)

terminals, variable condenser dial with vernier control, Igranite filament rheostat, and valve holder. The coil holder is situated at the side of the cabinet, and is provided with a long accessible handle. Additionally, the connections to the coil holder are made by means of neat strips of springy metal. Thus both efficiency and permanency are assured, and this method of eliminating the quite usual unsightly flexes deserves special commendation.

Plug-in coils are used with the Graves 1-valver, and two Igranites covering the lower broadcast band are supplied.

All the components employed are of first-class quality, and include such items as a "Utility" square law, low-loss variable condenser, "Aermonic" coil holder, low-loss pattern, etc. The accessories are good, too. Messrs. Graves evidently did not consider it a worth-while proposition to economise in this direction, for such items as an Excide accumulator, Cosmos valve, General Radio headphones, and properly terminated battery leads are included. Undoubtedly the outfit represents excellent value for money for its parts alone.

It is well assembled and neatly laid out, and is distinctively handsome in appearance. The coil adjustment is delightfully smooth, and this is more pronounced owing to the leverage that the long adjusting handle provides. The movement is a lateral one, so that the weight of coils

employed in no way affects it. The condenser and filament resistances are equally both positive and smooth, and are free from backlash.

On test the Graves 1-valver gave excellent results, the adjustments being such that close tuning was easily obtainable. Signals were loud and clear, and the degrees of selectivity and sensitivity evinced were well up to standard.

THE SYLVEX PERMANENT DETECTOR.

Messrs. Sylvex, Ltd., 144, Theobald's Road, London, W.C.1, recently submitted one of their new permanent crystal detectors for test. It is of the double crystal type, and is somewhat similar to a small variable grid leak in size and shape. Brackets are provided for mounting it externally to a panel, although the device can be fixed in a single hole drilled in the panel if desired. It is provided with a plunger to enable fresh settings of crystal contact to be obtained should the detector's sensitivity become impaired for any reason.

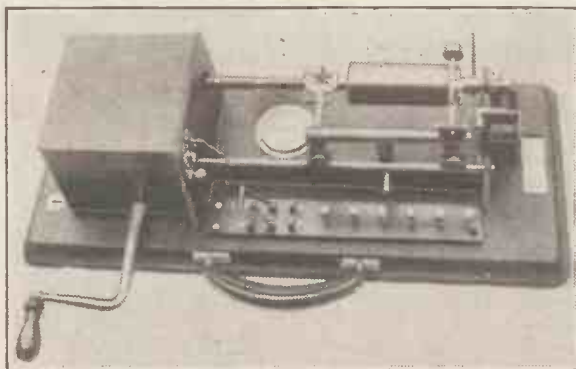
On test, this Sylvex component gave very good results indeed, and both in point of sensitivity and selectivity it proved to be equal, if not better, to any other we have had brought to our notice.

It is a neat, well-made little article, and is most reasonably priced at 2s. 6d. The plunger needs to be

carefully handled, and should be drawn out slowly, turned a little, and carefully released again, otherwise there is a risk of damaging the crystals. But we should not think that this operation has to be carried out very often, for the detector retains its sensitivity despite moderate mechanical vibration and fairly heavy inputs.

By the way, it is interesting to note that the Sylvex people have recently inaugurated a free gift scheme in connection with their Sylvex radio crystals. These are sold in two sizes: test size at 1/- and full size at 2/-.

With every 2/- size or two of the 1/- sizes is given a self-filling fountain pen of guaranteed British make. Personally, we consider the pen fully worth 2/-; it is handsome in appearance and is very pleasant to handle.



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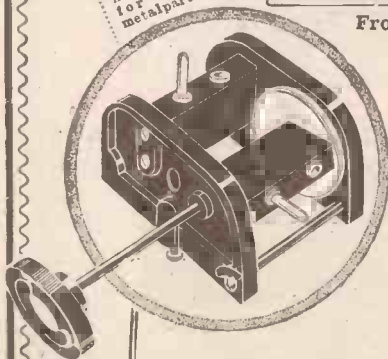
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In addition, it gives still more amplification and consumes very little H.T. current.

The S.P./B (Blue Spot) is an excellent valve for anode bend detection.

Designed to work in parallel with the S.P. 18 Red Spot and Green Spot Valves, it operates from a 2-volt accumulator and consumes only 0.09 amp. filament current.

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"Cosmos" SHORTPATH S.P.18 Valves are recommended for use as shown below with alternative H.T. values:

Stage	Coupling	Recommended Valves H.T. 20-80 V. 80-120 V.	
H.F. Amplifier	Tuned Anode (neutrodyne) Tuned Anode (not neutrodyne) Transformer (loose coupled) Transformer (tight coupled)	Green Green Red Green.	Blue — — —
Dual or Reflex	All Couplings	Red	Red
Detector (Grid Leak)	Resistance Coupling L.F. Transformer or Choke	Green	Blue Blue
Detector (Anode Bend)	All Couplings	—	Blue
L.F. Stages	Resistance L.F. Transformer or Choke	Green Green	Blue Green
Last Stage	All Couplings	Red	Red

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Increase Selectivity 100%. Give an auto-coupled tuning circuit without altering your set. You will cut out the local, or separate two difficult stations to an extent undreamed of. 5 terminals make it a Universal coil.

To introduce, a free chart will be given with each purchase, showing the many circuits in which this coil can be used—Auto-Coupled Neutrodyne, etc. No. 35, 4/6. No. 50, 5/-. No. 75, 5/6. No. 150, 7/6. Set of 4, 21/- Postage extra. Complete Catalogue of Sets and Accessories, 3d. stamps

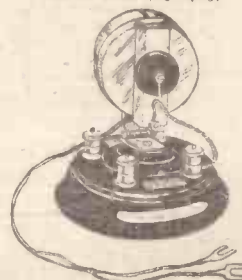
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Parr's Ad.

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(Patent No. 248581/25).

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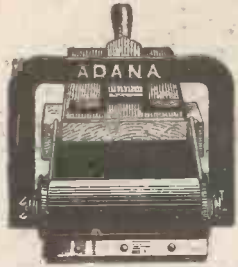
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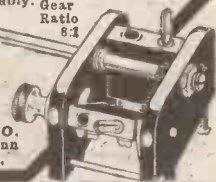


Patent No. 193150

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Special sizes made to order at slight additional cost.

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TRADE SUPPLIED

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As far as possible all advertisements appearing in "P.W." are subjected to careful scrutiny before publication, but should any reader experience delay or difficulty in getting orders fulfilled, or should the goods supplied not be as advertised, information should be sent to the Advertisement Manager, "Popular Wireless," 4, Ludgate Circus, London, E.C.4

RADIO TUTORIAL

All Editorial Communications to be addressed to The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

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The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

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

Readers' letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers. The envelope should be clearly marked "Patent Advice."

Questions and Answers

CRACKLING NOISES.

P. Q. (Stratford).—My set, which consists of one H.F., Det., and one L.F. (transformer coupled), has recently developed a loud crackling noise. To what part of the set do you consider I should look for the fault?

The trouble can be due to either a broken or faulty connection, a burnt-out L.F. transformer winding, or to one of the cells in the H.T. battery deteriorating. In the first case we advise you to carefully examine all soldered joints in the set, as it is probable one of them has gone "dry," although to all outward appearances it will look "O.K."

If the wiring is found to be sound the H.T. battery can then be tested with a voltmeter both in sections (so many volts at a time) and as a whole, as in this way any cell that may be at fault can be traced.

Should this also prove to be sound, we suggest you test the L.F. transformer windings for continuity.

Usually if any winding is faulty it is the primary (through which the anode current passes). The windings can be tested by means of a pair of 'phones and a 44-volt flashlamp battery joined in series, or by any other method as outlined in "P.W." at various times.

We advise you not to forget to examine also all coil and valve legs and sockets, as these will also cause trouble if they are not periodically cleaned and adjusted,

TECHNICAL QUERIES.

Letters should be addressed to: Technical Query Dept., "Popular Wireless," The Fleetway House, Farringdon Street, London, E.C.4.

They should be written on one side of the paper only, and **MUST** be accompanied by a stamped addressed envelope.

Queries should be asked in the form of the numbered questions: (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.

For every question asked a fee of 6d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the numbers. (It is not possible to reproduce the question in the answer.)

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

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

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

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

Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)

Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1s. per diagram, and these should be large, and as clear as possible.

No questions can be answered by 'phone. Remittances should be in the form of Postal Orders.

ANODE VARIABLE CONDENSERS.

P. A. (Tonbridge).—What capacity should the variable condenser across the anode coil be?

Any capacity between .0001 and .0003 can be used, the latter capacity now being the most popular. It is important to remember, however, that in the case of a coil in the plate circuit of an H.F. valve, the smallest amount of capacity and the largest amount of inductance are required. Consequently, if you can use a variable condenser of the former capacity (.0001) and use a suitable coil for each small band of wave-lengths you are advised to do so.

This method, while entailing the use of a larger number of anode coils for the B.B.C. band of wave-

IMPORTANT

All communications to the Query Department **MUST** be accompanied by a stamped addressed envelope.

Before posting your Query, carefully read the rules at the head of this section.

"A question properly asked is half-answered."

lengths (you would require coils of about 50, 60 and 75 turns) is more efficient than using a larger capacity condenser with only one coil.

In the latter case the condenser covers a wider band of wave-lengths, but does not do so quite as efficiently as a larger coil and smaller condenser.

(Continued on next page.)

RADIOTORIAL QUESTIONS & ANSWERS.

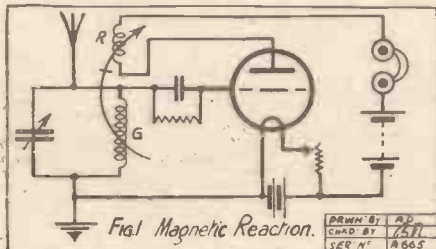
(Continued from previous page.)

REACTION.

B. L. A. (Clacton-on-Sea).—What is the difference between magnetic reaction and static reaction?

In both cases the essential function is to feed back some of the plate-circuit energy into the grid circuit.

Fig. 1 shows how this is accomplished magnetically, by connecting a reaction coil (R) in the anode circuit



of the valve, and coupling it to the tuned coil (G) which controls the grid.

As weak currents from the aerial influence the coil (G), they operate the valve, and similar but stronger currents are set up in (R). When G and R are

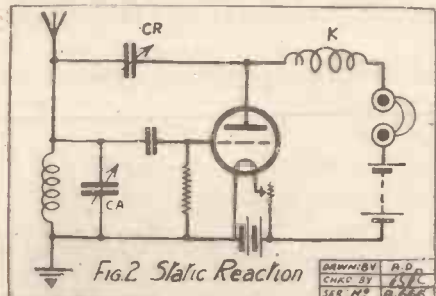
For the Constructor

No. 7.—HOW TO SOLDER.

1. Clean the joint to be soldered with a file or emery-cloth, and smear a small quantity of flux over the cleaned surface.
2. Remove the iron from the flame and file the tip until its surfaces are bright.
3. Dip the cleaned tip of the iron into a shallow tin containing some flux and pieces of solder. This "tins" the iron ready for use.
4. Heat the iron in a gas flame or clear fire until the flames appear slightly green.
5. Apply the iron, on the tip of which a piece of solder has been melted, and thus "tin" the wire to be soldered.
6. Hold the wires to be joined in position and heat the tinned surfaces of both with the iron, applying more solder if necessary.
7. Thoroughly wipe the joint with a clean rag immediately after soldering, to remove all traces of flux.

placed close together the magnetic field around the latter assists the weak aerial impulses (provided the R coil is connected round the right way), and the amount of this increase is regulated by the distance between the two coils.

Static reaction has the same effect upon weak signals flowing in the grid circuit, but in this instance the coil R is removed, its place being taken by a large



inductance coil (K), which acts as an H.F. choke. (See Fig. 2.)

Instead of the magnetic coupling between coils the anode-circuit energy is fed direct to the grid circuit by the reaction-condenser (CR), which provides what is known as a static coupling.

The amount of energy transferred back to the grid is in this instance regulated by the area of the condenser-plates which are placed in circuit, so that a good variable condenser gives a very exact control over reaction.

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TUNGSTONE High Tension 60 Volt Battery 3 a.h. is sold in the United Kingdom on monthly payments over extended period. Apply for particulars. Further interesting information on points of this advertisement are to be found on pages 58, 59, and 67 to 73 of the Illustrated Booklet "Photography tells the Story" which will be sent free on application to the Tungstone Accumulator Co., Ltd., St. Bride's House, Salisbury Square, Fleet Street, London, E.C.4.

T.40

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Phones rewound and remagnetised, 4/6 per pair. Remagnetised only, 2/-. Loud Speakers and Transformers rewound. Glass jars for making up wet H.T. units, waxed, 1/3 doz.; plain, 1/-. Post extra. The H.R.P. Co., 46, St. Mary's Road, Leyton, E.10.

TRITRON VALVES Why pay 14/- for Dull Emitter Valves? Special 14-day offer of the wonderful Tritron Dull Emitter Valves. 2 amp. 2 volts, 5/6. .06 amp. 4 volts, 6/6. Power Valves, 10/6. Post free. Cash refunded if not satisfied.—H. E. NICHOLLS, 29-30, Trinity Square, London, E.C.3.

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There are a thousand bargains to choose from in our Latest Catalogue. A Copy sent you Post Free for 4d. stamps.

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TECHNICAL NOTES.

(Continued from page 670.)

results and it is surprising that quite appreciable leakage currents are obtained in many cases where the current should be entirely negligible. It seems that this trouble of leaky bases is much more common than is usually suspected.

Another point that has been brought out in this correspondence is that the packing material, used by the makers to pack the valves, sometimes accounts for some of the leakage. Fibrous material, for example, leaves "hairs" entwined between the valve pins, and these, being hygroscopic, soon act as quite fair conductors of electricity.

Some Curious Effects.

Mr. W. H. Watkins, of Willesden, describes an experience which he had with his set which, although in its general form common enough, seems to have one or two peculiarities which may provide food for thought for other readers—who may care to provide the explanation. He found that, on touching one of the transformers with the hand, the 'phones being on the head but not connected to anything, he could hear the music—this, of course, is a well-known experience. Again, on touching a connection from the anode, the other conditions being the same, the same result was noticed. Shunting the 'phone leads together made no difference. On touching the H.T. positive lead, he could hear nothing.

Some of these observations appear to be a little at variance with one another, but I give them to you as they are given to me.

Screening in Buildings.

I had an interesting and striking example of the effect of "shielding" due to a building the other day, which was so pronounced that I think it may be worth describing, as I am sure many people regard the belief that different buildings differ in their "radio properties" as something of a myth—if not, indeed, frequently an excuse for poor performance of an otherwise perfectly good set.

The set I was using was a portable self-contained model, and the place was the office of a friend in the City, about three miles, I suppose, from 2 L O. The set, which works beautifully in most situations, would hardly give any result at all and the diminution in the reproduction seemed altogether too great to be accounted for by anything such as shielding. After the usual overhaul, however, it was decided to take it out upon a balcony outside the window, and here it was found to work, not perfectly, but at any rate very much better than within the room. And now the curious thing was noticed. The set was carried—whilst still operating—from the balcony into the room, and as it was moved, the reproduction rapidly diminished in volume; on returning the set to the balcony, the volume increased in a corresponding way. The effect was most striking, and resembled that which is obtained when the external frame aerial of a portable set is rotated. It left no doubt at all as to the question of my friend's office being very badly "screened."

If there is anything in this or any other issue of "Popular Wireless" that you DO NOT LIKE, please let us know what it is when you write.

CORRESPONDENCE.

(Continued from page 662.)

I often use the gas-pipe as an aerial, using no earth connection, and have bagged most of the stations from Birmingham to Barcelona by this method, the receiver being a single-valve Reinartz. The same arrangement gives excellent L.S. reception from 6 B M and 5 X X, there being a pleasing absence of atmospherics. Reception may be carried on with perfect safety during a thunderstorm, the outside aerial being earthed. A straight 3-or-4 valver is used on this job.

Yours faithfully,

H. BRAITHWAITE.

53, St. Catherine's Road,
Southbourne, Bournemouth.

DX DURING THE SUMMER.

The Editor, POPULAR WIRELESS.

Dear Sir,—We hear a lot about the difficulty of DX reception in the summer months. On my home-made three-valver I have received the following stations this summer: Eiffel Tower (2750 and 2640), Berlin (2525), Radio-Paris, Daventry, Berlin (1300), Geneva, Hilversum, Zurich, Aberdeen, Brussels (487), Lyons (la Dona), Birmingham, Toulouse, Belfast, Glasgow, Munich, Breslau, Munster, Newcastle, Hamburg, Madrid (Iberica), Dublin, Bournemouth, Oslo, Manchester, London, Petit-Parisien, Cardiff, Nuremberg, Edinburgh, Nottingham, Hull, Berne, Stoke, Seville, Lyons (Radio-Lyon); i.e. a total of 36 stations. All these were received before 9.30 p.m., in daylight. Besides these, many amateurs have been received on various wave-lengths.

Hoping this may interest some of your readers.

Yours faithfully,

Great Horwood Rectory, ARTHUR D. FINCHAM.
Winslow, Bucks.

AN EFFICIENT WAVE-TRAP.

The Editor, POPULAR WIRELESS.

Dear Sir,—I wish to thank you and your paper which has given me a wave-trap that is capable of cutting out the local station. I first made up the Trinadyne two-valver, which I found was a powerful DX worker and a fine loud-speaker circuit; then your H.F. Trinadyne amplifier came along, which I also constructed. It fetches up those remote stations, and as a wave-trap I cut London out and get Bournemouth, Manchester, Birmingham, and four foreign stations within a small scale on the dial. Speech from any of the above stations quite loud and uninterrupted from London. No loss in signal strength through use of wave-trap. Thanking you once again for your wonderful circuit.

Yours faithfully,

17, Henning Street,
Castle Street, Battersea, S.W.11. P. E. GRIFFIN.

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THE Rheostat which ensures fine adjustment of current to filament saves the life of your valves and enables you to enjoy the full volume of possible reproduction. Your Set needs an Anodon Rheostat.

With solid Bakelite Knob 3/9
With cold-moulded
Tapered Knob 2/6

The Anodon Coil with its unique plug and perfect insulation leaves no loophole for H.F. losses, and because of its low self-capacity, covers an unusually wide band of wavelengths.

Sizes . . . 25 — 300
Price . . . 2/6 — 6/- each

Special 2 Megohm Hard Rubber Grid Leak. Price 1/8 each.

Anodon

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Re-wound & re-magnetised 5/- per pair. Loud Speakers repaired 5/-. Transformers re-wound 5/- each. All work guaranteed and tested before delivery.

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Headphones, Loud Speakers & Transformers re-wound, remagnetised, and reconditioned

EQUAL TO NEW

and returned the same day on C.O.D. system. The unsolicited opinion of one of our many satisfied clients—"all I can say is, they are better than when new."

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H.T. Accumulators

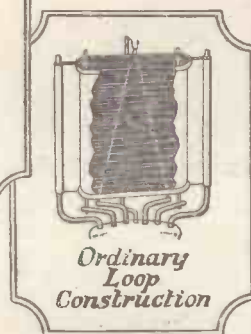
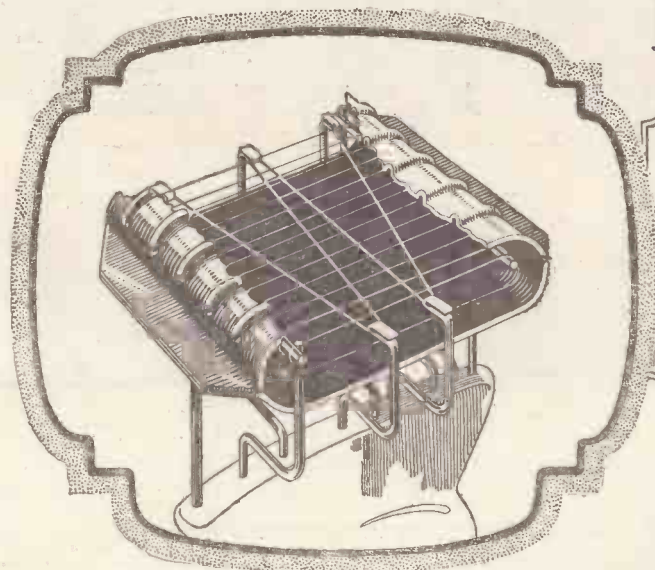
60 Volts 37/6
3 Actual Amp-hour



SOLD ON APPROVAL SYSTEM.
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have constructional features
but only P.M. Valves have the
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Which valve construction gives you the most for your money

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Is supported by 5 strong but resilient hooks. Cannot be broken except by the very roughest handling.

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Wastes no heat by glowing.

Is free from microphonic noises.

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ASK YOUR RADIO DEALER FOR THE VALVES WITH THE P.M. FILAMENT.

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THE P.M.4 (Power) 0.1 amp. 22/6

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THE P.M.5 (General Purpose)

0.1 amp. 22/6

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THE P.M.1 (General Purpose)

0.1 amp. 15/6

THE P.M.2 (Power) 0.15 amp. 18/6



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4 Steps to Better Radio

R.I. Components will do more than any others to help you with your set building. They not only make the actual construction easier, but they go a long way towards ensuring the most satisfactory results. There is a reliable R.I. Product ready for each successive stage of your set, ready to give perfect results in the capacity in which it can be used.

Let us commence with The R.I. Permanent Mineral Detector. Here we have a crystal detector absolutely permanent and unaffected by vibration. No cat-whisker is employed, a spring plunger maintains the correct pressure on the crystal, which is sensitive throughout its area, making it unnecessary to search for special sensitive spots.

Manufactured in two different forms—standard pattern, with supporting clips for mounting either above or below the panel, and one-hole fixing pattern with detachable ebonite cover, which protects the adjusting knob when in position.

PRICES

Standard Pattern	6/-
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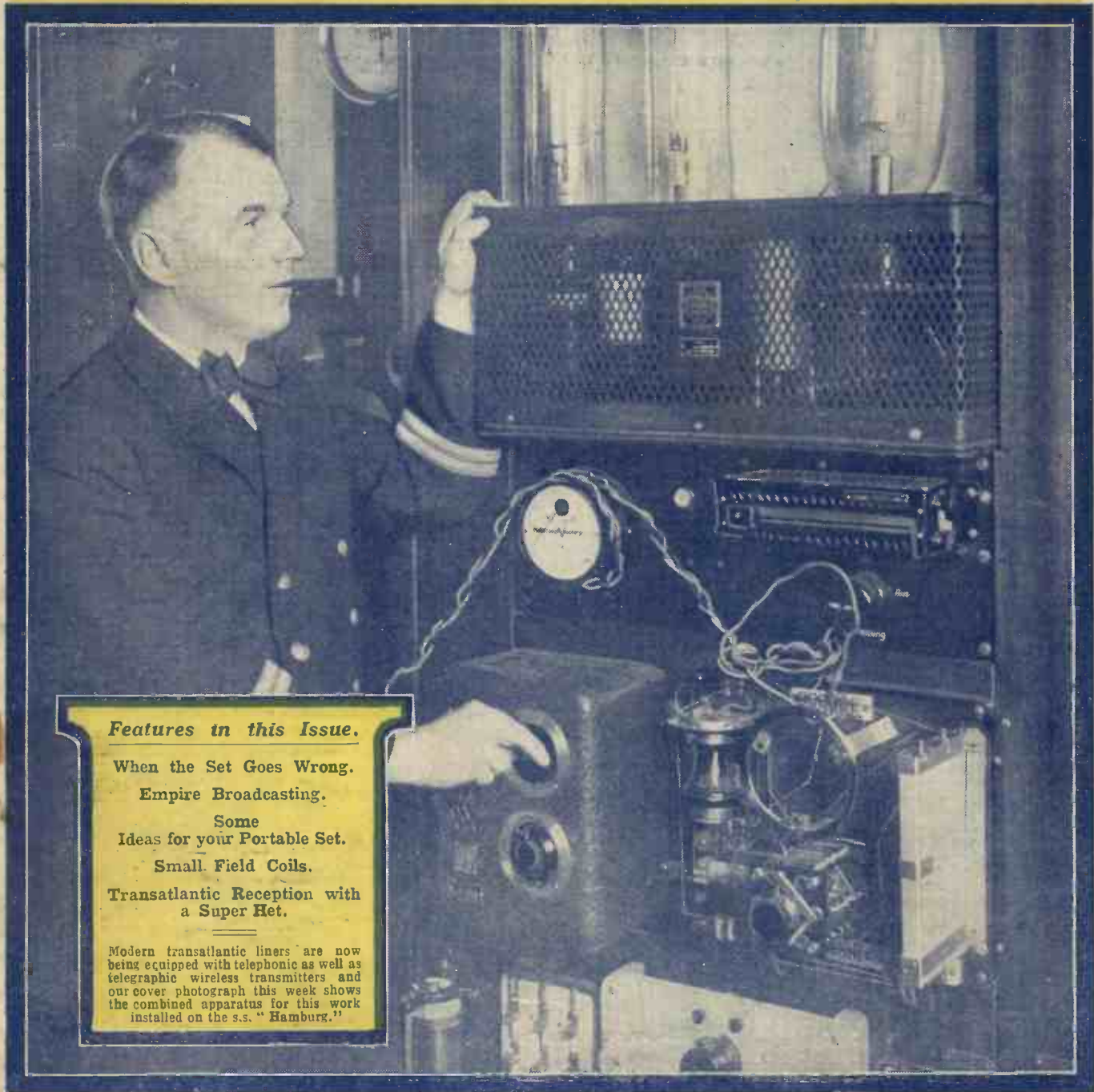
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No. 215. Vol. IX.

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

July 17th, 1926.



Features in this Issue.

When the Set Goes Wrong.

Empire Broadcasting.

Some

Ideas for your Portable Set.

Small Field Coils.

Transatlantic Reception with
a Super Het.

Modern transatlantic liners are now being equipped with telephonic as well as telegraphic wireless transmitters and our cover photograph this week shows the combined apparatus for this work installed on the s.s. "Hamburg."

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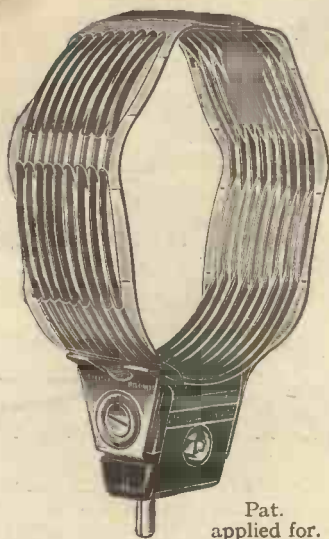
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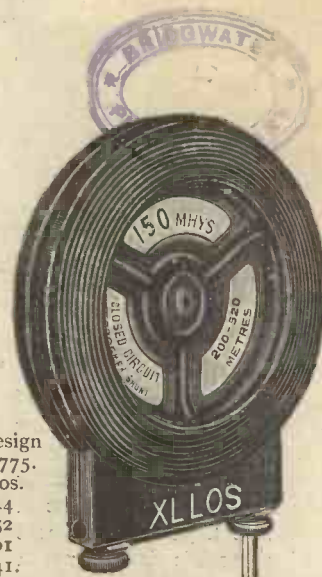
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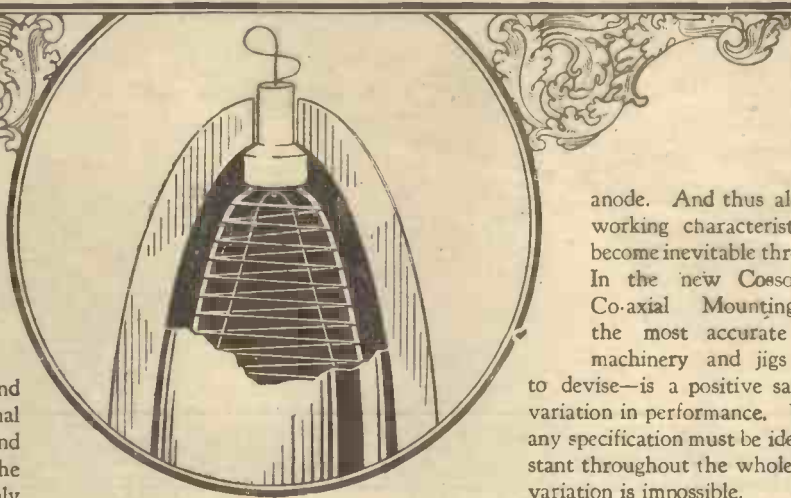
—Filament, Grid and Anode are now secured at top and bottom in the new Cossor Point One

ONCE again Cossor has blazed a trail in Valve design. First in 1922 with an arched filament operating within an electron-retaining hood-shape Anode system—first in 1924 with a triple-coated filament producing a prolific electron stream at a phenomenally low temperature—and now first in 1926 with a constructional system which automatically aligns and secures the filament, grid and anode at the top as well as at the bottom. The only valve in which the elements are fixed in three distinct positions.

The principle of Co-axial Mounting is not new. In fact, it has been the ultimate goal of every valve manufacturer since the invention of the three-electrode valve. But for years the difficulties proved insurmountable until Cossor—by reason of the peculiar advantages afforded by the hood-shaped Anode—was able to perfect a method sufficiently robust and accurate.

Co-axial Mounting ensures greater uniformity

The Cossor system of Concentric Mounting possesses far reaching advantages. In the first place, it ensures absolute uniformity of characteristics for all valves made to a certain specification. Experienced wireless enthusiasts know that in the past—in spite of the most critical manufacturing supervision—it has been difficult to prevent variations between valves of the same class. Two valves—identical to the eye—might give varying performances owing to minute differences in the spacings of the internal elements. Even if complete uniformity were possible in the factory, the wear and tear of everyday use causes changes in the relative positions of the filament, grid and



Sectional view of the elements in the new Cossor Point One

In the above illustration a section of the Anode is cut away in order to expose the grid and the filament. Observe the seonite insulator which securely holds in position the grid and the anode. To all intents and purposes this insulator becomes an integral part of these two elements—the slightest individual movement of either of them is quite impossible. Through the centre of the insulator is passed the fine wire which retains the filament in position. Thus—come what may—even the hardest shock cannot disturb the exact relative positions of the filament, grid and anode.

anode. And thus alterations in the working characteristics of a valve become inevitable throughout its life. In the new Cossor Point One, Co-axial Mounting—backed by the most accurate and sensitive machinery and jigs it is possible to devise—is a positive safeguard against variation in performance. Valves made to any specification must be identical and constant throughout the whole period of use—variation is impossible.

The supreme importance of this will be at once obvious to users of Neutrodyne Receivers employing two stages (or more) of matched high frequency amplification.

Tests prove a great increase in life.

A further tremendous advantage of this new system of construction lies in its shock-proof filament support. Whereas in many valves the filament, being straight, is retained under tension and is therefore subjected to considerable mechanical strain, that used in the new Cossor Point One is arched and retained in position by a fine wire passing through a seonite insulator.

It is not kept under tension and the sole object of the fine wire support is to hold the filament in position and to permit the slight elasticity necessary should the valve be dropped or otherwise subjected to accidental rough usage.

A series of tests—far more rigorous than any conditions under which the Cossor Point One would normally be used—has proved the complete efficacy of this new shockproof filament system. A concussion which caused an immediate fracture of the filament in an ordinary valve was easily and harmlessly absorbed by the filament in the Cossor Point One.

The new Cossor Point One

Red Top: For H.F. use 15/6 (Consumption '1 amp.)

Plain Top: For Detector 15/6 (Consumption '1 amp.)

The New Cossor Stentor Two

Green Top: For power use 18/6 (Consumption '15 amp.)

All operate at 1'8 volts.

Cossor Valves

—The new Dull Emitters with the long-life '1 amp. filament.

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RADIO NOTES AND NEWS.

A Lusty One-Year-Old—Dublin's Duplicates—Bands Across the Sea—Radio on the Rocks—Triangular Trans-world Talk—Wireless Whalers.

Michael Faraday.

NOT everyone who buys a condenser of so many microfarads knows that the unit of capacity gets its name from Michael Faraday. This great electrical scientist was the son of a Southwark blacksmith, and I am pleased to hear that it has recently been decided to erect a monument to him in his native place.

A Lusty One-Year-Old.

I AM sure all listeners will join with me in wishing "Many Happy Returns of the day" to the Daventry station, which will celebrate its first birthday upon July 27th.

5XX is a very fine station, and in the past year it has won for itself a unique place in the affections of listeners all over Europe. Everybody likes Daventry—I think it's because of the cheerful way it gets up early in the morning for those 10.30 a.m. concerts, and then merrily works away till there isn't a dance band left to listen to. How can you help liking a big, cheery-voiced, energetic chap like that?

Dublin's Duplicates.

THE Dublin station has had to stand up to plenty of criticism since it was erected a few months ago, but evidently it is really a success. The proof of this is that three additional broadcasting stations are now contemplated for the Irish Free State. The Minister of Posts and Telegraphs recently announced that one of these would be a super-station, with a power output greater than that of Dublin.

Bands Across the Sea.

RUMOURS that the B.B.C. had planned a short-wave station so that the Colonies and Dominions could pick up British broadcasting have now been

officially denied. I suppose it is hardly within the province of the B.B.C. to provide such programmes for our overseas friends. But why can't the Government, through the P.M.G., arrange for the B.B.C. to do it? The good effect of such a move would be incalculable, and the more one ponders the plan, the less objection one can see to it. "Hands Across the Sea" is all right, but "Savoy Bands Across the Sea" beats it.

"Milestones."

MR. Edward Knoblock, joint author



Sir Gerald du Maurier before the microphone at the London station.

of "Milestones," is very interested in R. E. Jeffrey's broadcast version of the work, which is being relayed to all stations today, July 15th.

This delightful piece was first produced by Dennis Eadie in 1912, at the Royalty Theatre.

Hearing Erin.

MR. W. R. BURNE, who operates the Irish amateur transmitting station, GW-15 B, tells me that he will be pleased to forward QSL cards, etc., to Irish experimenters from enthusiasts in this country. Cards should be addressed to

the station's call sign, c/o. "Irish Radio Journal," 34, Dame Street, Dublin.

A Boom in Beams.

THE ether will soon be filled with the voices of many new stations, getting ready for the big broadcasting boom that sets in in September.

Other interesting tests now going forward are those of the Empire "beam" stations, preparing for the winter's telegraphic traffic. The Bodmin and Bridgwater stations will soon be beaming away at Canada for all they're worth, and once the system is going the other stations in the Empire chain should link up quickly.

Radio on the Rocks.

WIRELESS works for mankind in many ways—firing fog signals is the latest. On dangerous rocks, where it is impossible to provide a lightkeeper, unattended lighthouses or fog signals are being erected, which can be switched on or off by radio. The first permanent one is at Roseneath Beacon, in the Firth of Clyde. Here one of these installations was put in experimentally six months ago, and it

has been so successful that further trial is now considered unnecessary.

A Two-Valve Tour.

THAT little short-wave set which G2OD described in "P.W." some months ago is giving splendid results all over the world. Among others, one South Australian reader built it, and in a letter to G2OD he says:

"It is sure F.B. ("fine business"), having received all Australia, New Zealand, U.S.A., Canada, Mexico, Chile, Argentine, Cuba,

(Continued on next page.)

NOTES AND NEWS.

Continued from previous page.)

Japan, Philippine Islands, South Africa, France, and Great Britain."

Pretty good travelling for two valves, isn't it?

Home to Roost.

A CURIOUS coincidence in connection with this particular set was the fact that right out there in South Australia it picked up its author. As mentioned above, the set was designed by G2 Q D (Mr. E. J. Simmonds, of Gerrard's Cross), who described it in "P.W." It was built in Australia by a "P.W." reader, from the description in this journal, and it promptly tuned in signals from the very station in England at which the set was designed and described!

Radio Fog Beacons.

SEVEN new wireless direction-finder stations have just been established upon the Great Lakes, where shipping has been greatly hampered in the past by fog.

America is now experimenting also with a low-power radio beacon on Long Island Sound. Many fatal accidents to New York's shipping have occurred here, and the beacon is an attempt to safeguard life in the Sound.

A-Schnell Circuit Unidyne.

THE many inquirers who have asked "Why not a short-wave Unidyne?" will hear with interest of fresh attempts in this direction being made in South Africa. The S.A. experimenters are keen short-wavers, and one of them has now worked out a Schnell circuit Unidyne, which is already giving some very promising results.

Germans and Short Waves.

THE German wireless station at Nauen has been experimenting with short-wave telephony for some time past, on a wave-length of 40 metres, with a power of ten kilowatts. Amongst the successes scored are conversations with Japan and with Buenos Aires.

The Pilot Boat.

ABOUT twelve months ago the Persian Gulf authorities equipped five of their harbour vessels with wireless telephones. Each has a wireless bell, which calls up when the vessel is wanted, and then the set can be used to talk, just like an ordinary telephone.

Each vessel can talk to all the others, the range for speech being about 50 miles, whilst telegraphy can be worked up to 150 miles or more. The installations are known as the Marconi YB Type—and pilots in other parts are asking, "Y B without one?"

Triangular Trans-World Talk.

THE late-lamented Euclid, Esquire, would have been very interested in amateur radio, for it embraces triangles undreamt of in his philosophy. A striking three-way three-Continent talk recently took place between Wickford (Essex), New Zealand, and the U.S.A., the stations concerned being G—2 L Z,

1—A A O, and 4—A M. The American suggested the triangle, because he found that he was receiving excellently from both Britain and New Zealand. It was a huge success.

"Since Hector Was a Pup."

THE British station heard the American suggest to the New Zealander that he should call England and all have a three-way chat. A moment later the call came through from the Antipodes, and then conversation became general, to the delight of the American. He was a cheery soul, and slangily remarked, "Heard all from both of you fine. I get some kick out of this; the best fun I've had since Hector was a pup!"

In the Studio at Eighty!

WHEN Sir Harry Lauder was broadcasting from London on July 3rd, there sat in the studio a very appreciative listener, who is eighty years of

SHORT WAVES.

"To-day the world cannot do without radio, just as it cannot do without electricity, and the motor-car."—Sir Harry Lauder (writing in the "Radio Times").

"There seems to be no reason why every sports club should not have its wireless."—A writer in "The Brown Budget."

"It is not proposed to introduce wireless concerts as a substitute for bands in any of the Royal parks."—Capt. Hacking (Under Secretary of the Home Office).

"Don't attempt to get on two valves all that your neighbours say they get on three."—Capt. Eckersley.

age! She is Mrs. Reith, of Dumfries, widow of a famous Moderator of the Church of Scotland, and mother of Mr. J. C. W. Reith, managing director of the B.B.C.

Radio and the Deaf.

GREAT interest has been aroused by the success of a Hull civil engineer, Mr. J. L. Calvard, in experiments to enable the deaf to hear. Apparatus which was installed at the Hull Deaf and Dumb Institute enabled 80 per cent of the audience of children to hear music and speech for the first time. Further experiments with the method are now being made.

The Wireless Whalers.

THE Marconi Co. is shortly despatching eight wireless telephone installations to the South Seas, where they are going a-whaling! An order has been received from the Southern Whaling and Sealing Co., Ltd., and the sets will be fitted to the company's whalers so that the various vessels can inter-communicate as they sweep through the deep looking for the finny monsters.

What are the Wild Waves Saying?

A THETFORD (Norfolk) reader, who has built a "P.W." One-valve Reflex set, tells me that he has tuned in twelve British stations on it, as well as Dublin, Radio-Paris, Hilversum, Berlin, Madrid, and Oslo. "Besides these, I get other stations, but I don't understand what they are saying," he writes.

I know what some people would say if they could only get results like these upon one valve and a crystal. ("Smarmvellous!")

Jazzing a Defence.

A NOVEL radio debate is announced for July 20th. Sir Landon Ronald and Mr. Jack Hylton are going to argue the case for and against jazz, and will back up the argument with blows (not the pugilistic, but the instrumental variety!). Sir Landon Ronald is going to use the B.B.C. orchestra to illustrate his arguments, and Mr. Jack Hylton's Band is going to bang and blow the jazz.

Broadcasting from the Parks.

THE London County Council Parks Committee has been investigating the possibilities of a municipal orchestra, which it was thought might provide relayed band-music for the parks.

Finding that Bournemouth, Eastbourne, and Manchester had all reported a loss upon their municipal orchestras, the proposal was turned down for the time being, but it will come up for discussion again in the autumn.

"One Moment, Please."

ACCORDING to the "Daily Sketch," a dear old woman—an enthusiastic wireless listener—is very disappointed that the B.B.C. did not figure in the Birthday Honours List.

She says she thinks her pet announcer, who says "Good-night" so nicely, ought at least to have had a good night-hood!

Music Lovers Should Not Miss—

AN organ recital from 2 L O, on July 24th, by the Organist of the Temple Church, London. This will be from the Royal College of Organists, Kensington Gore, and will include pieces selected for the January Diploma Examination.

Hoffman, one of the greatest living pianists, who is playing in the London studio at 9 p.m. on July 21st.

The series of organ recitals to be relayed from London each Friday during August. They will be by Mr. W. Herbert Hickox, Mus. Doc., F.R.C.O., Professor of the Organ, Guildhall School of Music.

Largest Loud-Speaker Set.

THE largest loud-speaker equipment in history figured in the Royal Air Force Pageant at Hendon, at the beginning of this month. There were twenty giant loud speakers, one hundred valves, fourteen miles of wiring, and thirteen banks of H.T. batteries, each of 350 volts.

The installation was in the hands of the Marconiphone Co., the H.T. batteries being special 24-volt Exide units, made by the Chloride Electrical Storage Co., Ltd.

Caracas Calling.

SOUTH AMERICA is now being badly bitten by the radio bug, the latest convert being Venezuela. A broadcasting station has been erected at Caracas, the installation and testing being successfully completed in May. The station is now working upon a power of 1 kw., using a wave-length of 375 metres.

ARIEL.

EMPIRE BROADCASTING



SOMETIMES England appears rather a rotten place when you have to live there year in and year out, probably in some dirty London slum, some forsaken village, or smoky factory town. And you sigh for the "great open spaces" of the Colonies.

But if you do gather up enough initiative to migrate to the "great open spaces," above mentioned, do you stop sighing? Not a bit of it.

Memories, now, are for the dear, dirty London slum, and beloved smoky Wigan, a trifle dirty, perhaps, but it was England—your England.

Overcoming Atmospheric.

Menfolk of this generation, perhaps more than any other, will understand the emigrants' longing for the Motherland. Flanders mud and African desert made Blighty seem a land of beauty and a joy for ever to them, or nearly so. And this brings us to Empire broadcasting. For what is more likely to alleviate the longing of the emigrant for a sight or a sound of England, than broadcasting?

Broadcasting, that is, straight from home—no bottled stuff, but the real goods—obtainable on his little set in the Canadian backwoods or under the Australian sun. Listening to the cries of the London streets, the noise of the traffic in the Strand, or the nightingale in the Surrey woods, what would this mean to the emigrants?

What are the possibilities of such a broadcasting scheme to supply the Empire? Is it a practical proposition?

Undoubtedly it is. Empire broadcasting could be in existence two years from now if the money were forthcoming. What it means principally is a link of high-power transmitting and receiving stations at various points in our Colonies and Dependencies.

Take, for instance, the new high-power station at Rugby. With stations of this power or less, at various points throughout the Empire, say one in Egypt, in India, in Canada, and in Australia, concerts could be radiated to and via these high-power stations, and picked up and re-broadcast by the local broadcast stations of the various countries concerned.

For example, the programme from London could be sent by landline to Rugby and then broadcast. From Rugby the music could be picked up by a powerful

* An Interesting Article on Simultaneous Broadcasting Round the Earth. *

By G. H. DALY.

receiving station situated near the mouth of the Nile. Owing to the power of Rugby there should be little difficulty in obtaining signals strong enough to be heard above even the worst atmospheric disturbances, if some of the more efficient but complicated atmospheric eliminators were used at the receiving station.

Critics will at once say that it is impossible to cut out these chronic Eastern atmospheric of the variety heard about October. But experience which the writer has had of the Eastern brand, leads him to believe that, given a sufficiently powerful

this time to be picked up by a powerful receiving station in Cape Town in the case of South Africa, and Bombay in the case of India.

From these receiving stations the concert would be carried by landline to the various local broadcasting stations in South Africa, and again re-broadcast. In the case of India another high-power transmitting station, some distance from Bombay, would radiate the music across India, and places like Calcutta and Madras would pick it up and re-broadcast it via the local stations.

Another high-power transmitting station in Ceylon, with its attendant receiving station some forty miles away, would deliver the goods to Northern Australia, where another high-power station would force the stuff across that continent to Southern, Eastern and Western Australia, where it would be picked up by such places as Perth, Melbourne and Sydney, and again re-radiated from the local broadcast stations.

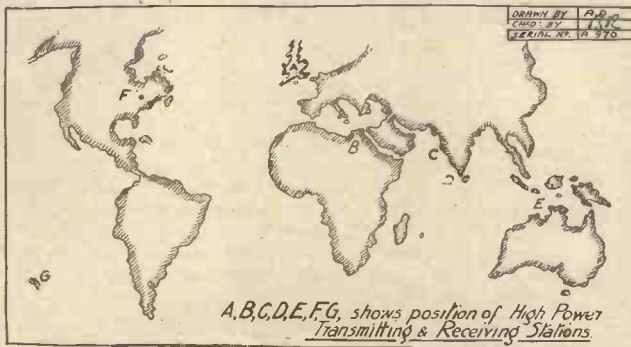
The high-power station in Northern Australia could be relied upon to supply New Zealand, where a receiving station in Auckland would S.B. the programme to the local broadcast stations via landline.

Annihilating Space.

Regarding Canada, only one high-power station, say at Montreal, would be required; the receiving station for Rugby being, of course, on the Eastern coast.

The total cost would probably be in the region of seven million pounds, rather a large sum. But to a country which spent over a million a day on the war this sum is very little compared with the good such a scheme would accomplish in fostering Empire trade, knitting the peoples together, and making the Empire more united and affluent.

Empire broadcasting is merely the beginning of the annihilation of space and time which science is just commencing to make possible. Some day, no doubt, television will be in use and we shall be able to travel at speeds undreamed of today. Year by year the world becomes more thickly populated. In time the most remote but habitable places will be well populated, and for this reason alone Imperial broadcasting should be considered now. For assuredly it will prove a mighty Empire builder.



A, B, C, D, E, F, G, shows position of High Power Transmitting & Receiving Stations

signal—and Rugby is certainly capable of doing that in Egypt—the atmospheric could be cut down to such an extent as to be unnoticeable, provided an efficient static eliminator is used in the hands of an expert.

A Suggested Scheme.

Perhaps a more simple way would be to fit the receiving station with directional underground antenna, similar to that used on some American high-power commercial station, and atmospheric elimination is a comparatively simple matter with this type of aerial; and it is quite efficient for reception purposes.

On being picked up at the receiving station in Egypt the broadcast matter could be amplified and corrected, and then relayed by landline to a high-power transmitting station, say at Cairo, where the same programme would again be radiated,

CHALIAPINE AND BROADCASTING.

The Opinions of a World-famous Singer.

By "ARIEL."

BEHIND the immense curtain that hides the stage from the audience there was hardly a sound. In the great auditorium a hush of expectancy had descended on the hundreds of people all gazing expectantly towards the foot-lights. Never was any theatre so quiet.

There is a peephole in the curtain at the Opera House, Covent Garden, and one minute before the curtain was due to rise on the first act of "Il Barbiere di Seviglia" the peephole was blocked by an eye staring out into the dim auditorium.

Feodor Chaliapine turned to me, and said: "But it's marvellous. Everyone is in his place. The theatre is silent. What a wonderful audience! This could only happen in England!"

Tribute to English Audiences.

When I again saw Mr. Chaliapine later in the evening at his hotel, he was still proclaiming his enthusiasm for British audiences.

"I have never appeared before such a wonderful audience. Their behaviour is a thing I shall never forget. It was all so perfectly organised. That is why I like English things; there is so much good organisation about things over here, especially so, I notice, when connected with the theatre and art."

Feodor Chaliapine is a very tall, athletic-looking man. His personality is so dominant and compelling that one forgets everything else when one is talking to him.

When I saw him he was dressed in a blue velveteen jacket and tennis shirt. His neck was bared. His snow-white hair was touzled, and those sympathetic blue eyes were smiling happily. He looked a picture of health; he was bubbling over with vitality. It was incredible to think that this same man was the greatest Mephistophele the stage has known.

"Well," said M. Chaliapin, waving me to a comfortable armchair, "*parlons de la téléphonie sans fil.*"

America's Amateur Talent.

And so we talked on and on in French till the time came when we had to part. Before we parted this is what he said to me:

"Ever since broadcasting came into its own it has provided me with a great deal of enjoyment.

"Its possibilities are tremendous and startling. I am almost alarmed when I think of the world of a hundred years hence with broadcasting as one of its greatest powers. In the same vein I should be very depressed to imagine the world of to-day without wireless.

"I have my likes and my dislikes: I like wireless, and there is very little about it that I dislike.

"As an entertainment, I think it has a very bright future, a future which apparently is not yet realised to the full.

"In my opinion England has made more progress than any other country in wireless

matters. I do not like the way broadcasting is run in America. The entertainment is of poor quality, as the American stations, owing to their reduced budgets, have to rely mainly on amateur talent. Amateur talent, however good, never comes anywhere near professional talent.

2 L O's "Wonderful Organisation."

"I think that the broadcasting organisation in England is excellent. I had the pleasure of singing for my great wireless audience at Savoy Hill last year, and my success was a financial as well as an artistic one.

"The wonderful organisation at the London station amazed me. Although it was the very first radio performance I had given, I was not in the least nervous. At first I had feared the padded and curtained rooms. I was astonished and agreeably surprised to find how easily everything went. I was made very welcome at the B.B.C., and my only regret is that it was not again possible for me to broadcast on this visit.

"I find very little fault with broadcasting. The artiste is alone and comfortable, and therefore in a position to give his best.

"There are some people who think that beautiful singing and music loses a lot by being broadcast. I am not one of these. I do think, however, that the effect on the

listener is not quite the same as if he were sitting in a seat at the theatre.

"The greatest drawback, to my mind, is the fact that the scene, the atmosphere, is missing. Sitting by the fire with the headphones on or by the loud speaker, one has to imagine all these things.

"Broadcasting is largely a thing of imagination. The better one's imagination the better one appreciates the programmes. If your imagination can run to moonlit African deserts when you hear the beat of tom-toms you will enjoy your entertainment all the more than if you could only see the raindrops on the window-pane.

"Of course, broadcasting to a certain extent is still mechanical; it has still the same disadvantages as a gramophone. But it is all the more enjoyable because you know the flesh and blood of the entertainment is actually behind the microphone.

"Personally, I prefer hand-sewn materials and clothes to machine-made. It is the same with wireless. There are some who will always—no matter how perfect broadcasting becomes—prefer the actual, real thing to the mechanical reproduction of the real thing.

"I Do Not Dislike Jazz."

"I often listen to wireless programmes; they are always a source of enjoyment and mystification to me. I am very glad to see that quite a generous part of wireless programmes in England is devoted to good music and opera.

"On the other hand, quite a large part is given over to jazz. I do not dislike jazz. It is entertaining and amusing as well as being melodious, so one can forgive its sometimes exaggerated eccentricity.

"I would like to take this opportunity to thank the many radio enthusiasts who are readers of POPULAR WIRELESS who write to me. I am deeply grateful for their kind messages, and please tell them if I could broadcast more often I would. . . . *Mais malheureusement ce n'est pas possible. Alors au revoir et — a bientôt!*"



An efficient crystal set constructed by Mr. F. J. Griffin, Lloyd's Bank House Kineton, Warwickshire.

NEXT WEEK!

Full constructional details will be given concerning a

"SHARMAN"

Two-Valve

Reflex Receiver.

A remarkably sensitive set which employs but one tuning control and one inductance coil, and which operates satisfactorily on a frame aerial. No crystal detector figures in the circuit.

ORDER YOUR COPY.



A GREAT deal of interest has been aroused in the last few months in various forms of small field coils, the object of which has been to increase selectivity, decrease direct pick-up from the local station, and overcome the interaction effects between coils which have made Neutrodyne circuits so difficult for the home constructor. There have been, however, few articles giving any idea how these may be constructed at home in a neat and efficient manner, so that, no doubt, many constructors have been deterred from what would have been very interesting

A Practical Article of Interest to
every Amateur who Makes his
own Coils.

By R. STUART WORTLEY.

playing two stages of high-frequency amplification, there is no reason why they should be limited to that type, and several suggested uses will be given below. Probably the best circuit in the case of the binocular coil is that used in the Grebe synchrophase, in which neutralisation is effected by the split primary method. The Bodine coil, however, does not seem to neutralise easily, and is better controlled by a potentiometer, or, better still, by including in the H.T. + lead to the primaries a 200,000-ohm variable non-inductive resistance permitting the use of $1\frac{1}{2}$ to 3 v. grid bias on the H.F. valves.

Both these types of coil, however, by the use of a little ingenuity in mounting, can be adapted for plugging into any one of the standard straight circuits. The two following are suggested as a starting-point: (1) a semi-aperiodic aerial coil, followed by a three-circuit coil in one unit (primary, secondary, and fixed reaction), the amount of reaction being controlled electrostatically by condenser, or by a 25,000 to 50,000 ohm variable non-inductive resistance (Marconi), placed in parallel with the reaction coil or in series with the H.T. lead to reaction; (2) standard tuned anode employing fixed reaction controlled in the same manner as No. 1.

Binocular Coil Construction.

Before proceeding with the binocular coil construction, it must be noted that the number of turns given are for use with .0003 mfd. variable condensers in parallel for both types of coil. To make the binocular aerial coil, wind two coils in the same direction, each containing 85 turns of No. 24 D.C.C. on a cardboard former $1\frac{1}{2}$ in. diameter by 6 in. long, which has previously been cut twice down the length so as to form two half-cylinders, securing the ends by knotting under adjacent turns. On one of these coils take out tappings at the 12th, 17th, 22nd, and 27th turns for the aerial connection. Now dry them thoroughly and paint with collodium, which can be obtained quite cheaply from any chemist's shop, and which, being a cellulose base compound, does not appreciably affect the H.F. resistance of the coil, as would shellac or other such compounds.

When this coating is well set, break

down the former, remove it, and paint the inside with collodium also. The result should be two self-supporting, practically damp-proof cylinders, which together form the aerial inductance. The last two turns at either end which were knotted in winding can now be stripped off, leaving enough wire for connections to a plug-in socket or directly to the wiring of the set. The illustration shows the actual method of mounting employed, but any method which keeps the two halves of the coil about $\frac{1}{8}$ in. apart and securely clamps the loose ends of the wires will be suitable. Assuming the two half-coils mounted side by side as shown, the connections will be: the top ends to each other, one of the taps to aerial, bottom of the tapped half to earth and L.T. —, and bottom of the other half to grid.

An H.F. Coupling Coil.

The construction of the second H.F. and detector coupling coil is very similar, except that the tapping is omitted and a primary included in the half-coil at earth potential as near as possible to the bottom or earth end. These primaries consist of 25 turns of No. 32 D.C.C. tapped at the centre, and wound in the same direction as the main coil, which has now become the secondary. The actual winding may be accomplished either by putting the primary

(Continued on next page.)

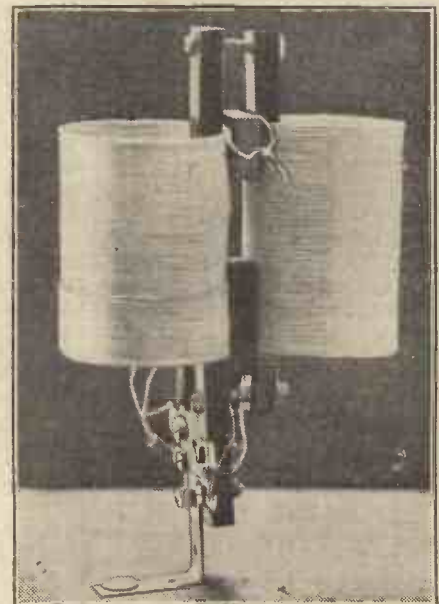


The Bodine coil described in this article.

and profitable experiments by the cost of the manufactured article.

In this article only the binocular and Bodine form of coils will be described, as these two types are probably the most efficient and the least known. It must be remembered, however, that these coils are not fieldless, do not eliminate coupling but minimise it, and therefore the ordinary rules of spacing cannot be entirely discarded. It must also be borne in mind that while the fields at the sides of the coil are small, there is a very decided and concentrated one at the ends, and consequently the wiring should be kept out of that area as far as possible.

While the most usual type of circuit in which these coils are used is one em-



A complete binocular coil ready for use.

SMALL FIELD COILS.

(Continued from previous page.)

on the former, first taking care to keep the tapping loop on the former side, and winding the secondary directly over it, applying collodium as you wind, or by making a separate primary on a slightly smaller former, inserting same in the secondary after completion. A very tight coupling is required using either method. The connections of the secondary are the same as before, without, of course, the aerial tapping, and the primary should be connected: top to neutralising condenser, tap to H.T. +, and bottom to anode of preceding valve. It should be noted here that the number of primary turns were determined for valves of the C.T. 25 type, and while the correct values for use with high-impedance valves have not been determined, at least twice to two and a half times as many turns will be required.

Making a Bodine Coil.

For circuits requiring reaction, about 40 turns of No. 32 D.C.C. wire wound in much the same manner as the primary; but in the grid end of the coil will give ample regenerative effect, although a condenser of .001 or .002 may be required across the primary of the L.F. transformer following. The same type of coil, including the reaction but omitting the primary, may be used in tuned anode circuits. The general methods for controlling reaction with a fixed coil have already been outlined above.

The Bodine coil, probably the better of the two types, is rather more quickly and easily constructed after the knack of winding has been mastered, but a slightly more complicated apparatus is required. A flat board, two wood cylinders 1 in. in diameter, two wood screws, and two pieces of cardboard former $1\frac{1}{2}$ in. or $1\frac{3}{4}$ in. in diameter, cut as for the binocular coils, comprise the kit. Actually, centres from $\frac{1}{2}$ -lb. wire reels, with the flanges cut off, served for the wood cylinders in making the coil illustrated above, and the cardboards were those previously used in making binocular coils, but so badly broken up as to be useless for further straight winding.

"Figure Eight" Winding.

The wood cylinders should be firmly screwed down to the board, $2\frac{3}{4}$ in. apart from centre to centre, so that when the half-formers are placed on the outside of each the over-all distance from outside of former to outside of former should be $3\frac{1}{2}$ in. Care must be taken to make these cylinders really solid, or the tops will be pulled together in winding, and the resulting coil will resemble one of those top-hats only seen in certain caricatures which immediately label the wearer a Frenchman. A piece of $\frac{1}{2}$ by $\frac{1}{4}$ in. ebonite 4 in. long will be needed, and is placed in an upright position between the two cylinders. This will have to be held by an assistant until a few turns have been wound around it, after which it will be found to remain in position by itself.

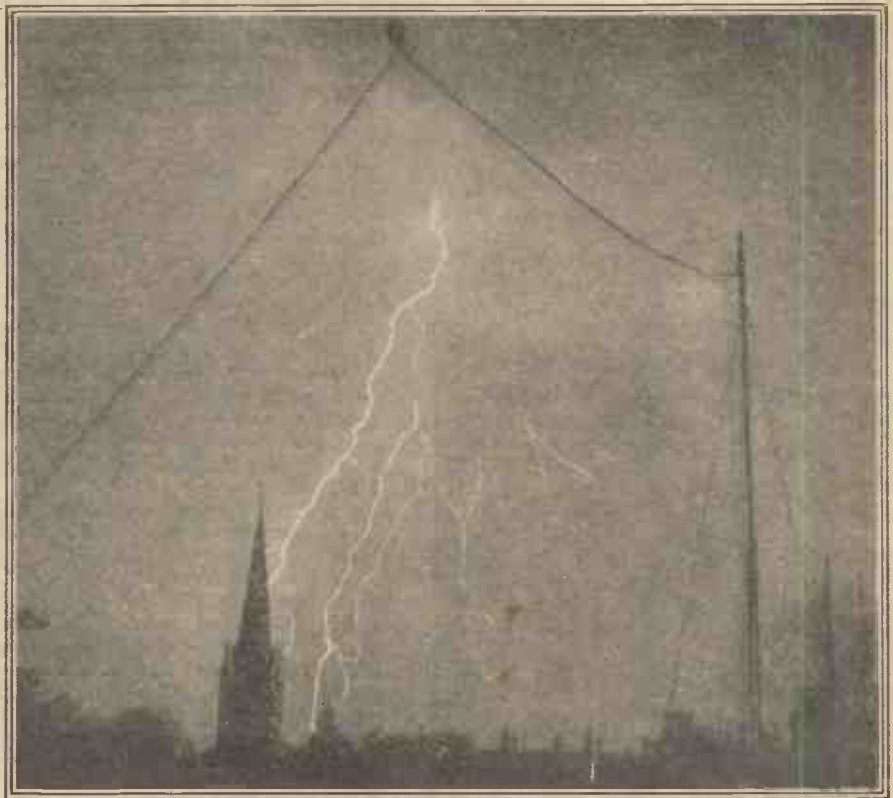
Using No. 26 D.C.C. wire, wind on one turn of wire in the shape of a figure eight. It will be noticed that at the point where the wires cross they touch only two faces of the square ebonite rod. Now wind on

another turn, but make the crossings come on the opposite corner of the rod, so that for each two turns wound there are two separate crossing points and each face of the rod is touched by one wire only. Continue winding, alternating the crossings so that the ebonite rod, which serves for mounting later, is firmly wound into the coil.

Excellent Results.

It will be found that on the outside of the coil the wires lie as close together as on an ordinary solenoid, which would not be the case if it were not for the double crossing at the centre. Now, after drying thoroughly and painting the loop part only with collodium, allow the coil to set well and loosen the screws holding the wood cylinders. It may now be slipped off the

Both these types of coil have been actually used in receivers with rather more than average success, and can be thoroughly recommended. The number of turns has been determined experimentally for use with two stages transformer-coupled H.F., but it is beyond the scope of this article to give values for other types of circuits, and it is only intended to point out a construction method which can be made adaptable to experiments of all sorts. Further, the general type of coil can be the basis of many hours' profitable investigation, and it is hoped that many experimenters and home constructors will find here a general working plan for some very effective inductances which they had hitherto considered out of their reach on account of cost or mechanical difficulties.



An interesting photograph of lightning occurring in the vicinity of a wireless aerial taken by a Croydon reader who, it should be noted, took the precaution of earthing his radio antenna!

formers, the ebonite rod left just as wound into the coil, and the inside of the loops painted. The coil is now ready for use.

The number of turns for covering the broadcast band with condensers as above is for the primary, 15, and for the secondary 95, the same type of coil being used for aerial inductance and all H.F. stages. The primary may be wound either separately, or at the same time as the secondary, the latter method making the neater coil, as the two parts may be held together with collodium, thus assuring a very solid job. The former method, however, was used in the coil illustrated, as it was desired to be able to change primaries for experimental purposes. The connections of the Bodine coils are identical with the binocular, except that the top goes to grid instead of the bottom of the second half-coil. In both cases it is wiser to have too many turns than not enough, as stripping off a few turns is simplicity itself, but adding more turns is well-nigh impossible. The number of turns above have been given accordingly.

TERMINAL INDICATING DISCS.

USEFUL and effective indicating discs may be made by mounting, between the terminals and the panel discs of celluloid under which are placed equal-sized discs of paper on which appropriate signs have been written. The celluloid may be cut from an old photographic film provided it is not too thin, or, for positive terminals, the tinted strips sold for coil mounting may be used. Tinted paper may, of course, be used if desired—e.g., green paper under plain celluloid for negative terminals.

In order to ensure that the centre hole is in the correct position, it is a good plan to punch the celluloid and paper with a small circular hole first, and to bolt them between two suitably sized large washers (or 4 B.A. insulating discs) when trimming the edges.



A "P.W." FILADYNE ONE VALVER



THIS receiver, as its title suggests, employs the Filadyne principle of filament input. Received impulses are not fed on to the grid of the valve as is usual practice, but are taken to the filament, there to influence the electron stream at its source. The grid is given a high positive potential by being connected through the 'phones to the plus of the H.T. battery and serves to reduce the space charge, and thus enables a greater number of electrons to bridge the "gap" in the H.T.-reaction-phones circuit.

The filament of the valve is isolated from the L.T. battery, filament rheostat and wiring by two H.F. chokes of low ohmic resistance. These are clearly shown in the diagram of the theoretical circuit,



As will be noted, the layout of the set is effective in its simplicity.

No grid condenser or grid leak is used. Otherwise the Filadyne circuit is more or less normal.

This particular Filadyne set is capable of

COMPONENTS AND MATERIALS REQUIRED.		£	s.	d.
1	Ebonite panel 13 in. by 6 1/2 in.	0	5	0
1	Case and baseboard (Peto-Scott) to fit.	1	1	0
1	.0005 mfd. square law condenser (Lampugh)	0	12	0
1	Two-way coil holder (short-handled "Lotus")	0	7	0
1	30 ohm filament rheostat (Burndept)	0	7	0
1	Baseboard mounting valve holder ("Lotus")	0	2	6
1	.002 mfd. fixed condenser ("Atlas")	0	1	9
1/2	lb. No. 24 gauge D.C.C. wire	0	2	6
1	Engraved terminal strip with terminals	0	3	6
	Square section wire, transfers, screws, etc. (approx.)	0	2	0

* * * * *

This receiver, which employs the principle of filament input described in "P.W." last week, is extremely sensitive and selective in operation, and forms a noteworthy diversion from normal practice.

The Set Designed and Described by G. V. DOWDING, Grad.I.E.E. (Technical Editor.)

Constructional work by H. A. MEADOWS and J. R. WHEATLEY. (Technical Staff.)

* * * * *

providing loud, clear signals over very excellent ranges from any station whose wavelength is below 1,000 metres, and is very selective without being difficult to handle. The one valver is not recommended for loud-speaker work, although it is capable of this within a few miles from a broadcasting station. Very good loud-speaker results indeed are possible when a stage of low-frequency amplification is added in the usual way.

Winding the Chokes.

The construction of a Filadyne set presents no greater difficulties than does an ordinary receiver, although there are one or two points in connection with it that should be carefully noted. A list of components and materials required is given separately and calls for little comment. The filament resistance should have a maximum value of at least 30 ohms, and it is advisable to employ an anti-microphonic valve holder.

Needless to say, too, the coil holder and variable condenser should be chosen with care if other than those that are specified are used. Smooth movements here will be required if the DX qualities of the receiver are to be brought out.

Having assembled the various components, the first actually constructional step should be the winding of the chokes.

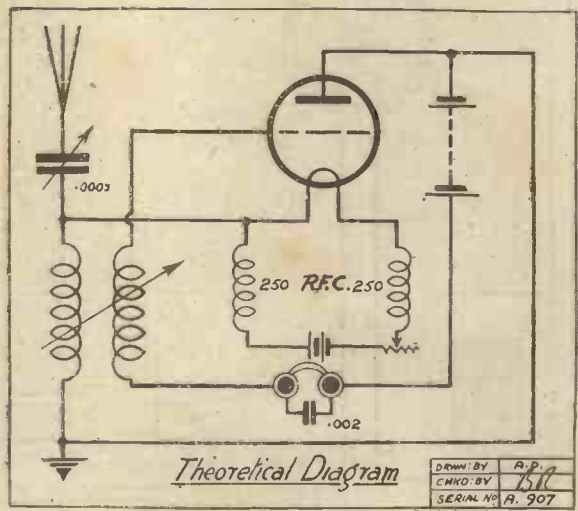
For these 24 gauge (D.C.C) wire should be used; 22 would answer the purpose, but is difficult to handle; but a finer gauge must not be employed as it would increase the ohmic resistance of the filament circuit and thus cause wastage.

Drilling the Panel.

The chokes should be wound in the form of honeycomb coils. Coil-winding formers with removable brass pins are available at most wireless stores, or one can be improvised out of a piece of wood and some nails. It might be mentioned, too, that firms such as Peto-Scott's will supply the chokes wound to our specification at reasonable prices.

Each choke should consist of 250 turns. Actually basket, spider-web, or solenoid coils would answer the purpose, although few of the commercial types have really low ohmic resistances.

The panel should be drilled in accordance with the panel drilling diagram. Only those



holes are necessary in addition to those provided for screws to hold the panel to the baseboard. The terminals, it will be noted, are situated on a strip of ebonite at the back of the baseboard. Terminal strips engraved and drilled can be purchased, but it is a simple task to fashion one. When mounting the components on the baseboard it is important to notice the chokes are widely separated and are placed so that they do not interact. They can be held down by strips of fibre screwed to the baseboard.

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A "P.W." FILADYNE ONE-VALVER.

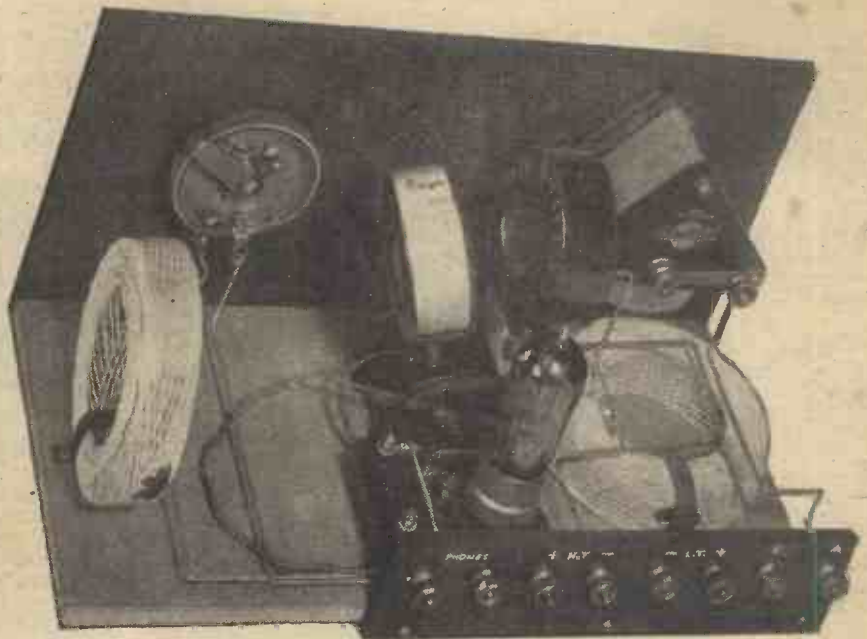
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The wiring should be carried out with square section tinned copper wire. The leads from the filament sockets of the valve holder to the choke should be kept well away from all other leads. The remaining leads to the chokes do not require such careful isolation, but all the wiring should be well spaced. Careful attention should be paid to the soldering, for a lot can be lost in a badly soldered joint. Constructors are advised to refer to the "For The Constructor" series published in our end columns for hints on soldering and other useful information concerned with this part of the work.

Points to Note.

There is little else in the construction of this set that calls for comment. The wiring diagram, back-of-panel photographs and point-to-point check list provided should enable the constructor to steer clear of all mistakes.

In this receiver the L.T. connections are almost as important as the H.T., and if, perchance, they are reversed, the set will fail to oscillate, and it may be impossible to receive any signals whatever.



This back-of-panel view shows the coils and valve in position and everything ready for use.

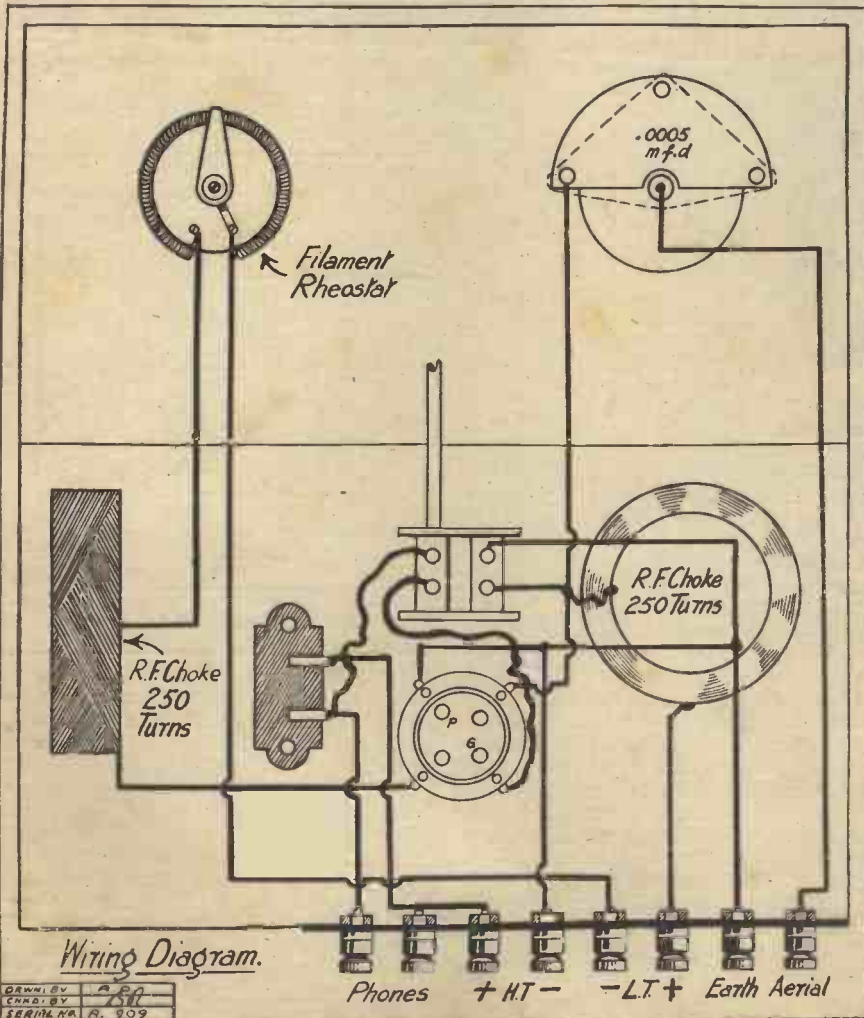
The two flexible leads which go to the moving block of the coil holder should be arranged so that they do not run parallel or lie across the choke-filament leads.

When the wiring is completed every trace of surplus flux and all accumulations

of ebonite or metal dust should be carefully removed by means of a piece of soft rag or a small brush. Transfers can then be fixed on to the front of the panel and to the terminal strip if this is not engraved.

A Wave-length Limitation.

Ordinary coils can be used with the Filadyne. For 2 L O and stations around about the 300-500 metres wave band a 75-turn aerial coil will be required and 75



POINT-TO-POINT CONNECTIONS.

Aerial terminal to moving vanes of variable condenser. Fixed vanes of variable condenser to one side of horizontal R.F. choke, to one side of aerial coil holder and to one filament socket of valve holder.

Other filament socket of valve holder to one side of vertical R.F. choke, other side of vertical R.F. choke to one side of filament rheostat, other side of filament rheostat to L.T. minus terminal.

L.T. plus terminal to remaining side of horizontal R.F. choke. Earth terminal to remaining side of aerial coil holder, to plate socket of valve holder and to H.T. minus terminal.

H.T. plus terminal to one 'phone terminal, other 'phone terminal to one side of reaction coil holder, other side of reaction coil holder to grid socket of valve holder.

A .002 mfd. fixed condenser is connected across the two 'phone terminals.

or 100 for the reaction. For the reception of 5 X X and other stations whose wave-lengths are above 1,000 metres, larger chokes are necessary. 500 turn chokes will prove sufficient for all wave-lengths up to 1,800 or so metres. The reason why smaller chokes are specified in this article and the set thus limited to the lower band is for purposes of economical construction. Constructors who, however, wish to include 5 X X can do so as previously mentioned, by winding larger chokes.

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A "P.W." FILADYNE ONE-VALVER.

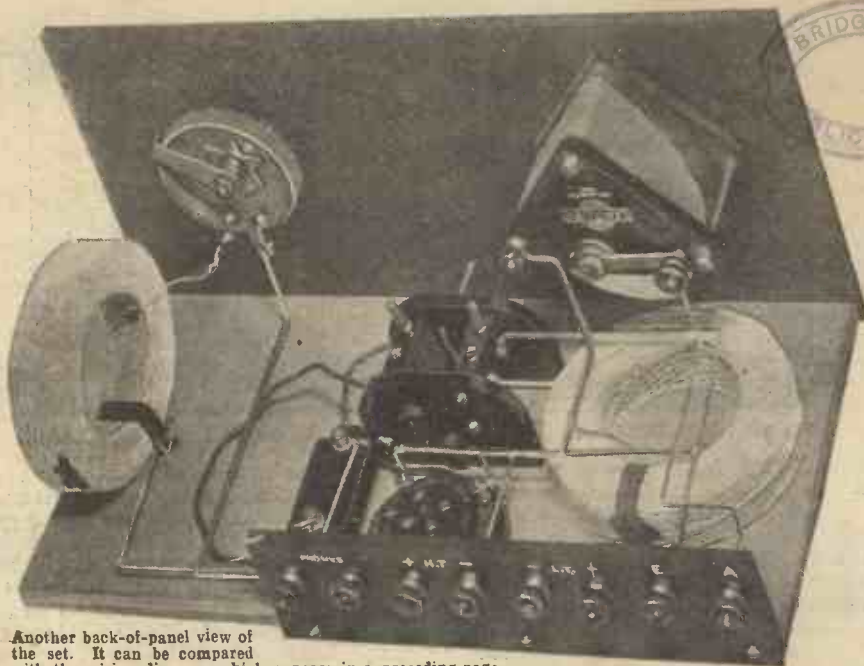
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The present 250-turn chokes can be "loaded" by placing in series with each one another choke of a similar number of turns. The additional chokes can be clamped on to the others, and this is perhaps a better method than winding 500 turn chokes "all-in-one." The larger circumferences are more difficult to pack away into a case than the larger widths.

A Distinct Advantage.

The usual amount of H.T., about 50 volts, will be required, and the telephone receivers should be of the usual high resistance type. But not all and any valves can be used in Filadyne receivers—very few allow these circuits to operate with optimum efficiency. We prefer the B5 and B6 above most others. Some valves, it should be noted, fail to work at all in this circuit. A B5 with either dry batteries or a 4-volt accumulator functions splendidly. The disposition and shapes of its electrodes and the nature of its filament are evidently all most suitable for Filadyne work.

Tuning is as usual except that the receiver is exceptionally selective—stations will come in and vanish over single degree movements of the variable condenser. If the B5 is used with a 4-volt accumulator, it will be by no means necessary to switch the filament resistance full out (minimum resistance), as the resistance of the chokes will amount to only an ohm or two. As a matter of fact it is another peculiarity and advantage of the Filadyne that it won't work properly if the filament of its valve is being overrun. The best results are obtained when the valve is receiving a little less than its usual current. The filament resistance can



Another back-of-panel view of the set. It can be compared with the wiring diagram which appears in a preceding page.

be used as a sort of vernier control and very sharp adjustments obtained by this means.

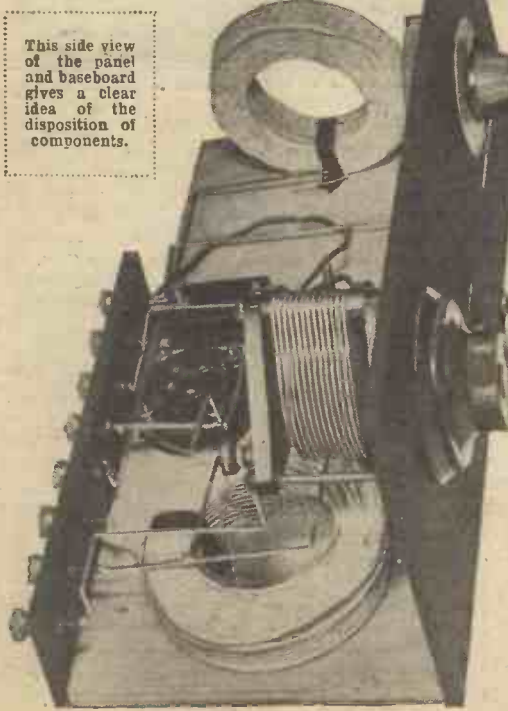
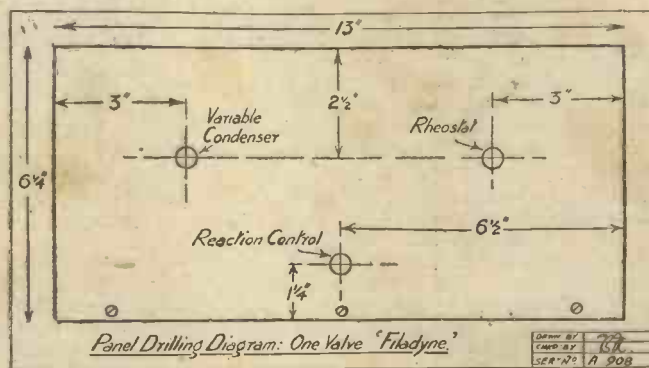
Normal Behaviour.

Very loud clicks are produced in the telephone receivers when the H.T. circuit is broken by extracting the reaction coil or altering the H.T. tapping while the filament is alight, and this is quite normal behaviour and not indicative of "shorts."

If the set does not oscillate, or if signals are weak, it should first be made sure that the filament of the valve is not too bright. Then the effect of reversing the L.T. leads should be noted, for a mistake in the wiring might have been made. Too much H.T., it should be noted, is nearly as bad as too much L.T. in the case of Filadynes. Fifty volts will be ample—probably 42 or even less will be sufficient.

A stage of L.F. amplification can, if desired, very easily be added to this Filadyne one-valver. It should be arranged in conventional manner with its transformer secondary to grid and plate to telephones. Grid bias should, of course, be incorporated, and no H.T. minus need figure in the additional part of the circuit. A separate H.T. should be arranged owing to the fact that the Filadyne part of the circuit requires but a moderate anode voltage.

To operate an L.F. amplifying stage on the Filadyne principle it would be necessary to employ L.F. chokes in the place of the H.F. chokes to isolate the filament, and this, normally, would be a difficult business. But we are hoping that within the near future we will be able to announce an interesting development bearing on this. We do not want to say too much about it just yet, but if our experiments prove successful, then in due course we will have a great deal more to say about the subject.



This side view of the panel and baseboard gives a clear idea of the disposition of components.

However, we trust readers will let us have their opinions concerning the one-valver described in this article. They may not obtain exceptional results with other valves than those mentioned above and may have to obtain the specified types. But it is distinctly interesting trying various types in the receiver, and possibly there are valves we have not employed which will give even better results still. This, of course, would be extremely valuable information.

Finally, when the set is working really nicely we invite constructors particularly to note the purity of the signals and the wonderful selectivity of the tuning. The faithful reproduction of music and speech evinced should be that of a crystal-set, but volume will rival any other one-valver.



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

FOLLOWING the remarks on coupling which were made recently in these columns, several readers have written on questions connected with the control of reaction. The control of reaction is, of course, a very important matter if the most efficient operation of a set employing this system is to be obtained. This is more particularly the case when the detector is followed by L.F. amplification, as it is usually.

Many amateurs employ reaction in order to make up for all kinds of losses and deficiencies in the set, but this is a great mistake and does not lead to the best results. It may be compared, in fact, in a general way to running a motor-car which is lacking in lubrication, and the engine of which is generally out of adjustment, by consuming more petrol than otherwise would be necessary. Reaction should always be used with discretion and, quite apart from the well-known trouble of oscillation, the necessary volume of reproduction should be obtained with as little reaction as possible.

Reaction Control.

An important point which arises in this connection is the function of the valve itself. Some valves will break into oscillation suddenly, whilst with others—depending upon the valve characteristics—the oscillation is approached more or less gradually. A good deal can be done by a properly geared coil holder, and also by the use of capacity control for the reaction, and again much can be done by the proper adjustment of the H.T. voltage and the grid leak. Furthermore, it is very desirable to have a reaction coil of the correct value.

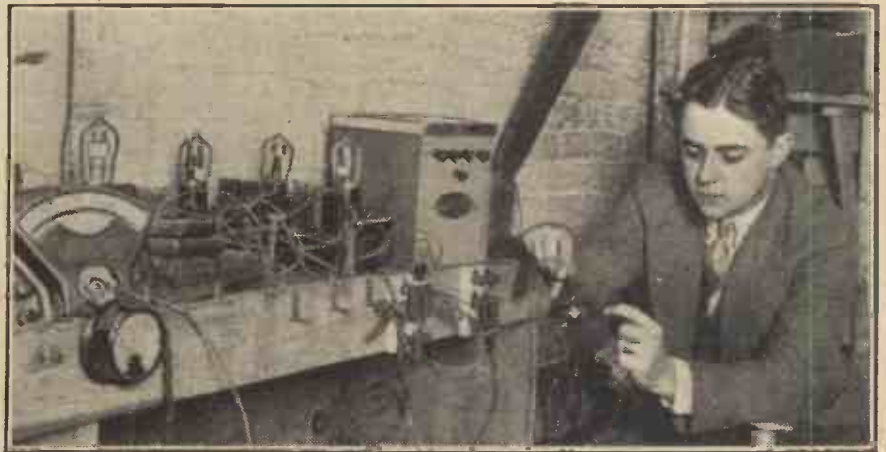
The control of the operating characteristics of the valve is probably the most important and should be attended to first; once this has been made most effective, the use of the geared coil holder or a capacity control for the reaction is a refinement which though useful, is not absolutely necessary.

It is common practice to connect the L.T. battery to the grid leak in such a way as to apply a bias to the latter equal to the voltage of the L.T. battery, but in some cases this bias is too great and it will be found preferable to apply a bias equal only to part of the voltage of the L.T. battery or even, in fact, to apply no bias at all. It is, as a matter of fact, much better to employ a separate grid bias battery of dry cells with suitable tappings, or again to connect a high resistance potentiometer across the filament battery and to tap off grid bias voltage as required. The aim should be always to employ the least possible amount of positive voltage which will give good

detection and smooth reaction control. In this connection it should also be remembered that the application of negative grid bias tends to reduce H.T. battery current, whilst the application of positive grid bias tends to increase it, and therefore too positive a grid, although it will be seen to have certain other advantages, will impose a heavier load on the H.T. battery.

The "N" Circuit.

The question has also been raised as to whether the new Lodge "N" circuit



Testing out a new H.T. eliminator which allows the set to be coupled direct to the mains.

employs reaction. Although, as is well known, it does not employ reaction coils, the answer to this appears to be (and I say "appears to be" advisedly, as the precise method of operation of this circuit is a matter on which many experts are not yet agreed) that the "N" circuit does not employ reaction, but that it obtains all the advantages of reaction without any of its well-known drawbacks. It is true that the circuit can be made to oscillate, and this indicates that the advantage of negative resistance is obtained, but at the same time the approach of the circuit to the oscillating point is not accompanied by the distortion which one is accustomed to associate with reaction, and furthermore, as is, of course, well known, it is not accompanied by any radiation such as will cause interference with neighbouring sets.

Remarkable Purity.

The speculation mentioned above with regard to the operation of the "N" circuit is of a purely theoretical nature, that is to say, the experts are not entirely in agree-

ment as to the theory of the circuit. This does not mean that there is any disagreement as to its practical operation. All who have heard it are agreed on the extraordinary volume and purity obtainable, as compared with the volume obtainable from a corresponding circuit using reaction in the same conditions.

Portable Sets.

In certain types of set of the portable or semi-portable kind it is often desired to introduce reaction and where the frame aerial is used reaction can be introduced in the ordinary way, as in the majority of cases it is not practicable to employ a movable plate coil. A small grid coil may be introduced in series with the frame aerial, but this is not always desirable as it has the effect of upsetting the inductance value of the aerial.

A method which, however, is frequently used in these cases and which permits of an excellent control of the reaction is to add a few extra turns of wire on the frame aerial in series with the frame. This is added at the end of the frame which is connected to the filament end of the grid circuit. A variable condenser is introduced between the frame aerial and the anode of the detector, and this variable condenser permits the reaction to be controlled. It is not easy to state off-hand how many turns of wire

should be used for this reaction, but generally speaking the number will be quite small, perhaps two or three turns, but this depends upon the amount of resistance in the circuit and also upon the nature of the frame aerial and the range of capacity-adjustment of the variable condenser. It should be noted that if this method is adopted that the variable condenser referred to is connected in the H.F. H.T. part of the circuit and consequently hand-capacity effects may be introduced, these being overcome in the usual way by means of an extension handle.

When using choke or resistance-capacity coupling with an L.F. amplifier, trouble is sometimes experienced owing to the transference of H.F. currents in the anode circuit to the grid of the L.F. valve. For this reason, an H.F. choke (with a by-pass condenser) is frequently useful, introduced into the circuit in such a way as to confine the current to the anode and filament circuit. With commercial coupling units, owing to the fact that the wiring is often difficult of

(Continued on page 716.)



SOME IDEAS FOR YOUR PORTABLE SET

Some Concise Notes and Suggestions on the Construction, Control and General Maintenance of Portable Wireless Receivers.

By J. ENGLISH.

TO be able to design a really good portable set is no mean accomplishment, and the owner of such a set may always be sure of a warm reception from fellow travellers, whether the journey be by road, rail, boat, or car. Even for a day's picnic the set may be called upon to perform the duty of host after that earthly person has succumbed to the heat of the day.

mean sacrificing points in favour of the others. One must, therefore, balance between erring too much in favour of any one feature.

Each of the above desired qualities may again be divided under a number of sub-headings, but by dealing with each in turn some helpful information may be gained.

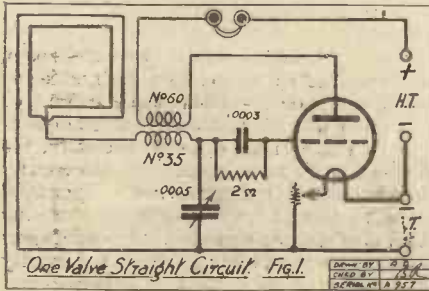
Concerning Portability.

What constitutes a portable set for use with a motor-car may prove to be a burden for the camping party, or may almost be the cause of a boating fatality on the river. It is therefore necessary to restrict one's ideas according to individual requirements when settling upon the ultimate size of the completed receiver. Another point is the inclusion of aerial, loud speaker (if any), 'phones and batteries in the one containing case, if real portability is required.

Frame aerials may be fitted permanently in the lid of the cabinet for general convenience, or on the other hand a separate folding frame aerial may be carried where conditions permit. Concerning batteries,

latter or 4-volt dry cell L.T. battery is used is left to the constructor, but the valves must be chosen to suit.

The number of valves one wishes to include in the set is governed by the restrictions imposed upon the size of the actual set, the range of reception, loud-speaker



One Valve Straight Circuit. Fig. 1.

The following notes are not intended to be a description of a particular portable set, but rather as a guide to the reader who intends to design his own portable receiver.

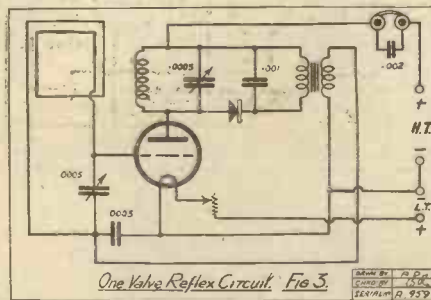
To deal fully with all the points in portable set design would doubtless take more space than our esteemed editor is likely to permit, but a thorough survey of the more salient features will, it is hoped, be of considerable assistance to intending constructors.

Desirable Features.

Let us consider the most desirable features of a portable set in order of merit. They are, I think,

1. Extreme compactness and portability.
2. Maximum receiving range.
3. Good quality reproduction; and
4. Ease of tuning without oscillation.

Not many, you may say, but sufficient and more so, for a moment's thought will serve to show that all are mutually antagonistic, for to strive for any one will



One Valve Reflex Circuit. Fig. 3.

these are best arranged inside the cabinet housing the actual receiver, provided that they are placed in a compartment apart from the actual receiving apparatus. This latter point is mentioned because the gases given off from some batteries are liable to corrode metal fittings and insulation attaching to wireless components.

"Dry Battery" Valves.

Dry cell batteries are very suitable for H.T. purposes and also for L.T. if dull-emitter valves are employed. Accumulator L.T. batteries are, however, advocated where semi-dull-emitter valves are used. The first mentioned valves constitute those consuming up to .12 of an ampere for filament lighting, whilst the semi-D.E. valves are those requiring as much as .25 and .3 of an ampere each. Whether a 2-volt accumu-

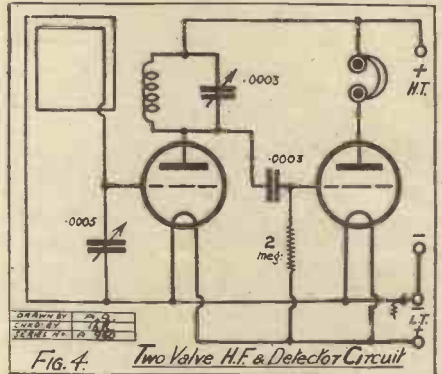


Fig. 4. Two Valve H.F. & Detector Circuit

results or otherwise, and quality of reproduction required by the constructor.

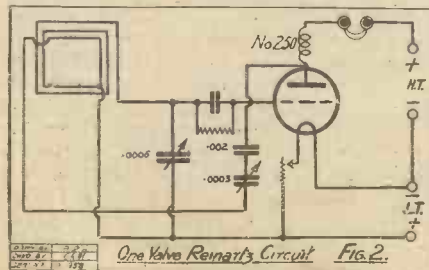
Range of Reception.

When speaking of the range of any particular receiver I find that it is best to err rather on the short side than the other, as atmospheric conditions experienced throughout the British Isles, especially during the summer months, are apt to be somewhat poor. Assuming that a frame aerial is used in every case, the following ranges of reception may be expected from the receivers immediately preceding them.

- One-valve straight circuit or Reinartz—15-20 miles.
- One-valve reflex or dual circuit receiver—20-25 miles.
- Two-valve straight H.F. and detector—25-30 miles.
- Two-valve reflex circuit receiver—30-35 miles.
- Seven-valve super-heterodyne receiver—150-200 miles.

Adding a two-valve transformer-coupled, or three-valve resistance-coupled amplifier to the three first mentioned sets will ensure satisfactory loud-speaker results, whilst a one-valve amplifier added to receiver number four will give similar results. Receiver number five will give efficient loud-speaker reproduction provided at least two L.F. valves are included in its design. Some representative circuits of the above-

(Continued on next page.)



One Valve Reinartz Circuit. Fig. 2.

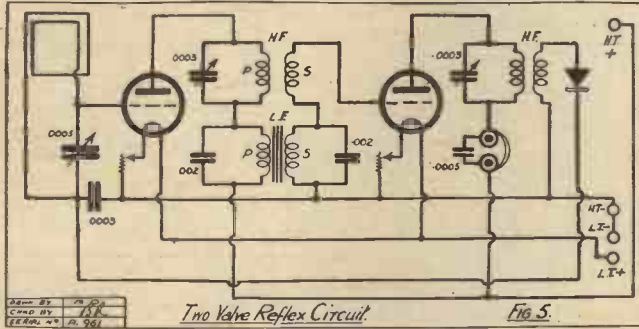
SOME IDEAS FOR YOUR PORTABLE SET.

(Continued from previous page.)

mentioned receivers are published in these pages.

Quality of Reproduction.

When building a receiver for loud-speaker results it is desirable to pay particular attention to the quality of reproduction. Distorted or poor quality music soon palls on the listener's ear and is liable to quench one's interest in wireless.



Two Valve Reflex Circuit. Fig. 5.

Remember that £3 spent on two good transformers is money well spent and that ample repayment will be made in the way of much enjoyment. Should space permit of the use of three L.F. amplifying valves, then resistance-capacity coupling may be used with gratifying results. An invaluable tip to remember is, to improve the mellowness of tone from the loud speaker, connect a large fixed condenser across the output terminals. The correct capacity for this condenser will need to be found by experience, but for most good loud speakers a .006 or .008 microfarad condenser will be found satisfactory. No appreciable diminution of signal strength will be discernible when adding such condensers.

Ease of Tuning.

The remaining point to receive our consideration is the question of simple tuning. Probably the simplest form of tuning for valve-set use is that met with in a single-valve set without reaction. Such may consist of a fixed coil with variable condenser or a variometer. The latter is generally considered to be the more efficient of the two, but suffers from the disadvantage that its wave-length tuning

range is very limited. However, there is no real objection to the use of fixed coils and tuning condensers, nor for that matter to other fixed coils for reaction purposes.

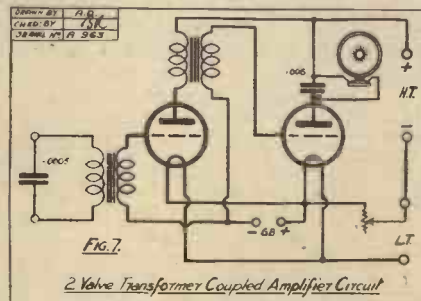
As far as frame aerials are concerned, where damping losses are small and remain constant, reaction may be set during the first trial and then fixed for all time. Many commercially built sets are designed in this manner. A word in connection with the use of reaction, however—never force reaction to extreme limits, as more distortion is caused in this way than is realised.

The Super-het.

Following the simple single-valve set for tuning comes the super-het. This statement may seem rather erroneous, but there is no doubt that once the tuning has been mastered it will be found to be much simpler than an ordinary straight circuit possessing one or two H.F. valves. Reflex receivers are perhaps the most difficult correctly to tune, owing no doubt to the inherent self-oscillation invariably present.

With care in the choice of instruments, and judicious spacing of wiring and components, much of this trouble may, however, be obviated.

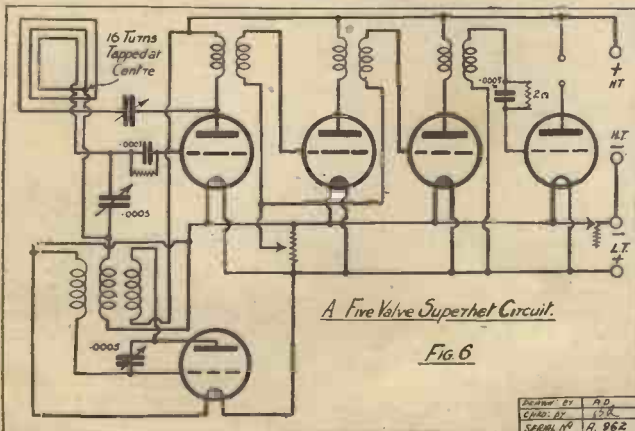
Should the constructor be within easy receiving range of the high-power station, and the choice of a number of programmes is not desired, then it would be a sound



2 Valve Transformer Coupled Amplifier Circuit. Fig. 7.

plan to design the portable set for the reception of Daventry only. The advantages gained would be many. Reducing the number of valves will be conducive to greater portability, lower current consumption, ease of tuning, loud signals without the need for reaction, and less likelihood of experiencing internal oscillation owing to the fact that H.F. amplification will no longer be necessary.

In any case, even if such amplification is found to be desirable, the high wave-length will enable the constructor to carry it out efficiently, while the set will not be nearly so prone to self oscillation or instability as in the case when the higher frequencies are being dealt with, as in the case of local stations.



A Five Valve Superhet Circuit. Fig. 6.

EARTHS.

By J. R. WHEATLEY.

GOOD crystal-set reception depends upon two main features—the aerial and earth system. The first is usually carried out with a fair amount of success, but the earth system is usually overlooked, and generally consists of a poor connection to a water tap, pipe, or a buried plate.

If long-distance results are hoped for, as well as the reception of the local station, the earth system cannot be too carefully arranged, and is, in fact, quite as important as the aerial system.

If possible, your earth should consist of an exact replica of the aerial system buried two ground or three feet below the surface of the and directly under the aerial. Unfortunately this is in most cases impossible, and another solution has, therefore, to be found.

Water-Pipe Earths.

This difficulty is usually solved by the use of a nearby water-pipe, but this has several drawbacks unless the following points are borne in mind. Firstly, this pipe must be connected direct to earth—i.e. it must not be connected to a pipe which is merely an outlet from the cistern, or reception will vary according to the quantity of water in the cistern. Secondly, the connection to this pipe must be electrically perfect, and this presents a difficulty owing to the practical impossibility of soldering to a pipe containing water. This can, however, be overcome by the use of a correctly designed earth clip.

An alternative is to employ a buried plate or rod. This, in some cases, is quite efficient, but this will also give endless trouble unless the following points are noted. The metal which is employed for the earth plate should be one of the following, which are listed in their order of efficiency: copper, zinc, brass, heavy galvanised or tinned sheet iron.

Effects of Corrosion.

It may not appear to be very important whether the iron is heavily tinned or not, but unless it is, it will not be long before mysterious fading, unaccountable loss of signals and noises occur. These are due in many cases to the corrosive action of surrounding soil on the earth plate and in time gradually break this up into a number of small, useless pieces. It is a good plan to surround this plate with an absorbent material such as coke or ashes.

A note of warning might be given here. When driving in an earth rod, great care should be taken that this is not in the vicinity of a water-pipe, gas main or drainage system, or you may find that damage to one of these has resulted.

As a final word of advice, if the following points are borne in mind, poor reception should not be experienced from this part of your installation.

Employ a large earth plate, as large as possible, bury it deeply, make a good connection to it, and keep the earth lead short. And do not forget to have a look over it every now and then, it may save endless trouble later on.

WHEN THE SET GOES WRONG

UNFORTUNATELY, like all other mechanical or electrical contrivances, wireless sets are not immune from breakdowns, and one day the listeners may find on switching on that all is not as it should be.

Naturally, the main trouble when a wireless receiver goes wrong is to find out exactly where the fault or faults lie, so that I propose to classify them under the headings of their symptoms as they make their

By K. D. ROGERS.
(Assistant Technical Editor.)

Having seen that the aerial and earth are properly connected to the set, he should make certain that both aerial and earth are in good condition.

Let us consider the aerial first. A journey outside will show whether it is still "up," and if it is touching anything, such as a tree or house; or the down lead might easily have been blown into contact with some bushes or the side of the building. (See Fig. 1).

The Earth System.

If an outside earthing switch is employed, care should be taken to see that damp or dirt is not causing a short circuit between the aerial and earth connections. The insulators and the aerial itself should be examined periodically, especially in manufacturing centres, where smoke is likely to form a thin deposit of carbon across the surface of the insulators. Such a deposit will cause loss

of signal strength, if not complete failure to receive anything.

Having made sure that the aerial is in good condition and is connected to the set properly, attention should be turned to the earth lead. If the earth goes to a water or gas pipe (the latter is not to be recommended as a rule), the listener should make sure that there is a continuous connection between the set and the pipe and that the joint between wire and pipe is firmly made.

If the earth connection is a "real" one—to a buried plate in the ground—he should make sure that the lead is continuous, and also that the "earth" is wet. In dry weather the connection between the buried plate and the earth itself is very often poor, and so the ground round about the "earth" should be kept moist by pouring water over it from time to time.

If both the aerial and earth are found to be satisfactory, or are repaired and still no

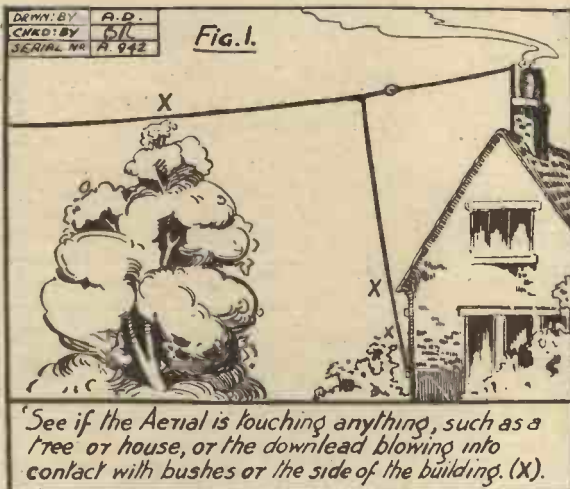
signals are heard, and everything in the set is adjusted properly, the telephones should be examined carefully. The listener should look at each earpiece and see that the wires are making good contact. The small terminals of each earpiece being screwed up tightly, make sure that pieces of the leads which usually consist of numerous strands of very fine wire are not touching the metal part of the 'phones, for if they are they are likely to cause a short circuit and so put that earpiece out of action.

Test the telephones by connecting them to a battery (small dry battery will do), and listen for a click when the contact is made or broken. Test each earpiece separately by shorting first one and then the other with a piece of wire connected across the two terminals on the back of the earpiece. If one works when the other is shorted and nothing is heard, or only faint noises are heard when the other is not shorted, then the one shorted is faulty, and probably needs repairing by a competent firm of telephone repairers.

If a click is heard when the battery is connected to the telephones, the 'phone leads should be gently bent, inch by inch, to make sure that there is not a break in them anywhere. If there is, it will be denoted by a click each time the leads are bent, and new leads will be necessary.

Faulty Valves.

In the case of valve sets it sometimes happens that the valve or valves will not light up, and in this event the reader should turn his attention to the battery and the internal connections of the set before testing the aerial or earth.



See if the Aerial is touching anything, such as a tree or house, or the downlead blowing into contact with bushes or the side of the building. (X).

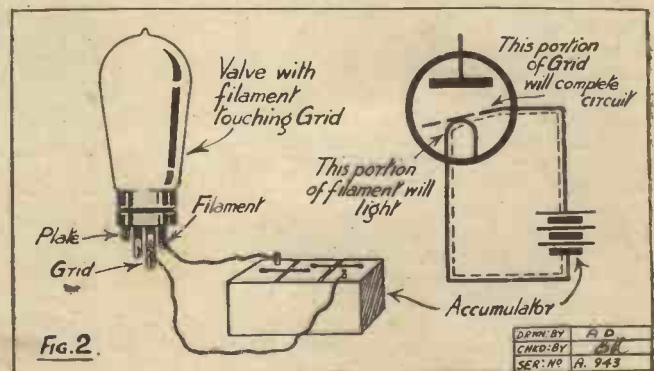
presence known to the listener. These can be classified under the following headings:

1. The set absolutely silent and dead.
2. Peculiar noises in the 'phones—sometimes known as frying noises—either continuous or intermittent.
3. Fading and weak signals.
4. Uncontrollability.

Dead Silence.

When the reader is confronted with a set that will not work or is working unsatisfactorily, he should go about tracing the trouble in as methodical a manner as possible, for if he dodges about from one idea to another he is very likely to miss the cause of the trouble for a long time, especially if his receiver be a multi-valve or a reflex receiver.

Naturally, the aerial and earth system should receive the first thought, and the listener should make sure that the two leads going to the aerial and earth respectively are connected to the set properly. By this I mean that they should be tightly connected, and the connection should be clean. In wireless reception we are dealing with very minute currents, and the slightest trace of dirt or grease is liable to cause trouble.



If the battery is O.K. and the connections are good, the valves themselves should be examined to see if the filaments are intact and not sagging and touching the grids. ((Fig. 2).

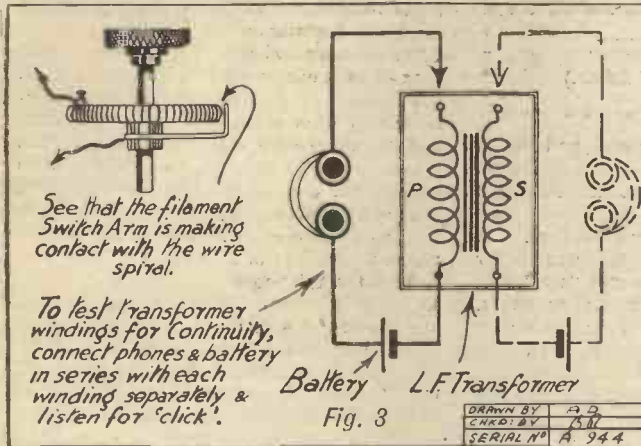
In the latter event there is only one (Continued on next page.)

WHEN THE SET GOES WRONG.

(Continued from previous page.)

remedy, and this is rather a drastic one, though it can be undertaken with confidence, as it will be obvious that the valves are useless in their present condition.

Connect the faulty valve by the filament and grid legs to the accumulator, when part at least of the filament will light, and then tap the valve sharply on the hand,



holding it so that the filament when jarred will fall away from the grid. (Care should be taken in this operation if a valve that has been repaired is being used, for sometimes these valves burst if a sharp tap is given.) If this does not cure the valve it will have to be discarded.

Testing the H.T.

If the filament is quite in order, the reader should examine the legs of the valve and see that they are clean and are making contact with their sockets properly. After this, if the valve still refuses to light, the L.T. connections in the set should be examined, especially the variable resistance, which should be carefully looked over to see if any bad connections exist anywhere. It may often happen that the moving arm of the filament resistance may make poor contact with the coil of wire. (Fig. 3.)

If the valves light up properly and yet no sound is heard, the H.T. battery plugs should be removed and replaced while the telephones are worn; this should give an indication as to whether the H.T. circuit is in order. If clicks are not heard, the reader should go over the connections in the plate circuit after testing the battery itself in the way I have indicated.

Finally, if all the connections of the set are quite firm and clean, the grid leak and condenser should be examined. If another grid leak is not available, the reader should try the effect of a piece of paper with a thick line of Indian ink or pencil on it across the two points where the grid leak usually is connected.

Leaky Condensers.

The grid condenser, the telephone condenser, and any other fixed condenser that may be used in the set can be tested for leaks in the following way, it having been taken for granted that the aerial and earth

and tuning system have already been examined and found in order as described on the previous page.

To test the condensers, remove them and momentarily touch each end with connections from the H.T. battery—that is, apply the whole H.T. battery voltage across the condenser. Remove the connections rapidly, not touching the terminals with the hands, and leave the condenser for several minutes.

After a while, take a pair of 'phones and touch the ends of the condenser with the two telephone tags. If the condenser is quite in order and does not leak, the reader will hear a sharp click in the telephones due to the condenser discharging itself through the telephones. The condenser takes the charge while the H.T. potential is being applied to it, and a good condenser should hold its charge for several minutes, even half an hour; in fact, a perfect condenser would keep it for ever, but it is unfortunately impossible to achieve such perfection.

Noisy Reception or Intermittent Signals.

Noises due to external reasons are

usually caused by dirty or loose connections, while those generated internally can generally be traced to such things as broken leads, faulty transformers, etc.

If external faults are suspected, all the

the windings and the transformer is useless. The same process should be carried out with both the primary and the secondary windings, each winding giving a distinct click when the connections are made and broken. (Fig. 3.)

Fading or Weak Signals.

These can be caused by dirty connections or by etheric conditions. If fading is noticed, attention should be paid to the aerial to see that it is not swinging and thus varying the tuning of the set.

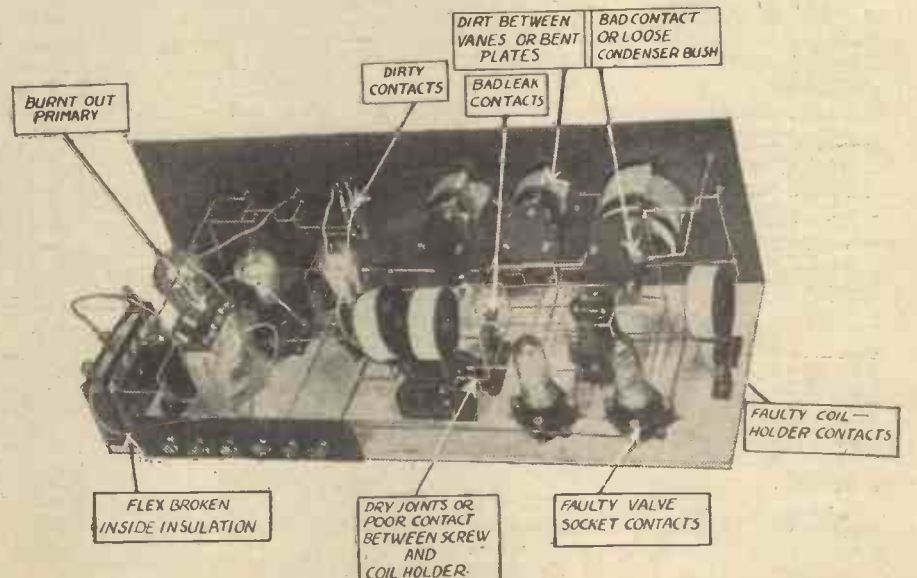
Another cause of bad fading may be a leaky condenser or a faulty grid leak, and all condensers should be tested with a battery and a pair of 'phones.

Oscillation and Uncontrollability.

The reader will be able to recognise the symptoms of self-oscillation by the distortion of signals that invariably accompanies it and also by howl or whistle that may be present as well. In a single-valve set self-oscillation should not be encountered, and upon removing the reaction coil away from the aerial coil the distortion and whistle should cease. If they do not, the listener should try the effect of short-circuiting the reaction coil by means of a piece of wire. If this stops the trouble, a smaller reaction coil is indicated.

Should, however, this procedure not have the desired effect, the reader will have to overhaul the set. Reversal of the L.T. leads may be advantageous, but if this is accompanied by a great loss of signal strength another remedy must be found.

Upon examination of the internal wiring of the set, the reader will probably find, if the oscillation is insistent, that the grid and plate connection are close together and running parallel. Perhaps the reaction coil



This illustration shows the main points at which some of the most encountered faults may occur.

forementioned points on the batteries should be examined and the same tests carried out. In the case of internal noises, all the leads in the set should be examined for faulty joints, etc., and finally transformers and 'phones should be tested. If a transformer is suspected, it should be connected up in series with a pair of telephones and a battery, the click heard being noted.

If no click is heard, it denotes a break in

connections go close to those leading to the tuner, or the telephone connections are too near the tuning condenser; in any case the reader should make sure that there is as much space as possible between any two leads and especially between those connecting the plate and grid circuits.

I have specially emphasised this point about the leads because if the reader goes (Continued on next page.)

THE modern super-heterodyne receiver has made transatlantic reception extremely simple and relieved it of all unpleasantness. There is now no need to come downstairs at 3 a.m. to shiver by the side of an unresponsive set, vainly twiddling knobs in the effort to hear the nasal accents of W G Y. The super-heterodyne is independent of an outside aerial, and thus eliminates the atmospheric which are so troublesome in long-distance reception.

Adjusting the Set.

It is a very good plan to tune-in Bourne-mouth (6 B M) on 380 metres, and to leave the set adjusted to this wave-length until it is time to listen for the transatlantic stations. A slight turn of the vernier condenser in the oscillator circuit should bring in the desired station. The strength of W G Y's transmissions varies greatly from night to night, but in most cases there is very little trouble in picking it up with a seven-valve super-het. including one stage of L.F. There will be scarcely any interference from commercial stations, owing to the selective powers of the frame aerial. On the other hand, the owner must be sure to point the frame towards the required station before tuning in; many amateurs, especially if they are beginners, are apt to overlook this point and thus spoil their chances.

For the distant reception a good map and an accurate compass will be found very useful. The map should be laid on the table by the side of the frame aerial and the loop adjusted with the help of the compass.

The whole secret lies in critical tuning and a properly-adjusted frame. In this condition, with the valves just off oscillating point, a super-het is tremendously sensitive. Take great care to adjust the verniers of both aerial and oscillator circuits until the best results are obtained.

Increasing Sensitivity.

When for any reason conditions are unfavourable the normal sensitivity of the super-het. can be increased in the following way. Erect an efficient indoor aerial by suspending two wires between opposite walls about six inches below the ceiling. Wind one turn of flex around the frame and connect one end to the aerial; an excellent counterpoise can be arranged by joining the other end to a wire laid along the floor under the carpet. By this method the range of the set is considerably increased without any loss of selectivity.

Alternatively a stage of H.F. can be placed before the super-het. to increase the sensitivity of the receiver. This H.F. amplifier can very easily be made by the constructor himself. The connections are quite straightforward. The H.F. transformer consists of a pair of honeycomb coils, preferably wound on the low-loss principle; the primary has 20 turns and the secondary 60. The coils should be mounted on a two-way coil holder with fairly loose coupling to ensure selectivity.

In conclusion, take care and observe the following points. Choose a night which is fairly cloudy, with a little rain. In fact, as a general rule, the rougher the weather the better are the chances of "getting across."

TRANSATLANTIC RECEPTION WITH A SUPER-HET.

By G. MARCUS.

Find out the best values of H.T., etc., tune the set as far as possible to the required wave-length beforehand, and adjust the



A recent photograph of the Manchester station studio. The microphone can be seen in the centre of the illustration.

frame aerial. Listen patiently and tune carefully with the vernier condensers until fairly strong signals are heard. Above all, exercise a little patience and do not be put off if nothing can be heard during the first ten minutes.

Sometimes on nights when no atmospherics are present it may be advantageous to use the outdoor aerial coupled either to the frame aerial by a few turns of wire or else connected direct to the super-het. "aerial" terminal. This procedure does not always require an earth and will not always give better results. It will remain for the reader to try this out and decide for himself whether it gives any improvement or not.

Sometimes it is found that an outdoor aerial connected to the "earth" terminal of the super-het. will give better results.

WHEN THE SET GOES WRONG.

(Continued from previous page.)

in for a multi-valve set or a valve and crystal set he will find that this point has to be very carefully followed; in fact, it becomes quite a problem to keep the grid and plate leads away from each other and as short as possible when dealing with a 4 or 5 valve receiver.

The batteries of a valve set may cause any of the four complaints that I have mentioned previously, though the L.T. battery usually confines itself to "fading," failure to give sufficient signal strength, and occasional grating noises, especially in super-hets. In either case the leads should be examined and then the accumulator or dry cell itself. In either case the voltage should be taken by means of a voltmeter while the battery is in use—that is, while the valves are alight and the battery is discharging. If the voltage is much below the proper voltage the cell is running down, and if it is an accumulator it should be recharged. In the case of the dry battery the only thing to do is to buy a new one.

H.T. Troubles.

Provided the voltage of the battery is quite in order and terminals are clean, the reader may be reasonably sure that the battery is not causing the trouble.

If the battery shows signs of a bad deposit of sulphate, then it is best to take it to a competent electrician to be "cured."

The H.T. battery is more likely to give trouble than its companion the accumulator, and its condition should always be examined upon the slightest sign of trouble

with the set. The H.T. battery usually makes itself felt by producing a series of crackles not unlike atmospherics. If, however, the battery is more than half run down or has a faulty cell, it may often refuse to operate at all and dead silence results.

If crackling occurs, it is usually a sign that the battery contains a faulty cell, and the reader will be advised to go over the whole battery cell by cell with a voltmeter until the faulty one is found. If they are all down to half or more than half their proper voltage, the whole battery should be renewed, but if only one or two cells are down they can be short-circuited by a piece of wire, connecting up across them to two good cells.

Cause of Instability.

Sometimes the voltage of the cells appears to be very little below normal and yet crackling occurs, and in this event the only thing to do is to connect a large, fixed condenser of about 1 mfd. capacity across the whole battery. This will have the effect of steadying the output of current from the battery, and may succeed in eliminating the noises. If it does not, however, and subsequent search makes it absolutely certain that the trouble is in the H.T. battery, the only thing to do is to "scrap" the battery and get a new one.

On occasion the presence of a faulty H.T. cell will cause instability in the set, especially if several stages of H.F. amplification are being used. This is caused by the increase of resistance in the plate circuits due to the faulty cell, and in fact this phenomenon is made use of in one well-known super-het. to provide reaction control. The insertion of a 30-ohm rheostat in the H.F. plate leads allows a variation of resistance sufficient to give good reaction control. The use of accumulator H.T. precludes any troubles from this kind of fault.

CURRENT TOPICS.

By THE EDITOR.

The Reaction Clause in Your Licence—No Drastic Remedy—The "N" Circuit Again—A Letter from the B.B.C.—Broadcasting Finances—The Double Programme Experiment.

WE pointed out in our last issue that the evil of oscillation had reached such proportions that Colonel Harry Day, M.P., had asked the P.M.G., in the House of Commons, whether he was aware that oscillation was causing increasing interference with broadcast reception in this country, and whether he would consider the possibility of prohibiting the use of reaction on the aerial.

We commented on this and suggested that the remedy for oscillation need not be so drastic as this. Our suggestion was that the B.B.C. should investigate the Lodge "N" circuit which, as our readers know, enables the veriest novice to tune in a broadcasting station without the slightest possibility of howling, or causing interference with neighbours.

However, we are glad now to note—and we are sure our readers will also be glad—that Lord Wolmer, the assistant P.M.G., replying to Colonel Day, stated that a condition was inserted in all wireless receiving licences to the effect that reaction must not be used to such an extent as to disturb any neighbouring area. Further, Lord Wolmer did not think that it would be in the general interest entirely to prohibit the use of reaction which "was of considerable advantage in increasing the sensitiveness of wireless sets and only caused interference when improperly used."

No Reaction Ban.

It is true that wireless licences contain the clause about the use of reaction, but that is beside the point. People are warned not to put their heads out of train windows; not to get off a bus until it stops; and not to do a multitude of other things; but they do them, and one cannot really stop them doing them. It is the same with reaction. There might be a dozen clauses in the wireless licence on the use of reaction, but those clauses will never stop thousands of people who—either through ignorance or carelessness—will use reaction improperly.

But, at any rate, the fears of amateurs in this country that an absolute ban will be put upon reaction have been allayed, and we have the assurance of the assistant P.M.G. that no such drastic steps will be taken.

We have received an official letter from the B.B.C. regarding our remarks published in recent issues to the effect that the B.B.C. should investigate the "N" circuit. The B.B.C. state that Sir Oliver Lodge wrote to Captain Eckersley, sending him a copy of the account of the "N" circuit, which was also sent to Dr. Eccles and Captain Round. Captain Eckersley replied giving certain criticisms and suggestions. Sir Oliver's rejoinder was that the circuit worked, and he went on to suggest that Captain Eckersley should make an appointment on a particular evening and inspect the "N" circuit.

Captain Eckersley excused himself, however (he had another appointment) and

suggested another member of the B.B.C.'s technical staff should take his place. Very naturally, Sir Oliver and those associated with him in the matter of the "N" circuit felt that this course would not be so satisfactory, but a date was arranged. The general strike, however, intervened, and the date was deferred.

The B.B.C. state in their letter to this journal that their engineers are anxious and ready to conduct the promised inspection, subject to Sir Oliver's convenience, and that Captain Eckersley will make every effort to be present at the test himself.

We feel sure that our readers will agree that the B.B.C. have now indicated a very praiseworthy spirit in this matter. We have



A typical American cone type loudspeaker. It is a Crosley product and retails for a little over the equivalent of £3.

felt all along that, in urging them to test the "N" circuit, we were doing the right thing. They have now shown their willingness to accept this suggestion and arrangements will shortly be made for a test. We venture to express our warm thanks to the B.B.C. for the manner in which they have received our editorial comments. We can only add that we feel sure they will find their test of the "N" circuit one of extreme interest and satisfaction.

* * *

The report of the Directors of the British Broadcasting Co. for the year ended March 31st, 1926, states that the Company's income from licences, having been limited by the Government to £500,000 per annum, its rate of progress has been retarded. Nevertheless, in spite of all this,—the

Directors of the B.B.C. have found it possible to set aside out of revenue, to March 31st, 1926, the sum of £159,463 to capital and depreciation reserve.

The excess income over expenditure to March 31st, 1926, after forming the capital and depreciation reserve, and providing for income and Corporation profits taxes, and a sum for the Staff Provident Fund, amounts to £6,418.

The B.B.C. Directors recommend a payment of a dividend at the rate of 7½ per cent. per annum on all shares allotted and fully paid up as at March 31st, 1925, and in respect of all shares allotted during the year ended March 31st, 1926, as from the date of full payment, requiring £5,308; and that the remaining surplus of £1,110 be carried forward.

The following figures from the accounts are for the three years ended March 31st, and are of particular interest to all students of broadcasting:—

	£
Income from licences, etc., for 1924	206,974
" " " " 1925	538,528
" " " " 1926	509,872
Expenditure on construction, 1924	55,082
" " " " 1925	128,896
" " " " 1926	271,448
Debtors " 1924	140,402
" " " " 1925	141,235
" " " " 1926	78,220

Dual Broadcasting.

The B.B.C. experiments in dual broadcasting from Oxford Street on the standard 2 L O wave-length of 365 metres and another programme from Marconi House on a wave-length of 460 metres have proved not only interesting, but successful.

The B.B.C. report that they have had many letters from listeners, and that the evidence goes to show that the experiment was of undoubted success.

London valve users do not seem to have found much trouble in completely cutting out one station or another at will, while both stations were received at about equal strength.

The idea of the experiment was chiefly for the benefit of crystal users; it being the B.B.C.'s wish to see whether it would be possible to provide them with a choice of programmes.

Judging by the results of the experiment to hand, this idea would seem to be quite practicable.

In connection with this scheme of simultaneous broadcasting, the "Daily Telegraph" quotes an interesting experiment in radio synchronism, which was recently carried out in America.

Three instrumentalists—a violinist, 'cellist and organist—successfully joined together in an instrumental trio, although the violinist was playing in St. Paul, the organist in the City of Minneapolis, and the 'cellist in the transmitting room of the Minneapolis station eighteen miles away. Each instrumentalist wore headphones all intercommunicating, and by this method a perfect ensemble was maintained.



IMPORTANT NOTICE

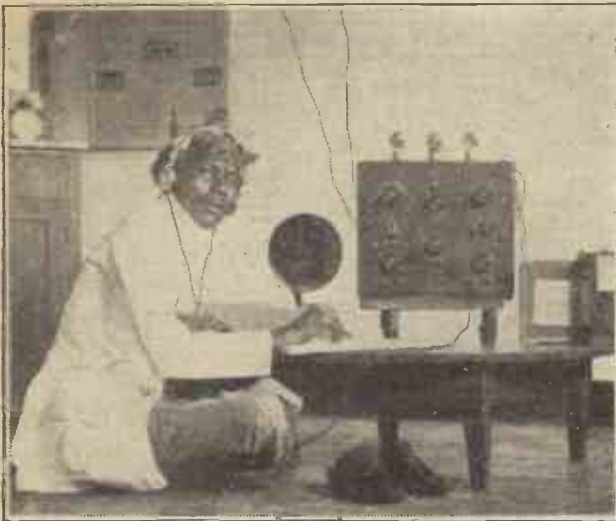
WIRELESS VALVES

INJUNCTION WITH DAMAGES

ON the 15th June, 1926, in the High Court of Justice, Chancery Division, in the case Marconi's Wireless Telegraph Co., Ltd., v. Brahams (Houndsditch), Ltd., Mr. Justice Tomlin granted an Injunction restraining the Defendants from infringing Letters Patent No. 184,446, and ordered them to deliver up to the Plaintiffs all TRIOTRON DULL EMITTER '06 AMPERE VALVES and pay DAMAGES and also the costs of the action.

WARNING

Dealers in TRIOTRON Valves are warned that the PATENTEES will take legal proceedings against any person selling or using infringing valves. No licence has been granted under the above Patent to any foreign Valve Manufacturer.



East comes West for true Radio reproduction

IN many respects the East excels the West. Not so in Radio. That is why in many an Indian or Chinese home, you'll find the Brown.

The fame of such a superb instrument as the Brown was sure to spread. A Loud Speaker, upon which such care was lavished and such scrupulous pains were taken to ensure it being perfect in volume and tone, was, from the first, destined to have a world-wide popularity. The first Loud Speaker to be used for Wireless purposes in this country is now to be found rendering faithful radio-service throughout the world. There's a reason—hear the Brown at your nearest Dealer's, and you'll understand the world's preference.

There's a Brown for everyone!

Brown Loud Speakers are made in the following types—H.1, 120 ohms £5 5 0, 2,000 ohms £5 8 0, 4,000 ohms £5 10 0. H.2, 120 ohms £2 5 0, 2,000 ohms £2 8 0, 4,000-ohms £2 10 0. H.3, 2,000 ohms £3 0 0. H.4, 2,000 ohms £1 10 0. H.Q., 2,000 or 4,000 ohms £6 0 0. Type Q., 120, 2,000 or 4,000 ohms £15 15 0. Cabinet Type, 2,000 or 4,000 ohms £6 6 0 and Crystavox £6 0 0.

There is also a range of **Brown** Headphones. They are priced from 20/- to 60/-. Ask your dealer!



S. G. BROWN, Ltd.,

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Retail Showrooms—19, Mortimer Street, W.1; 15, Moorfields, Liverpool; 67, High Street, Southampton.

Wholesale Depots—2, Lansdown Place West, Bath; Cross House, Westgate Road, Newcastle; 120, Wellington Street, Glasgow; 5-7, Godwin Street, Bradford.

EDISWAN VALVES

Two New Dull Emitters!

THE ORIGINATORS OF THE
WIRELESS VALVE NOW BRING YOU
BETTER RECEPTION THAN EVER

G. P. 4. General Purpose DULL EMITTER for use with 4-volt accumulator. :: :: Lower current consumption. Clearer reception. Louder volume. Microphonic effects reduced to minimum. 16/6 each	P. V. 4. Power Valve for use with 4-volt accumulator. It is the ideal companion to G.P.4. :: :: Loud Speaker volume with extreme purity of tone. :: 22/6 each
---	--

Volts 3.5-4	Volts 3.5-4
Amps ... .. .15	Amps ... .. .35
Plate Voltage 60-120	Plate Voltage 60-120
Amplification Factor 12	Amplification Factor ... 6
Slope ... .. .55 Ma/v	Slope ... .. .65 Ma/v
Impedance 22,000 Ohms.	Impedance 9,500 Ohms.

The following table indicates the combinations of Ediswan Valves for PERFECT RECEPTION

Receiving	Price	Amplification of Service Valve	Power	Price
G.P.4	16/6	4	P.V.4	
A.R.	8/-	4	P.V.4	22/6
A.R.		6	P.V.5	22/6
*ARDE	14/-	2	P.V.6	18/6
*A.R.06	16/6	3	P.V.8	22/6

* Made in L.F. and H.F. types.
- All DULL EMITTERS except A.R.

Obtain from your Dealer the New Ediswan Folder "2 New Valves"

The
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123-5, Queen Victoria
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BROADCAST NOTES.

By O. H. M.

The Annual Meeting—That £900,000 Broadcasting Honours—The New Commission Completed—Who Are The Commissioners?—Special Broadcasts—A Hint to Captain Eckersley—B.B.C.'s Big Concert Series.

AT long last the B.B.C. has spoken out officially. Lord Gainford's speech, as Chairman, at the last Annual General Meeting of the Company on July 8th, contained some home truths for the Government as well as for listeners. The limitation of revenue from licence fees was definitely stigmatised as having seriously crippled the service during the past year. It was shown that at the end of this year, when the B.B.C. hands over, there will be no less than £900,000 of licence money at the Post Office over and above the amount required to defray the cost of collecting licences. A strong plea was made for the extension of the frontiers of broadcasting, and the definite acceptance of the principle. "No privileges and no restrictions," in dealing with other organisations. There was no attempt to give expression to the views of a section of manufacturers that the B.B.C. licence as at present should be extended. Although there was some liveliness at the General Meeting, it is unlikely that the declared policy of the Government will be modified.

I imagine there was a feeling of genuine relief among B.B.C. well-wishers of discernment that the rumoured "Broadcasting Honours" were not included in the Birthday List. This List had been deferred in order to enable the Government to reward those of its supporters who did good work during the General Strike. It would have been invidious in the extreme if the B.B.C. had been classified in this category. Of course the B.B.C. honours should have been conferred at the beginning of the year. No doubt an effort will be made to include them in the next New Year's list; but I have a strong impression that they will be declined. There has been so much talk about these honours that the threatened recipients are heartily sick of the whole idea.

The New Commission.

At a dinner party the other night I had the good fortune to find myself placed next to a prominent Post Office official who got much more talkative about broadcasting than is customary for members of that department. Among tit-bits I gleaned was that the new Commission has now been completed, and has already held two meetings fully attended. It is being constituted under a Royal Charter, and the Government has definitely decided to prevent any parliamentary discussion of the Constitution. This will be done by following the administrative procedure, and tabling the Charter as a *fait accompli*. My informant did mention, however, that the Government had secured the acquiescence of the leaders of the opposition parties. Even so, I imagine there will be some heartburning in backbenches on both sides of the House that a measure settling the permanent constitution of such an enormous factor for good or evil should be slid through without any debate. Anyway, it will not be "slid"

until November or December, when it will be too late to change it. I am surprised that no Press sleuths have as yet discovered the name of the new Chairman of Broadcasting. "Street" trackers have been on the job for ten days or more without result.

Sir John Martin Harvey is to broadcast in one of his shorter plays towards the end of August. This year the new radio season will open earlier in anticipation of the first really national wireless Exhibition in September.

Future Programmes.

The great American artiste, Miss Ruth Draper, will probably be included in a programme at Savoy Hill early in the autumn.

The Chorales from the Bach Passion music will be broadcast from Peterborough Cathedral at an early future date.

Continuing its series of "atmosphere" school broadcasts, the B.B.C. will take half

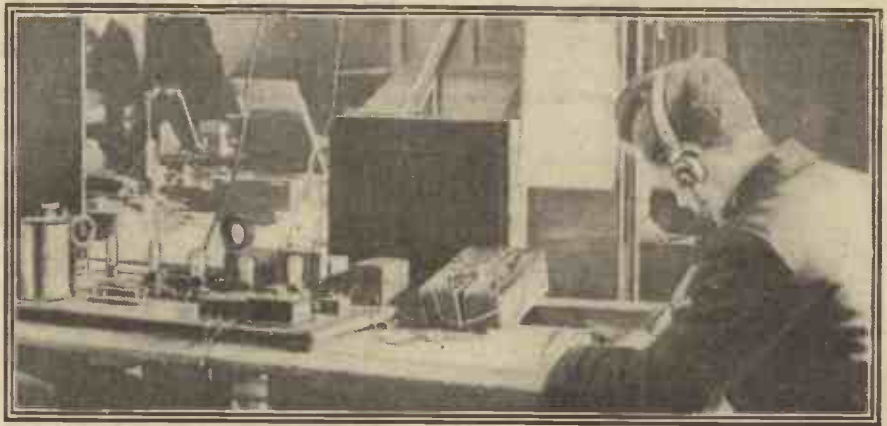
cut has been deliberately ignored. Another example is the way the short wavelength transatlantic experiments have been scorned. I should think that the B.B.C. engineering department, although admittedly efficient, has become too self-contained and perhaps also too self-satisfied. Captain Eckersley, the Chief Engineer, has had to spend a great deal of time abroad in connection with international affairs. I hope that the pressure in this direction will shortly relax to permit the popular Chief Engineer of the B.B.C. to curb the bureaucratic tendencies of some of his hierarchy. It would take him just two days to put matters right.

B.B.C. and Concert Industry.

Mention of Captain Eckersley reminds me that he has undertaken to organise and superintend a special programme in celebration of Daventry's birthday on July 29th. Listeners should reserve this date. Captain Eckersley's abilities as a programme builder are unexcelled either here or abroad.

Prospective forthcoming arrangements include Sir Frank Benson in a talk on Shakespearean Memories.

The B.B.C. plans for their big concert series next season are now complete, and, if the concert industry do not discover the wisdom of negotiation before the end of July, they will be very unwise. There will be straight "no quarter" competition with the whole power of the microphone thrown



Part of the new receiving station set up by 2RN (Dublin) for the purpose of picking up news for broadcasting.

an hour of Highgate School concert at 9 o'clock on July 26th.

The Royal Academy of Dramatic Art has been asked to arrange a special broadcasting programme in the autumn.

I hear growing murmurs of the alleged haughtiness and pontifical attitude of B.B.C. engineers. I have not seen anything of this myself, but the rumours are so persistent that it looks as if someone is really at fault. There seems little doubt, for one thing, that the attitude of B.B.C. engineers towards amateurs leaves a good deal to be desired. Then, again, there seems to be no inclination whatever to encourage new ideas that originate outside the charmed circle of the professional experts of the staffs of the half dozen manufacturing firms that started the B.B.C. An example of this intolerance is the way the Lodge "N" cir-

into the scale for the first time. I do not care for the prospect of such a struggle, for the reason that it would be bad for art if the concert industry were adversely affected; but, at the same time, the broadcasting authority cannot be expected to run away from such definite challenges as have been flying about lately.

Programme Research.

Programme research has taken its place definitely as a properly constituted section of B.B.C. activities. This was overdue. The preparation of standard programmes without reference to date should be going on constantly at Savoy Hill.

There has been a big public dust-up at Belfast about the local programmes. A town's meeting passed severe resolutions. There is no doubt that there is substance in the complaints, and the B.B.C. headquarters have the matter in hand.

RADIO TUTORIAL

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The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

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

Readers' letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers. The envelope should be clearly marked "Patent Advice."

TECHNICAL QUERIES.

Letters should be addressed to: Technical Query Dept., "Popular Wireless," The Fleetway House, Farringdon Street, London, E.C.4.

They should be written on one side of the paper only, and **MUST** be accompanied by a stamped addressed envelope.

Queries should be asked in the form of the numbered questions: (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.

For every question asked a fee of 6d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the numbers. (It is not possible to reproduce the question in the answer.)

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

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

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

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

Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)

Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1s. per diagram, and these should be large, and as clear as possible.

No questions can be answered by 'phone. Remittances should be in the form of Postal Orders.

Questions and Answers

WINDING BASKET COILS.

"COIL-WINDER" (Walton-on-the-Naze).— I am winding a set of basket coils, having eleven slots, and I have found the smaller sizes—35 to 75 turns—very efficient. For coils of 100 turns or more, however, there is a difficulty owing to the coil getting too bulky. Can this disadvantage be obviated in any way?

(Continued on page 714.)



Traders and manufacturers are invited to submit wireless sets and components to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." Test room under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

A PRICE CORRECTION.

IN a recent issue the price of Messrs. Clarke's well-known and efficient "Atlas" filament control was given as 5s. 6d. This should have been 6s. 6d., at which figure the component is still most excellent value for money.

BOWYER-LOWE PLUGS AND JACKS.

Jacks are very neat fittings and are able to take the places of most switches in a receiver. For instance, a single jack and plug can be used to replace a D.P.D.T. switch for cutting out a stage of amplification, or a series of jacks can be incorporated in a set so that the 'phones or loud speaker can be plugged into any desired combination of valves which becomes automatically available by this means.

But both the plugs and jacks must be of efficient design, or otherwise trouble may be experienced through bad contacts. Old

line-telephone plugs and jacks are seldom above suspicion, but there are now on the market several makes produced especially for radio work. A good example is the new series introduced by Messrs. Bowyer-Lowe, who recently sent us a number of samples for our examination. Of stout girder construction with pure silver contacts and hard tinned phosphor bronze springs, the jacks are very different to some on the market. Mechanically and electrically they reach a very high standard and will go a long way towards removing the suspicion against this type of component which has been caused by a flood of inefficiently designed and damaged "ex-service" stocks.

The Bowyer-Lowe plug is also distinctly substantial in construction, but in our opinion is rather too large, not to say clumsy. Its insulating section is nearly 2 in. long and has a diameter of nearly 1 in.

It is very nicely made, but could be improved in appearance by a reduction of dimensions.

The Single Circuit (open) Jack (No. 1) costs 2s. 2d., and the closed type (No. 2) 2s. 7d. Other prices are 3s. for the Double Circuit Jack (No. 3) and 3s. 3d. for the Filament Double Control (No. 5). These prices are quite reasonable, but 5s. for the plug would seem a trifle high.

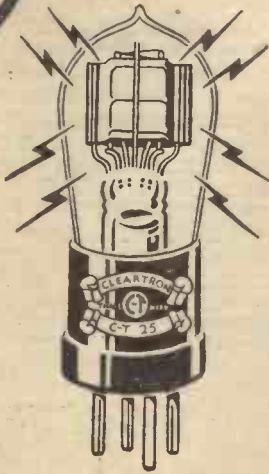
THE KAY-RAY S.L.F. VARIABLE CONDENSER.

It is interesting to note the progress that has been made in variable condenser design during the past few years. Also it is even more interesting to compare the prices of early and late models of this component. In 1922 17s. 6d. was considered quite a reasonable price for a .0005 mfd. variable of the crude built up ebonite end plate type. We were reminded of this by the arrival from Messrs. K. Raymond of two of their Kay-Ray straight-line-frequency variables.

These are of an essentially modern design, one that is particularly new to the English market, although perhaps one that has dominated the American market for some time—comparatively speaking. An absolute minimum of solid dielectric is employed and the moving vanes are connected to the metal end supports. These latter cannot be styled plates in the case of such a condenser as the Kay-Ray, for in this stout aluminium castings of a girder shape are used.

Mechanically the Kay-Ray is a nice piece of work and it is accurately assembled and cleanly finished. The movement is smooth

(Continued on page 712.)



ELECTRONS

The Life of the Valve

The unusual electronic emission from the filament of this valve is responsible for its remarkable efficiency and utility. But to give you this efficiency the electron flow must be thoroughly constant and generous.

Not only is the CLEARTRON-built anode efficient but it brings a 40 to 60 per cent. increase in electronic emission. A unique theory—protected by patents pending—develops a specially constructed path which yields greater and more even electron output. That is why CLEARTRON valves bring greater distance and increased volume.

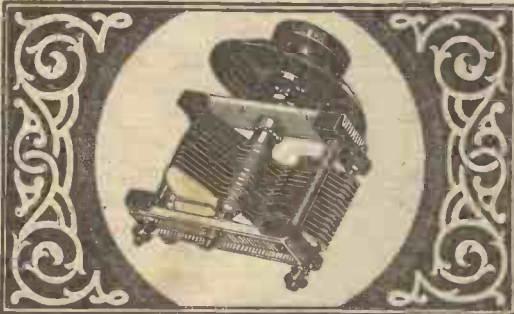
Full technical data of all types obtainable from your dealer or from

CLEARTRON RADIO, LIMITED
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BRITISH  MADE

CT/51



Wonderful

THE popular price of this new condenser of unrivalled precision, presents to the amateur the ideal instrument for his experimental set. The construction, executed for mechanical perfection has been achieved by the use of a ball-bearing rotor eliminating harshness and unreliability of tuning. Electrical efficiency and exceptional range of wave-length, together with full dial availability for tuning, is combined in its low-loss square law design.

If at any time the Bowyer-Lowe Condenser develops a fault during the twelve months after purchase, the article will be replaced free of charge.

Instal this instrument now.

Write for descriptive leaflet free on application to:-
The Bowyer-Lowe Co., Ltd., Letchworth.

10/-  10/6

BOWYER-LOWE

ANNOUNCEMENT BY THE BOWYER-LOWE CO. LTD. LETCHWORTH HERTS

Simple, accurate, and easily adjusted

Moving Block cannot fall:

Don't experiment! Get a "Lotus" and be certain of better results. The vernier movement comprises three sets of enclosed precision machine cut gears and reduces the speed of the moving coil block by eight times. The moving block moves in the same direction as the knob, which prevents confusion. It also becomes absolutely rigid in any position, holding the heaviest coil securely. No screws required to tighten it.

LOTUS

VERNIER COIL HOLDERS

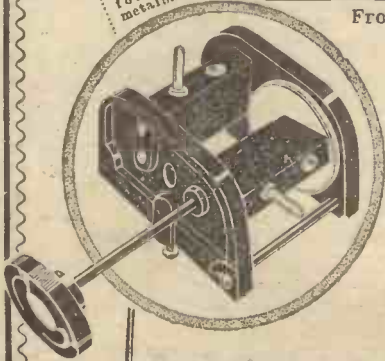
From all Radio Dealers.

Two Types:

- For outside panel mounting:
- Two-way 7/-
- Three-way 10/6
- For inside baseboard mounting, with 6 in. handle:
- Two-way 8/-
- Three-way 12/6

Garnett, Whiteley & Co., Ltd.,
 Lotus Works, Broadgreen Road, Liverpool
 Makers of the new improved "LOTUS" Valve Holder.

Patent mouldings for the side plates and knobs. Heavy nickel plating for the metal parts.



APPARATUS TESTED.

(Continued from page 710.)

and free from any suggestion of "backlash." Stout terminals of a novel pattern are fitted and the dial is clearly engraved and provided with a large milled knob. The



Proving the world-wide popularity of Brown loud speakers, one is shown above in use in Egypt, and—

component is arranged for single hole panel mounting. Electrically the Kay-Ray is well up to standard, having a low minimum capacity, a maximum substantially as stated, and an insulation resistance reading infinity. At 8s. 3d. for the '0003 mfd. and 8s. 11d. for the '0005 mfd., the Kay-Ray is, in our opinion, very excellent value for money.

THE "ENHANSA" INDOOR AERIAL.

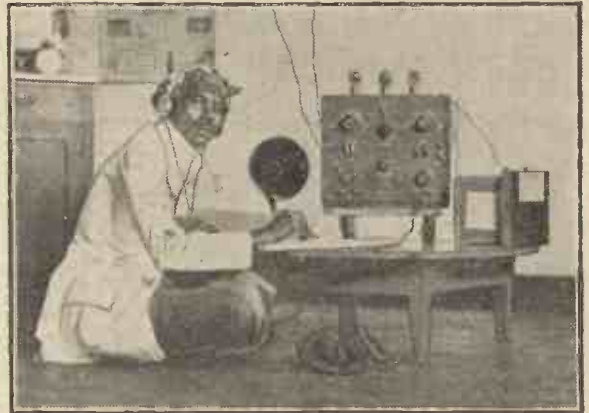
Messrs. Ward & Goldstone, Ltd., Frederick Road, Pendleton, Manchester, recently sent us a sample of their new "Enhansa" indoor aerial. It consists of a twelve-foot length of thick braided flexible wire at each end of which an insulator is fitted. It can easily be hooked up, and should prove useful both for indoor work and for portable set purposes. Owing to the manner in which the wire is braided it has a very large reception surface.

On test we obtained fair crystal signals at a distance of six miles from 2 L O with the "Enhansa" strung up at a height of about 15 ft. from the ground level, and in view of the existence of considerable shielding, this result is distinctly good. With a valve set the results were better than those given by a large frame at a similar height. The price of the "Enhansa" is 2s. We understand that similar stranded wire to that used in this patent

aerial will shortly be available in sufficient lengths for ordinary outdoor aerial work.

AN EFFICIENT LITTLE TRANSFORMER.

An excellent little L.F. transformer for the price is the "Empire," a product of the H.T.C. Electrical Co., Ltd., of 2, Boundaries Road, London, S.W.12. It is retailed at 7s. 6d., and was designed to compete with cheap imported transformers. A twelve months' guarantee is given with each one sold. On test the two samples sent in gave surprisingly good results, and, although they did not reach the standard of the higher-priced English transformer, they evinced an efficiency out of all proportion to their size and price, and in our opinion are markedly superior to the majority of cheap foreigners.



—another "loud speaking" efficiently in the home of a Penang enthusiast.

FILAMENT RHEOSTATS AND POTENTIOMETERS



With the windings carried on a porcelain bobbin and having the contact arm moving on its inner side, the "Cosmos" Filament Rheostat takes up remarkably little space, is strong in construction, and has a very smooth and reliable movement. It is fixed by ONE HOLE, and is provided with a handsome knob and dial. Made in four types, two of which are double wound for Dull OR Bright Valves, and one a Potentiometer, the prices are as given below.

METRO-VICK SUPPLIES, LTD.

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

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P10

Description	Ohms	Carrying Current	Price	
			s.	d.
Single Wound	6'0	1'0 amp.	4	6
Double "	18+2	'4-1'5	5	0
Double "	30+4	'2-1'0	5	0
Potentiometer	300	—	6	0

Cosmos
RADIO COMPONENTS



British Made

L.F. TRANSFORMER TYPE A.F.3

A TESTIMONIAL FROM OVERSEAS

"It is a pleasure to us now being able to inform you about the result obtained with your A.F.3 transformers, built into our sets.

"There is but one expression for it—'excellent' and it is indeed the most perfect transformer which exists and with which one can only obtain a true and pure reception.

"As you perhaps know, we have used till to-day the world's best transformer in name, but in comparison with the new A.F.3 Ferranti, there is a striking advantage in favour of the FERRANTI.

"We can congratulate you with such a product of high refinement, and we hope to be able to do good business for you."

Ask your Dealer for Leaflet Wa 401



25/-

FERRANTI LTD., HOLLINWOOD, LANCASHIRE

Selectivity

The following letters of appreciation are taken at random from numerous communications of a similar nature, which our friends have been kind enough to send us:—

70, Alexander Road, London, N.

Dear Sirs,—I have made up one of your 4-valve sets from your instructions, and thank you for the pleasure the set is giving me. I have constructed a great number of sets during the last three years but never had results to equal this set of yours, which is wonderful. Stations come in on nearly every degree of the condensers and at loud speaker strength. I am using one of your Reaction Units, which makes tuning as simple as A B C. I have had several friends round to hear the foreign stations come in, and I may tell you they are all going to turn their sets into one like mine.—G. A. Pullen.

Dear Sirs,—I have one of your Long Range Selective Receivers and am very delighted with same. I can cut out 2 L.O. and receive Birmingham, Brussels and Ecole Supérieure, Radio-Paris, Berlin, and Hilversum in daylight. I am within half a mile of 2 L.O., in fact I can see its two wires plainly from my roof.

Wishing you every success in the future.—C. A. Narring.

P.S.—Birmingham and Brussels on thirty foot indoor aerial.

Price of the Ormsby Receiver is £25 (including Royalties)

For those who wish to construct their own sets, the Ormsby Patent Cardboard Model will assure success. It puts this wonderfully selective set within the reach of all. Price 3/-

Postage 3d.

Ormsby & Co., Ltd.

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Telephone: Holborn 4897.

SCRAP H.T. BATTERIES!



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

SAFE! SILENT! SOUND!

MODEL	VOLTAGE TAPPINGS.	PRICE
1A	ONE	42/6
2A	TWO	55/-
3	THREE	67/6
V2A	1 VARIABLE, 1 FIXED	£3: 17: 6
V3	2 VARIABLE, 1 FIXED	£4: 17: 6
V3A	THREE VARIABLE	£5: 5: 0
3A	SPECIAL "MARCONI STRAIGHT 8" MODEL	£6: 6: 0

Most favourable Test Reports have appeared in:
 "Popular Wireless" May 29
 "Wireless Trader" June 2
 "Broadcaster" April
 "Birmingham Mail" June 2
 "Shopping" June
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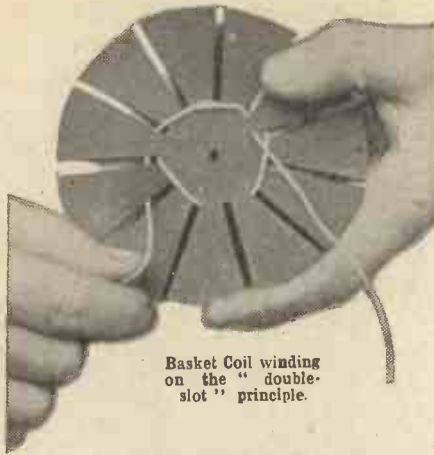
Contents include:—Laws of Football for the coming season. Four Pages of Photographs. All English League Fixtures for 1926-27. Full particulars of New Players, etc., etc.

On Sale Everywhere!
Buy it AT ONCE

RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 710.)

The disadvantage of making the coils too big can be overcome partially, though for the really large coils of 200 turns or more the "honeycomb" or "diolateral" method of winding is to be preferred to "basket" winding.



Basket Coil winding on the "double-slot" principle.

For coils of from 75 to 150 turns, the method of double-slot-winding basket coils should be tried. The wire is wound on in exactly the same way as before, but instead of every slot being filled, the wiring enters and misses alternate slots.

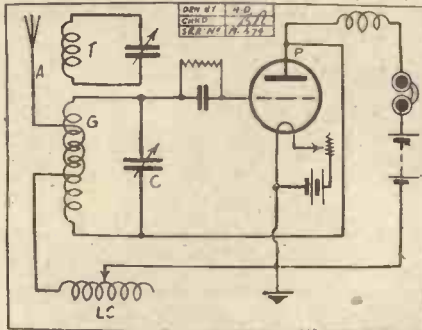
This will be clear from the accompanying photograph. Near the thumb on the right is a hole in the former which holds the beginning of the wire. After passing through this hole, the wire emerges at the slot above, and then crosses two sections before being passed down the slot. It remains behind the former for two slots, and then emerges again; and so on round and round, as shown in the illustration.

THE COCKADAY CIRCUIT.

H. H. W. (Maida Vale).—Living quite close to the London station I find great difficulty in cutting this out so as to be able to receive other stations. I have a very efficient 2-valve amplifier, and I think that if I could only obtain a really selective single-valve set to add to this it should be possible to receive several stations on the L.S.

A really selective circuit is required in your case or it will be practically impossible to cut out this station, especially if further amplification is used. Such a circuit is the Cockaday, which we are reproducing herewith. The manner in which broadcast telephony can be handled by this receiver is remarkable. A set placed within two miles of 2 LO with your amplifier should enable you to receive several stations on the L.S. when 2 LO is working.

The greatest peculiarity of the circuit is that the length, capacity, and characteristics of the circuit to which it is added (either the aerial or amplifier side) are almost immaterial.



For winding the coils ebonite formers $3\frac{1}{2}$ in. diameter are used. The aerial coil L.C. is bank wound on a $3\frac{1}{2}$ in. by $1\frac{1}{2}$ in. ebonite former. The winding consists of 43 turns of 20 D.C.C. tapped at the 3rd, 7th, 13th, 21st, 31st, and the end. This coil is mounted standing upright on the panel. The remaining coils A, T, and G are wound as follows. T is wound at

one end of a piece of ebonite tube $3\frac{1}{2}$ by 6 in., and consists of 34 turns of 20 D.C.C. wound in a single layer. A space of $\frac{1}{4}$ in. is left and then the coil G is wound, which consists of 65 turns with an inch space left at 32 turns before continuing the winding. Over the coil G is wound one turn of 20 S.W.G. D.C.C.—this constitutes the coil A. One point to bear in mind when mounting L.C. is to make sure that this is mounted close up to the main coil and absolutely at right angles to G. The choke is of the ordinary H.F. type—i.e. 250-300 turns.

A fairly good rheostat is advised for this circuit, having a resistance of approximately 30 ohms. The valve should preferably be of the soft type, although it will be found that practically any type of detector valve will work well in this set. As the H.T. is fairly critical, the H.T. battery employed should be tapped every three volts.

For the Constructor

No. 8.—WORKING EBONITE.

- (a) Don't use pencil to mark a panel. Unless thoroughly cleaned off with a slightly oily cloth, there is a tendency for leaks to occur along the pencil-marks.
- (b) When the marking has been done, a light tap with a centre-punch will ensure that the drill starts properly.
- (c) Ebonite can be cut perfectly square if a tenon saw is employed.
- (d) If a hacksaw or (for big panels) a rip-saw is used, the "cut" should not be along the line marked, but just outside it. Otherwise the panel will be too small.
- (e) Use a coarse file to trim panel edges. Fine files become choked.
- (f) "Metal-working" drills should be chosen, and only a light pressure employed.
- (g) Keep the bench clear whilst working, or the panel will be disfigured by scratches.
- (h) When "breaking through" with the drill, relax the pressure, or the panel surface may chip.
- (i) When withdrawing the drill, do not reverse, but continue turning slowly.
- (j) Ebonite melts under heat, so terminals will need tightening after they have been soldered.

STRAIGHT AS A DIE!

The amplification curve of the Watmel Auto-Choke—literally as straight as a die—speaks for itself. It tells of unsurpassed purity of tone—of whippers built up into voluminous sound. It reveals, as plainly as can be, the way to natural-toned reproduction without sacrificing an iota of volume. Unlike most chokes, the Watmel Auto-Choke, by virtue of its patent core and specially balanced windings, gives a step-up increase in volume equal to a transformer-coupled stage of low frequency. Price 18/6.

Ask your dealer for a demonstration or send a postcard for booklet telling you more about "the Inter-valve coupling with the 'straight-line' curve."

Watmel

AUTO-CHOKE

Built by the makers of the Watmel Variable Leaks and Fixed Condensers.
 THE WATMEL WIRELESS CO., LTD., 332a, Goswell Rd., London, E.C.1
 Lancashire and Cheshire Representative:
 Mr. J. B. LEEVEE, 23, HARTLEY ST., LEVENSHULME, MANCHESTER.
 Telephone: 475 Heaton Moor.

...lower H.F. resistance than any other commercial plug in coil!

TESTS carried out by the National Physical Laboratory show that the LEWCOS COIL has a lower H.F. Resistance than any other coil on the market. Its low H.F. resistance combined with great selectivity and mechanical strength make the LEWCOS Coil the finest you can buy.

Try a LEWCOS Coil in your set—it makes all

Made by the manufacturers of Glazite.

the difference! Descriptive leaflet sent free on request to:

THE LONDON ELECTRIC WIRE COMPANY & SMITHS LTD.
 Playhouse Yard, Golden Lane, London, E.C.1.

No.	25	35	40	50	60	75	100	150	200	250	300
Price	4/6	4/6	4/6	5/-	5/6	5/6	6/9	7/6	8/6	9/-	10/-

LEWCOS

Inductance COIL

SHORT-WAVE JOTTINGS.

By 2 O.D.

E. J. SIMMONDS, M.I.R.E.
(Staff Consultant).

IN my short-wave notes a few weeks ago, I mentioned that it had been possible to maintain consistent communication with Australia for several hours daily, using at this end a small indoor aerial, both for transmission and reception, and it is thought that perhaps some details of the type of aerial used for these tests may be of interest and also direct attention to the possibilities of such systems.

A master oscillator transmitter, operating on a wave-length of 32.1 metres, was available as a source of radio-frequency energy, this transmission having been used in a long series of adjustment tests on various types of outside aerials, and exceedingly strong signals had been reported from various parts of the world.

Many trials were made to determine the best type of aerial suitable for indoor transmission, and by far the best results were obtained by using a horizontal half-wave Hertz oscillator, placed in the loft of the house under the tiles, and fed from the transmitter by two parallel radio-frequency feeders. The transmitter is erected in a lower room some distance away, and the radio-frequency feeders connecting to the Hertz oscillator are approximately 8 yards long, the wires being spaced 3 inches apart.

An Indoor Transmitting Aerial.

The Hertz oscillator has a three-turn coil at the centre, which is magnetically coupled to a similar coil at the termination of the feeders.

The coupling coil in the aerial is split at the centre, and a radio-frequency ammeter is inserted to measure the current. By suitable adjustment of the circuit in the transmitter, the maximum readings are obtained at this point. As mentioned above, the aerial is designed to operate as a half-wave oscillator, and as the operating wave-length chosen was 32 metres, the total length of the aerial was 16 metres.

During the tests on this indoor aerial the existing outdoor aerials were entirely removed, as it was considered that the presence of any form of external radiator would undoubtedly mask the true action of the indoor aerial under test, and tend towards unreliable conclusions.

Using the simple aerial here described, it was found possible to maintain consistent daily contact with Australia 2 L.M., and reports are to hand of good reception of these signals by many New Zealand listeners.

This type of aerial gave very favourable results on the reception of long-distance stations using the 30 to 40 metre band, there being a marked reduction of atmospheric, in favour of the desired signal.

4 - ELECTRODE VALVES



We are the suppliers of the genuine U.C. and Thorpe valves, as specially tested and recommended by the "Valdyne" inventors and "Popular Wireless" U.C.5 and Thorpe K.4 (both 4-electrode 5-pin valves), each, post free.....

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Order direct from—**LUDGATE RADIO CO.,**

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Designed for strength

At last there is a Coil which is not only electrically perfect, but is also mechanically strong—most coils are flimsy in construction, and after a little use become shapeless. The Eureka Low Loss Coil is so made that the greatest strength is in the base which bears the most strain. The ebonite rib, situated immediately above the plug, allows repeated removal from the socket without any damage whatever to the coil. The solid ebonite former and band also add materially to the strength of this fine coil.

Q Low Self Capacity

There is no coil on the market which has such a low self capacity—an examination will convince you of this. The unique method of winding, and the exact spacing of the high grade silk-covered wire permit of such a minute self-capacity that sharper tuning and therefore greater selectivity must result.

Q Handsome Appearance

Mechanical strength and electrical perfection are indeed sufficient to commend the Eureka Coil, yet, there is another point in its superiority—appearance. When you see this Coil at your Dealer's you'll at once agree that it is the most handsome coil you ever saw. Its green silk wire and neat finish will enhance the appearance of any Receiver. Glance at the prices alongside and see how little you have to pay for this super Coil.

Here is the range:

E20	40-150 metres	4/3
E25	55-250 metres	4/3
E35	80-375 metres	4/3
E50	120-560 metres	4/6
E75	185-760 metres	4/10
E100	285-1000 metres	6/3
E150	360-1500 metres	7/-
E200	470-1375 metres	8/-
E250	530-2725 metres	8/6

All the above wave-lengths are obtained with a 0005 mfd. variable condenser in parallel.

Portable Utilities Co. Ltd.
(Eureka Radio Products),
Fisher St., London, W.C.1

EUREKA

Low Loss Coils

LOW LOSS SQUARE LAW

This variable Condenser is simply marvellous value. It cannot be equalled in price or quality.

Post 6d. set. 0003 - 4/11
VERNIER 1/- each extra.

SPECIAL DISTRIBUTOR OF ORMOND PRODUCTS SQUARE LAW LOW LOSS, 0005, 9/6, 0003, 8/8 (1/6 each, less no vernier). FRICTION GEARED, 0005, 15/-, 0003, 14/6; 00025, 13/6. STRAIGHT LINE FREQUENCY FREQUENCY GEARED, 0005, 20/-; 00035, 19/6. FILAMENT RHEOSTATS DUAL, 2/6; 6 ohms or 15 ohms, 2/- POTENTIOMETER, 400 ohms, 2/6, L.F. SROUDED, latest model, 17/6.

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05 - 8/11
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With knob & dial. Post 6d. set.

This true Straight Line Frequency Condenser will amazingly improve the selectivity of any set. Sturdily built. Electrically and mechanically right—meeting all requirements of low loss design. Mounting this real Straight Line Frequency Condenser in your set NOW, and experience the joy of quick, certain tuning. TAKES ANY SLOW MOTION DIAL. Supreme Selectivity.

SETS FOR THE MILLION



Sets complete with following accessories— Long distance 2-valve L.F. and Detector Receiver in handsome polished cabinet; includes set as shown, 1 power, 1-06 D.E. valves, tuning coils, H.T. 50v. L.T., Aerial Equipment, H.T. & L.T. Leads, 2 pairs of 4,000 ohms phones, or LOUD SPEAKER (Marconi Tax Paid). £4 : 10 : 0

Also new circuit specially adapted for use with indoor aerials. Specification as above. 25 : 10 : 0 Carr. and Packing, 5/- set.

HEADPHONES

N. & E. GENUINE. See name in full on outside cases, new Lightweights, 11/8. Extra quality do. 13/6. DR. NESPER, unapproachable value, adjustable, wonderful tone, 12/11. Do. TELEFUNKEN (20), model limited number at 14/11, adjustable, genuine. "BRUNET" stood the test of years, need no boosting, 11/8, 12/11, 14/6, 3 models. ERICSSON EV CONCENTRICAL, still as good as ever, exquisite tone, sample pair, 7/11. ALL 4,000 OHMS.

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BARGAIN DEPT. Huge quantities of window-rolled and goods which have been taken in exchange for sale at ridiculous prices. Bargains not sent by post.

ALL PETO SCOTT'S PARTS SOLD HERE

CALLERS' COLUMN (SEND FOR POST LIST.)

ACCUMULATORS. - 2 v. 40, 7/1; 2 v. 60, 9/6; 2 v. 80, 12/8; 2 v. 100, 14/6; 4 v. 40, 13/11; 4 v. 60, 17/11; 4 v. 80, 23/6; 6 v. 60, 26/6; 5 v. 80, 35/6. ALSO another good make, 1/6 extra on each. Switch-Spade Terminals for H.T., L.T., etc., 1/6 pr. Spade tags, 6 a 1d. Spade screws, 2 for 14d. Red or Black, 3d. pr. Ins. staples, 5 a 1d. Ormond screws and nuts, 2 a 1d. Switch arms and studs, 1/- Nickel, 1/4 Wander Plugs, 2d. 3d., 4d. pr. Plug and socket, red and black, 3d. Twin Flex, red and black, 12 yds., 1/6. Miniature silk, 6 yds. 6d. Ins. hooks or egg insulators, 2 for 1d. Aerial wire, 7/22, 100 ft., 1/11. Extra heavy weight, 2/3. Stranded aerial, 100 feet (49 strands), 1/3. H.T. BATTERIES, 60 v. 5/11; 100 v. 11/6; 150 v. 17/6; 200 v. 23/6. B.B.O. 60 v. 8/11; 100 v. 13/9. 4.5 Flash Lamp Batteries, 6d. line, 6 for 2/9. "A.B.", 3 for 1/- for 1/3. Various per dozen, 3/8, 3/9, 3/11. D.C.C. wire per lb., reel 20 g., 8d.; 22 g., 9d.; 24 g., 10d.; 26 g., 10d.; 28 g., 11d. Tinned copper, 1/16 sq. Bus bar, 12 ft. 6d. Empire tape, 12 yds., 6d. Earth Tubes. Copper, good value, 1/11. Climax, 2/3, 5/-. Sets of 5 Coils (Dickenson Patent) air spaced, 25/30/50/75/100, 1/9 set. EVEREADY 66 v. 12/6; 108 v. 21/- L.T.3 for D.E. Valves 7/6. SIEMENS H.T. 60 v. 12/6. Hellesen's 60 v. 14/6. Various, 1.5 D.E. Batteries, 10/8, 10/8. GRID BIAS (tapped 14 volts), 6 v. 1/3, 9 v. 1/8, 1/9 2/- "Grado A" cut while you wait, 3/16 at halfpenny per sq. inch. 1 in. three farthings. Scrap obsolete on sale.

RADIO MICRO, .06 Special, 6/11; Power, 8/11. 2 volt, 6/11. Various .06 valves, 4/11. 5/11. Power valves D.R.E. 7/11, etc. 1 valve L.F. Amplifier in polished box, beautifully made, 16/11. 2 valve do., 31/11. Hand-some crystal sets, variable tuning, 10/11, 12/11. "ESSANCO" Mounted Coils.—Made under Burn-dept Licence, Patent No. 168248. No. 25, 35, 50 each 2/-; 75, 2/6; 100, 3/-; 150, 3/-; 200, 250, 300, each 4/-.

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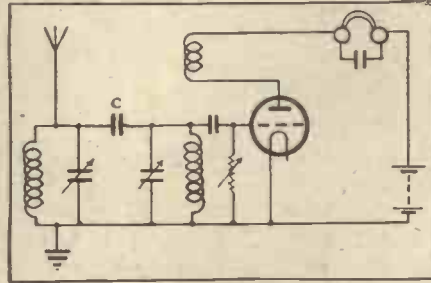
Correspondence

Letters from readers discussing interesting and topical wireless events or recording unusual experiences are always welcomed, but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot accept any responsibility for information given.—Editor.

Ref. "A One-Valve 'Marvel,'" "P.W." June 12th, page 555.

The Editor, POPULAR WIRELESS. Dear Sir,—Mr. Collins asks for criticism. Without wishing to be unkind, I suggest his "super" circuit is the ordinary tuned anode H.F. and Det., with the H.F. valve removed. The circuit should be redrawn as shown, "C" being the capacity of the H.F. valve-holder.

I have omitted the potentiometer, because it merely introduces a little unnecessary resistance, the 1 mfd. condenser, because it is a continuous path for H.F. currents, and the small condenser, which



Mr. Collins put across the anode and reaction coils, because it is in parallel (for all practical purposes) with the telephone by-pass condenser.

Apparently the H.F. valve is normally "stabilised" by the potentiometer; the inference is that this stage is not very efficient, and the detector used as shown would probably give results quite equal to the normal H.F. and Det., on account of the reduced damping and improved reaction control. The sharp tuning is due to the very loose coupling between the tuned circuits.

There is nothing super about this; new circuits are not discovered by haphazard "experimenting" of this kind. Let Mr. Collins try again, this time, say, some form of Reinartz, and the best of luck to him.

Yours faithfully, W. M. WHITEMAN.

In a further letter, referring to the above circuit, Mr. Collins says:

"A three-way coil-holder is essential—not a two-way. I've also substituted a '6-60' valve, with good results, using 80 volts on the plate. Grid-leak at maximum, aerial coil at 45° and reaction brought up tight."—ED.

TECHNICAL NOTES.

(Continued from page 700.)

access, a special method of connecting in the by-pass condenser and choke may be useful. The H.F. choke is connected from a point between the anode condenser, and the reaction coil to the grid condenser and the by-pass condenser should be quite small, not more than perhaps .0001 mfd.

1,000 WONDERFUL BARGAINS ARE INCLUDED IN OUR NEW Summer Catalogue of CRYSTAL AND VALVE RECEIVERS LOUD SPEAKERS, HEADPHONES H.T. BATTERIES, ACCUMULATORS CONDENSERS, AMPLIFIERS, ETC. and over 500 illustrations are given too. A copy sent by return post upon receipt of 4d. stamps ELECTRADIX RADIOS 218 Upper Thames Street, E.C.4

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WET H.T. BATTERIES British made round or square Leclanché Glass Jars, 2 1/2 x 1 1/2, for wet H.T. Units. Waxed, 1/3 doz.; plain, 1/4 doz. Carriage and packing extra. Phones and Loud Speakers reconditioned, 4/6 & 5/-. The H.R.P. Co., 46, St. Mary's Road, Leyton, E.10.

AT LAST! 60-volt H.T. batteries 21/- no electricity needed, just acid, costs 6d. Battery practically everlasting. Lists Free. GET ONE NOW, guaranteed. Dull Emitters, 4-volt 06, 7/- Bright, 3/6. Trade Supplied. Tennants Wireless (Dept. P), Hyllon Road, SUNDERLAND.

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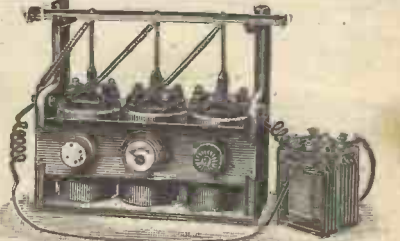
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HEADPHONES REPAIRED Re-wound & re-magnetised 5/- per pair. Loud Speakers repaired 5/-. Transformers re-wound 5/- each. All work guaranteed and tested before delivery. Write for Trade Prices. Phone: Clerk 1795 MASON & CO., 44, East Road, City Road, N.1.

GREEN DRAGON DIAPHRAGM PAPER Ready for use. Splendid results. 12" diam. 1/6. LISSENOLA UNIT with REED also supplied, 14/6. N.M.C. DETECTORS, 2/6. F. J. EASTOE, 29, Prince's Parade, LONDON, N.3.



YOUR CHARGING PROBLEM SOLVED. WHAT EVERYBODY IS LOOKING FOR. Heavy capacity primary Charging Batteries fitted in case. Set of 2 for charging 2-volt Accumulators, 20/-. Set of 3 for 4-volt Accumulators, 25/-. Set of 4 for 6-volt Accumulators, 30/-, including Chemicals and full instructions. ORDER NOW. Trade Terms for quantities only. J. MOORE, 32, Church St. OLDBURY, BIRMINGHAM

PLAYER'S "MEDIUM" NAVY CUT CIGARETTES WITH OR WITHOUT CORK TIPS



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PLAYER'S Navy Cut CIGARETTES

10 for 6d. 20 for 11½d.

50 for 2/5 100 for 4/8



7 P.M. advantages

that save you money, give better reception and cost no more to secure than the price of an ordinary valve—



1 GREATER EMISSION SURFACE.

P.M. Filaments have up to 5 1/2 times greater emission surface than ordinary filaments ensuring a much wider range of power for economical operation; in fact these new filaments are so conservatively rated that they give ample results at lower voltages than marked & will stand up to a reasonable overload.

2 LONGER VALVE LIFE.

The special alloy of rare metals that forms the heavy covering of P.M. Filaments is prepared by a patented process that secures a copious flow of electrons and the operating temperature is so low that this precious alloy cannot be discharged, a definite proof of long useful life.

3 UNBREAKABLE FILAMENT.

P.M. Filaments are longer than ordinary filaments, and retain their ductility even after 1,000 hours life, so that it is possible to tie them in a knot. At no time does the low operating temperature cause sag, and these filaments are specially set around the five strong resilient hooks so that they are free from tension and cannot be broken except by the very roughest handling.

4 NO VISIBLE GLOW.

The extreme economy in heat of P.M. Filaments can be judged by the fact that no sign of glow can be discerned during operation.

5 REDUCED CURRENT CONSUMPTION.

P.M. Filaments only require one-tenth ampere filament current, giving up to seven times the life of each accumulator charge, a reduction to one-seventh in your cost of accumulator maintenance.

6 NO MICROPHONIC NOISES.

The unique method of mounting the filament within the field of the grid and anode, so that the filament lies without tension or sag in its correct position, and all the electrons are utilised and controlled, completely eliminates all microphonic noises, leaving an effective background of silence to emphasise faithful reception.

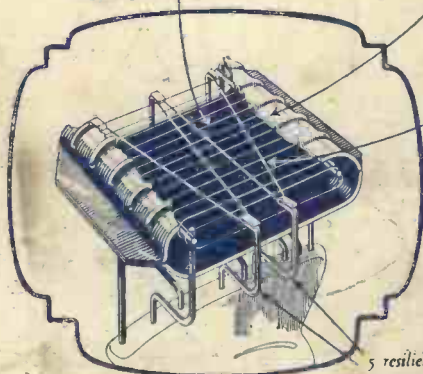
7 MAJESTIC VOLUME.

Every P.M. Valve is a master valve in its own class, designed to give you

Perfect Radio Reception.

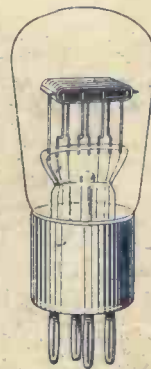
Grid with two supports

Anode (with two supports) cut away to show filament and grid,



Filament two complete loops

5 resilient filament supports keeping filament in permanent alignment.



Note that the vastly increased length of the P.M. Filament completely within the field of the anode and grid is obviously greater than that of any other valve on the market.

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 - For 2-volt accumulator
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Q According to Homer, Stentor was the name of a Greek herald in the Trojan War whose voice was as loud as that of 50 other men combined. As the name for a new Cossor Power Valve it is, therefore, peculiarly appropriate.



The new Stentor Two

described by "Popular Wireless" as a wonderful little power valve with a punch out of all proportion to its diminutive wattage.

FOR more than 20 years automobile engineers have been waging a ceaseless struggle in an effort to produce engines of more power with less weight. So successful have they been that to-day motor-car engines develop more than twice the horse-power of engines of equal weight constructed a decade or so ago.

And with the reduction in weight naturally follows a tremendous economy in upkeep. Less petrol, less oil, lighter moving parts with less wear. In fact cheaper motoring all round.

This lesson has been taken seriously to heart by wireless engineers. Everyone realises that to obtain really good loud speaker results a power valve is essential. The ordinary valve cannot give the volume necessary because it has little or no reserve of output. But in the past power valves have suffered from two main disadvantages: (a) they have been expensive to buy and (b) they have been costly to maintain both in filament and anode current.

Takes only .15 of an ampere

At last, however, there is available a real power valve—entirely redesigned and utilising principles of construction never before found in any valve—which finally overcomes both of these serious disadvantages. It is the new Stentor Two—manufactured under a group of Cossor Patents.

Its superb fidelity of tone and unparalleled grandeur of reproduction has astonished even the most critical of radio technicians. They have readily admitted that never before has a 2-volt dull emitter consuming so little as .15 of an ampere been able to produce such magnificent results.

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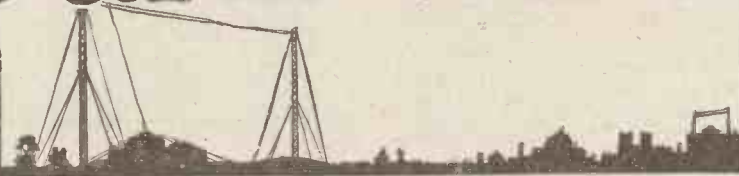
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RADIO NOTES AND NEWS.

Another Mystery Station—Pleasing the Hardest Critic—"P.W." Booklet in Braille—
 New Irish Stations Coming—Wireless in the Mines—The Filadyne—New B.B.C.

Another Mystery Station.

WHO is the mysterious stranger that is sneaking round on about 400 metres? Several sleuths report mysterious music, and one Milford Haven reader says:

"Whilst searching the ether I came across a mystery station, on about 400 metres. The call was 'Low-power station.' I heard a few songs and a piece of orchestral music, and then it closed down with the National Anthem."

Has anyone trailed this newcomer to his lair?

New Irish Stations Coming.

THE Irish Free State Minister for Posts and Telegraphs has recently disclosed the details of the new broadcasting scheme. Three relay stations are to be completed within a year, at Cork, Galway and Bundoran, Co. Donegal. In addition, there is to be a high-power station in the Midlands, due for completion within two years. Including Dublin, this makes five stations for the twenty-six counties.

"Up in the Mountains."

BERGEN station, which is now working upon 400 metres, is using a power of 1 kilowatt (two-thirds of that of a main B.B.C. station). It is intended to rig up a duplicate set upon a mountain just outside the city. The idea apparently is that this will serve to test which position is better, and will at the same time provide an emergency transmitting plant.

Pleasing the Hardest Critic.

MR. ARTHUR CATTERALL, the violinist who recently played Delius's "Legende" before the microphone, has had a letter from the composer. The latter is now partially paralysed and unable to leave his home, so it was with great pleasure that in his home near Fontainebleau, he tuned in and heard his own work coming from England.

His delight is a tribute to the quality of the B.B.C. transmission, for he is known to be a fastidious critic.

No Option.

TOMMY HANDLEY and Ena Grossmith are amongst those engaged in the new microphone revue, "No Option," which will be broadcast on Saturday. The scene is laid in a prison!

"P.W." Booklet in Braille.

REGULAR readers who remember "The 'P.W.' Valve Experimenter's Handbook" (which was given away with "P.W." No. 176) will be interested to know that it is being translated in Braille, for the benefit of the blind. A kindly Harrow reader is doing this quite voluntarily, on behalf of the National Institute for the Blind, Great Portland Street.

I'm afraid he wouldn't like his name mentioned, but considering the time and labour involved in such a task, I think it only right that I should thank him thus publicly for his generous thought. Incidentally, it is one of the nicest compliments "P.W." has ever been paid, I think.

Prices Down.

A WEEK or two ago I had a bit of a grouch because price reductions seem to me to be a little overdue. Things are looking up considerably since then, and I recently received a notice from the B.T.-H. Co. that showed some really remarkable reductions. Up to £10 has been knocked off complete sets, whilst there was a couple of pounds off loud speakers, and a nice little 7s. 6d. saved on L.F. transformer, etc.

We can do with a lot of that kind of thing, can't we?

Brussels Higher Wave-length.

MANY thanks to all those readers who dropped me a line about Radio-Belgique, and the effect of the wave-length alteration at that station. Unfortunately we have now performed that complicated evolution known in military circles as "As you were," for half the reports say, "great improvement," and the other half say Brussels has absolutely spoiled itself.

Two or three readers, however, have remarked upon the clearness of the Belgian announcements, and, come to think of it,

(Continued on next page.)



Radio music is now usually served with breakfast at all the large hotels in America.

By the way, Miss Ena Grossmith is the daughter of George Grossmith, who, as readers know, himself sometimes leaves the footlights to talk to the microphone.

Albert Sammons To-night!

A VIOLIN recital by Mr. Albert Sammons is the feature of to-night's London programme. He has arranged to give us nearly half an hour of his popular successes before 2 L O goes over to the Savoy for dance music.

NOTES AND NEWS.

(Continued from previous page.)

that "Ah-lo" of theirs is one of the "sights" of the ether, isn't it?

"Sweet" Songs.

LEEDS-BRADFORD stations went for a "tour" round the Rowntree Cocoa Works at York recently, and listeners were able to hear the singing of the girls in the packing-rooms, which is a daily feature.

Most of us can't sing at our work, but it's nice to think of these little dears carolling away as they wrap up the chocs. In these troublous times, such zest might truly be described as "Grateful and Comforting."

Announcer Killed.

FROM Chicago comes the announcement of a very unusual radio death. It appears that Lester Wolfe, the announcer at the broadcasting station at the Beach Hotel, Chicago, attempted to replace a burnt-out fuse. He inadvertently omitted to switch off the power before touching the fuse, and was electrocuted, death being instantaneous.

"The Vicar at the Jumble Sale."

THIS is the intriguing title of part of to-night's programme from London, Daventry, and other stations. It is rendered by "The Roosters," and by Mr. Laurence Anderson, who is well known on the halls as a raconteur.

The Filadyne.

THE Technical Editor tells me that the Filadyne circuit, which he introduced to readers a fortnight ago, is already proving a hot favourite. At the time of writing the full constructional details have not been given, but many readers were able to hook up a set from the details given in the first article, and were rather staggered by the results.

These early reports show that in certain cases 15 volts on the Filadyne are as good as 60 or more in the conventional hook-up, and some readers were using grid-bias batteries for H.T., and getting much better results than with the big batteries. To all who have sent reports Mr. Dowding sends his thanks. Such information about an entirely novel circuit is invaluable, and the results will in due course be passed on for the benefit of all readers of "P.W."

A Better Ether?

IS the ether "on the mend"? For a long time it seemed that wireless was passing through a dull phase, in which long-distance reception was difficult and unsatisfactory. Right through last winter, and until about a month ago, searching for distant stations—or for some of the British ones, for that matter—seemed a hopeless task. Nobody could explain it, but all over the world it was known that the ether was comparatively "soggy."

Now the good old conditions seem to be coming back again, and the far-off stations are creeping back into British 'phones. There is a great pleasure in hauling the foreigners out of the air; and if conditions

go on improving at this rate, two valves and a good aerial ought to rope in dozens of them when the long evenings come again.

Points from the Programmes.

THE next broadcast of the famous old bells of Croyland Abbey will be on August 1st.

On Saturday, at 4 p.m., music from the famous organ of the Temple Church, London, will be on the air.

The Prince of Wales' speech at the annual meeting of the British Association is to be broadcast on August 4th. The ceremony will take place in the Sheldonian Main Hall, Oxford.

State Broadcasting for France.

FOR some reason the French have never taken up broadcasting as vigorously as one might expect, though they have some first-class

SHORT WAVES.

"The photograph of the North Pole taken by American airmen discloses only a hole in the ice. It is presumed that some unscrupulous Eskimo had purloined the thing for his wireless aerial so that he could listen to the Savoy bands."—London Opinion.

"We have only one ether, and if we are all to enjoy the benefits of broadcasting, there must be certain good manners or polite use of the ether."—Professor J. A. Plening, D.Sc., F.R.S.

"Programmes of the kind are not accepted if they are of a sufficiently high standard.—Reported statement by the B.B.C. A cynic says he has long suspected this."—Birmingham Daily Mail.

stations. Now it is announced that the Government intend taking over the broadcasting service in France, and one reason for the present non-development—that of conflicting interests—will be abolished. So far as can be learned at the moment of writing, no striking changes in the French programmes or stations are likely to result from this decision of the Senate.

Silverex Crystals.

FIRE, which broke out recently at the Silverex Factory at Hatton Garden, destroyed the large stocks of permanent detectors and Silverex crystals carried there. I hear from the company that ample stocks for present demands are held at 41, High Holborn, W.C.1, and the head office there can deal with all orders immediately.

A Voyage to See!

AN interesting voyage has just been undertaken by a Belfast amateur experimenter, who transplanted his apparatus upon the steamer "Lord Antrim." The vessel was voyaging from Dublin to Montreal, and the idea was to try out a short-wave amateur set, and see if communication could be maintained right across the Atlantic. It was found that when Daventry started to fall off, and other British stations on normal wave-lengths had disappeared, the short-wave telephony continued to come over clearly, even on low power. The length was 45 metres, and the call sign G X 6 M U.

Lord Gainford's Speech.

PLAIN speaking by the chairman, Lord Gainford, marked the last annual meeting of the British Broadcasting Company, and all listeners will agree with the following remarks he made:

"We have always maintained that the money collected from the public for the express purpose of the broadcasting service should be devoted to the service, and not alienated or diverted to other purposes. Naturally the cost of collection of licence fees and other expenses legitimately incurred must first be paid, but the balance should be available for the purpose for which it was intended."

Results with a One-Valver.

IHAVE already referred in these columns to the fact that conditions are getting better and better. Here is a report from an Oxford reader:

"I have been going to write you for some time to let you know the excellent results I get with the 1-valve set I made up from 'P.W.' Sixpenny Blueprint, No. 1. I use an amplifier with it, but of course the 1-valver 'finds them.' My aerial is 28 ft. high, and I use Cosmos valves."

Nearly Fifty Stations.

THE list of stations received is on a separate sheet—there are nearly fifty of them. Of these no less than eight can be received at any time of the day or night at which they are working. These all-the-time programmes, which can be relied upon, come from the following stations—Cardiff, London, Manchester, Birmingham, Bournemouth, Daventry, Radio-Paris, and Rome.

Four or five other foreigners come in occasionally in daylight, and after dark—well, that receiver must sound like the Tower of Babel.

Wireless in the Mines.

WHAT'S all this about a wonderful new wireless set for miners?

There is a rumour that Marconi's Wireless Telegraph Co., Ltd., have produced a set which will revolutionise conditions below ground. I hear that it will employ no batteries whatever! Consequently the set will be a real emergency one, capable of being carried anywhere in the workings, along with that other great miners' safeguard—the Davy lamp.

Does this mean that the dreadful danger of buried-alive isolation has been overcome? Will men entombed in the next tragedy be able to talk to their rescuers by radio?

The New B.B.C.

THE Postmaster-General's recent statement in the Commons upon the future of broadcasting contained little that had not been foretold.

The British Broadcasting Company comes to an end—as expected—at the end of this year. The service will continue, without any kind of interruption, on January 1st, 1927, under the name of the British Broadcast Corporation (incorporated by Royal Charter).

It is hoped that the number of the members and their names will be disclosed in the autumn. The report that Lord Reading will be the new chief has not been confirmed at the time of writing.

ARIEL.

COLLAPSIBLE FRAME AERIALS

Straightforward Instructions for Amateurs who want to Make a really efficient Portable Aerial.

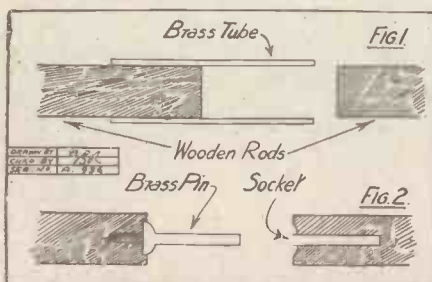
By J. ENGLISH.

A COLLAPSIBLE frame aerial is a very useful addition to any experimental station, and where a portable receiver is used such an accessory is almost essential, as one does not always want to put up a temporary aerial. When used in conjunction with the portable set, the frame aerial should be light and strong, capable of being packed into a small space, and easily erected or dismantled in a few moments. Such a frame, moreover, is decidedly useful with a

An idea of the general scheme of construction can be gathered from the illustration. The four arms are each composed of two lengths of wood joined together with a brass "fishing-rod" joint, and are clamped together at the centre by a special centre-piece. At the end of each arm is a strip of ebonite, the wire being wound and firmly secured in slots cut in the edges of these strips. By unscrewing the fly-nut in the centre, the top plate of the centre-piece can be lifted off and the arms removed. These can then be halved by means of the joint, and the whole packed up into a neat bundle. The base arm is slightly longer than the other three, and fits into a well-spread stand, also collapsible. On the base arm is mounted an ebonite terminal strip, providing suitable connections for a simple or a tapped frame aerial. It will be evident that this principle of construction is sufficiently elastic to be applied to any form of frame, large or small, and having any number of sides.

When in construction first be to the

commencement, should devoted arms. For



"fixed" receiver, as it can be packed up and placed in a drawer or any odd corner when not in use.

The purpose of this article is not so much to describe the building of any particular frame as to outline the methods of designing and constructing collapsible frame aerials of a general type. It is hoped that the details given below of frames designed by the writer will enable the experimenter to make up the type most suitable for his requirements.

Double Wound Frame.

The dimensions of a frame aerial have a decided influence upon its efficiency, and considerable experiment has shown that for the usual broadcast wave-lengths, say, 200 to 500 metres, a suitable size is a square frame having diagonals four feet long, the sides measuring about $2\frac{3}{4}$ feet. The dimensions of such a frame may seem rather large, but its efficiency is greater than that of a smaller one, while, when dismantled, it can be packed into a space measuring roughly 15 by 4 by 2 inches.

Now, a frame aerial is usually wound as a solenoid, the box type, or as a spiral, the pancake type, and, for reasons of mechanical strength and economy of space, the latter form is more suitable for this type of frame. The one illustrated on this page has two pancake windings, one on each side of the former. This gives a well-balanced frame of compact and pleasing appearance.

these, five lengths of required, material is diameter els. The

one-foot wood are and suitable half-inch-birch dow-bottom half

A photograph of the completed frame aerial.



section of the base arm should have, preferably, a square section to give more strength, and for this a fifteen-inch length of oak or some other hard wood half-inch square will be required. Having obtained four 2-inch lengths of $\frac{1}{2}$ -inch external diameter brass tubing, one piece is fitted on the end of the round and the square-arm sections, the wood passing into the tube for a distance of 1 inch, leaving a socket of the same depth. These pieces of tube must be a very tight fit on the rods, and a smear of glue or seccotine may be placed on the wood before forcing on the brass tube. The square section will have to be shaved down and rounded off at one end so that the brass tube will fit. The four arm sections furnished with brass sockets will eventually have an ebonite former piece screwed on at each end.

Constructing the Arms.

The remaining four round rods are to be fitted into the sockets already formed on the other four arm sections, and must be sand-papered down until they are a nice tight fit. Loose-fitting joints will cause the frame to be "wobbly" when erected. Details of the joint are given in Fig. 1.

A neater joint, but one requiring more care in construction, is that shown in Fig. 2. With this method square or round section wood can be used. One half of the arm is fitted with a brass pin which plugs into a hole drilled into the other half. Suitable pins can be formed from large brass "dresser" hooks with the bent part cut off. With this type of joint it is essential that both pin and socket are truly in line with the axis of the arm section, otherwise the frame will be somewhat distorted when put together.

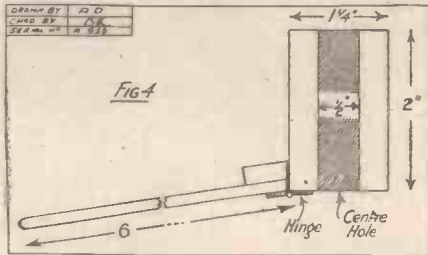
The centre-piece, clamping the four arms together, is composed of two flat pieces of wood 4 inches square and $\frac{1}{4}$ inch thick. Four triangular pieces, $\frac{3}{8}$ inch thick, are glued or screwed to one of the flat pieces. In the four diagonal channels so formed are placed the ends of the arms, and the other flat piece is placed on top and screwed down tightly by means of a fly-nut working on a bolt

(Continued on next page.)

COLLAPSIBLE FRAME AERIALS.

(Continued from previous page.)

which passes through the centre. Constructional details with dimensions are given in Fig. 3. This centre-piece forms the keystone, as it were, of the frame, and care should be taken that the four channels are exactly at right angles, and that the arms fit nicely into them. If six arms are used for a hexagonal frame, then the construction



must be modified so that six channels are formed making an angle of 60 deg. with one another.

The final portion of the woodwork is the stand, and here some latitude is permissible. Taking into account the height of the frame, the stand must have an appreciable base area or the frame will be liable to be knocked over at the least touch. For home use, a simple stand is perhaps preferable, and the end of the base arm may fit into a square hole cut in a block of wood, which, in turn, may be screwed to or arranged to rotate upon a piece of board as the base proper.

Wooden Portion Completed.

This method is unsuitable, however, for a portable frame, and a stand similar to that illustrated is necessary. This is composed of a block of wood having a square hole down the centre, into which is fitted the end of the

base arm. On each of the four sides of the block is a 6-inch leg attached by means of a hinge, so that the legs will fold up. Such a stand holds the frame rigidly in an upright position so that the latter is not easily knocked over, while the whole is easily rotated.

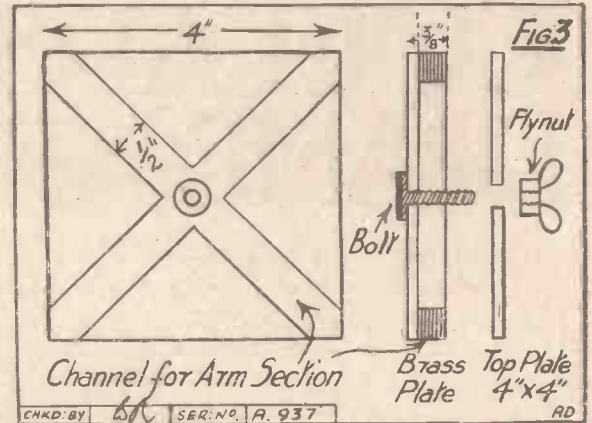
Constructional details are given in Fig. 4, which shows in section the block and one of the legs. The legs can be made from wood having 1 by 1/4 or 1/2 inch square section.

The best way of making the square hole is to mark out a 1/2-inch square at each end, drill a 3/8-inch hole exactly through the centre, and cut away the wood down to the marked lines with a chisel. This hole should taper off slightly towards the bottom so that the base arm will be firmly gripped when it is pushed in.

The Ebonite Distance Pieces.

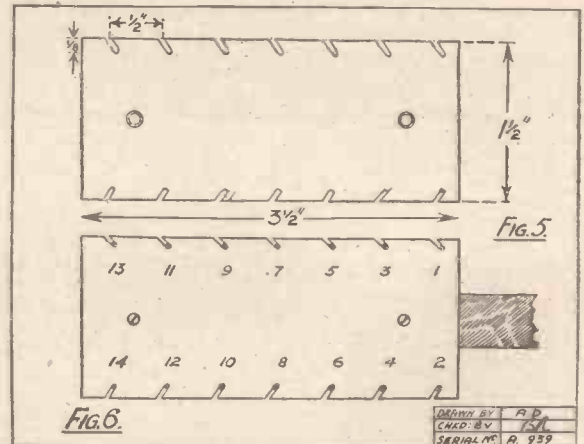
This completes the construction of the wooden portion of the frame, and, before assembly, it can be stained and polished as desired. A good finish is obtained by applying a thin coat of some dark oak spirit stain, allowing to dry, and then given a rub over with polish.

The four ebonite formers on which the wire is wound and secured are cut out as shown in Fig. 5. The width of the slots will naturally depend upon the diameter of the wire used, and, should this be rubber-covered flex, they can be cut with a coarse tenon saw or a double-bladed hacksaw. The dimensions given in Fig. 5 are suitable for a 14-turn frame, which will cover a wave-length range of 200 to 500 metres with a .0003 mfd. condenser in



parallel, a tapping being provided for the Reinartz system of reaction control. Details of the use of this are given below. For a simple frame, 12 turns are sufficient to cover the same range of wave-lengths.

The ebonite formers are screwed to the end of three arms, a piece being cut out to give a flat base. As the base section is

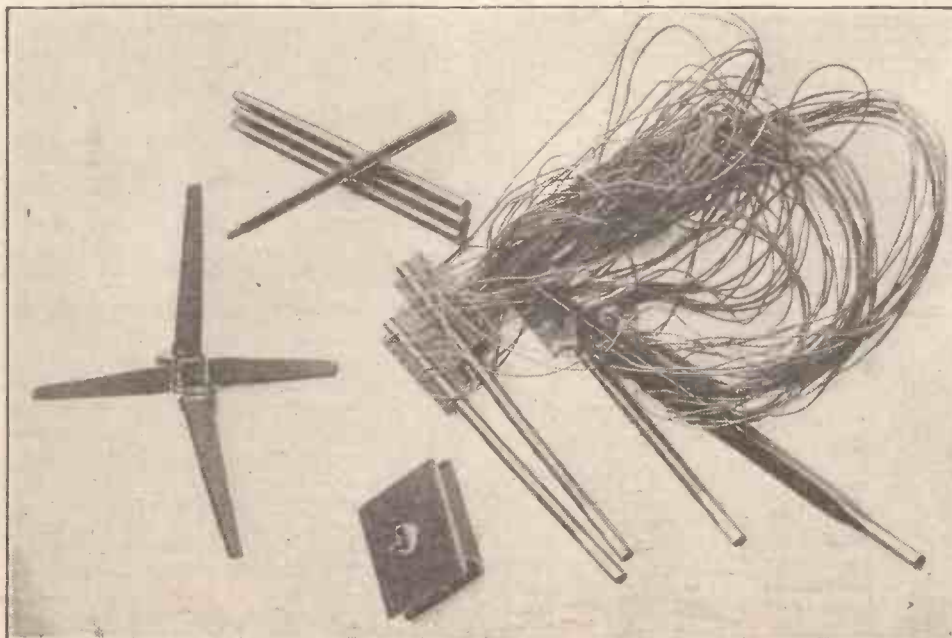


15 inches long, the ebonite former in this case is screwed 3 inches from the bottom end. The manner of fixing will be evident from the illustration.

For frame aerials of greater inductance, the ebonite formers must be made sufficiently long to include the requisite number of slots, and for more than 20 turns the spacing can be reduced to 1/4 inch or one centimetre.

Flexible Wire Essential.

As regards a suitable form of wire for winding, the necessary requirements are good flexibility and strength. The wire must not be elastic, or in time it would stretch, causing the windings to sag. A suitable wire is rubber-covered flex, and that composed of fourteen strands of 36 S.W.G. is very useful, as it has a good cross-section of low H.F. resistance. About 165 feet are required for a 14-turn frame. Other forms of stranded wire can be used where obtainable, and a lighter kind of good conductivity is preferable to the rubber-covered flex, as this comprises the major portion of the weight of this type of collapsible frame.



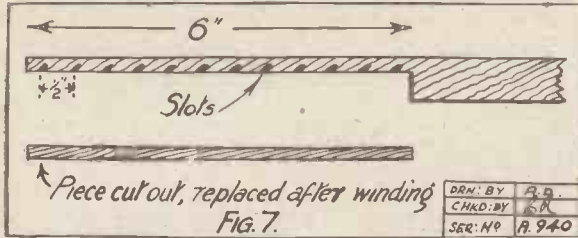
This illustration shows the frame aerial completely dissembled.

(Continued on next page.)

COLLAPSIBLE FRAME AERIALS.

(Continued from previous page.)

When ready to commence winding, the four arms are fitted together and secured in the centre-piece, laying the whole framework flat on a table. In order to get a symmetrical frame, it is best to pass a length of wire or string round the ends of the arms, so that they are maintained rigidly at right angles. Winding can then be carried out without fear of distorting their alignment. One end of the wire is secured to the



base arm and the wire wound in the slots, using a fair tension in accordance with Fig. 6. This method is preferable to winding one side first and then the other, as the self-capacity of the frame would be greater. It will be noticed that the wires cross over on one side at each turn, but this does not matter even if bare wire is used, as the winding tension prevents the turns from touching.

When the last turn is reached, the free end is temporarily secured to the base arm, and the frame replaced on the table. A drop of secotone is then run into each slot, and worked in round the wire with a needle or piece of stiff wire. When all the slots have been treated in this manner, the frame is placed on one side until the secotone is properly set. Secotone, when thoroughly dry, appears to have a very high insulation resistance, so that no fear of leakage need be entertained on this score. After about 24 hours the frame can be dismantled, and the wire will be found to be firmly secured in the grooves, considerable force being required to dislodge it.

Securing the Winding.

A somewhat neater method of securing the windings is indicated in Fig. 7. One half of the arm section, which may be round or square, is split off for a distance of 6 inches, and slots cut in the remaining half as shown. The wire is then wound on and secured as before, finally replacing, with the aid of more secotone, the piece of wood previously cut out. This gives a flat one-layer frame of compact appearance, twelve turns being required to cover the range specified above, or 15 turns if a reaction winding is used. If well-seasoned dry wood is used, the insulation resistance between the turns will be almost as high as if wound on ebonite.

At the bottom end of the base arm is fitted an ebonite terminal strip carrying two

terminals, to which the ends of the wires are soldered. A second terminal piece for a tapping-point can be mounted on the same arm as in the illustration. In passing, it is important to note that soldered joints in stranded wire must be very soundly made. One strand unsoldered, or merely making bad contact, will introduce considerable H.F. resistance, so that when soldering up the strands should be counted, thoroughly cleared with fine emery cloth, and then well soldered, using a hot iron.

Reinartz Reaction.

When employing the Reinartz method of reaction control, which is most suitable for frame aerial circuits, the three inner turns comprise the reaction winding, the other eleven being connected to the grid circuit. The connections for the use of a frame in this manner are indicated in Fig. 8, a detector valve only being shown. This circuit is eminently suitable for frame aerial reception, and, since the reaction winding also forms part of the frame, the additional turns increase slightly the "pick-up" effect.

In conclusion, it may be mentioned that frame aerials constructed in accordance with the methods outlined above have proved very efficient in operation and invaluable for use with portable receivers. The construction of a collapsible frame as described above entails little expenditure of time and skill, while the finished instrument, costing at the most about ten shillings, will be a useful addition to any experimenter's laboratory.

CORRESPONDENCE.

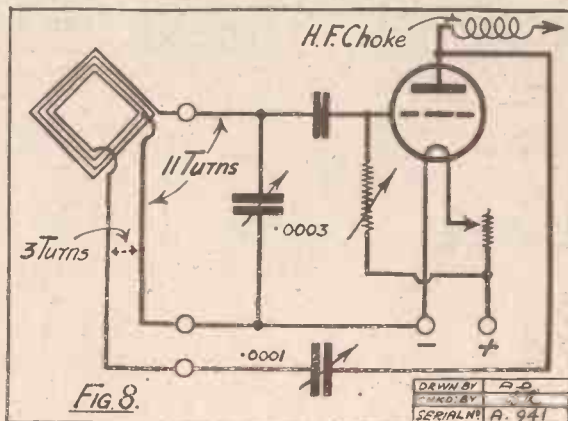
ELIMINATING HUM.

The Editor, POPULAR WIRELESS.
Dear Sir,—I was keenly interested in your reply to S. T. R. (London) in your issue of June 12th, 1926, re Eliminating Hum.

I am troubled with the same complaint, only I think more so. The town supply is 230 volts and 460 volts on the three-wire system, and our house is on the negative earth side of the 230 volt supply. All wiring is steel-cased and earthed, and H.T. supply lead-covered and earthed.

In one downstairs room I have a i.v.t. valve receiver and loud speaker on short leads. Upstairs I have my den and have a short-wave receiver and two-valve L.F. amplifier. All aerials and earth leads are direct, only a few feet of wire inside.

At times, when the sets are switched off, the hum of the mains is so strong that it can be heard all



over the room to an unpleasant extent; in fact, it has been so strong at times that we have mistaken it for the tuning note.

When using the low-wave set with two-valve L.F., I have to switch off at the mains or I cannot hear any signals. I have also tried one valve (Det. only), but the hum is still there, almost as strong.

The hum varies considerably from time to time. During the morning and evening is usually the strongest, and at midnight is practically gone. I have tried almost everything, condensers across mains, H.T., I.T. and short leads from H.T. counterpoise, shielding L.F. transformers, earthing cores, earthing mains and H.T. pos., through all sizes of condensers to 2 mfd. and condenser in the earth of set, but not the slightest difference: in fact, I have been trying for over eighteen months and have given it up for a bad job.

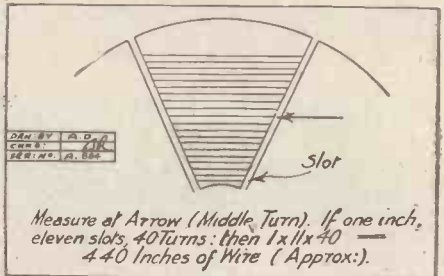
Another problem is: Between 50 and 60 metres there is (when the mains are off) a sound just as though there is a motor or dynamo running with a badly-made belt joint, and it can be heard jumping over the pulley. I have heard this on other stations about a mile away and it is going twenty-four hours a day. What is it? Yours faithfully,

N. W. (Weymouth).

RE WINDING COILS.

The Editor, POPULAR WIRELESS.

Dear Sir,—Will you permit me to mention a hint or two to your readers in regard to the double wound basket coil. With this method of winding considerably more wire will be on the coil for the same number of turns as on the single coil, the wave-length being affected. From experiments made, the proportion of turns is roughly as 3 on the double wound to 5 on the single wound.



My experiments were made on a spoke former made of thirteen 2 B.A. rods, removable.

These figures were arrived at:

Feet of wire in each case.	Turns on single coil proportion 5.	Turns on double coil proportion 3
21	35	21
25	40	24
34	50	30
44	60	36
No record	100	60

It may be mentioned also that, to find the number of turns on a single wound coil, count the turns between adjacent slots and multiply by 2, which is apparent, but with the double wound, multiply by 4 as two turns are hidden, it being four times round to return to the starting layer. Also, to approximate the length of wire on a basket coil already wound of either type, measure between two slots, the middle turn of the winding as sketch, multiply by the number of slots and the number of turns, when the result will be very near the mark.

It is often useful to know this before starting to wind a coil and thus prevent joins in the coil.

Yours faithfully,

W. E. GIBSON.

15, Greenhill Crescent, Harrow.

TEST THE LOUD SPEAKER.

The Editor, POPULAR WIRELESS.

Dear Sir,—I thought it might interest the readers of POPULAR WIRELESS to hear of the difficulties that a beginner in wireless had to put up with before he found out the reason for an unexplainable lack of power in a loud-speaker set.

Now I live about ten miles from the Birmingham studio, and about 45 miles from Daventry. This set, when connected up, gave just nicely hearable signals in the one room (not a large one at that), and could be heard hardly at all in the next room.

Then, quite by accident, I discovered what was the matter. A sudden idea struck me, and I tuned in for maximum volume. Then I placed the horn of the loud speaker on one of the 'phones—and was absolutely staggered by the tremendous volume that came from it. So the secret was out at last!

The loud speaker was a faulty one, there is no doubt about that.

Of course, the remedy was now obvious. So if any of you have L.S. sets that do not give enough volume, test the speaker, no matter who the maker's name may be. You never know what it might have gone through in transport from the maker to the dealer, so I will end by repeating what I have now taken for a slogan:

"Not enough volume? TEST THE LOUD SPEAKER!"

Yours faithfully,

ALFRED DICKENS.

16, Attwood Street, Lye, near Stourbridge.

BROADCAST NOTES.

By O. H. M.

Correct Pronunciation—A Bell Broadcast—Forthcoming Attractions—The E.N.O.C. and the B.B.C.—The Government and the Report; Ventilation Wanted—Eisteddfod Agitation—The Search for Novelty.

A CUTE controversy is likely to be caused by a forthcoming announcement from Savoy Hill about the proceedings and decisions of a Committee on the correct pronunciation of English. This committee, presided over by the Poet Laureate (Dr. Bridges), consists of Sir J. Forbes Robertson, Professor Daniel Jones, Mr. Logan Pearsall Smith, Mr. Lloyd James, and Mr. Reith.

In conversation with a member of this committee the other day I was told that they had drawn up a "definitive" scheme of correct pronunciation which would be followed by all B.B.C. announcers in future. Any attempt to standardise English always meets with violent opposition, and this attempt promises to be no exception to the general rule. The most active hostility will come from Oxford and Cambridge, whose theories have not been maintained. Nevertheless the B.B.C. was quite right to initiate the inquiry and to abide by its results. It is high time there was a standardised pronunciation, and the B.B.C. is obviously the medium best qualified to bring it about.

A Bell Broadcast.

A new attempt is to be made on Sunday, August 1st, from 8 to 8.15 p.m., to broadcast the famous Croyland Abbey bells near Peterborough. The method to be used in the peals this time is that known as "720 Plain Bob Minor." Listeners will recall that on the last occasion there was deliberate interference with the line leading from the Abbey, and the attempt to broadcast the peals was frustrated. Elaborate precautions are to be taken to prevent another fiasco. I gather that it is proposed also to set a number of traps in the hope of catching the malefactors who have already threatened to repeat their exploit.

Music lovers are promised a special treat on August 8th when Joan Elwes will give a first performance of some new songs by Vaughan Williams.

The B.B.C. has arranged with Mr. Nigel Playfair to produce "Lionel and Clarissa" for broadcasting, with practically the entire original cast. This performance will be given between eight and nine on August 9th.

A forthcoming "outside broadcast" of unusual interest is a relay of the famous Toy Symphony Band from Dogmersfield. The personnel of this band is made up of farm-labourers.

I am glad to hear that the broadcasting of gramophone records is again under consideration. This is a programme item that causes universal irritation. Listeners invariably prefer even a mediocre "O.B." or "dead" studio performance to gramophone records. The latter are all very well in their place, but not over the other.

Cardiff is tackling an ambitious dramatic work on July 26th. This is a revival of Dibdin's light opera, "The Waterman," which was produced first at the Haymarket Theatre, in 1774. This play contains several very well-known ballads, notably "The Bay of Biscay."

Mr. P. Smallman, Town Clerk of Weymouth, should have an interesting story to tell listeners when he broadcasts, on July 28th, an account of the visit of representatives of Weymouth Corporation to Weymouth, Massachusetts, U.S.A., where they presented a banner to the American town on Independence Day.

The British Legion has been backward in making use of broadcasting. It is good news, therefore, that this omission is to be corrected on August 4th, when most of the

NEXT WEEK

How to Make

The "P.W." "Daventry" Portable

A completely self-contained receiver capable of providing loud-speaker signals anywhere in the country.

ORDER YOUR COPY NOW!

London programme will be arranged under the direct auspices of the great organisation of British ex-service men.

The B.N.O.C. and the B.B.C.

Apparently the B.N.O.C. looks like getting less support than ever from the B.B.C. during its next season. This is not because of any lack of goodwill. The Savoy Hill people are all out to help British opera and are prepared to pay a good deal more than programme value merits. But the hard fact is that despite all the recent agitation, there is absolutely no sign that the Post Office will "loosen up" with its big reserve of licence money even after the new Broadcasting Authority takes over. Lord Gainford truly emphasized at the B.B.C. annual meeting that the broadcasting service had been seriously prejudiced last year by the withholding of funds. But the position with regard to next year promises to be even more acute.

All the big plans of programme expansion are suspended. If the present uncertainty is not cleared up by the end of July, there will almost certainly be a de-

plorable debacle of the service at the beginning of next year.

What the Government and the Post Office alike fail to realise is that the quality of the programmes in the first quarter of next year depends in large measure on what is done or left undone by the end of this month. Another effect of the prolonged official delay is to permit a recrudescence of the movement for open commercial competitive broadcasting on the United States model.

The Radio Association, through Commander Kenworthy, are taking the lead in this new movement, which is attracting wide support. The commonsense view is that with all its disadvantages, United States broadcasting is better than any form of nationalised broadcasting. The protagonists of the new Authority deny that it represents nationalisation, and I admit that a fair reading of the Report of the Committee would appear to support their view.

But as yet there is no sign whatever that the Government is prepared to accept a fair reading of the Report. There is no doubt that this is not the interpretation put on the report by the sections of the Civil Service concerned. I know of three Civil Servants who have been promised high appointments in the reconstituted broadcasting authority. The whole question demands early ventilation both in Parliament and in the Press.

Eisteddfod Agitation.

The agitation about the broadcasting of the Eisteddfod continues unabated. The organisers of the Swansea festival this year miscalculated gravely when they tried to force the hands of the B.B.C. by a raging, tearing publicity campaign.

They choose insecure ground when they challenged the judgment of the B.B.C. in paying Sir Harry Lauder more for one studio performance than they were ready to pay for excerpts from the Eisteddfod. In entertainment values there is no possible comparison. More than 90 per cent. of listeners would support the B.B.C. assessment on this issue. The Eisteddfod is of interest to only a small minority. It is more a spectacle than anything else, and it is not good broadcasting material.

Moreover, the truculent attitude of the organisers may have unfavourable consequences for their fellow Welshmen. The Savoy Hill people are naturally upset at the campaign of calumny that has been going on and may revise their policy of putting out special Welsh programmes from Daventry, Liverpool and Manchester. I hope that they refrain from taking any such action, because I am sure the majority of Welsh listeners would dissociate themselves from the campaign started by the small group at Swansea.

The Search for Novelty.

Apparently the search for novelty is still rewarded. The latest idea that is being worked out is that Carl Ambrose, the film acrobat, should climb the 300 feet lattice work masts at the Oxford Street transmitter, and broadcast from there his impressions of London.

I hope the next time the B.B.C. does an opera on its own, that it will take care to put the same words in the libretto as are used in the performance. "Rigoletto" was unhappy in this respect.



EASY to make, straightforward in operation, perfectly clear in reproduction—this is the ideal set for the clear reception of the broadcasting programmes. As shown by the photographs on this page, all the complications are cut out. There are only two movable controls on the panel. One of these turns the two valves on or off, and the other controls the tuning. Now that appreciation of purity of reproduction is steadily prevailing over the demand-for-distance craze, the reflex set without reaction is gaining great popularity.



Simplicity itself. The set is a good example of the modern tendency to eliminate unnecessary controls.

In such a set several of the objections to reflex working can be overcome, and there is no doubt that great purity of tone can be obtained.

The set which is illustrated in the photographs has been made upon these lines, the first valve being used as a reflex amplifier and the second valve as a detector. It will be seen that the receiver is of neat appearance, with the wiring absolutely straightforward. For this reason it is quite a good set for constructors who have not had much previous experience of building valve sets.

Tuning without Trouble.

The set is self-contained in a cabinet of the American type, with connections to all the batteries, and to the aerial and earth, taken from the back of the receiver. This leaves the panel bare except for the telephone terminals, which are placed centrally, and for two controls.

Looking at the front of the receiver, the

 The Receiver Designed, Constructed and Described by the
 "P.W." Technical Staff.

dial on the left is the aerial tuning control, operating a variable condenser. This is fixed permanently in parallel with the aerial coil, and is about as simple a tuning arrangement as it is possible to have.

The right-hand dial is the filament resistance, simultaneously controlling the supply for the L.T. battery to both the valves.

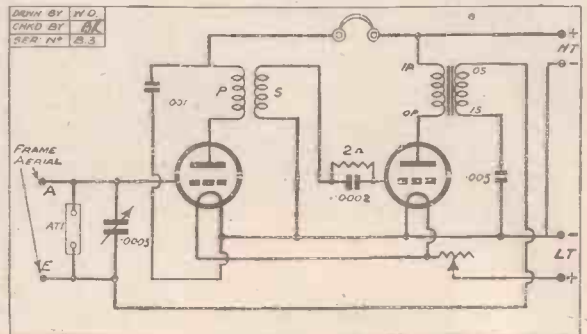
Now that most of the valve makers have a range of valves taking the same filament current, it is possible to efficiently control both valves at once by connecting the filaments in parallel. This obviates the necessity for two rheostats, and providing that valves having similar L.T. requirements

are used, there is no disadvantage in this simplification.

Referring to the theoretical diagram of connections (Fig. 1) it will be seen that they are quite straightforward, though they present several novelties as compared with the old-fashioned 2-valve reflex receiver, using reaction.

How the Set Works.

The action of the circuit may be described briefly as follows: Oscillations in the aerial circuit, which is tuned by the variable condenser, are impressed across grid and filament of the first valve and cause similar H.F. variations in the plate circuit of this valve, in which is connected the primary of an H.F. transformer. The secondary of the transformer is connected to L.T. — at one end, and to the grid of the second valve at the other, the latter connection being



LIST OF COMPONENTS.		£	s.	d.
1	Panel, 13 x 6½, with cabinet to fit (Peto-Scott)	1	6	0
1	Variable condenser, .0005 (Ormond)	15	0	
1	Filament resistance (Burn-dept)	5	0	
1	Single coil holder, baseboard mounting (Peto-Scott)	1	0	
1	L.F. transformer, ratio 4 to 1 (Eastern Wireless Co., Sutton)	8	0	
2	Valve holders, "anti-Phonic" (Lotus)	4	6	
1	Valve holder (Burwood)	1	3	
1	.0002 fixed condenser (T.C.C.)	2	4	
1	.001 fixed condenser ("Atlas")	1	9	
1	.005 fixed condenser (Dubilier)	3	0	
1	Grid leak 2 meg. (Lissen)	1	8	
3	Terminals	1	0	
	Wires, screws, etc.			

made via the usual grid leak and condenser.

So far, this is more or less the equivalent of a straightforward H.F. and detector circuit (without reaction), but instead of the telephones being connected in the plate circuit of the second valve, the primary of an L.F. transformer is in circuit here.

The secondary of this L.F. transformer is connected between grid and filament of the first valve (the grid-to-secondary connection being via the aerial coil).

By this means the L.F. impulses of the detector valve are transferred back to the first valve for further amplification. Corresponding but magnified L.F. impulses will therefore appear in plate circuit of the first valve, in addition to the H.F. variations which are already present there. The telephones are connected in the plate circuit of this first valve, and through them the amplified output of the receiver can be heard.

The purpose of two fixed condensers may not be apparent at first sight. The .005

(Continued on next page.)

A SHARMAN TWO-VALVE REFLEX SET.

(Continued from previous page.)

fixed condenser is the "floating" grid condenser which has been popularised in the well-known Sharman circuit. The .001 condenser serves to by-pass the H.F. impulses across the H.T. battery and telephones.

The absence of reaction necessarily means a certain reduction in volume as compared with a similar set in which reaction is incorporated. But the increased stability and purity of results will more than compensate for the drop in volume.

The list of components necessary to build the set is given on the preceding page.

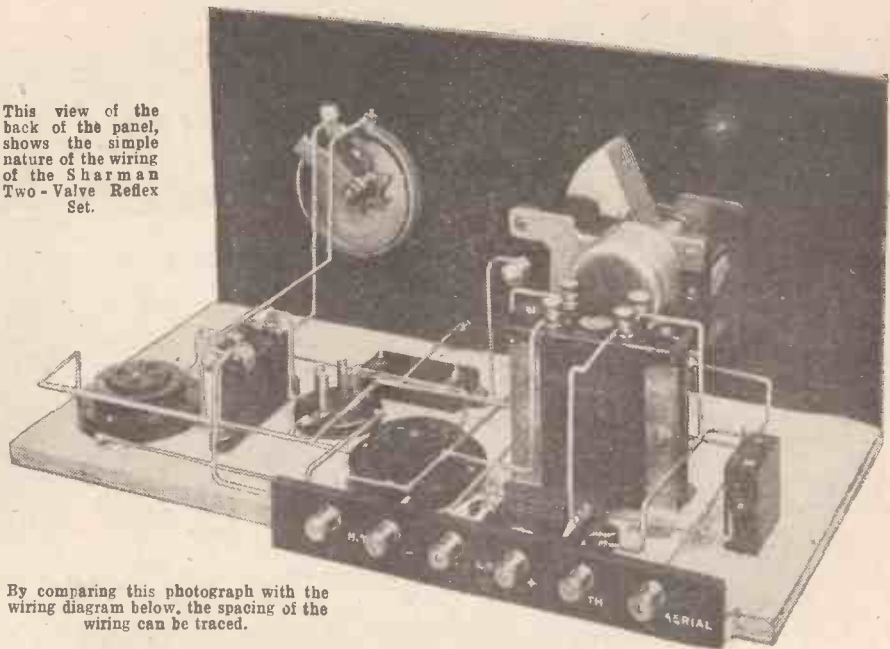
Arrangement of the Components.

Construction is commenced by assembling the components, and mounting the valve holders, coil holder, L.F. transformer and fixed condensers upon the baseboard in the positions shown in the photograph.

The drilling of the panel is quite a simple affair, only seven holes being necessary. The positions of the holes for the controls are shown in the panel drilling diagram, and three $\frac{3}{8}$ in. fixing screws at the bottom of the panel secure it to the baseboard.

In addition to the main panel and baseboard, a terminal strip is required at the back of the case. This strip is 7 in. long by 1 in. wide, and it is fastened to the baseboard by three fixing screws, in the same way as the panel. Six terminals are

This view of the back of the panel, shows the simple nature of the wiring of the Sharman Two-Valve Reflex Set.



By comparing this photograph with the wiring diagram below, the spacing of the wiring can be traced.

mounted upon it, in line $\frac{3}{8}$ in. from the top. The terminals are 1 in. apart, and the first and last terminals are 1 in. from the end of the strip. The back of panel photographs show quite clearly how the strip is arranged at the back of the case.

Two of the valve holders are of the anti-microphonic type, and these, of course, are for the valves themselves. The third valve holder is of the rigid type, and instead of a valve it holds in position the H.F. transformer, which is mounted in the usual way

upon four pins, spaced exactly as the legs of a valve.

No Troublesome Moving Parts.

The assembly and mounting of the components is exceptionally easy in this receiver, as apart from the vanes of the variable condenser, and the moving arm of the rheostat,

POINT-TO-POINT CONNECTIONS.

Aerial terminal to fixed plates of variable condenser, socket of aerial coil holder and to grid socket of first valve holder.

Earth terminal to plug of aerial coil holder, moving plates of variable condenser and to the O.S. terminal on the L.F. transformer.

I.S. terminal of L.F. transformer to one side of the .005 fixed condenser, the other side of which is taken to L.T.—

The L.T.— and H.T.— are joined together, and the L.T. positive terminal is taken to one side of the rheostat, other side going to one filament socket of each valve holder.

The remaining two filament sockets are joined together and taken to L.T.—. Plate socket of first valve holder is taken to one filament (primary) socket of the H.F. transformer holder, the other primary socket goes to one 'phone terminal and to one side of the .001 fixed condenser.

The other side of the .001 fixed condenser is taken to L.T.—

The remaining 'phone terminal is taken to H.T. +.

Grid (secondary) socket of the H.F. transformer holder goes to one side of the grid leak and condenser, the other side of which goes to grid socket of second valve holder.

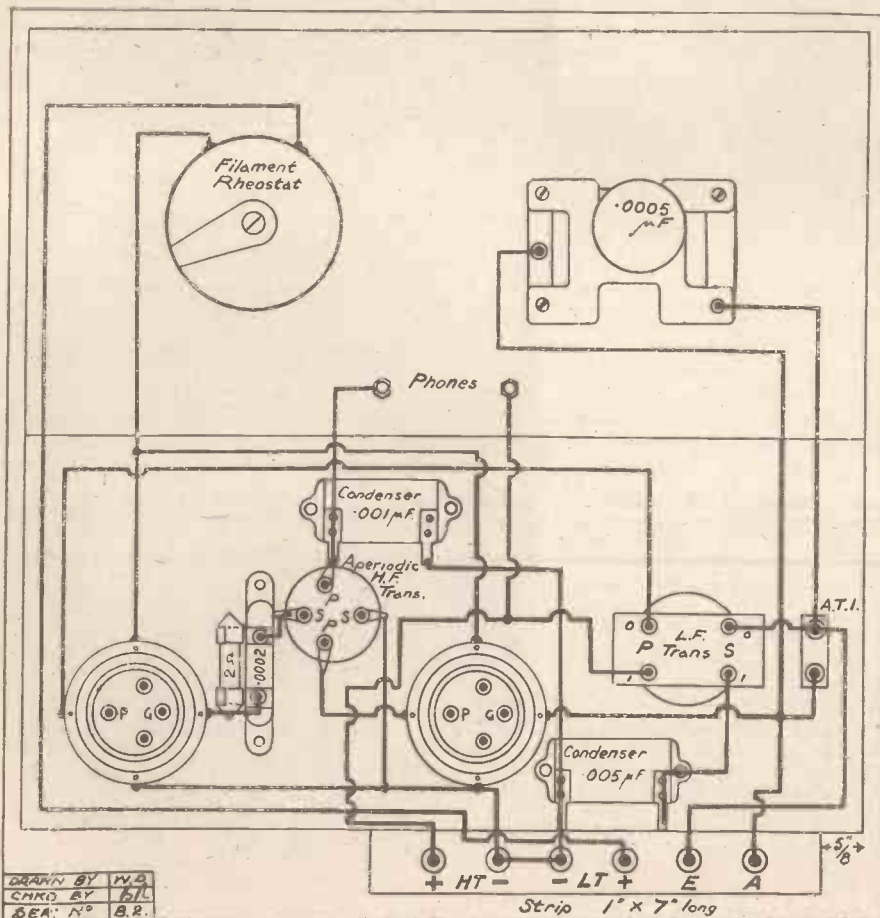
Other secondary socket of the H.F. transformer holder is joined to negative L.T.

Plate socket of second valve holder to O.P. terminal of L.F. transformer.

I.P. terminal to H.T. positive.

there are no moving parts behind the panel. It is therefore impossible for the wiring to interfere with the operation of the set, provided ordinary care is used in connecting up.

(Continued on next page.)



DRAWN BY W.S.
CHKD BY B.L.
SER. NO. 82.

A SHARMAN TWO-VALVE REFLEX SET

(Continued from previous page.)

The actual wiring is carried out with stiff copper wire, that shown in the photographs being No. $\frac{1}{16}$ square section tinned copper wire. The arrangement of the wires can be seen in the photographs, which should be studied in conjunction with the wiring diagram that is given upon the preceding page.

There should be no difficulty about this part of the construction provided that a good hot iron is used, and the work is kept scrupulously clean. Remember that as soon as a joint has been made, and whilst it is still hot, it should be wiped over with a clean cloth. This removes the liquefied flux, and results in a perfectly clean job at the back of the panel.

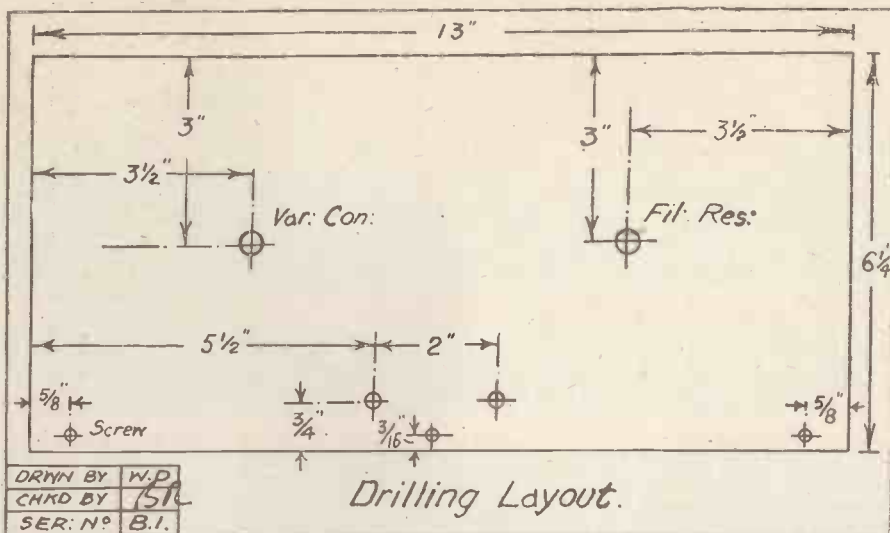
For all B.B.C. Wave-lengths.

When all the connections have been made, the wiring should be carefully compared with the wiring diagram, and checked from the list of point-to-point connections which is given on the preceding page.

The set will receive well on either long or short waves, the former requiring a 200 coil in the aerial sockets, and the latter a 35, 40, or 50 coil (if the aerial is an exceptionally long one a 150 turn coil will suffice for Daventry, whilst if it is very short a 250-turn coil may give rather better results).

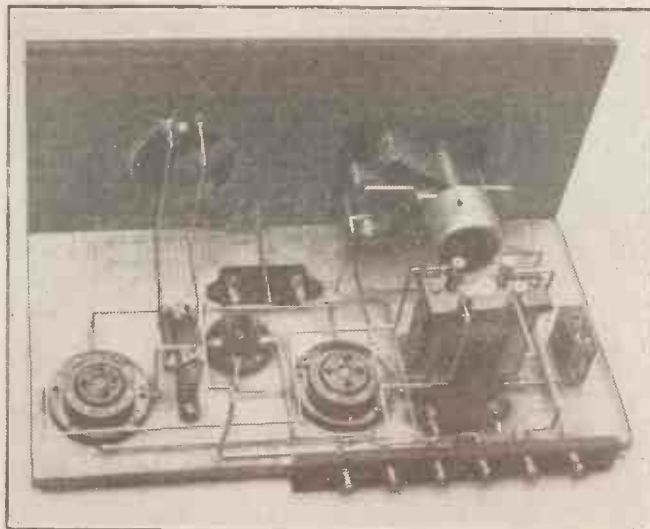
Close in to one of the main stations and using valves of B.T.-H. B.4 type the set will work a large loud speaker. It will give excellent headphone reception up to 20 or 30 miles on a main station, but as usual a good deal will depend upon the aerial employed.

Very good results are obtainable with indoor aerials, and at short distances the set is sufficiently sensitive to work well from a frame aerial.



As the set is not intended for a long distance reception the question of the possibility of further H.F. amplification does not arise. Adding an extra L.F. valve is, however, quite easily done, so that readers who have a power amplifying unit can use this for loud loud-speaker work.

Regarding valves, the combination tried successfully included two B.T.-H. B.5, two Marconi or Osram D.E.3's, two B.T.-H. B.4's, two of the new Cossor Point One's (plain top) and two of the Stentor Two's. In fact, the set is



This photograph shows the spacing of the components on the baseboard, and the straightforward nature of the wiring.

not at all critical in respect of the valves required, and any of the popular general purpose valves will give good results.

It has been stated that very good results are obtainable when using a frame aerial.

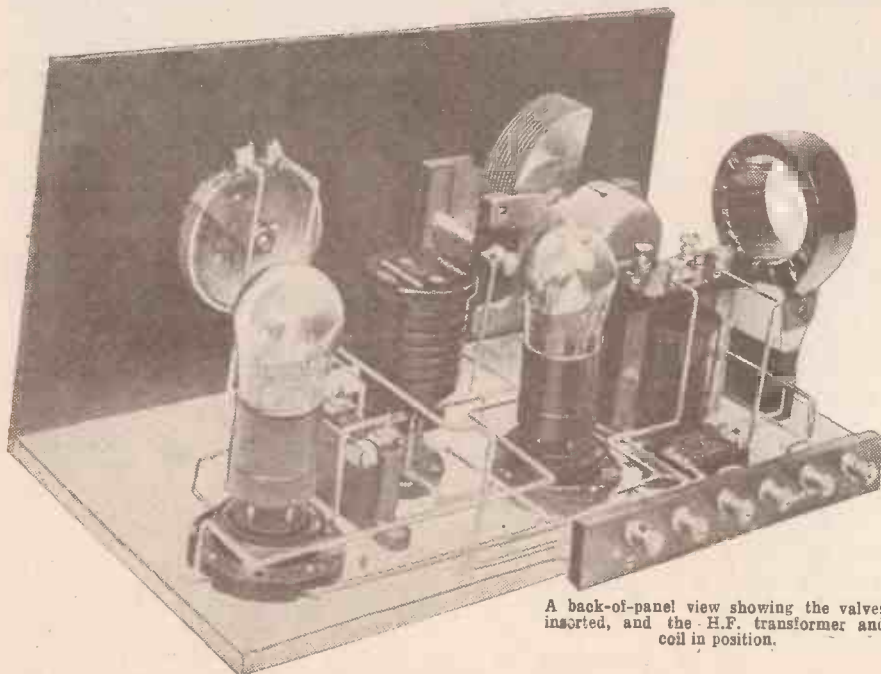
Although all ordinary sets are reduced in range by a frame, the receiver described here gives much better results than the average two-valve set, under such conditions.

The actual frame aerial used for testing the set shown was a collapsible one made by Peto-Scott, Ltd., and costing £2 2s.

Using a Frame Aerial.

For ordinary main or relay stations, no aerial coil is necessary when using a frame. But for receiving from 5 X X a loading coil is necessary. An ordinary tuning coil of 150 turns is used, and instead of the frame being connected direct to the A and E terminals, the latter connection is made through the loading coil.

Good telephone reception was obtainable using a frame from a main B.B.C. station, up to 16 miles or so. This range would only be about 6 or 7 miles in the case of a relay station, but would be greatly increased for 5 X X.



A back-of-panel view showing the valves inserted, and the H.F. transformer and coil in position.



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

A NEW type of valve has lately been produced in the United States which is designed to operate directly from the electric-lighting mains, whether direct or alternating current. This valve has many remarkable features.

In the first place, it operates without the use of any step-down transformer, and it is claimed that there is no audible ripple or hum, even in the case of alternating current. Moreover, the valve does not require any H.T. battery, for the H.T. is also obtained from the mains. By its use the L.T. and the H.T. batteries are thus eliminated.

The valve is claimed to act efficiently as a detector or H.F. or L.F. amplifier. It oscillates well and can also be used as a rectifier. When used as a power amplifier it has an amplification factor of about 8. The valve is made with a metal cap which is used as a fifth contact.

The cost of running this valve is said to be only about a tenth of a penny per hour, so that a 5-valve set using valves of this kind would cost about one halfpenny per hour to run. The life of the valve is estimated to be the same as that of the valves at present in use. Fuller particulars of this valve are not yet to hand.

Coils "by the Yard."

A new type of receiving inductance is now available, which can be bought "by the inch." The windings are laid upon a tube of transparent insulating material, about 3 in. in diameter and 0.005 in. in thickness. The turns are spaced a distance apart equal to the diameter of the wire used. In some cases there are as few as 10 turns to the inch, in other cases as many as 80 turns to the inch. The windings are varnished over in such a way that if the tube material is cut to length, the windings do not come loose.

Enclosed Batteries.

Is it bad practice to have the H.T. and L.T. batteries housed within the same compartment as the set? This seems to be one of those points on which opinion is traditional. The usual idea is that it is bad to have the L.T. inside (if an accumulator), but that it is permissible to have the H.T. dry battery, and also the L.T. (if of the dry battery type) within the cabinet. A writer in this journal, however, recently pointed out that the dry H.T., being of the Leclanché type, is more to be regarded with suspicion than a healthy accumulator.

The fact appears to be that there is practically no danger with either type (provided there is no actual spilling, or loose liquid about). I have myself had a set in use for over two years, with L.T. accumulator within the cabinet, and have never observed the least corrosion on any of the metal parts of the set. No doubt it is better to be on the safe side, to house the batteries in a separate compartment, shut off as effectively as possible from that in which the wiring and components are placed, but whether it is really worth the expense of such a more elaborate cabinet is a matter of opinion.



A compact 4-valver constructed by one of our Bedford readers.

In any case, I am convinced that the set of the future will employ battery eliminators, so that this question should automatically work itself out in time.

Converting Old Valves.

Readers frequently enquire as to the desirability of having their burnt-out valves repaired, and I am often asked to recommend particular firms who can be relied upon to do this work efficiently. In some cases it is desired to convert a burnt-out bright emitter into a dull emitter. There is no difficulty, of course, at any rate there is no serious difficulty, in introducing any particular filament into a burnt-out valve while the glass envelope is open. At the same time it must be remembered that the characteristics of a valve will depend upon the emission from the filament, and the mere obtaining of a high emission would not necessarily convert an H.F. amplifier, for example, into a power valve.

The filament emission is only one of the factors which go towards the characteristics of the valve, and the spacing of the electrodes and also the grid spacing have an

important bearing upon the characteristics of the valve. Whilst these remain the same, the degree of adjustment of the valve by way of introducing a new filament is decidedly limited. As a matter of fact it is better to have a valve fitted with a new filament of the same type as the one which was in the valve originally, and any attempt to change the characteristics of the valve when changing the filament is not likely to meet with very much success.

Bright or Dull Emitters?

Whilst on this subject of valve filaments, another question which is frequently raised is that of the comparative efficiency of dull emitters and bright emitters. By this I do not mean the efficiency in the engineering sense, that is to say, the amount of energy which has to be employed in order to secure a given result. On this point there is no doubt that, speaking generally, the dull-emitter type of valve is much more efficient than the bright emitter, since its wattage consumption is much less. This is indeed the reason for the commercial adoption of the dull-emitter type of valve and for its growing popularity.

The word "efficiency" was used above rather in the sense of reception efficiency. Here, however, in spite of the fact that there is still a lingering prejudice in the minds of many amateurs against the dull-emitter valve, it appears to me to be beyond question that the dull emitter is quite as efficient as the bright emitter. It is true that the bright emitter is in some cases more readily controllable, and one sometimes imagines that certain effects, connected more particularly with the control of the set, are obtainable with bright emitters which are not, at any rate so readily, obtainable with dull emitters, but nevertheless, operated in a proper manner, there seems to be little left in favour of the bright emitter and a great deal to be said against it.

Over-running D.E.'s.

In spite of the frequent warning with regard to the dull emitter valve that the filament should never be run beyond its rated temperature, many amateurs, no doubt in the hope of getting an improved performance from the valve, are apt to push the temperature a little too high. This has the effect of destroying its characteristic dull-emitter properties and, like other vicious practices, the more it is indulged in the more it has to be continued; in other words, the dull emitter is gradually converted into a bright emitter and has subsequently to be run as a bright emitter in order that it may be made to function at all. Since it was designed as a dull emitter its design when used as a bright emitter is wrong and consequently its life is apt to be very short. It is highly important, therefore, to take the greatest care never to operate a dull-emitter filament with a current in excess of the rated value, and this is a case where prevention is very much better than cure.

Choke-Coupled L.F.

A reader sends me a suggestion which, although not very original, is apparently not as well known as one might have thought. It refers to the use of an ordinary transformer for the purpose of choke-coupled amplification. It is common, in the absence of a regular choke, to employ one of the coils of an L.F. transformer as a choke.

(Continued on page 744.)

A Five Valve Distortionless Receiver



THE object of this receiver is to cut out, as far as possible, all distortion and to have an efficient instrument capable of receiving over long distances, without introducing complicated controls

Properly constructed, it gives results of far greater clarity than the usual sets and has a simplicity of control which enables even the uninitiated to handle it with ease.

The panel consists of a sheet of $\frac{1}{4}$ -in. ebonite (10 in. by 20 in.). It is an easy matter to place the transformer, chokes, fixed condensers and grid leaks in convenient positions at the rear of this, care being taken to avoid inter-action between chokes and the transformer.

Components Used.

The variable condensers should be of a reliable vernier type and of values .0005 mfd. for aerial tuning and .0003 mfd. for anode tuning.

Potentiometers are of 400 ohms resist-

 * A short Description of an Interesting *
 * Broadcast Receiver. *
 * From a Correspondent. *

ance, and they provide an automatic bias for all four grids. They are of great assistance for long distance and local work.

The crystal is of the permanent detector type, but should be of such construction that the crystals can be easily replaced by the owner. Zincite and bornite are a thoroughly reliable combination; care should be taken not to grind them when adjusting. Benzine brushed over their surfaces occasionally, keeps them clean and sensitive.

Rheostats are of the single-hole securing type; Woodhall's vernier 30-ohm rheostat is an excellent instrument and has the advantages of quick

adjustment and compactness.

The transformer is a "Ferranti"—ratio 4-1, and ordinary L.F. chokes are used.

Switching arrangements allow either three, four or five valves to be put into operation.

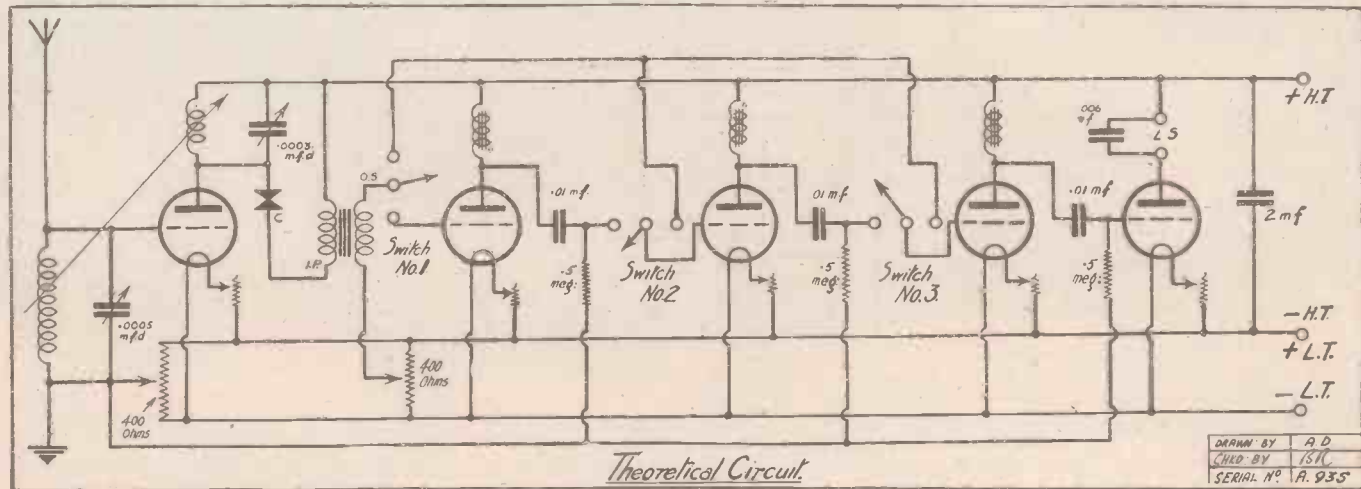
All condensers are "Mansbridge" (fixed); a 2 mfd. is placed across the H.T., .01 mfd. between the valves and the value of the condenser across the loud speaker depends entirely on the make of speaker used. For "Sterling Baby" its value is .006 mfd.

Grid leaks are of the fixed type and should be .5 meg.

Low Anode Voltages.

Valves should be preferably of the .06 amp. type, although bright valves give almost as good results, but have the disadvantage of consuming more current.

The circuit works at its best when 50-66 v. are applied to the H.T.



 * CEMENTING EBONITE. *
 * By J. F. C. *

ACCIDENTS, we are informed, have a persistent and unhappy knack of cropping up in even the most perfectly controlled household establishment. And in the radio constructional world, alas, the same dictum is true also.

It is really an accident of the very first water when an ebonite panel over which some considerable time has been spent in marking out and drilling happens to fall on to the floor, and to break in some part or other. Happily, however, good ebonite, when it does break, exhibits a clean fracture, and, on trial, it

will usually be found that the broken pieces of ebonite fit very neatly together.

A good cement for sticking such pieces of ebonite together can be very easily made.

Obtain a tube of bicycle tyre cement. Empty the tube out, and add about half a teaspoonful of methylated spirit to it. Next add an equal quantity of very thick shellac varnish, and stir the ingredients together very thoroughly. Finally, transfer the mixture to a small, well-corked bottle. The cement will now be ready for use, and, if the bottle is well-corked, it will keep in good working condition almost indefinitely.

Good Insulators.

When using the cement, make the surfaces to which it is to be applied slightly warm. The cement itself should also be warmed before use. In applying it, use a matchstalk to spread it in a thick, even layer over the

surfaces to be joined together. Press the surfaces together in close contact and, if possible, arrange weights or suitable means of pressure to keep the joined surfaces together for the following twenty-four hours.

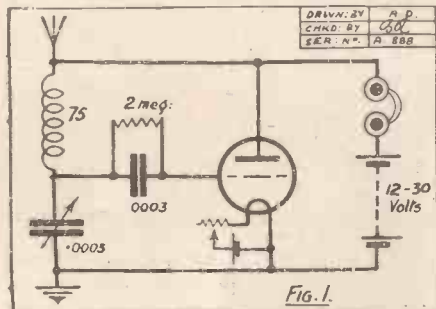
After the elapse of this time, clean away any surplus cement from the ebonite with a little fine sandpaper. The result will be a well and neatly-made joint. Such a joint will, of course, not look entirely satisfactory, in an artistic sense, if the panel is included in any "show" set, but for experimental or workshop receivers the joint will be quite efficient.

Finally, the joint will be sufficiently strong to stand up to a reasonable amount of strain, and, of course, as the ingredients of the cement (rubber and shellac) are both good insulators, no fear of leakage losses due to the joint need be entertained.

THE ULTRA-AUDION AND THE ULTRA COIL.

By K. SMITH, B.Sc.

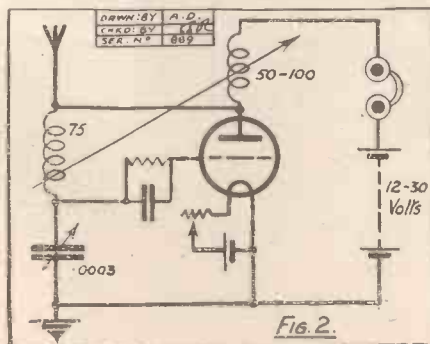
THE Ultra-Audion circuit, in which the aerial inductance is connected between the grid and the plate of the valve (instead of across filament and grid as in the ordinary regenerative receiver) is very popular with the one-valve man. Deservedly so, since in capable hands it will give good loud signals from a near station and will bring in clearly the distant stations. But like all "out-of-the-ordinary" circuits, the advantages are compensated for by



some disadvantages. It has a strong tendency to fall into oscillation with a flop, and if the reaction is to be under any sort of control careful adjustment must be made of the filament current and the H.T. voltage. A simple form of the circuit is shown in Fig. 1. The A.T.I. should be as large and the A.T.C. as small as possible.

Increasing Selectivity.

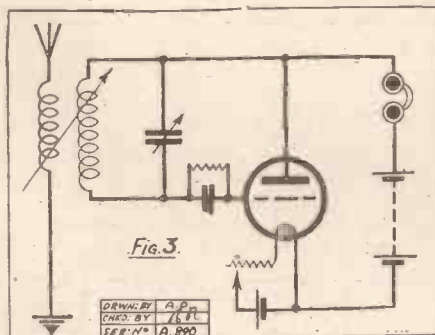
It has no outstanding merits, is not very selective, and generally is capable of ordinary one-valve results. Both selectivity and loudness are increased by introducing reaction as in Fig. 2. The reaction is very critical, and often one station can be lost and another tuned in on this alone. For the broadcast wave-lengths two 75 coils are suitable. Not a volt more H.T. than necessary must be used, and 12 volts will be found ample for DX. work. A choke in the plate-telephone circuit is often recommended, while on the other hand the author has found that a variable condenser across the 'phones (which act as a choke) gives a fine reaction effect, by passing some of the H.F. impulses. This circuit is to be recommended.



Another variant using loose-coupling is shown in Fig. 3. The aerial coil is untuned, and coupled to the tuning coil by a two-way coil holder. Their values can be 35 to 50 and 50 to 75, experiment will indicate the best values to use. The variable condenser may have a value of .0003 or .0005. This circuit is much more selective than Fig. 1. and slightly more selective than 2. Signal strength, however, is not so good as Fig. 2.

The Ultra Coil.

Having proved the value of the Ultra coil in a straight circuit (described in previous numbers of "P.W.") the author tried the experiment of introducing it into the Ultra-Audion circuit, hoping thereby to gain selectivity without loss of signal strength. Fig. 4 shows a hook-up which gave exceedingly good results. Reaction was arranged for, which was sparingly used. Strength of signals was as good as in Fig. 2. and for absence of mush equal to Fig. 3. The Ultra coil was of 60 turns basket type, tapped at the 20th and 40th to which aerial and earth were connected.

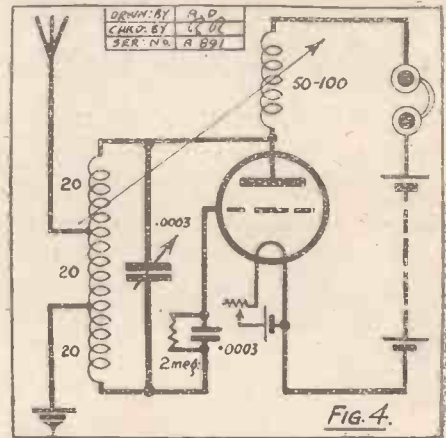


The diagram is self-explanatory. A variable grid leak is an advantage, but one of 2 megohms was satisfactory. Several B.B.C. stations came in at good strength, and tuning was quite sharp. The sharpness of tuning can be controlled by the position of the reaction coil. Hamburg and some of the German relays were nearly as strong as 2 L.O. Radio-Toulouse, Oslo, Madrid were very plain. One evening Radio-Berne came roaring in.

"Excellent Results."

With a larger coil Berlin and Aberdeen on the higher wave-length would doubtless be heard. Optimum results are obtained when the A.T.C. is small. The filament temperature is a critical feature, and a vernier rheostat would be a refinement; H.T., too, must be carefully regulated. The best value will be found by trial, and it will be noticed that a slight variation of increase or decrease may cause signals to disappear; 20 volts will generally be ample. Altogether the circuit gave excellent results both as regards loudness and clarity, and is well worthy of experiment.

Note.—With some valves it may be found an advantage to connect the grid leak between grid and L.T. + instead of across grid condenser as shown. For Daventry, author has not found either circuit of much advantage, and would advise a straight regenerative circuit.



ADAPTING A VARIABLE CONDENSER.

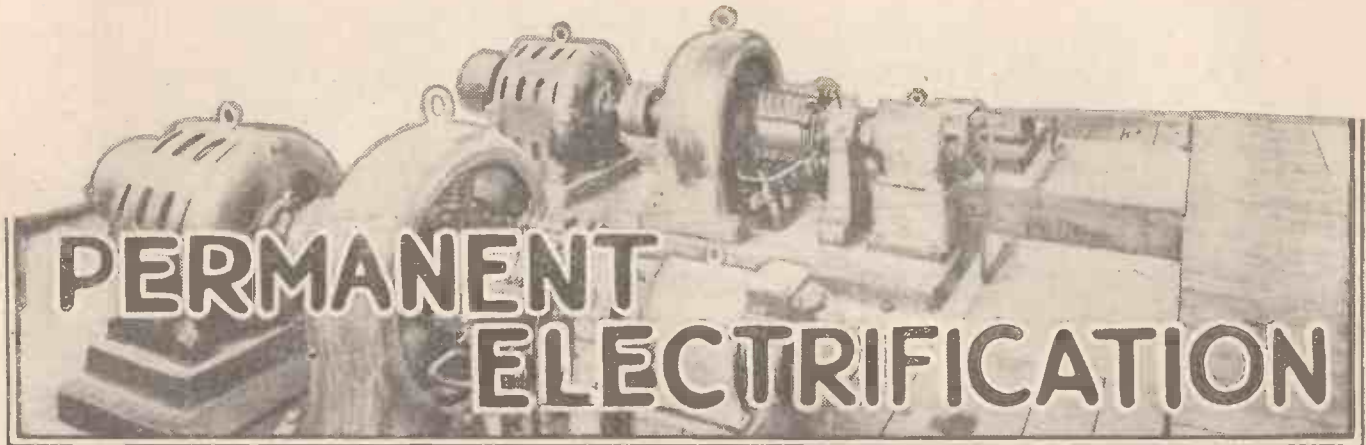
IT sometimes happens that one has a variable condenser which is of a larger capacity than is required in a position where it might otherwise be employed. For example, a variable condenser of .0003 capacity used as a reaction condenser in a Reinartz set may bring the set to the point of oscillation when the dial reading is about 30, whereas it is obvious that a more gradual control of reaction would be possible if the dial would be turned until a reading of 150 or 160 were recorded before oscillation occurred.

An Added Safeguard.

There are two simple remedies for this, apart from the rather troublesome expedient of rewinding a coil. The first is to insert a small fixed condenser in series with the variable condenser. The size will depend on circumstances, but .0001 or .0002 should be suitable. This plan, which is quite effective, has the further merit that it acts as a safeguard in case the variable condenser should, by mishap, be short-circuited.

The second remedy is to partially dismantle the variable condenser, removing about half or two-thirds the number of fixed vanes. The spacing washers between the fixed vanes should be replaced on the spindles, and the removed vanes replaced all together at the bottom of the condenser. Thus, although the number of moving vanes remains unaltered, the capacity of the condenser will be reduced, because a proportion of the fixed vanes have been put out of action.

If, at a later time, it is desired to restore the condenser to its former capacity, it is the work of only a few moments to reinsert the fixed vanes in their previous positions between the spacing washers.



IT has now become a well-known fact among radio and other experimenters that if we take a certain type of crystalline compound, such as Rochelle Salt, or Quartz, and subject the crystal to a twisting or straining pressure, certain portions of the crystal develop an electrical charge upon their surfaces. This effect, in brief, constitutes the phenomenon of what is known as pressure, or "piezo," electricity, and the discovery of it, now many years old, is being increasingly made use of in various fields of radio and electrical science.

The electrification of the crystal surface, under these conditions, is not permanent. It quickly disappears when the exciting

By J. F. CORRIGAN, M.Sc., A.I.C.
(Staff Consultant.)
The Germ of a New Electrical Principle.

develop electrical charges upon its surface, and to retain these charges, so far as one can at present surmise, for ever.

This discovery of permanent electrification, which is exactly analogous to the magnetism of a body, has been made by a Japanese scientist, a certain Professor Mototaro Eguchi, of Tokyo, and readers who are interested in the subject will be able to find details of the experiments which have been carried out in the London and Edinburgh Philosophical Magazine, Vol. 49.

Essentially, the Japanese professor's method of setting up a condition of permanent electrification in a body consists in subjecting the body to the influence of an extremely powerful electrostatic field.

Electrified Wax.

The substances experimented upon have been, in the main, fats and waxes, which under ordinary circumstances are efficient insulators of electricity. Professor Eguchi's process can be conveniently and briefly described as follows:

The wax is placed in a shallow tin or sheet-iron vessel and is heated until it has thoroughly melted. The metallic vessel which contains the wax is made one plate of a powerful electrostatic machine, whilst the other plate or pole of the machine is suspended a short distance above the surface of the molten wax. Such an arrangement is depicted in diagrammatic fashion at Fig. 1.

After the wax has been melted for some time in order to allow its composition throughout its mass to become perfectly homogeneous, the source of heat is withdrawn, and the generator is put into action. So that whilst the wax is cooling a very strong electrostatic field is created around it. In reality, the wax forms the dielectric medium of a specially devised condenser.

After the wax has become solid it is removed from the vessel, and it is found to have become permanently electrified. One side of the wax disc is negatively charged, the other side becomes positively charged, and, so far as one can tell at the moment, these electrical charges are absolutely permanent and do not tend to disappear under ordinary conditions. The waxes experimented upon have been mixtures of

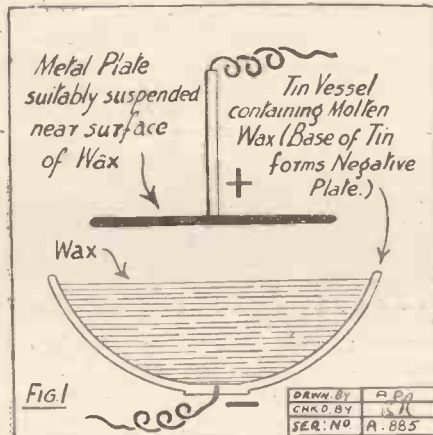
various resins and tree waxes. Ordinary beeswax has also formed a constituent of some of the electrified bodies.

It has been found that various chemical influences, such as treatment with strong acids and salt solutions, heating, and strong cooling, all destroy the electrification for a time, but nevertheless the electrical charges on the surfaces of the wax disc are rapidly restored to it after it has been allowed to return to its normal condition.

Powerful Machine Required.

Although the above experiments are of enormous interest to the radio experimenter, and although they are simple enough to carry out, it is unfortunate that the average amateur will be unable to imitate them owing to the difficulty of providing the necessary electrostatic generator.

It is conceivable, of course, that a powerful Wimshurst machine, suitably connected up with Leyden jar condensers, might be able to create a sufficiently strong electrostatic field in order to electrify some waxes, and experimenters who are able to avail themselves of the services of such an



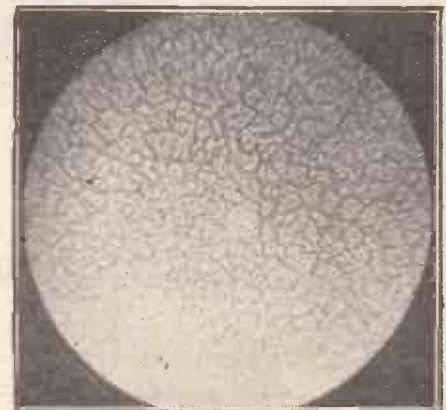
circumstances have been removed. Similarly, up to recent times no one has ever been successful in permanently electrifying any material substance in the same way as a body may be permanently magnetised.

The grid of a valve, for instance, is electrified so long as the H.T. battery is in circuit. Take away the H.T. supply, and the electrification of the grid immediately ceases.

Japanese Discovery.

Place, however, a steel bar across the poles of a permanent or electro-magnet. In this case the steel bar is magnetised, and further, the magnetism persists more or less permanently after the bar has been removed from the exciting source of magnetism.

Now, an interesting discovery has been very recently made. This discovery concerns the setting up of a permanent state, not of magnetism, but of electrification. By certain means, a body can be made to



A photomicrograph of a thin film of wax showing its crystalline structure.

instrument might well carry out a few experiments of their own in this direction.

The necessary potential at the surfaces of the wax must amount to an order of many thousand volts, and therefore it will be unnecessary to point out that a battery of ordinary H.T. cells will be of little use for the purpose.

In order to seek out a possible explanation, let us come back for a

(Continued on next page.)

WHY THE H.T. ACCUMULATOR MAY REPLACE THE DRY BATTERY.

FROM A CORRESPONDENT.

THE man who uses a dry battery for his anode supply backs a losing horse from the start. Let us see why.

He goes into a shop and asks for a Blank 108 Volt High Tension Battery. Down it comes from the shelf, where it has been oozing away volts since it came into stock. A volt-meter is flicked across its positive and minus terminals and momentarily registers 108 volts. So far so good.

It is then connected up, probably across the plates of four valves (one a power valve) and promptly starts to die—slowly and surely. Soon crackling develops in the 'phones or loud-speaker. "Atmospherics!" says the listener, never for a moment dreaming that those mysterious sputterings and

the outside sees these 100 volts on their last legs, and if efficiency is to be kept at concert pitch, bang goes another 27/-! Six times 27/- is £8 2s. in twelve months. Now let us take the H.T. accumulator. In the case of the Tungstone, for instance, this costs £5 15s. This includes a free first partial charge ready for work. The battery is then "worked in" for about a month on any set, and then recharged at a cost of probably 1/6 to 2/-. It will from now on give an *unvarying unfluctuating* voltage of 60 volts for well over three months on any multi-valve set. This voltage of 60 volts is *easily equal to the rated 100 volts of the dry battery*, if not better, because every volt "registers" —pulling its weight, *steady and unvarying*.



Members of the Golders Green and Hendon Radio Society, after taking tea at Berkhamstead, listen to a broadcast concert.

cracklings come from the rapidly disintegrating high-tension supply. "Fading" develops on distant stations through fluctuating high tension voltage, causing reaction to be pushed to the limit, creating distortion and "howling," spoiling reproduction and near-by listeners' programmes.

Serious Voltage Drop.

If now a volt-meter be applied to the H.T. dry battery the voltage is found to have dropped to 60 or 80—very few volts for good money spent.

Gradually it dawns upon the listener that dry batteries are false economy, and if he be a wise man he invests in a good H.T. accumulator. It must be a good one, giving its ampere hour capacity in addition to its voltage. Too many so-called cheap H.T. accumulators now on the market simply give their reputed voltage, and preserve a discreet silence as to their amperage.

The initial outlay appears a trifle on the high side—but is it? The average better-class high-tension dry battery costs round about 27/- per 100 volts. Three months at

As regards the working life of H.T. accumulators let us take the above as an example. The plates have a good working lifetime of four years under normal working conditions, and all other parts will outlast the lifetime of the average man. In fact, the battery can be handed down from father to son! This fact alone will put the dry battery out of court with the practical listener who has a regard for his pocket.

Modern receivers are hard on the H.T. supply. Multi-valve sets are the order of the day, among them the various "dynes"—neutrodynes, super-heterodynes, etc., and reflexes in their many varieties. These latter are notorious for their big drain on the anode supply. Dry batteries are a hopeless proposition in the case of 7, 8, 9 and 10 valve "super-hets." No dry battery can honestly stand up to the big demand of this number of valves—the good class H.T. accumulator is a *sine qua non* here.

Silent Background Assured.

For DX work on the ultra-short waves (below 450 metres) a *dead silent background*

is absolutely necessary for the accurate reception of faint Morse signals from the other side of the globe. This happy state of affairs can only be obtained with a good H.T. accumulator as the anode supply. Goodness knows, static and "jamming" are bad enough disturbers on these wavelengths without the additions of the complainings and groanings of a dying dry cell H.T. battery!

Extremes of climate play havoc with dry batteries—damp rapidly ruins them, heat equally so. Neither of these conditions has the slightest effect on the stoutly constructed, sturdily housed H.T. accumulator.

Replacing Plates.

Should anything go wrong with the dry battery it rapidly becomes a dead loss. Should it polarise, should a cell in the middle give up the ghost, should it be badly short-circuited, it can only be thrown away, and that's the end of it—another 27/- vanished into thin air!

It is totally different in the case of a really well made H.T. accumulator. Should a plate develop trouble (which is most unlikely) it can be easily got at, examined, removed and repaired. If necessary it can be totally overhauled, replacements can be made, units added or taken away.

To sum up, the H.T. dry battery as opposed to the H.T. accumulator of a good class is a hopelessly uneconomic proposition. Against the steady unvarying efficiency of service of the accumulator it can only oppose an illusory initial cheapness (apt description) which soon fades in a welter of crackling, poor reception and final expense. The H.T. accumulator has come to stay, and with it the exasperation and disgust some listeners experience will disappear in the realisation that the H.T. accumulator is the only lasting and efficient solution of the H.T. problem.

PERMANENT ELECTRIFICATION.

(Continued from previous page.)

moment to the phenomenon of piezo-electricity. A crystal develops electrical charges upon its surface under the influence of pressure or strain. As a working hypothesis for this effect, we may consider that it is due to the displacement of the molecular structure of the crystal, with the consequent temporary liberation of free electrons upon the crystal surface. As soon as the pressure or strain is removed, the electrons go back to their normal positions in the crystal atomic and molecular structure, and thus the electrical charge disappears.

Now, in the case of permanent electrification of fats and waxes which, up to now, have generally been considered to be entirely non-crystalline bodies, it is possible that some form of crystalline structure even exists in substances such as these, and that the melting and subsequent solidifying process under the influence of a strong electrical field causes a displacement of the electrons in the crystalline structure of the wax, and that once the crystal structure of the wax has been given an electrical twist, so to speak, it is unable to return to its normal state, thus setting up a condition of permanent electrification.

Ebonite or Substitute?



By J. F. CORRIGAN,
M.Sc., A.I.C.
(Staff Consultant.)

Synthetic insulating materials versus the "real thing." That is the theme of Mr. Corrigan's practical and extremely useful article.

WITHOUT a doubt there exists no practical wireless enthusiast who, at one time or other, has not been keenly interested in the rival claims which

are now showing themselves to be serious competitors to the real article.

Before considering the various pros and cons of ebonite and ebonite substitutes, however, it will no doubt be advantageous if we recall the manner in which these materials are manufactured in order that we may have a clear idea of the way in which they differ with respect to their chemical nature.

Ebonite proper, as is well known, is produced by the over-vulcanisation of high-grade rubber. Sheets of the highest grade Borneo rubber are treated with molten sulphur for varying periods. The rubber

Of course, the ebonite suffers very greatly by the incorporation of such adulterants. There is not one good thing to be said on behalf of low-grade ebonite. It is nasty stuff altogether. It is brittle, it has a low dielectric constant, and it "works" badly. Again, low-grade ebonite often turns green or brown after it has been exposed to the air for a year or two. And it is usually impossible to produce any degree of finish on the surface of the material. No amateur and experimenter who cares one bit for the appearance, not to speak of the efficiency of his instruments, should have anything to do with low-grade ebonites. Like money-lenders' advances, they are generally a snare and a delusion.

Effect of Exposure.

Turning now to ebonite substitutes, these materials are manufactured by an entirely different process. In principle the process by which ebonite substitutes are produced consists in taking pure carbolic acid, mixing it with a certain proportion of formalin, together with a little hydrochloric acid, and gently heating the mixture under special conditions. The liquid mass gradually turns into an insoluble resin, known as *Bakelite B*. This product is then heated under pressure, whereupon it is converted into a very hard infusible mass which is quite unaffected by acids and organic solvents. It is called *Bakelite C*. *Bakelite C* possesses a very considerable tensile strength, and it is from this material that

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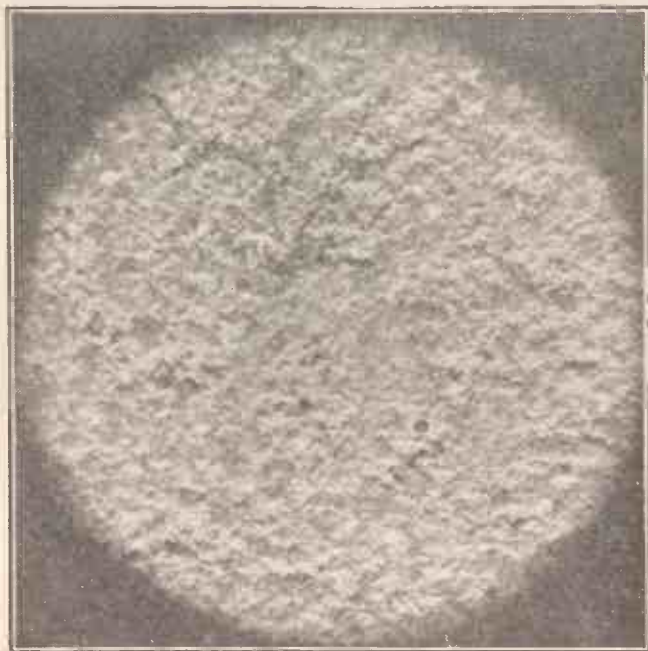


Fig. 1. The surface of an ebonite panel as seen under a powerful microscope and—

the suppliers of ebonite and ebonite substitutes put forward on behalf of their respective products. Real ebonite, it is true, may be considered to constitute the "classical" insulating medium of the radio world. For many years it has held undisputed sway over the radio market, and even two or three years ago it was a difficult matter to procure any synthetic insulating material for panel construction and similar uses which would come up to real ebonite in appearance and all-round efficiency.

How Ebonite is Made.

Times have changed now. And rapid progress has been made in the production of synthetic insulating materials. So much so, that synthetic ebonites, or, as they are more usually called, "ebonite substitutes,"

absorbs the sulphur, and in due course the final product appears as ebonite. The crude ebonite sheets are then rolled, pressed and polished, or otherwise finished.

Sometimes, however, in order to produce a cheaper grade of ebonite, various "fillers" are incorporated with the material. These filling substances are things such as lime, soot, gypsum, chalk, various powdered minerals, and so forth.

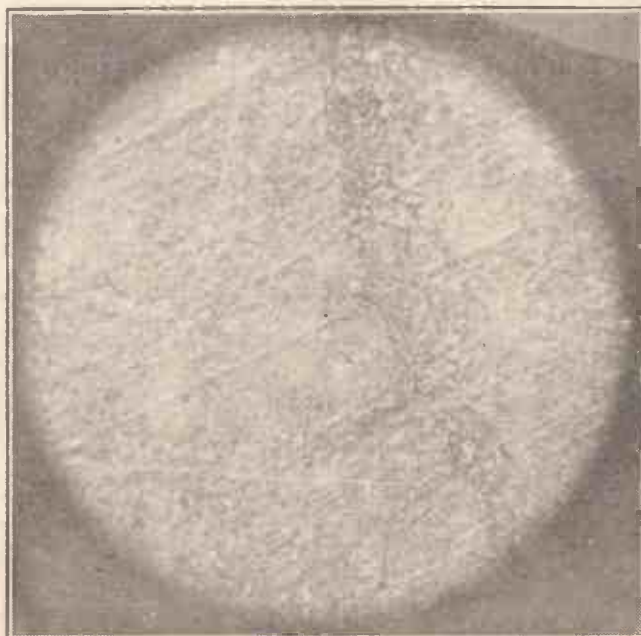


Fig. 2. A piece of ebonite substitute seen under similar conditions.

EBONITE or SUBSTITUTE?

(Continued from previous page.)

practically all the varying brands of ebonite substitute are produced.

Now let us consider the various advantages and disadvantages which are attendant upon the use of ebonite and its substitutes.

In the first place, real ebonite, provided it is of the highest grade, usually has a greater insulating power than its substitutes. But the difference is not excessive, however, and for general use such a discrepancy may be neglected. One important point to remember in this connection is that no matter how perfect the insulating power of ebonite is to begin with, the material very often shows tendencies to decrease in efficiency in this respect after it has been in use for some considerable time. Exposure to impure and smoke-laden atmosphere seems in some way to cause the insulating power of ebonite to become decreased. On the other hand, good ebonite substitutes are absolutely constant in this respect, and no lowering of their insulating efficiency takes place.

Another Interesting Fact.

Probably the reason why ebonite suffers in this manner from exposure to the atmosphere is because its surface is porous in nature. Even the smoothest surface of an ebonite panel will present the appearance seen in Fig. 1 when viewed under a sufficiently high-powered microscope. Ebonite substitutes are much less porous, as will be seen from a glance at the photomicrograph, Fig. 2.

Another interesting fact is that various batches of even high-class ebonite vary to some extent in their properties. One batch of the material may have a different dielectric constant than another. One batch may exhibit tendencies, to brittleness, another may perhaps show signs of warping to a slight extent. It is an exceedingly difficult matter to accurately standardise the quality of ebonite from batch to batch of the material, owing to the lack of fine control on the rubber vulcanising process which is present during the manufacture of the material.

"Electric Puncturing Voltage."

Ebonite substitutes, on the other hand, suffer less in this respect. When the stuff is carefully made one batch of the material is as good as another, and most ebonite substitutes have a nearly constant resistance.

Ebonite substitutes are usually more easy to work than the real material. They are rather less brittle than real ebonite, and, as they have a high tensile strength, they can be honeycombed with holes without losing much of their rigidity. Oil does not affect ebonite substitutes detrimentally, and therefore the tip of the drill can be dipped in some light lubricant in order to facilitate the drilling of the material. With many grades of ebonite it is impossible to carry out this procedure owing to the softening action of the oil on the ebonite.

What is known as the "electrical puncturing voltage" of a good grade of ebonite substitute is of the order of 35,000 volts per millimetre thickness of the material.

The electrical puncturing voltage of high-class radio ebonite is rather higher than this, being in the neighbourhood of 40,000, or even 45,000 volts.

Let us now sum up briefly the respective advantages and disadvantages of ebonite and its substitutes.

The advantages of ebonite are mainly the following: When carefully produced it possesses extremely high insulating powers. It can be given a good appearance, and it possesses a dead black colour. High grades of ebonite are fairly easy to work.

Summing Up.

The disadvantages of the material are mainly to be seen in the facts that it tends to deteriorate somewhat after it has been exposed to impure atmospheres for some time. Also that it shows a decided tendency to warp in warm weather, and to change in colour. In many cases ebonite is often brittle, and the relatively high cost of the material seems to have proved an incentive to the placing on the market of quantities of low grade stuff, which is most unsatisfactory in practical use.

Ebonite substitutes, on the other hand, possess the advantages of being rather cheaper than real ebonite. They are quite unaffected by heat, liquids, and common

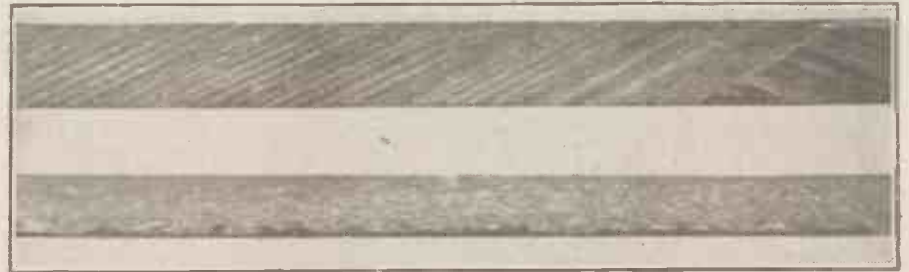


Fig. 3 (top), section of ebonite substitute; (below), section of ebonite, both magnified.

chemical reagents. They do not tend to change in colour. They possess, also, greater strength than ebonite itself, and they are generally less brittle than the latter material.

The disadvantages attendant upon the use of such material are, firstly, that it does not possess the fine, dead black colour that ebonite does; secondly, that it has not quite the same insulative power. And, thirdly, that it is not capable of being given the same excellent degree of finish as is the case with real ebonite.

Such, then, are the respective advantages and disadvantages of the two classes of materials. In the construction of the average radio set, it is quite a matter of opinion which to use. For all ordinary purposes, both classes of material are equally efficient. If, however, results of the very highest electrical accuracy are required, the best grade of real ebonite should be used. In other cases, there is no reason why the use of either material should make a scrap of difference in the results obtained with the instrument.

Two Easy Tests.

The best way to distinguish between ebonite and one of its substitutes, is to hold the sheet up to the level of the eyes, and to look along its surface. Ebonite itself will almost invariably show a roughened surface, unless it has been very highly polished. The surface of the ebonite substitute will be seen to be much smoother.

Another method of distinguishing between the two materials is to examine a cleanly cut edge of the sheet. The photograph shown at Fig. 3, on a considerably enlarged scale, indicates the appearance of the two products when viewed in this manner. The top strip in the photograph is an ebonite substitute, the lower one being real ebonite. It will be noticed that the real material has a fibrous structure which is quite absent in the ebonite substitute. Some of the low grades of ebonite possess an edge on appearance similar to that of an ebonite substitute as seen in the upper part of the photograph, Fig. 3. However, such materials can generally be distinguished from a high-grade ebonite substitute owing to the fact that when viewed in this manner they show patches of unequal colour, which are quite absent in the case of an ebonite substitute.

BATTERY CONNECTIONS.

THE H.T. — to L.T. connections are apt to vary in different valve sets. Sometimes H.T. negative is joined to L.T. negative and sometimes to L.T.

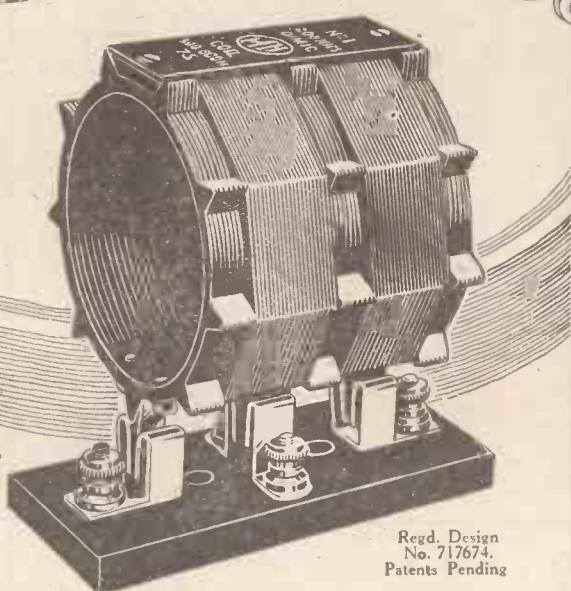
positive. This does not matter so long as an amplifier is not used with the receiver.

Before an amplifier is joined to a set it should be ascertained that the H.T. negative connection is similar in both cases. If it is not and two leads are taken to L.T. — and L.T. + from the same battery to both instruments a dead short will occur. The leads will get red hot and may even melt.

But safety can always be assured by ignoring the H.T. negative terminal on the amplifier, leaving it connected neither to the H.T. battery nor to the receiver to which the amplifier is connected. To use the terminal at all is merely to duplicate a connection that is already made in the receiving set, for here the H.T. negative is already joined to L.T.

When the batteries are concealed beneath the table, distinguishing leads and terminals should be used so that no mistake can be made when connecting them to the set. If plain wires are employed, knots should be tied in the H.T. flexes, one for negative and two for positive, so that they can never be mistaken for L.T. leads.

To reverse the H.T. and L.T. connections is dangerous, for by this means the valves can be burnt out, and to reverse the H.T. connections, taking the minus terminal of the battery to the plus (positive) of the set and the positive to minus will merely prevent the receiver from functioning. But it is always worth while trying the effect of reversing the L.T. connections for sometimes this considerably improves results.



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Number

1. DETECTOR VALVE WITH REACTION.
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3. 1-VALVE L.F. AMPLIFIER.
4. CRYSTAL DETECTOR WITH L.F. AMPLIFIER.
5. H.F. (Tuned Anode) AND CRYSTAL, WITH REACTION.
6. H.F. AND CRYSTAL. (Transformer Coupled, Without Reaction).
7. 1-VALVE REFLEX WITH CRYSTAL DETECTOR (Tuned Anode).
8. 1-VALVE REFLEX AND CRYSTAL DETECTOR (Employing H.F. Transformer, without Reaction).
9. H.F. AND DETECTOR (Tuned Anode Coupling, with Reaction on Anode).
10. H.F. AND DETECTOR. (Transformer Coupled, with Reaction).
11. DETECTOR AND L.F. (With Switch to Cut Out L.F. Valve).
12. DETECTOR AND L.F. UNIDYNE (With Switch to Cut Out L.F. Valve).
13. 2-VALVE REFLEX (Employing Valve Detector).
14. 2-VALVE L.F. AMPLIFIER (Transformer coupled with Switch to Cut Out Last Valve).
15. 2-VALVE L.F. AMPLIFIER (Transformer-Resistance Coupled with Switch for Cutting Out Last Valve).
16. H.F. (Tuned Anode), CRYSTAL DETECTOR AND L.F. (with Switch for Last Valve).
17. CRYSTAL DETECTOR WITH TWO L.F. AMPLIFIERS (with Switching).
18. 1-VALVE REFLEX AND CRYSTAL DETECTOR, with 1-VALVE L.F. AMPLIFIER, Controlled by Switch.
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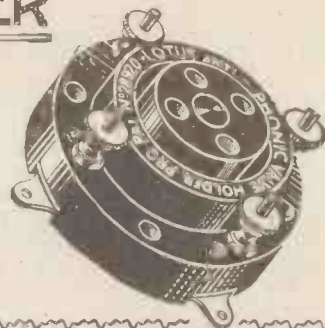
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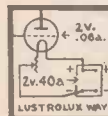
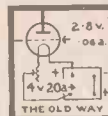
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WE understand on good authority that the new broadcasting Commissioners have been chosen. We have made every endeavour to ascertain the names of the gentlemen, but unfortunately at the time of going to press we have not been able to secure the necessary information, except that it is rumoured that the Marquis of Reading will be the new chief of the B.B.C. However, there are not many more months to run before all these Commissioners will blossom forth into the light of the public gaze, and then we shall see what broadcasting will be like under the control of Civil servants.

We have no doubt that the best available men have been appointed by the Government—that is, men who the Government consider the best for the job. At least, we have been assured on high authority that the best available men have been chosen. But that, we are afraid, has not lessened the nervousness of those who have had experience of Government control, especially in entertainment matters. We sincerely hope these gentlemen have not received their posts because of political services; and, although it is true that half of them are supposed to retire after five years and are eligible for re-election, enough damage can be done in five years, if their policy is wrong, to make broadcasting unpopular.

Lieut.-Commander Kenworthy, M.P., Chairman of the Radio Association, points out in the "Referee" that one of the objections to the new arrangement is that the temptation of the Government to force views, etc., into the ears of listeners which the Government thinks will be good for them, will be well nigh irresistible. If the Government finds this temptation irresistible they can be assured of one thing, and that is that they will be inundated with protests from hundreds of thousands of listeners.

The Future.

Now that it is certain that the broadcasting service will fall into the hands of the Government, listeners are beginning to realise that the present B.B.C. management has, on the whole, been extraordinarily good. Of course, it has been criticised; it has been "slanged"; and abuse and destructive criticism has been heaped upon it; but it has borne all this with a good deal of dignity and a good deal of restraint, which we, for one, admire. It has done this because the men who are controlling the B.B.C. policy know from long experience that their policy is the only possible one in a case where two million people, or more, all with a variety of likes and dislikes, have to be served with an entertainment which, owing to cash and other restrictions, has to be kept on a certain level.

These and other points are now being realised by the listener. If he looks through his week's programme for his local station we think he will find many items which do not interest him in the slightest; but he is a difficult listener to please who, on looking through the week's programmes, could not honestly declare that there were not one or two items which did give him pleasure, and if only one or two items per night give the listener pleasure at the cost of 10s. per year, then he can hardly say that he is not getting his money's worth.

How many times does one go to a theatre or to a cinema in a year, spending on an aggregate at least several pounds, and how

CURRENT TOPICS.

By The Editor.

The New Commissioners — The Government's Temptation — What Listeners Realise — A Belated Protest — A Modern Sindbad the Sailor — The Executive Management of the New B.B.C.

many times after one has been to such an entertainment can one truthfully say that one has had one's money's worth? From our own experience, very seldom.

The annual general meeting—quite possibly the last general meeting—of the B.B.C. was held at the Hotel Cecil a few days ago. We were interested to note a belated protest by a group of radio manufacturers against the coming change in the control of broadcasting. We can understand, appreciate, and sympathise with their protest against the delay in making known any decision on the composition of the new broadcasting Board of Commissioners, but we cannot help thinking that it was very late in the day to protest on

ago when there was a chance of a united protest against Government control having some effect. The protest on the part of certain manufacturers that they were not being given a fair chance of knowing upon what type of set they had to concentrate for the coming year was a legitimate one, and one which, we hope, will be given every satisfaction as soon as possible. It certainly does seem very hard on manufacturers that the Government should delay in making fully known their future plans for broadcasting, because this delay will inevitably react unfavourably on the wireless trade for the forthcoming year.

In September, it was pointed out that there will open the biggest wireless exhibition ever held in this country, and on it the radio manufacturers will have to base their business for the coming twelve months. Yet to-day the radio manufacturers do not know what is going to happen to broadcasting. It seems that (according to certain speakers representative of the wireless trade) people are "waiting and seeing" and are not buying wireless sets.

We are inclined to doubt whether this is really the cause of the falling off of wireless business; we are more inclined to believe that the explanation is much more simple, and that the whole trouble can be summed



Members of the 4th South Croydon troop of Boy Scouts rehearsing for their recent "camp fire" broadcast from 2 L O.]

the grounds that change of control was undesirable.

All this should have been thrashed out when Lord Crawford's Committee of Enquiry was hearing evidence. When this evidence was being heard the policy of the manufacturers with regard to the change in broadcasting control was by no means definite; in fact, it would be no exaggeration to say it was a negative policy; and they cannot expect now that the Government will change their mind and decide to extend the B.B.C.'s licence for a further period.

Certain shareholders pointed out that the entertainment service by broadcasting stood but little chance of success if run by the Government, and expressed a fear that measures would be passed by the Government without a chance of fair discussion. One speaker outlined the state of the broadcasting service in the future as being like "Sindbad in the clutches of the old man of the sea."

It is a pity that this revelation was not given to the manufacturers many months

up in the one word "summer." It is not to be expected that people are going to take a frenzied interest in broadcasting during the hot summer months. The attractions out of doors are too numerous to leave any room for doubt that so long as we bask in summer sunshine the wireless set will be relegated to a secondary position until the autumn and winter months come round again.

Early News Expected.

As we go to press with this issue, we understand that by the time "P.W." is on sale, the Government will have made a public statement regarding the future of broadcasting. We hope the information given will assist the radio trade to determine its policy, and that listeners will be given definite news concerning the new commissioners, and that, whatever changes are made, that the Government will see to it that the executive management of the new B.B.C. is left in the hands of the best man available—Mr. J. C. W. Reith

RADIOTORIAL

All Editorial Communications to be addressed to The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

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The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

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

Readers' letters dealing with patent questions, if sent to the Editor, will be forwarded to our own patent advisers, where every facility and help will be afforded to readers. The envelope should be clearly marked "Patent Advice."

TECHNICAL QUERIES.

Letters should be addressed to: Technical Query Dept., "Popular Wireless," The Fleetway House, Farringdon Street, London, E.C.4. They should be written on one side of the paper only, and MUST be accompanied by a stamped addressed envelope.

Queries should be asked in the form of the numbered questions: (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.

For every question asked a fee of 6d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the numbers. (It is not possible to reproduce the question in the answer.)

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

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

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

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

Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)

Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1s. per diagram, and these should be large, and as clear as possible. No questions can be answered by 'phone. Remittances should be in the form of Postal Orders

Questions and Answers

TWO-VALVE LONG DISTANCE SET.

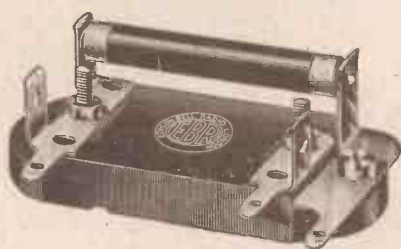
B. E. M. (Hertfordshire).—For some time I have been obtaining excellent results with a Det. and L.F. receiver, but find that though good for local and British broadcasting it still leaves something to be desired when it comes to DX work. I use 'phones only, so thought I could convert the two valves into a set more suited for DX work. What set should I use?

(Continued on page 740.)

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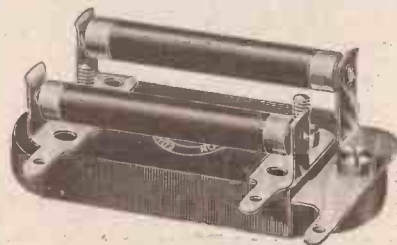
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In these condensers the two clips used when the grid leak is in parallel are fitted under the terminals. The third clip is supplied loose and should be held in position by the screw which holds the condenser to the panel. The exact position of the third clip is clearly indicated in the above illustrations, and full directions are supplied with each condenser. The parallel connection is usual in valve detectors, and the series arrangement is used in tuned anode and resistance couplings, etc. The above can be supplied with or without grid leaks fitted.

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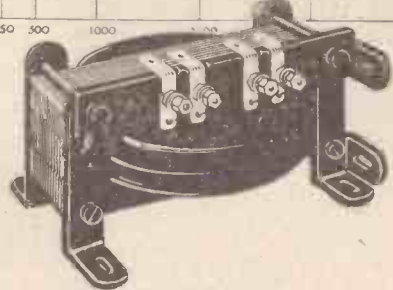
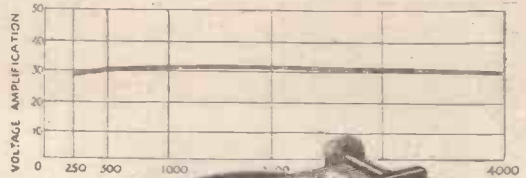


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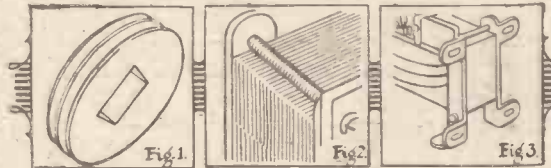
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RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 738.)

Probably the receiver that would suit you best is the one described in "P.W." some time ago as the "P.W." Continental Receiver. This consisted of a 2-valve set, using one H.F. valve and one detector with tuned anode coupling and reaction on the anode coil. Unfortunately, full details of the set are now out of print, but a blue print of an exactly similar circuit, but with slightly different lay-out, has been prepared and can be forwarded on receipt of 6d. This blue print gives the theoretical, pictorial and wiring diagrams of the set, together with a list of components required for building it. The results obtained are exactly similar to those obtained by the "P.W." Continental Receiver. (The number of the blue print is No. 9, and this should be quoted when application is made.)

AERIAL TUNING CONDENSER.

A. H. C. (Exeter).—I have at present a 3-valve set employing one det. valve, one H.F., and one stage of L.F., controlled by two variable condenser values .001 and .0003. I have been told that those values are incorrect, the condensers to be correct should be .0005 and .0003 respectively. Would it be to my advantage to alter same?

There would be a slight advantage in using a .0005 instead of the .001.

TAKING A SET ABROAD.

F. C. C. (No address).—My friend is about to sail for New Zealand. She has a 2-valve receiving set. Can she take it with her without tax to land in that country; or what would the tax be, as she is very anxious to take it with her to that part of the earth, as it is a splendid receiving set?

The duty payable on sets varies according to the components, etc., but details of the charges for any particular set can be obtained from the Secretary, H.M. Customs and Excise, Customs House, London, E.1.

SIMPLE SERIES PARALLEL TUNING.

E. W. N. (Chigwell Row, Essex).—I have a 4-valve receiver which I wish to modify to incorporate series parallel tuning for the aerial circuit. Can this be done easily by means of an extra terminal, or is it better to use a switch?

We recommend the method of three terminal tuning, which is clearly shown in the accompanying photograph. This shows part of the panel of a multi-valve set, the first valve of which is an H.F. amplifier and a second valve the detector.

The plug-in aerial coil is shown on the left in the foreground and the aerial tuning condenser is behind the rheostat, at the back of the panel. Instead of only two terminals for aerial and earth leads, three terminals are necessary. The centre one is the aerial "series" terminal, and it is connected to one side of the variable condenser. The other side of the variable condenser is connected to the aerial "parallel" terminal, which is also joined to one side of the aerial coil holder, and to the grid of the valve holder.

The remaining terminal is for the "earth" connection, and it is joined internally to the remaining side of the aerial coil and to the filament circuit.

When the set is in use, the change-over from series to parallel is made by altering the position of the aerial lead. For "series" tuning connect aerial lead to "series" terminal, leaving "parallel" terminal without external connection. For "parallel" tuning connect aerial lead to "parallel" terminal, and join "series" terminal to the "earth" terminal externally.

CUTTING OUT AN H.F. VALVE.

S. T. R. (Nottingham).—How can I insert a switch in my set to cut out the H.F. valve when not required? What type of switch should be employed? (The set is of the usual tuned-anode type, on the lines of "P.W." Blue Print No. 9.)

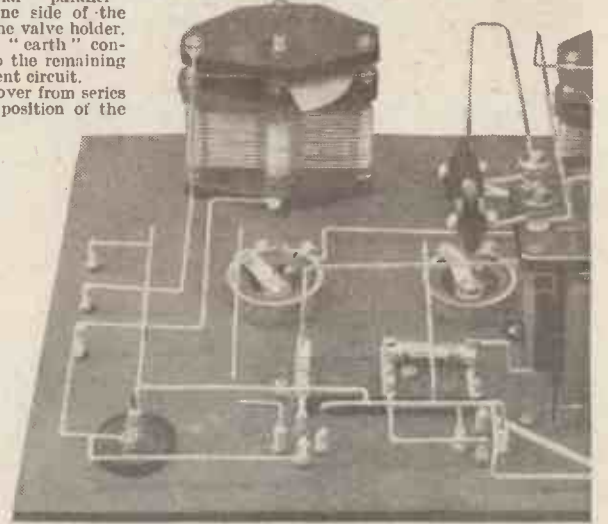
A single-pole double-throw (S.P.D.T.) switch should be utilised for your purpose. The connections and alterations will be as follows:

Break the connection between grid condenser (o-detector valve) and plate of the H.F. valve and connect this side of grid condenser to the centre or arm of switch. The plate of the H.F. valve will be joined to one end contact of the switch and the remaining end contact will go to the grid of the H.F. valve. It should be remembered that when an H.F. valve is switched in or out of circuit, the reaction-coil connections will need reversal.

ECONOMICAL LOUD-SPEAKER SET.

B.P. (Ilford).—I have been told that the most economical local loud-speaker sets is the one known as the "P.W." combination set, with an additional L.F. amplifier. Can this be had in a simplified form, as I understand that the original set incorporated a number of switches?

Yes. The circuit of this can now be obtained in Blue Print form under our Blue Print scheme. The theoretical, pictorial and wiring diagrams are given on "P.W." Blue Print No. 18.



The wiring for three-terminal series-parallel tuning.

“the best English fixed condenser in the Country”

Such is the opinion of a London Wireless firm after subjecting the "Cosmos" Permacon to a rigid test for insulation and capacity.

The "Cosmos" Permacon is an ideal fixed condenser, being light in weight, of guaranteed accurate capacity, and having the lowest possible losses.

The dielectric is mica and each condenser is tested at 500 volts during inspection. Nickel plated cases give them a particularly neat appearance.

Prices are given below.

Ask for copy of the "Cosmos" Components Brochure.

METRO-VICK SUPPLIES, LTD.
(Proprietors: Metropolitan-Vickers Electrical Co., Ltd.)
Metro-Vick House, 145, Charing Cross Rd., London, W.C.2

.0001 mfd.	1/6
.0002 " " " " " " " "	1/6
.0005 " " " " " " " "	1/6
.0003 " " (with clip for grid leak)	1/8
.001 " " " " " " " "	1/8
.002 " " " " " " " "	1/10
.005 " " " " " " " "	2/8
.01 " " " " " " " "	3/9

"COSMOS" GRID LEAKS
are uniform and permanent

½, 1, 2, and 3 megohms, each 1/6.

Cosmos

RADIO COMPONENTS



"Goltone"TM HIGH TENSION BATTERY ELIMINATORS

British Made.
**FIRST COST SAVED
IN A SHORT TIME.**

**A REFINEMENT AND
CONVENIENCE BEYOND
PRAISE.**

Entirely dispenses with the use of High Tension Dry Batteries or Accumulators and provides a ready, convenient and cheaper method of High Tension Supply, with greatly improved reception.

Operates from the Electric Light Mains by simply plugging-in to any convenient lampholder. Supplied complete with Flexible Cord and Adaptor, Switch and Cords for connections to Wireless Receiving Set.

DIRECT CURRENT MODEL.

5 Different Voltage Tappings. **£3 0 0**

ALTERNATING CURRENT MODEL.

4 Different Voltage Tappings, each duplicated, providing 8 Tappings in all.

£5 10 0

Please state voltage and frequency when ordering.

*Large fully illustrated 40 page
Catalogue free on request.*



USERS WRITE:

Mr. C. R. B., Littleborough, Lancs.:—Have installed the "Goltone" A.C.H.T. Eliminator, and must say that it has exceeded expectations. It has not the slightest suggestion of hum or distortion of any kind, and is very satisfactory.

R. C. L., Exmouth:—On test, I have found it far superior to dry batteries, and the increase in volume and clarity is surprising.

S. & Co., London:—I find the Eliminator excellent, no hum whatever, and giving wonderful volume.

Write for Name of nearest stockist.

Figures to Remember



The Highwayman

Stand and Deliver!

—the command of the Highwayman—yes, and the valuables delivered were well worth having. Now, we deliver **SIX-SIXTY VALVES**, and if you value really good reception, they too are well worth having. With these perfectly designed valves the delicate gradations of music are reproduced in all their original beauty, while the remarkably clear reproduction of speech is a proof of the real contribution which **SIX-SIXTY VALVES** have made to modern radio science.

Take the S.S. 3 L.F. (green disc), for small or medium-sized Loud Speakers. This 3-volt Valve consumes only '06 amps filament current—which, in itself, means a big economy in accumulator re-charging—and in addition works at such a low temperature that the life of the filament is immeasurably increased. The S.S. 3 (red disc) gives excellent results both as an H.F. amplifier and as a detector. Owing to the low current consumption of both types, dry cells may be used.

Then, for a real Power Valve, the S.S. 7 has no equal. It is absolutely non-microphonic, and when operating at the correct voltage there is no glow whatever from the filament. This valve consumes only '1 amps filament current, and combines remarkable volume with unequalled purity of tone.

Recommended by all the leading Wireless Journals of to-day.

FOR PERFECTION OF QUALITY insist on **SIX-SIXTY VALVES**.



S.S. 3 L.F.

(Green Disc)

Voltage - 3 volts

Consumption '06 amps.

PRICE 16/6

These prices do not apply in the Irish Free State.

Leaflet S.S. 1.7 gives full particulars. Your Dealer will be pleased to order Six-Sixty Valves for you if he is out of stock.



SIX-SIXTY VALVES

Better by Six times Sixty

Soldering simplified

The Fluxite Soldering Set will solve your soldering problems for ever.

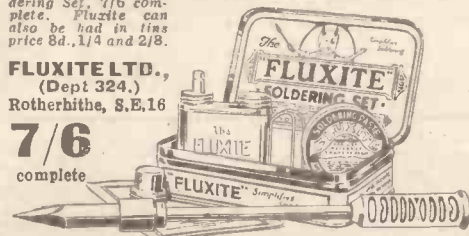
Everything from an aerial connection to a big multi-valve set may be soldered quickly and successfully with this simple soldering set.

The Fluxite Soldering Set is exceptionally suited for Wireless; it is simple and compact, and will last for ever. It contains a special "small-space" soldering iron with non-heating metal handle, a really efficient pocket blow-lamp, Fluxite, solder and full instructions.

All Hardware and Ironmongery Stores sell the Fluxite Soldering Set, 7/6 complete. Fluxite can also be had in tins price 8d., 1/4 and 2/8.

FLUXITE LTD.,
(Dept 324.)
Rotherhithe, S.E.16

7/6
complete



FLUXITE



Apparatus Tested

Traders and manufacturers are invited to submit wireless sets and components to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." Test room under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

"LEWCOFLEX."

THE London Electric Wire Company and Smiths, Ltd., famous in the radio world as makers of that useful material "Glazite," recently sent us samples of their new "Lewcoflex." This is a rubber covered flexible wire suitable for connecting movable parts in wireless sets such as, for instance, adjustable coil holders. As in the case of "Glazite," "Lewcoflex" is supplied in several different colours. It is made in two sizes—one consisting of fourteen strands of 36 gauge wire which is priced at 11s. per 100 yards, and another consisting of twenty-three strands of the same gauged tinned copper wire which is priced at 15s. per 100 yards.

The coloured rubber covering is of the highest quality and subsequently is very tough and provides excellent insulation. Each strand being tinned makes the wire

easy to solder. Hitherto there has been an inadequate supply of flexible wire really suitable for wireless work on the market, and probably every amateur has, at one time or another, felt the need of a piece of really satisfactory wire with which to make grid bias and other such connections. "Lewcoflex" is vastly different to ordinary rubber-covered flexes in that it is of exactly the correct "weight," etc., and is given distinctive colourings. We can only hope the makers will make early arrangements for the supply of small quantities either direct or through the trade. Packets containing, say, one yard each of any two or three of the five available colours, would, we feel sure, command an enormous sale.

THE U.5 RECTIFYING VALVE.

The Marconiphone Co., Ltd., recently sent us a sample of their new U.5 A.C. rectifying valve. It is of the bi-phase type

and is, therefore, provided with two plates. It is somewhat similar in appearance to a large power receiving valve and is fitted with the usual four-pin type of base. The filament pins are as in usual practice, while the plates are connected to the grid and plate pins. The following are the operational details of the U.5: Fil. volts, 5; fil. amps, 1.6; maximum rectified current, 50 milliamps; maximum A.C. voltage, 250 + 250 bi-phase (full wave).

A transformer with a centrally-tapped secondary winding should be used with this valve if full-wave rectification is to be carried out.

Using the U.5 with appropriate transformers, chokes and condensers, we were able to obtain a perfectly noiseless H.T. supply for any number of valves we cared to employ, the filament being lighted from the mains from a separate step-down transformer used for this purpose. We did not find it necessary to employ large smoothing chokes; in fact, in one "hook-up" the secondary winding of an ordinary L.F. transformer answered the purpose admirably. The U.5 costs 30s., but is robust and efficient. For half-wave rectification another type, the U.4, is available at 15s.

TRANSFORMER FOR H.T. ELIMINATORS.

The subject of obtaining H.T. from electric light mains appears to be attracting more and more attention. Providing the apparatus employed is suitably efficient the method has much to recommend it. For instance, it is economical, or at least should be so, and it is consistent and trouble free.

(Continued on page 744.)



—the dependable
EBONITE

REGISTERED TRADE MARK

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

RODS, TUBES, SHEETS, MOULDINGS.

Always ask for "BECOL."

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

C.E. PRECISION RHEOSTATS 7½ & 15 ohms 2/9, 30 ohms 3/-.
C.E. PRECISION POTENTIOMETERS, essential for efficient H.F. control, 3/9.



Used in such famous Circuits as: The 1926 Unddyne 2-Valver; The Marcuse Short-Wave Receiver; The Household 3-Valver; The Trindyne 1-Valver, &c.

WHY PAY MORE?

You may pay more, but you certainly will never require a better rheostat than the C.E. Precision. They are perfectly finished, and the neat silvered dial which mounts flush with the panel, lends an air of distinction to any set. Call in and see one; you will buy it.
G. EDE & CO., LTD., High Road, Byfleet, Surrey.

Concentrated Efficiency

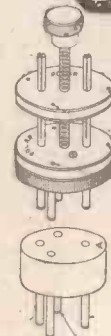
You don't really know the possibilities of your circuit until you adopt the "Polar" Coil Unit

IT increases efficiency—saves space—simplifies wiring—and actually costs far less than other methods of aerial tuning. There is a distinct increase in volume from distant stations, a distinct improvement in selectivity and the micrometric adjustment enables the operator to get 50% more efficiency from his reaction without breaking into oscillation, and to obtain maximum volume without distortion. The compactness of the coil-windings minimises stray external fields, while the absence of flexible leads prevents capacity losses.

Ideal for a Portable Receiver

Free leaflet describing the "Polar" Coil Unit and its applications will be sent on request, by any "Polar" Service Agent or the Manufacturers at any of the addresses below.

Radio Communication Co., Ltd.
125, Hope Street, GLASGOW | Barnes, LONDON, S.W.13 | 66, Oxford Road, MANCHESTER



Obtainable from "Polar" Service Agents and all reputable Radio Dealers. Prices: Coil Unit Complete 9/- Coils (any wavelength) each 3/- Carrier alone 3/- Fits any valve-holder. Completely interchangeable. Standard with all "Polar" Receiving Sets.

Coils are at present available to cover from 235 to 4,720 metres. All one size: 1½" x 2½" overall.

Out in the open

Don't move your set away from the aerial lead-in for outdoor radio, or loss in reception strength will occur. Let the "Brownie" Distribution Board overcome this difficulty. A length of flex run from your set to the "Brownie" Distribution Board is all you require to take four pairs of headphones or loud speaker into the garden (or to any remote room) without any loss of efficiency. The "Brownie" Distribution Board is a beautifully designed moulding with nickel fittings, suitable for use with any make or type of receiver. Its price is only **3/-**

THE BROWNIE WIRELESS CO.
(of Gt. Britain) LTD.
310a-312a, Euston Road,
London, N.W.1.
'Phone: Museum 3747.

The Brownie Wireless "Permatector" is known as the always "ever-set" crystal detector. Neither vibration, nor shocks disturb the loud connection **3/-**

The Brownie Wireless (No. 2) Crystal Receiver is the world's most famous crystal set. Wonderfully efficient, and without equal for **10/6** value.

The "Brownie" Distribution Board

for outdoor summer radio



3/-
IN CARTON

Now you can Charge your H.T. Accumulator at home!



WITH the Rectalloy Charger shown above you can keep your high tension accumulator fully charged at practically no cost from your a.c. mains. It will charge any high tension accumulator up to 90 volts, in the normal series arrangement. It takes very little current, wasteful resistance being entirely obviated. At last the big difficulty of charging high tension accumulators is solved by an

entirely new and patented method. No need to carry heavy accumulators to the charging station and wait while they are charged (and perhaps ruined). Install a Rectalloy and leave it to do its work satisfactorily and well.

The charging rate is automatically governed so that a 20 or 90 volt H. T. Accumulator receives practically the same charge. An extremely neat charge-indicator and excess-current fuse is incorporated, making the apparatus fool-proof and trustworthy.

47/6

For a.c. only, 200-250 volts, 40-60 cycles

RECTALLOY
The ideal Battery charger

Send at once for full particulars and explanatory Folder 'P.S.' post free.

A separate charger is also available for filament lighting accumulators with a.c. current **65/-**

Rectalloy Ltd., Vulcan House, Ludgate Hill, London, E.C.4.

G.A. 5510



VALUE!

THE Igranic-Pacient Porcelain Rheostat is only 2s. 6d., but the action is smooth and silent and the contact thoroughly reliable and constant.

The method of mounting is particularly simple and preserves the original accuracy of adjustment.

Each rheostat is supplied with an attractive bakelite knob and silvered dial, which forms a pleasing contrast to the panel when mounted.

Made with resistances of 6, 10, 20, 30, and 50 ohms, and as a potentiometer with a resistance of 400 ohms.

At 2s. 6d. it is difficult to find better value for the money.

Hear the Igranic "Talk" broadcast from Radio Belgique every Wednesday at 9 p.m.

2/6

Send for List R 16.

IGRANIC ELECTRIC CO., LTD.,

149, QUEEN VICTORIA ST.,
LONDON

Works: BEDFORD

Don't forget to use

GLAZITE

BRITISH MADE REGD.

COLOURED CONNECTING WIRE

[RED YELLOW BLUE BLACK WHITE and GREEN]

Write for descriptive leaflet to
The LONDON ELECTRIC WIRE CO & SMITHS LTD
Playhouse Yard, Golden Lane, London, E.C.1.

Makers of Electric Wire  for over 40 years

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What about these? "BARGAINS"

CRYSTAL AND VALVE SETS
Crystal Sets with HR Phone, 10/-, 15/- and 25/-
1-Valve Set and Crystal, enclosed Cabinet, and Valve, 31/-
2-Valve Set, enclosed Cabinet, and Valves, 50/-
3-Valve Set, enclosed Cabinet, and Valves, 60/-
5-Valve Set, enclosed Cabinet, and Valves, 85/-
Valveless Brown Amplifier for Crystal Sets.
Demonstrated on Loud Speakers here, 50/-
2-Valve Amplifier in Mahogany Case, 35/-
3-Valve Amplifier, M.111, 60/-
7-Valve R.A.F. Amplifier, 25 10 0.

LOUD SPEAKERS
"T.M.C." Junior, 4,000 ohms, 14/-
Western Electric, any res. 10/-
There are a thousand bargains to choose from in our Latest Catalogue. A Copy sent you Post Free for 4d. stamps.

ELECTRADIX RADIOS.
18, Upper Thames Street, London, E.C.4.

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

Pay while you Listen!

Don't deny yourself the joys of Radio because of the initial cost of a complete Receiver. We can supply many "P.W." and other well known sets, guaranteed Components and Accessories on the Easy Payment System. It will pay you to write at once for our comprehensive Catalogue, and let us know your requirements.

New Times SALES CO., VULCAN HO., LUDGATE HILL, E.C. 4. 5530

NO OTHER JUST AS GOOD

No other Coil Holder has so many unique and essential features combined to enable perfect and easy tuning. The moving block simply cannot fall back.

Patent No. 193150
Other Patents pending

The Penton
GEARED
COIL HOLDER

Gear Ratio 9:1

The Only Perfect Coil Holder
Fading Banished—Backlash Vanished

6/-
Of all good Radio Dealers, or post free direct from

THE PENTON
ENGINEERING CO.,
15, Cromer St. Gray's
Inn Rd., W.O.1.

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

Valves Repaired

AS GOOD AS NEW!!

HALF
1/3
PRICE

(Except Weco, S.P.'s, and low capacity types). Minimum D.E. Current 0-15 amps when repaired.
ALL BRIGHT & DULL EMITTERS
Listed at less than 10/-
Minimum charge 5/-
VALCO LTD., Dept. P.W., Tabor Grove, Wimbledon, S.W.

WET H.T. BATTERIES

Building made easy. Zincs with special connectors, slip on carbon. NO SOLDERING. Build in half-hour. 1/- doz., plain; 1/3 doz., pitched. Post extra.
COLE & VINCENT, 147, Barclay Road, near Whipps Cross, Walthamstow, E.17.

'PHONE REPAIR SERVICE

Phones rewound and remagnetised, 4/6 per pair. Remagnetised only, 2/-. Loud Speakers and Transformers rewound. Glass Jars for making up wet H.T. units, waxed, 1/3 doz.; plain, 1/-. Post extra.
The H.R.P. Co., 46, St. Mary's Road, Leyton, E.10.

SMALL PARTS TO THE TRADE.

MAP

MAP Co., 246, Gt. Lister St., Birmingham.

TECHNICAL NOTES.

(Continued from page 728.)

The two coils of the transformer may, however, be used if they are connected together in series. This is not quite as satisfactory as the use of a choke of an impedance equal to the combined separate impedances of the two coils of the transformer, since even though the two windings may be connected in series they are actually coupled electromagnetically, and consequently the impedance of the two when used in this way is not the same as the sum of the separate impedances. However, probably in practice this effect will not be noticed, and in case an amateur who is making experiments with choke-coupled amplification finds himself short of the necessary choke, an L.F. transformer used in this way may be temporarily pressed into service.

New Method of Broadcast "Reception."

A rather interesting system for the "supply" of broadcast is to be tried out in Holland. According to the present plans it is proposed that all telephone subscribers shall have the broadcast service available through the medium of their telephone lines. Technical details have been worked out in such a way that no interference with the ordinary telephone service is anticipated through the switching on of the radio connection. Automatic discontinuance of the programme is provided for in the case of a subscriber being called in the ordinary way. A fee of about 30/- per annum has been suggested as the charge to the subscriber. This system has certain features in common with another system which was in use in this country and in various other parts of the world before broadcasting commenced.

Novel Connecting Wire.

In one of the foreign Radio journals I noticed recently a suggestion which may interest wireless inventors. It is to the effect that a very useful invention would be a type of busbar which was coated with a hard and yet resilient insulating covering so that the covering would not crack or split when the busbar was bent. The insulation, moreover, should be such that it would melt at any particular spot on being heated and would permit the soldering of a connection at the spot, the insulation itself acting as a flux.

It will be seen that some of these requirements appear to be rather contradictory, but perhaps some of my readers who may be inclined to invention may care to give the matter their consideration.

A Useful Voltmeter.

A type of instrument which should prove very useful in connection with the charging of wireless and other kinds of accumulators has recently been placed on the market in the United States. It is, in effect, a voltmeter reading between about 5 and 8 volts, the scale of which, however, instead of being marked actually in volts, is marked with certain instructions such as "Commence Charge," "O.K.," "Stop." Thus even an uninitiated user can see at a glance the requirements. If the needle points to "Start Charge" the instruction is obvious. Of course, each of the "instructions" covers a certain range over the scale. This little device makes for simplicity and helps to popularise the wireless receiver with the non-technical user.

APPARATUS TESTED.

(Continued from page 742.)

The vagaries of temperamental battery supplies accentuate the uniformity of generating station outputs.

But mains current must be smoother, and in the case of A.C. must be rectified before satisfactory results can be obtained. And an important item in a rectifying system is the transformer. If full wave rectification is to be carried out a transformer with a centrally tapped secondary winding is required. A component of this nature, specially designed for the purpose, has been produced by Mr. G. E. Pearson, of Town Street, Farsley, Leeds. It is a neat, compact little transformer, and is provided with porcelain insulating terminal blocks and a nice metal casing.

We tested the sample sent us in a straightforward circuit employing a Marconiphone U.5 rectifying valve, T.C.C. condensers and a Kaynite choke, and obtained very excellent results. The Pearson transformer showed no sign of heating, and there was very little loss from this or any other cause.

Sold at a reasonable price, the component should prove popular among all those interested in A.C. H.T. battery eliminators.

A NEUTROVERNIA INDICATING DIAL.

Messrs. Gambrell Bros., Ltd., have produced a most useful little accessory for use with their well-known Neutrovernica condenser. It is an indicating dial that can be fitted without necessitating any further panel drilling. Neatly made and pleasing in appearance it provides direct readings with clear-cut engraved figures and a zero line indicator. Owing to the design of the Neutrovernica itself, which is such that capacity charges are uniform, it was possible to calibrate the scale so that ten degrees on it represent approximately 6 micro-microfarads. Thus, besides enabling settings to be recorded, this dial is a guide to definite capacity variations. In neutrodyne receivers it furnishes a method of recording the capacity of valves by this means fairly closely and should, therefore, be of interest to experimenters as well as useful to the amateur and constructor.

The price of the Neutrovernica Indicating Dial is 1s. 8d., at which figure it is good value for money.

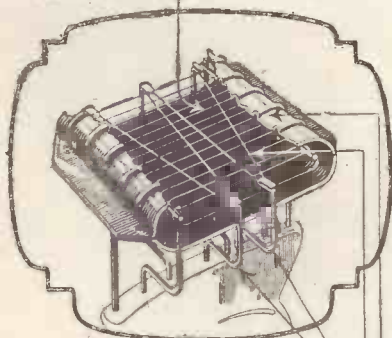
A neat bracket for mounting the Neutrovernica condenser behind a panel is now available at the small cost of 4d.

ADVERTISEMENTS

As far as possible all advertisements appearing in "P.W." are subjected to careful scrutiny before publication, but should any reader experience delay or difficulty in getting orders fulfilled, or should the goods supplied not be as advertised, information should be sent to the Advertisement Manager, "Popular Wireless," 4, Ludgate Circus, London, E.C.4

LOOK

Grid with two supports



5 resilient filament supports keeping filament in permanent alignment.

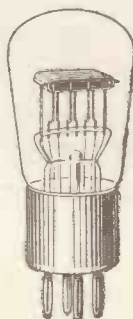
Filament two complete loops.

Anode (with two supports) cut away to show filament and grid.

at this P.M. Filament and you will understand why P.M. Valves are the best value on the market.

THESE

seven P.M. advantages reduce your maintenance costs and give you better results—



- 1 **GREATER EMISSION SERVICE.** P.M. Filaments have up to 5½ times greater emission surface than ordinary filaments ensuring a much wider range of power for economical operation; in fact, these new filaments are so conservatively rated that they give ample results at lower voltages than marked and will stand up to a reasonable overload.
- 2 **LONGER VALVE LIFE.** The special alloy of rare metals that forms the heavy covering of P.M. Filaments is prepared by a patented process that secures a copious flow of electrons and the operating temperature is so low that this precious alloy cannot be discharged, a definite proof of long useful life.
- 3 **UNBREAKABLE FILAMENT.** P.M. Filaments are longer than ordinary filaments, and retain their ductility even after 1,000 hours life, so that it is possible to tie them in a knot. At no time does the low operating temperature cause sag, and these filaments are specially set round the five strong resilient hooks so that they are free from tension and cannot be broken except by the very roughest handling.
- 4 **NO VISIBLE GLOW.** The extreme economy in heat of P.M. Filaments can be judged by the fact that no sign of glow can be discerned during operation.
- 5 **REDUCED CURRENT CONSUMPTION.** P.M. Filaments only require one-tenth ampere filament current, giving up to seven times the life of each accumulator charge, a reduction to one-seventh in your cost of accumulator maintenance.
- 6 **NO MICROPHONIC NOISES.** The unique method of mounting the filament within the field of the grid and anode, so that the filament lies without tension or sag in its correct position, and all the electrons are utilised and controlled, completely eliminates all microphonic noises, leaving an effective background of silence to emphasise faithful reception.
- 7 **MAJESTIC VOLUME.** Every P.M. Valve is a master valve in its own class, designed to give you

It is the filament that counts and this is what you pay for.

For 4-volt accumulator or 3 dry cells
 THE P.M.3. (General Purpose) 0.1 amp. 16/6
 THE P.M.4 (Power) 0.1 amp. 22/6

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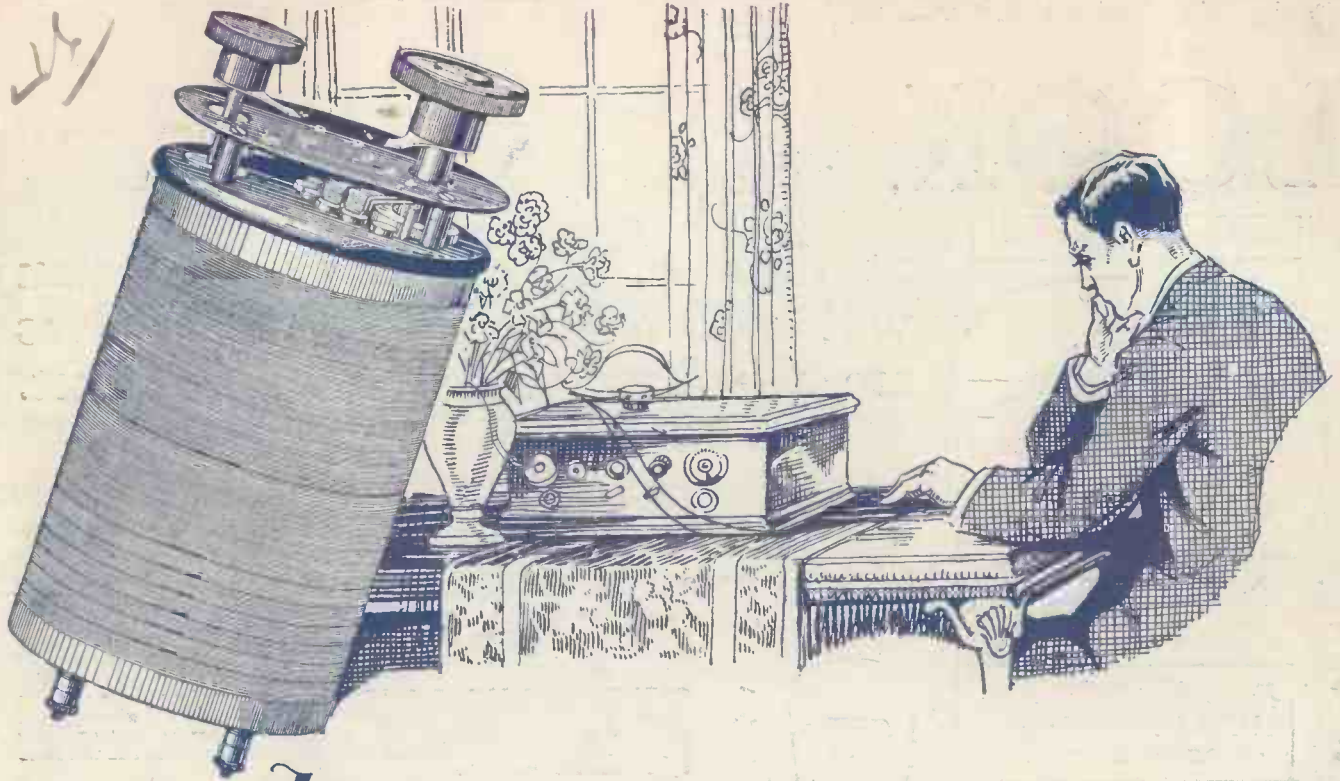


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You'll find what you want in the R.I. Retroactive Tuner. Simple tuning over the range of wave-lengths from 175-4,000 metres. All in one unit, not a multitude of coils to choose from. Cheaper, too, than a set of coils with coil holder to cover the same range.

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P.C.36

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7/R

THE RADIO DEATH RAY. (Exclusive to "P.W.")

Popular Wireless

Every Thursday
PRICE
3d.

No. 217. Vol. IX.

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

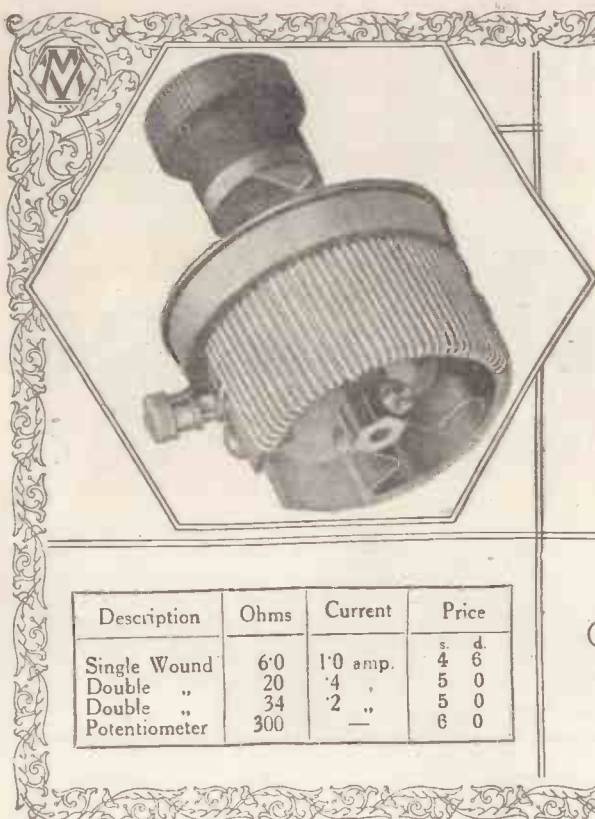
July 31st, 1926.



CONTENTS.

- Aerial Developments.
- A Low-Loss Variometer Crystal Set.
- The "P.W." Daventry Portable.
- Shakespeare on Wireless.
- Housing the Set.
- Etc., etc., etc.

The 250-watt amateur transmitting station shown in our cover photograph is so light that one person can carry it about. Wood is used throughout for both the framework and panels. It was constructed by Jerome Gross, an American enthusiast.



Smooth movement

The principal features of the "Cosmos" Filament Rheostat are its sturdy construction and reliable, smooth movement. The contact arm cannot easily be damaged, having its movement on the inner side of a porcelain bobbin, which carries the windings. Other pleasing features of this Precision Rheostat are the handsome knob and dial, ONE HOLE fixing, and the small space it occupies.

Made in four types, two of which are double wound for DULL or Bright Valves and one a Potentiometer, the prices are given below.

METRO-VICK SUPPLIES, LTD.

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

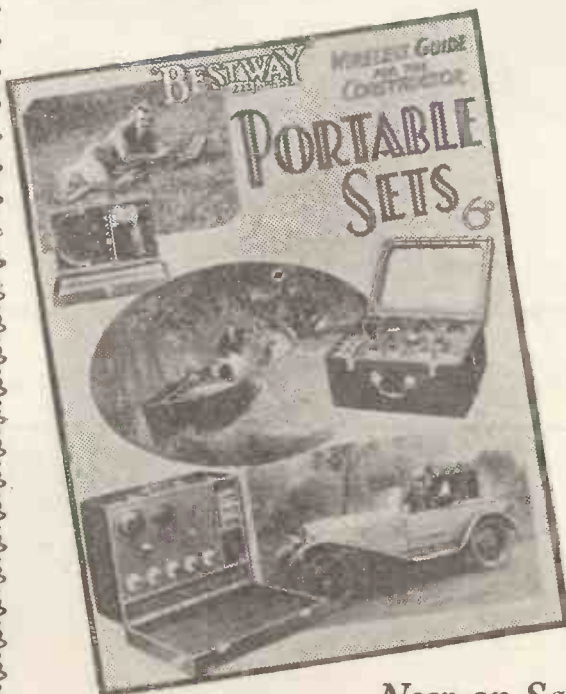
Metro-Vick House, 145, Charing Cross Rd., London, W.C.2

Description	Ohms	Current	Price
Single Wound	6'0	1'0 amp.	s. d. 4 6
Double "	20	'4 "	5 0
Double "	34	'2 "	5 0
Potentiometer	300	—	6 0

Cosmos

RADIO COMPONENTS

The NEW "BEST WAY" Guide for Wireless Constructors



Details of the three splendid sets described in this "Best Way" Wireless Guide are given below. The book is amply illustrated with photographs and diagrams, and constructors will find the wiring directions most lucid and straightforward.

The All-Station Loudspeaker Portable

A remarkably compact six valve SUPER-HET. Aerial, batteries and loudspeaker all completely enclosed and permanently connected. This receiver will appeal strongly to Motorists, Caravanners, River Parties, and Seaside Bungalow inhabitants.

A Three-Valve Portable

Several stations on the loudspeaker and many on the Telephone receivers can be obtained with this receiver. It employs a frame aerial which is built into the lid of its neat carrying case. It will prove popular among Motor Cyclists and other Road and River Tourists.

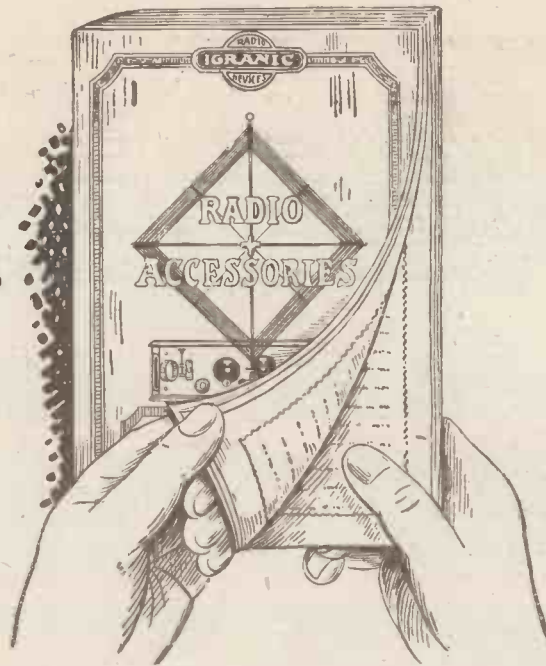
The Baby Portable

A two-valve receiver contained in a very small attaché case. Batteries and telephone receivers are enclosed and a reel of wire and earth pin for erecting temporary aeriels are provided. This is the set for the Cyclist Holiday Tourer.

Now on Sale Everywhere. Buy a Copy To-day 6d.

**NEW
COMPONENTS**

**LOWER
PRICES.**

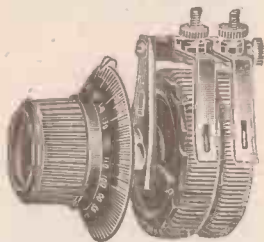


The new Igranic Radio Accessories Catalogue is now ready. It contains particulars of many **NEW AND INTERESTING COMPONENTS** and **SUBSTANTIAL PRICE REDUCTIONS**, made possible by improved manufacturing methods. Even if you are in no immediate need of components you will find the new Igranic Catalogue of considerable interest and useful for reference. Below are two interesting extracts.

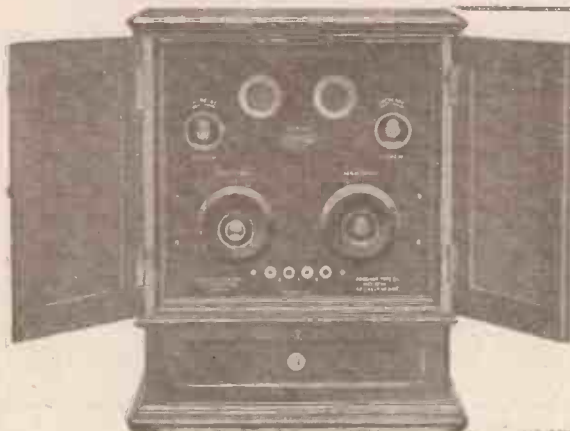
The Universal Rheostat is made in two types, "A" and "B." Type "A" is adjustable to resistances of 4, 8 or 16 ohms, and Type "B," to 7½, 15 or 30 ohms. The price (as illustrated) is 4/6 for either type.

**SEND FOR YOUR COPY
OF THE NEW
CATALOGUE No. R. 17.**

The well-known Igranic "E" Type L.F. Transformer is still made in two ratios, 1:5 for the first and single stage and 1:3 for second stages. The prices have been reduced to 16/- for the 1:5 and 15/- for the 1:3 pattern.



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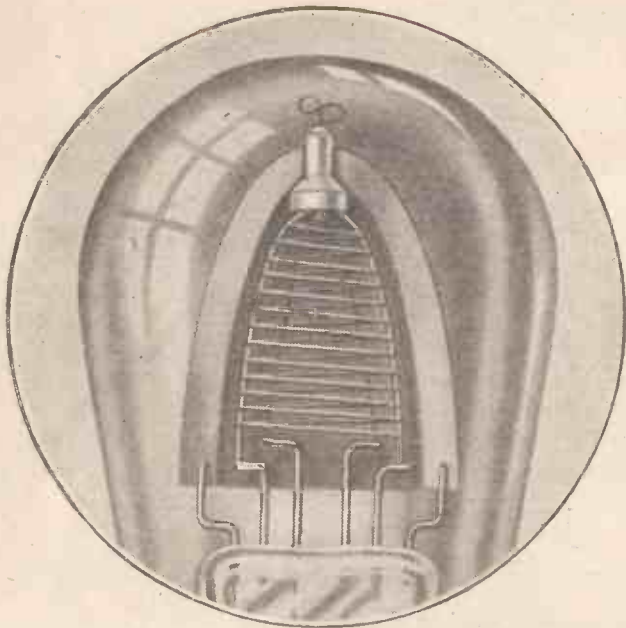
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28, Little St. Andrews Street, London, W.C.



Three reasons for the amazing efficiency of the new Cossor "Point One" series of Valves

1. Absolute Uniformity

If a number of valves were made with identical filaments, grids and anodes without due regard to the exact spacing of these elements, considerable variations in performance would result. True uniformity in Cossor Point One Valves is achieved through Co-axial Mounting—a method which secures the three elements to each other at the top and infallibly holds them in exact alignment for all time.

2. A Shockproof Filament Suspension System

The filament in the Cossor Point One is arched and retained in position by a fine wire which is secured to the seonite insulator immediately above it. It is not held under tension. The fine wire provides just that degree of elasticity which enables the filament to withstand the sharp blow which would shatter the filament in an ordinary valve.

3. Current Consumption Cut to One Third

The new Cossor Point One sets a new record for economy. It requires only one tenth of an ampere at 1.8 volts. That means that a Super Heterodyne using seven of them would still consume less current than a little single-valve set using one Bright Emitter. A Cossor Point One will work satisfactorily as low as 1.2 volts with a current consumption of .07 amp.—thus being suitable for use with dry cells when required.

Co-axial Mounting

—described by the *Technical Press* as "one of the greatest developments in Valve construction during recent years."

AS the old adage says, "Necessity is the Mother of Invention." The congested traffic conditions of to-day necessitated the invention of four-wheel brakes to ensure the greatest possible measure of safety. And in like manner to-day's wireless conditions have forced the successful development of Co-axial Mounting in order to ensure the greatest possible uniformity between valves of the same type. This in turn obviously means a big increase in efficiency in any Receiving Set using two or more stages of high frequency amplification. Greater sensitiveness—improved stability—better tone.

Co-axial Mounting introduced a few weeks ago by Cossor will exert a far reaching influence upon Valve design. For the first time there is available a method of construction which during the whole life of the valve automatically ensures perfect alignment between the filament, the grid and the anode. All three of these elements are permanently secured to each other at the top of the valve by means of a seonite insulator. Not even the hardest knock can displace their relative positions.

Co-axial Mounting permits a far higher degree of uniformity being attained than ever before. The importance of this will be instantly realised by all those using such multi-valve sets as Neutrodyne and Super-Heterodynes where the exact matching of valves makes all the difference between success and failure.

It is safe to prophesy that the forthcoming season will witness—with the aid of these new Cossor Point One Valves—the shattering of all records for long distance reception.

Available in three types :

COSSOR POINT ONE

Black Band: For Detector or L.F. 15/6
(Consumption '1 amp.)

Red Band: For H.F. use 15/6
(Consumption '1 amp.)

STENTOR TWO

Green Band: For power use 18/6
(Consumption '3 amp.)
All operate at 1.8 volts.



Cossor Point One

Popular Wireless

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RADIO NOTES AND NEWS.

A Radio Legacy—More Mikes for “Mike”—A Fine Response—Filadyne Feats—
 Suing the Eiffel Tower—No Break in Broadcasting—Britain’s New Wave-lengths.

Turkish Delight.

THE Turkish delight in music, and they often hum a little tune on their way to the harem, or as they stroll beside the Bosphorus. Noticing this, an enterprising French company has decided to cater for the demand by putting up a broadcasting station near Stamboul. The local children are already getting very excited over the forthcoming Children’s Corners—the young Turks!

The Volta Centenary.

IT is now nearly 100 years since the death of Volta, the father of every volt, voltage, and voltmeter in existence! There is a proposal to celebrate the centenary by an International Exhibition and Congress, to be held at Como (Italy) sometime between May and October, 1927. Radio—undreamt of by the great scientist, is to be well represented.

More Swedish Stations.

THREE new relay stations have recently been put into operation in Sweden, at Kalmar, Karlskrona, and Helsingborg. They work in conjunction with the Malmo station, and have had the effect of causing a radio boom in Sweden. This has been accentuated by the reduction of the licence-fee to ten crowns. I’m not quite sure how much a crown is, but, even so, news of cheaper broadcasting is always good news!

“Benk-oldey.”

THE London Bank Holiday programme on Monday, August 2nd, will have as its main feature a seaside concert. In addition there will be a timely rendering of Keble Howard’s sketch, “Benk-oldey,” and a programme of military band music.

A Radio Legacy.

MISS DOROTHY HEARN, of Honor Oak, London, S.E., has been bequeathed £10,000 under the will of her late employer, Mr. E. A. Graham. She

was engaged as Mr. Graham’s secretary long before he had made the Amplion loud speaker famous the world over, and she remained with the firm through all its trials and triumphs.

Apart from this legacy, Mr. Graham left everything else to his wife, “knowing that she will make appropriate provision for my children.”

Neutrodyne Inventor Honoured.

PROFESSOR L. A. HAZELINE, the man who first connected a wee bit condenser between plate and grid circuits to balance out the inter-electrode capacity of the valve, was recently the guest of honour at a Savoy Hotel luncheon. Nobody

Further details of the scheme will be forthcoming shortly.

Westminster Abbey Broadcast.

THE Westminster Abbey broadcast has been postponed. Originally the B.B.C. announced that Evensong would be relayed from the Abbey on July 22nd, but these arrangements fell through, and the event will not take place for another week or two.

More Mikes for “Mike.”

THE Irish Free State Minister for Posts and Telegraphs, Mr. J. J. Walsh, has now officially endorsed a comprehensive scheme for broadcasting in Ireland. The ideal to be aimed at is the same as the B.B.C.’s—crystal reception for everybody. As already announced, there are to be five stations in all, including a high-power station, which it is hoped will be on the air within two years. The site chosen for this is in Athlone.



Mr. Augustus John, the famous artist, before the microphone at 2 L.O.

grudges him his fame, for by stopping self-oscillation in H.F. valves he conferred upon us all a marked benefit. May he always dine as successfully as he neutrodyne!

Wave-lengths for Britain.

INCIDENTALLY, it was at this luncheon that Capt. Eckersley said, “During the second fortnight in September a new plan of wave-lengths will be put into operation. Under this plan Britain gets ten wave-lengths, . . . and this will lead to less interference with European broadcasting.”

The B.B.C. is now using more than double this number of wave-lengths, but that does not mean that the number of stations would necessarily be reduced, for one wave-length might be common to several stations.

A Fine Response.

WHEN a Glasgow listener was fined £5 for failing to take out a licence for his set, it was stated that following a previous prosecution, no less than 220 people took out licences in two days!

In the circumstances, a fine would seem to be a sort of sprat to catch a Mac.

British Beam Stations.

THE Postmaster-General’s references, in the House of Commons, to the Imperial Wireless Chain, have prompted many readers to wonder just how many “beam” stations there are under construction in Britain? According to my reckoning, there are half a dozen—situated
 (Continued on next page.)

NOTES AND NEWS.

(Continued from previous page.)

at Bodmin, Bridgwater, Grimsby, Skegness, Dorchester (Dorset), and Somerton (Somerset).

Links in the Chain.

THE Bodmin station will transmit to Canada and South Africa, whilst Bridgwater is equipped to receive from these points. Similarly, Grimsby will transmit to India and Australia, whilst Skegness listens in for the replies. Finally, Dorchester (a Marconi Co. station) will send to North and South America, the opposite number in this case being the receiving station at Somerton.

It looks all right in print, but the question is, how will the beam signals sound in the far-off 'phones?

Forthcoming Features.

NIGEL PLAYFAIR will provide practically the entire original cast for the broadcast performance of "Lionel and Clarissa," on August 9th.

Famous "Songs of History," from London to-morrow (Friday) at 10 p.m., will include "The Marseillaise," "John Brown's Body," "Marching Through Georgia," and other history-making tunes.

Some new songs by Dr. Vaughan Williams will be broadcast on August 8th, and it is hoped that Miss Joan Elwes will assist at this first performance.

A £10 Prize Essay.

DORSET readers will be interested in the offer of a prize competition, which appears on page 772 of this issue.

The subject chosen is a fascinating one, and if my own fixed abode happened to be in Dorset I should certainly be tempted to have a go for the medal—and the boodle!

Quote Nace 3

QUATE a nace hullabaloo is being kicked up about the refanned voices of the B.B.C. announcers. Hwat is the correct English pronunciation of words like laboratory, capitalist, and golf? There are many other words hwich are offen—I mean often—broadcast nonchalantly, because they are extraordinarily—or should it be extraordinarily?—difficult to say with certainty.

Sound English.

SO now the B.B.C. has appointed an advisory committee, which includes the Poet Laureate and Mr. Bernard Shaw amongst its members, to rule Britannia's sound waves.

This news has been flashed to America, where guys an' mutts alike are all het up at the glad tidin's. Gosh! They guess that ole man Bern Shaw and the Potc Lorryate gotta hot job, but a pair of pepper-lads of their caliber will sure fix it. Yep Bo, Bern's a wiz, whennit comes to shootin' a mouthful, and you gotta hand it to the Lorryate for an elegant spill-of-speech. Yessir!

Morse Interference.

THE old Morse nuisance, which seemed to be abating a few months ago, is creeping back. London listeners who can read the dots and dashes are often edified

by a raucous radio roar announcing to GNF "This is the S.S. Soandso, Now leaving Tilbury Dks fr Hambg.," or some such slogan that might just as well wait till the vessel passes abeam of GNF (North Foreland).

South Coast listeners appear to be the worst sufferers, for FFP and the others are always with them, right on the B.B.C. band of wave-lengths.

Filadyne Feats.

FURTHER reports of the new Filadyne circuit, the details of which are appearing exclusively in this journal, show that it is one of the hottest hook-ups ever introduced to the public. Apparently nobody can make out exactly how it works—but all are agreed that work it can, does, and will!

Ingenious readers have adapted it to the Reinartz, and other special circuits, with great success. One London reader even tried it without aerial and earth, and was staggered to hear the one valve then bring in Radio-Paris!

A Tip for Experimenters.

A POINT well worth noting in connection with the Filadyne is that although many different sorts of valves have given good results, the most

SHORT WAVES.

"A military expert predicts that the next war will be fought by wireless. From what we heard the other night we had the impression that it had started."—"Punch."

"In a world where the cultivation of the voice is so much neglected, the B.B.C. is to be commended on its success in finding so many speakers and artists with ingratiating voices, charming voices, and sometimes really beautiful voices."—A writer in "The Outlook."

"A cowman has written to an American station that he has set up a portable wireless set out on the range, and treated the cows to metropolitan dance music." "It sure is a big saving on the voice," he declared. "The herds don't seem to tell the difference. Don't put on any speeches, though. That'll stampede 'em as sure as shootin'."—"News of the World."

spectacular successes to date appear to be with the Marconi or Osram D.E.R. valve. So many interesting facts have come to light that further special articles on the Filadyne will be forthcoming as soon as possible.

Sir Walford Davies.

IF, as is rumoured, Sir Walford Davies is giving up his post of Professor of Music at the University College of Aberystwyth, in order that he may devote himself more completely to popularising music through the microphone, he will thereby prove several things. For instance, the fact that he enjoys his broadcasts as much as his listeners will become obvious; and it will also be apparent that Sir Walford thinks the microphone is the finest ally he could have for the work he has at heart—the widening of our appreciation and love of music.

Suing the Eiffel Tower.

RATHER a piquant situation has arisen in France over author's fees for broadcasting. The Eiffel Tower is a Government station, but the entertainment side of its transmissions has been sub-let. The lessee, good easy man, now refuses to sign the contract which the Society of Dramatic Authors and Composers have presented to him!

It's no good threatening him with a withdrawal of artistes' support, for the famous actors can be dispensed with in a broadcast. So it's possible that the Eiffel Tower will be "taken to court"!

Sunday Morning Services.

HAVE you noticed how well the Sunday morning concerts and services are coming over now? Fishing round on an H.F., Det. and L.F. recently, upon the high waves, I came across clear signals from Königswusterhausen (1,300 metres), strong enough to hear all over the room. After twelve, on the same day, Radio-Paris was simply roaring in, and worked the loud speaker nicely in the garden. Last year the daylight mid-summer conditions were not nearly so good, though I fancy there was not much to choose between then and now after darkness had set in.

10,000 Listeners' Letters.

WHEN Captain Eckersley referred to the B.B.C.'s policy of alternative programmes, at the Savoy dinner to Professor Hazeltine recently, he spoke extempore. Since then he has been interviewed, and asked to disclose further details, and these make interesting reading. The Chief Engineer disclosed that following the Oxford Street and Marconi House two-programme tests, the B.B.C. received 10,000 letters from listeners, and although all these were not tabulated, a random selection of about two thousand gave very satisfactory indications.

Picking Out Dual Programmes.

A CURVE was drawn up, based upon these reports, and it showed that two-thirds of the crystal sets situated at five miles from the nearer transmitter separated the programmes quite well.

When the valve sets were considered, only about 4 per cent were troubled by the mutual interference, the remaining 96 per cent being able to separate the programme satisfactorily. This result encourages the engineers to go ahead with the new scheme just as quickly as the Post Office and circumstances allow.

No Break in Broadcasting.

CAPTAIN ECKERSLEY emphasised the fact that there will be no interruption in the programmes, but merely a gradual extension towards better conditions of alternative programme reception. He expects that the new stations will be of much higher power than the present ones, and will be placed a little way out of the cities to which they are attached, so that the screening effect of buildings is avoided. Altogether, the outlook from the listeners' point of view is very promising, though much depends upon the promptitude of the various authorities concerned.

Britain's New Wave-lengths.

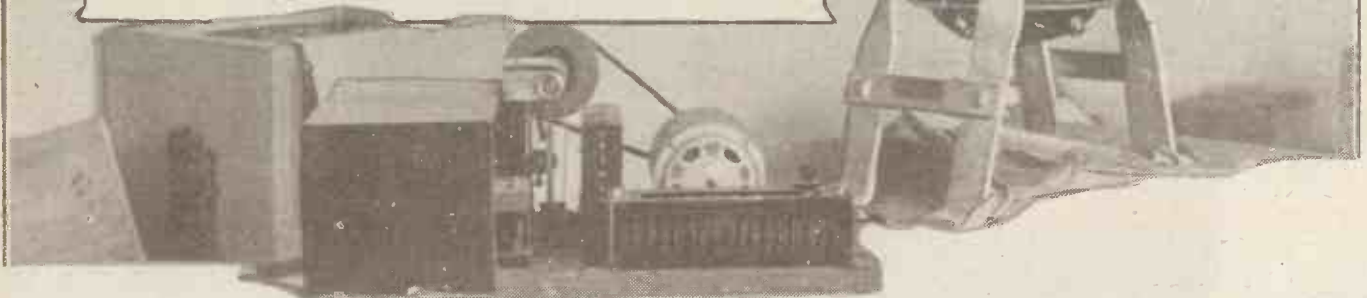
THE latest news from Geneva is that the International Bureau has allotted nine exclusive wave-lengths to Great Britain, under its scheme for redistribution of Europe's wave-lengths.

All the wave-lengths of the British station will therefore be revised as from the second week in September, but as previously announced, no drastic alterations to receivers will be necessary on this account.

ARIEL.

The RADIO DEATH RAY

M. Lucien Levy, a famous French expert, has devised a new method of propagating electric waves, and believes he has invented a Radio Death Ray.
FROM A SPECIAL CORRESPONDENT.



M. LUCIEN LEVY, the well-known French expert, who claims to be the original inventor of the super-heterodyne method of reception, and who is responsible for many other remarkable contributions to wireless science, has

charges on the zones of air molecules that are under compression being continually passed on to the air zones that are expanding. The result is that a succession of electric potentials, constituting a new type of electric wave, is set up, each electric charge being separated from its neighbour by an intervening zone of insulation.

of the air molecule. By impact with the latter the light waves set free a certain proportion of the normally "bound" electrons, and these in turn render the surrounding air conductive.

A spiked ring is set in the path of the light beam, and transfers high-frequency currents into the conducting column of air, which then functions in the same way as an ordinary aerial. To prevent the aerial currents from being short-circuited to earth through the optical projector, an alternating electrostatic field is set up across the plates of a condenser, C. This localises the free electrons and, in effect, insulates the part of the air column above the spiked ring from the part below.

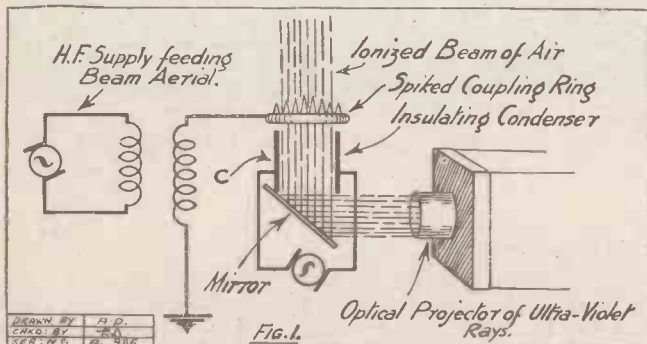
Ionised Path.

From one point of view, the electric charges travel through the air as if the latter were a conducting body; but the process must be distinguished from ordinary ionisation. It is well-known that a column of air, when ionised, becomes more or less a conductor capable of transmitting electric currents. Efforts have already been made, in fact, to utilise an ionised column of air as a substitute for the ordinary aerial.

Fig. 1, for example, illustrates an arrangement that was put forward in the early

Instantaneous Discharge.

As previously explained, the electron charges in M. Lucien Levy's system are communicated by inductive action to the molecules of a compression-wave set up in the air, and then travel forward along the carrier-wave by a similar inductive action as the air molecules are alternately compressed and rarefied. The effect is more akin to a convection current than to the ordinary phenomenon of conduction



recently evolved a new and revolutionary scheme for transmitting electric waves through the atmosphere.

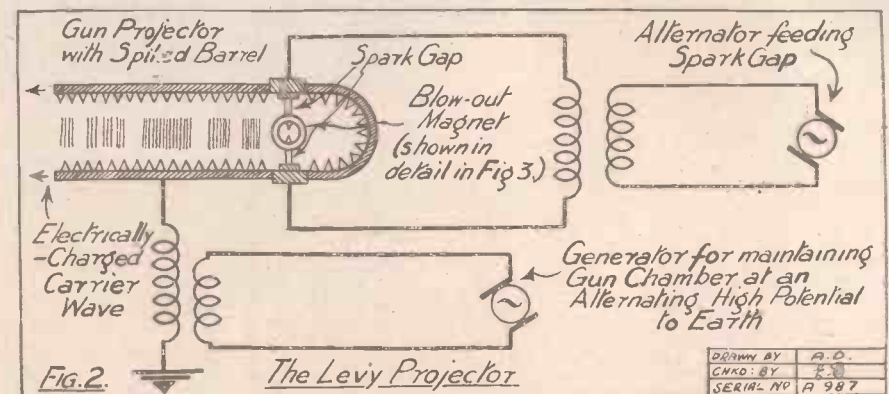
Broadly speaking, his method consists in setting up a train of sound-waves and then imposing a succession of electric charges upon the "carrier-wave" system so formed. The sound-waves are of high frequency, and are created by means of a special spark-gap located in the breech part of a gun-barrel.

300 Metres a Second.

The barrel of the gun is maintained at a high potential relatively to the earth, the inner surface of the chamber being fitted with a large number of spikes. As the sound-waves are shot through the barrel, electric charges of opposite sign are induced upon the pulsating air molecules by a process of electro-static induction.

A sound-wave is of the compression type in which the relative pressure of adjacent air-molecules is constantly changing. Alternate areas of compression and rarefaction follow each other in rapid succession, forming a series of moving zones in which the applied charges of electricity are carried forward at an approximate speed of 300 metres per second.

The charges travel, so to speak, on the back of the train of sound-waves, the



part of the war with this object in view. A stream of ultra-violet rays, generated by a powerful arc-lamp, is reflected by a mirror into a vertical beam. Ultra-violet light is of extremely short wave-length, small even in comparison with the size

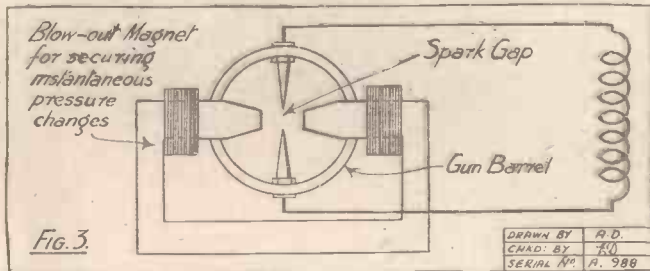
by moving electrons, such as takes place in the arrangement shown in Fig. 1.

The projecting apparatus used by M. Levy is shown in Fig. 2. It consists of a spiked barrel, similar to that of a gun and
(Continued on next page.)

THE RADIO DEATH RAY.

(Continued from previous page.)

closed at one end. Near the rear end of the barrel a spark-gap is mounted, and is fed through a transformer from an alternator or other source of high-frequency current. The frequency is limited to a high acoustic



pitch of the order of 10,000 cycles per second, higher frequencies being subject to excessive absorption and attenuation by the atmosphere.

In order to secure a practically instantaneous discharge, a magnetic blow-out is placed across the spark-gap, the pole-pieces of the magnet being arranged as shown in Fig. 3. This accelerates the forward propulsion of the sound-wave set up by the discharge.

Alternating Charges.

As previously stated, the sound-wave moves forward as an alternate compression and rarefaction of adjacent air molecules, the movement of each particle taking place in line with the wave as a whole, and not transversely to it, as in the case of a light wave.

The barrel of the projector is charged alternately positive and negative relatively to the earth through a transformer and high-frequency generator, as shown. The spikes arranged inside the barrel act as discharge points, and as successive pulses of air sweep forward they are charged first negatively and then positively by ordinary inductive action, retaining their charge as they travel outwards through the air to their distant target. Signalling is effected by interrupting at definite intervals

either the spark or the barrel-charging alternator.

The gun-barrel may be kept at a steady, instead of an alternating, potential relatively to the earth, in which case the carrier-wave will convey successive impulses of electricity of the same sign, which can also readily be detected at the distant end.

Concentrated Beam.

In Fig. 4 the spark-gap source is replaced by a series of explosive chambers arranged upon a rotating ring, somewhat after the fashion of a revolver. The ring is rotated at high speed, so as to give a large number of explosions per second, and the resulting "carrier" train of sound-waves passes through a spiked barrel, as before, to pick up its burden of electric charges.

It would appear that either of the arrangements described should be capable of transmitting a more

concentrated beam of electric energy through the air than any other known method of propagation.

Such a beam could be brought to bear with almost the same precision as gun-fire upon any selected point or apparatus at a distance.

It could, for instance, be utilised to disable the magneto of an aeroplane engine after the fashion of that claimed for the so-called "death" ray, but in a much more effective manner.

"Heat-Ray" Possible.

It may be added, in conclusion, that M. Levy claims that it is possible, by means of his apparatus, to change the carrier-wave with concentrated heat-energy instead of electricity, and to focus the heat beam upon any selected point at a distance.

If this is so, he has got within close distance of the famous "heat-ray" utilised with such fatal effect by the Martian invaders in Mr. H. G. Wells' well-known romance, "The War of the Worlds." Finally, M. Levy sees no reason why his new electro-elastic wave should not also be utilised for the transmission of electric power.

THE ON-OFF SWITCH.

FROM A CORRESPONDENT.

A YEAR ago our relatives used to say that the "Off" switch was the only component that they needed or desired to understand on our wireless sets. It was meant as a gibe, and as a hint that the set was appreciated most when it was silent. Most of them have been converted since then. But it is a fact that if a set is to be used by people who do not understand the functions of rheostats and condensers and moving coils, a simple on-off switch will not only save them a lot of trouble, but will probably save the owner or maker of the set trouble, too.

There are definite advantages in incorporating a switch in one of the low-tension leads:

(i) The set can be put out of action instantly; there is thus no risk of one of the valves being left burning all night.

(ii) Current may be saved by switching off for comparatively short periods during uninteresting talks and five-minute intervals.

(iii) The set may be switched on by anyone without risk of any of the valves being made too bright.

(iv) If it is desired to move the high-tension wander-plugs, or to insert or remove tele

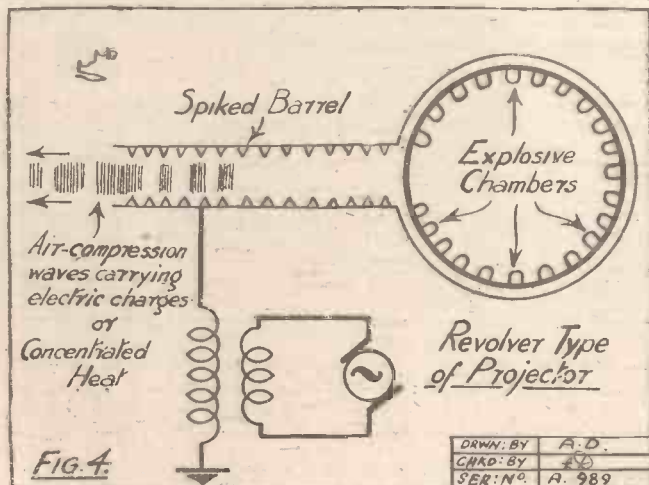
phones or loud-speaker, the filaments can easily be shut off while the change is being made; this will reduce the risk of damage to the windings of telephones, loud-speaker, and transformers, besides preventing a series of unpleasant noises in the receiver.

(v) As the switch completely breaks the low-tension circuit, there is no danger of the leakage that may sometimes occur when compression rheostats are used and are not turned completely off, or of the leakage which will inevitably occur if a potentiometer across the low-tension leads is included in the set.

A Master Rheostat.

The type of switch is immaterial. The best type—if space is available—is probably an ordinary wire-wound rheostat, which will control the supply to the other rheostats. The wire in this master rheostat must be of sufficiently heavy gauge to carry the total current used by all the valves, and it is therefore useless to instal a small 30-ohm type if more than a small fraction of an ampere is being taken from the low-tension battery. One having a resistance of 5 or 6 ohms will be quite suitable, and it need not be of an expensive make.

It is not a matter of great importance whether the switch is inserted in the negative or positive lead from the low-tension supply. There is perhaps some slight advantage as regards safety if the switch is inserted in the lead which is connected to high-tension negative, because when the switch is at "Off," it then becomes more difficult to achieve a burn-out. The position of the switch, however, may quite well be governed by the question of convenient wiring.



The P.W. DAVENTRY PORTABLE

The Set designed and described by K. D. ROGERS.

(Asst. Technical Editor).

Constructional work by G. V. COLLE and C. A. MEADOWS.

(Technical Staff).



IN order to make the portable receiver really successful it is necessary not only to keep the weight and size down as far as possible, but also to arrange the circuit that the least trouble is experienced in finding the stations required and in adjusting the set. A great number of similar receivers are spoiled by the fact that either a large number of controls are necessary or else those fitted have to be extremely carefully operated before good results are obtained.

This is due to the fact that the sets contain the minimum number of valves, for obvious reasons, and have these valves working at their most sensitive points and, generally, if not using what is known as silent point reception, right on the verge of oscillation.

Obtaining Stability.

It is very difficult to design a compact receiver which shall have all its batteries, loud speaker, and frame aerial enclosed without rendering the whole receiver very unstable owing to the fact that it must be made as sensitive as possible in order to make up for the low sensitivity of its pick-up system. Instability is, of course, much more marked the lower the wavelength, so that, on the average broadcast band, where the frequency of the signals to be received is fairly high, the necessary H.F. stages incorporated in the set render the receiver very difficult to operate. Therefore, in the construction of the receiver described here it was decided to neglect the lower bands altogether and to confine the set to the reception of Daventry. This is all the more convenient because not only can H.F. amplification be carried out more effectively on the wave-length used by that station, but the transmissions from 5 X X are usually more frequent than those from any other B.B.C. station, while its power make it much easier to pick up.

The circuit employed is shown in the theoretical diagram where it will be seen to consist of two stages of H.F. amplification followed by a detector and 1 L.F. A frame aerial tuned by a .0005 variable condenser is used to pick up the energy from the station and this is followed by an H.F. stage aperiodically coupled to the next stage.

LIST OF COMPONENTS.

	£	s.	d.
1 Panel, 13 in. by 10 in. by 1/4 in.	8	0	0
Cabinet to fit (with baseboard)	2	4	0
1 Cydon .0005 var. condenser	17	6	0
1 Wates "K" type .0003 var. condenser	7	9	0
1 Ferranti A.F.3 L.F. transformer	1	5	0
4 Precision rheostats	12	0	0
1 Lissen key switch	2	9	0
4 Lotus valve holders	10	0	0
1 Burwood valve holder	1	3	0
1 "Atlas" .0003 grid condenser	2	0	0
1 Lissen grid leak	1	8	0
1 Terminal strip, 8 in. by 1 in. by 1/4 in. (with terminals)	2	0	0
4 Pillar terminals	8	0	0
Wire, screws, transfers	2	6	0
1 L.E.S. 2-way coil holder	6	0	0
Lissenola unit	13	6	0

This method eliminates the possibility of any serious back-coupling between the plate and grid circuits of the first valve, due to the two circuits being in resonance. The next stage of H.F. amplification utilises the tuned anode method of coupling and enables reaction effects from the detector to be obtained by coupling the reaction coil to the anode coil,

Few Controls.

Thus, not counting the filament rheostats, which need no critical control whatever, there are only three controls necessary for the handling of the set, viz. aerial and anode condensers and the reaction control. Tuning is not very critical on the aerial circuit

providing the frame consists of the right number of turns, which should be so arranged that the condenser reading, when the station is tuned in, is just under half-way round the dial; anode tuning, of course, is moderately sharp.

The case in which the set was built can be obtained from the Caxton Wood Turnery Co., of Market Harborough, and is admir-

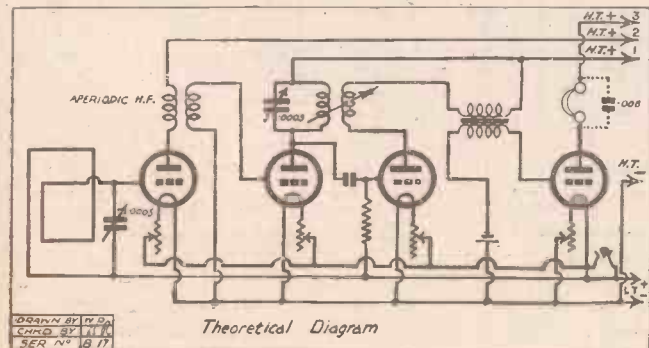
ably suited to the purpose, plenty of room being available for H.T. batteries, L.T. accumulator, and a small loud speaker, besides a frame aerial and the receiver itself.

The latter is built on the panel and baseboard system, the former being 13 by 10 by 1/4 in., with a baseboard of 13 by 6 by 3/8 in. The panel drilling diagram shows the position of the various controls while the wiring diagram and the photographs will give the constructor a clear idea of the disposition of the various components. These latter should be of the types mentioned in the list of components, otherwise the layout would possibly have to be altered to the detriment of the operation of the receiver.

A small terminal strip is necessary on the left-hand side of the reverse of the panel and this carries all the terminals except those for the frame aerial.

The strip about 8 in. in length and is 1 in. wide, the being spaced 1 in. apart, of the type and as possible care taken placing (Continued)

measures length, thick and terminals in. apart, of the type and as possible care taken placing (Continued on next page.)



The portability of the set is clearly shown in this photograph.

THE "P.W." DAVENTRY PORTABLE.

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holders in position that all their contacts are in order, otherwise trouble may be experienced when the set has been built, due to faulty valve contacts.

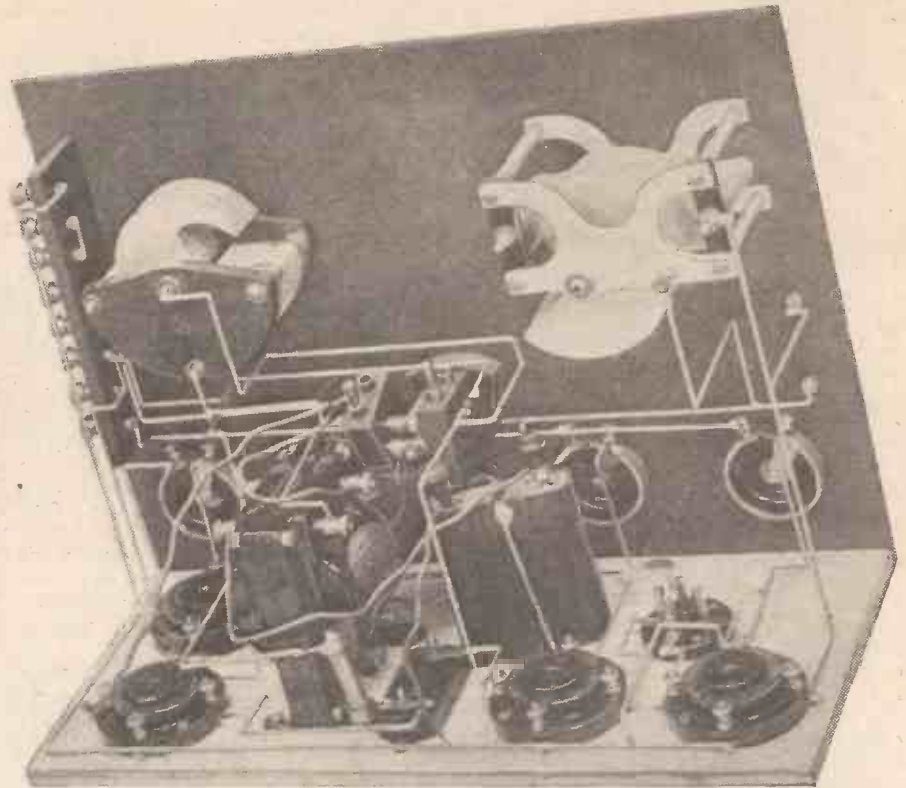
Wiring should be carried out according to the diagram given with square section tinned copper wire of about 16 gauge. All joints should be well soldered, care being taken that no faulty connections are made and the flux and all traces of loose solder being removed immediately after each joint is made.

The grid bias battery is held in position to the right of the L.F. transformer by means of two pieces of square section wire screwed into the baseboard and bent up over the top of the battery. This will be made clear from the photographs of the set.

The Frame Aerial.

The frame aerial is constructed from two pieces of curtain rod, half an inch thick, and cut so that they form a tight fit diagonally across the inside of the lid of case. Where they cross they should be slotted so as to fit into each other to make a flush joint, a wood screw through this point into the centre of the lid being the only fixing necessary after the frame has been wound.

Meanwhile, the two pieces of wood should be well glued together to ensure the rigidity of the frame. This latter should be wound round the frame work on to four screws (one at each corner), covered with small pieces of systoflex tubing. About 42 turns of 32 gauge S.S.C. copper wire to be used for the frame, the ends of the wire being brought to two small terminals mounted on a small piece of ebonite fixed near the right-hand bottom end of the framework.



The disposition of the components can be seen in this illustration of the inside of the set.

It is a good plan to paste thin strips of paper round the windings in the middle of the sides in order to keep the wires together and obviate any possibility of the frame "fraying out."

It will be noticed from the photograph that the case is divided into four sections, comprising one large one for the set itself, a long one at the back for the H.T. batteries, and one each for the loud speaker and L.T.

battery. This latter is of the 2-volt non-spillable Oldham type D.L., and is packed in position between the long compartment at the back of the case and a small one at the front, by means of a piece of wood. The loud speaker is fixed through the next partition so that it points into the small section on the left side of the front of the case. A Lissenola unit is used for this purpose, and this, when in position, just fills up the space between the partition inserted by the accumulator and the one through which the front of the unit projects. If desired, a small horn can be made to fit over end of the loud speaker, curving upwards to fill the loud-speaker section, from four pieces of sheet metal shaped so as to fill the chamber, at the same time curving upwards to throw the sound out.

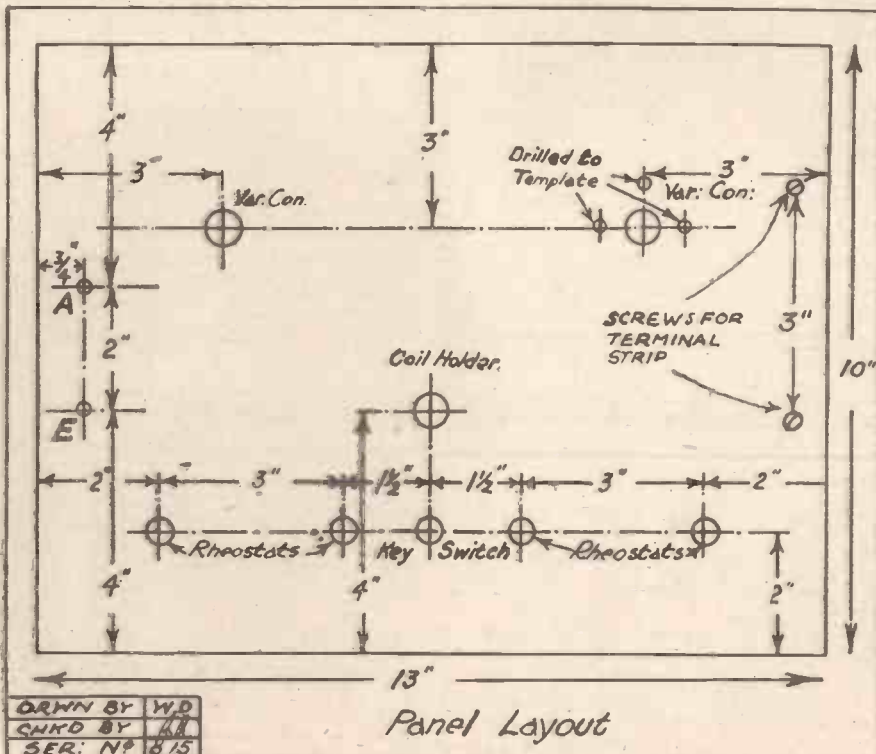
New Type of Valve.

The new type of Cossor dull emitter valve, taking 1 of an amp at 1.8 volts, is used throughout the set, there being two H.F. valves and 2 L.F. valves. No aerial coil is necessary, of course, while it was found that a 300-turn anode coil and a 250-turn reaction gave the best results. Ordinary plug-in coils are quite suitable.

The H.F. transformer should be of the aperiodic type, covering a range of wavelengths of from 800 to 2,000 metres, and known as a resistoformer. The H.T. batteries are kept in the section of the case at the back, and consist of four 15-volt units, and five 9-volt grid bias battery units joined in series. Separate wander plugs give control over the first valve, the second two, and the L.F. valve.

The H.T. batteries should be arranged so that the first three valves can have about 60 volts on their plate, while the full voltage is available for the last valve.

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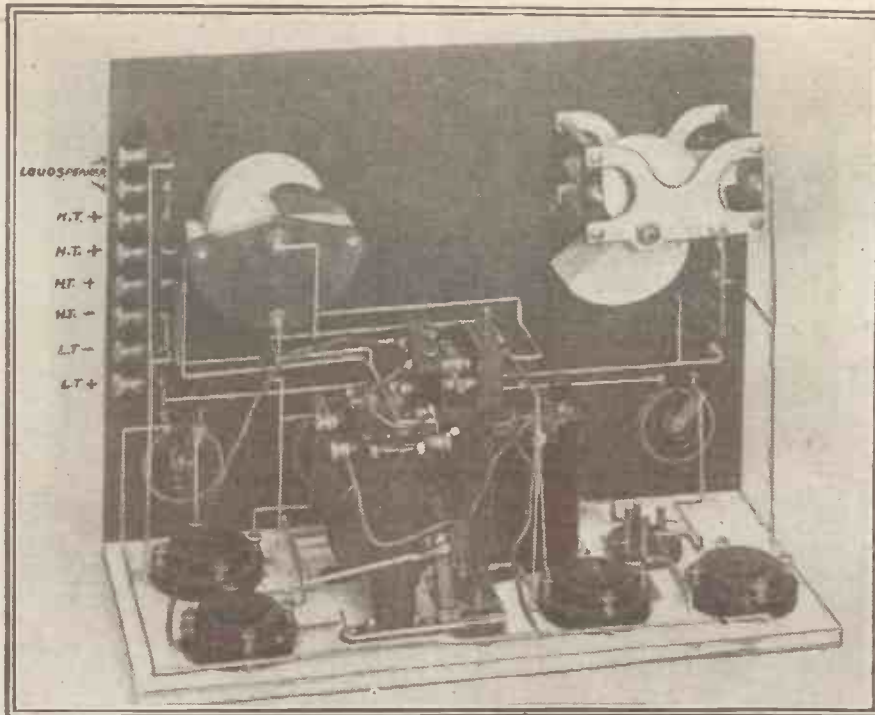
THE "P.W." DAVENTRY PORTABLE.

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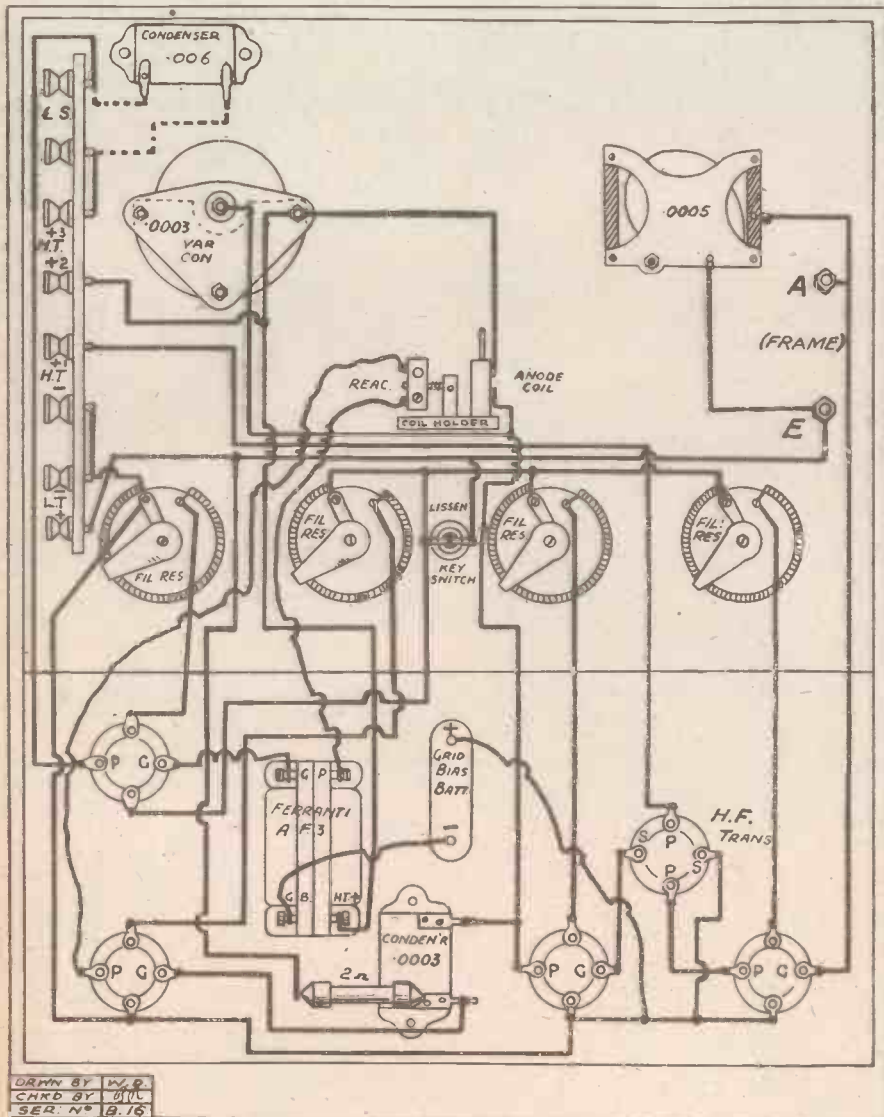
In operation, the set should be placed so that when the lid is open (it should have a piece of webbing attached to it to prevent it falling backwards, and to keep it vertical) the frame aerial is edge on to Daventry. Tuning is carried out in the usual manner by rotating the two variable condenser dials while reaction is controlled and neutralised to bring the signal strength up to its maximum.

A final word about the frame aerial. Although this may be tested for efficiency before the set is finally packed into its case, it will be necessary to re-test it when everything is in position, for it will be found that the tuning will have altered owing to the capacity of the case and its contents.

It is advisable, therefore, not to fix the frame permanently in position until this final test has been carried out, because it may be necessary to remove some of the turns in order to obtain maximum signal strength when the aerial condenser reads somewhere about 70 degrees.



A further illustration of back-of-panel wiring, showing the positions of the various battery terminals.



POINT-TO-POINT CONNECTIONS OF THE "P.W." DAVENTRY PORTABLE.

Aerial terminal to fixed plates of .0005 variable condenser and to grid socket of first valve holder. Earth terminal to moving plates of .0005 variable condenser, L.T. positive terminal, and to one side of key switch. Other side of key switch to one side of first three rheostats and to one filament socket of fourth valve holder. Other connection of each of first three rheostats to one filament socket of corresponding valve holder. Other filament sockets of first three valve holders to L.T. negative, which also goes to H.T. negative, grid bias positive, and to one side of fourth rheostat. Other side of fourth rheostat to remaining filament socket of fourth valve holder.

Plate socket of first valve holder to one filament (primary) socket of H.F. transformer holder, other primary socket to H.T. positive 1.

Grid (secondary) socket to grid socket of second valve holder, other secondary socket (plate) to L.T. negative lead.

Plate socket of second valve holder to one side of grid condenser, one side of fixed coil holder, and moving plates of .0003 variable condenser.

Fixed plates of .0003 variable condenser, to other side of fixed coil holder and to H.T. positive 2.

Other side of grid condenser to grid socket of third valve holder and to one side of grid leak. Other side of grid leak to L.T. positive.

Plate socket of third valve holder to one side of moving coil holder, other side of moving coil holder to "plate" terminal of L.F. transformer. "H.T. +" terminal of transformer to H.T. positive 2.

"Grid" terminal to grid socket of fourth valve holder, "grid bias" terminal to the negative grid bias.

Plate socket of fourth valve holder to one loud-speaker terminal, other loud-speaker terminal to H.T. positive 3. A .006 fixed condenser may be connected across the loud-speaker terminals if desired.



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

REFERRING to the mention which was recently made in these columns of the need for some new and more compact type of aerial which should at the same time have a sensitivity about the same as that of a good extended outdoor antenna, many new types of aerial are now making their appearance. I recently had an opportunity of examining the Clarebex aerial: this, as some of my readers may know, is a sort of box or cage aerial mounted upon the end of a short pole. There are ten spokes which radiate from a central hub in various directions and each spoke carries a right-angle cross-piece at the end. The aerial wire is wound upon these cross-pieces in a very ingenious manner which it is rather difficult to describe without the aid of a diagram. This aerial gives very good reception when compared with an ordinary outdoor aerial. The pole may be secured either in a position in which it projects above the roof of the house or from a window ledge or in any other convenient position.

Good Indoor Aerial Wanted.

There seems to be little doubt that aerials of this kind can be made very efficient, and having regard to their much greater convenience there should be a considerable future for them. There is no doubt that whilst great improvements have been made in circuits and sets, and also in many of the components which go to the making up of a complete receiver, the aerial has always been and is still the "bugbear." There are a large number of people who, even at the expense of an extra valve or two, will choose a self-contained set with frame aerial in order to avoid the trouble of having an outdoor aerial erected and the possible unsightliness of the same when installed.

As I have said before, if some form of indoor aerial could be devised, particularly if only of the size and compass of an average frame aerial, which at the same time had a pick-up sensitivity of even an average outdoor aerial, there would be an immense field for it.

Use of H.F. Amplification.

Whilst on the subject of aerials, one frequently receives inquiries, especially from beginners, as to the relative merits of a frame aerial and an outside aerial. It is very difficult, of course, to state the relative efficiencies of these two types of aerial, as it depends a good deal upon the nature of

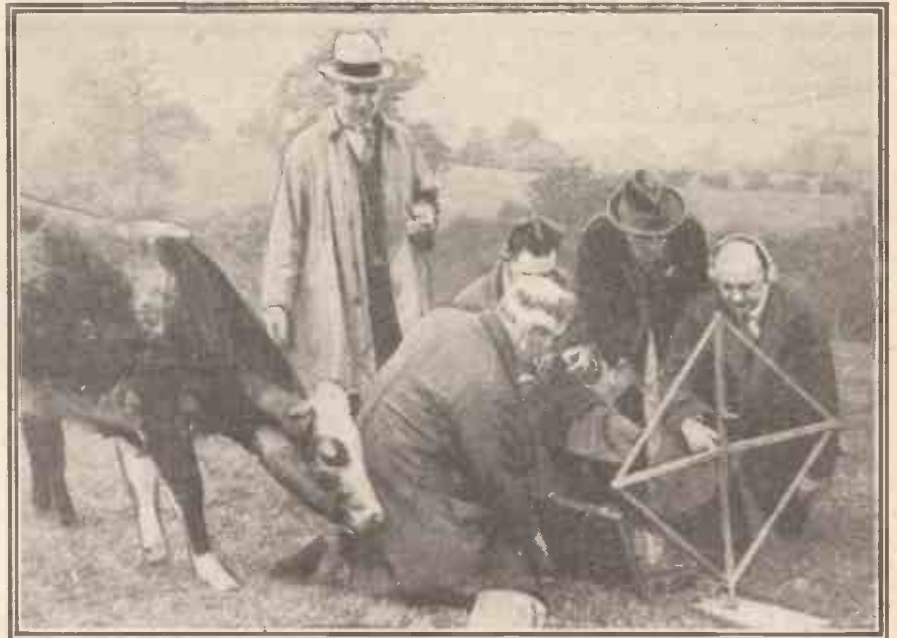
the set and upon local conditions. Speaking generally, it should be said that some amount of H.F. amplification will be required if a set is to be used with a frame aerial. Sometimes a single H.F. amplifier will be sufficient, but generally it is more satisfactory to employ two H.F. stages. If this be done the set will probably pick up almost equally well at different distances

energy is received from the aerial, and this may be—and in some cases within 10 or 20 miles of a station it will be—sufficient to operate the detector efficiently. If, however, the distance from the station is increased to, say, 50 miles, the incoming energy may be insufficient. In some cases a set without any H.F. amplification at all may be worked perfectly well from a frame aerial, even from quite a small frame aerial, but in order to get the best results in this case it is desirable to use two stages of L.F. amplification, with reaction, of course, and also to use the best components and to have the circuit very carefully arranged so as to avoid any losses.

Importance of Efficient "Lay-out."

In this connection it is worth while mentioning that the lay-out of the set is of very much greater importance than is commonly appreciated, and it is possible, with exactly the same components and the same circuit, to lay out the set in two different ways, one of which will give immensely better results than the other.

What are the relative advantages and disadvantages of high-frequency coil switching and of the use of separate plug-in coils? Everyone admits the much greater convenience of the switching arrangement, yet



Members of the Sheffield and District Wireless Society testing out a portable D.F. set, to the obvious interest of the regular occupiers of the field where the tests were carried out.

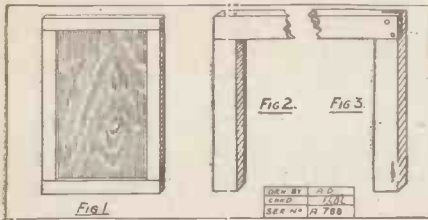
from a broadcasting station up to perhaps 10 or 20 miles. The reason for this is that the H.F. amplification does not make a great deal of difference to the strength of powerful signals. Or, to put the matter perhaps in a better way, the purpose of the H.F. amplifying stages is to bring up the strength of the incoming signals until they are sufficient to operate the detector efficiently. If the set is a comparatively short distance from a broadcasting station, so that the H.F. amplification is not really so necessary, the detector is operated efficiently even without the aid of the H.F. amplifiers.

On the other hand, when a good outdoor aerial is used, a much larger amount of

there are many amateurs and experimenters who on technical grounds prefer the use of plug-in coils. The use of a switch for throwing in different coils, for example broadcast wave-length and Daventry, has the objection that it introduces, or is liable to introduce, "dead-end" and capacity effects. So far as my own experience goes, and I think this will be supported by most of my readers, there is no doubt that better results are obtainable by the use of separate plug-in coils, and almost the only advantage of the switching arrangement is in the case of manufactured sets, where simplicity of operation and the requirements of the non-technical user have to be kept in view.

HOUSING THE SET

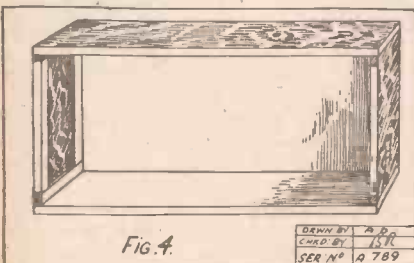
HOW frequently is it the amateur constructor's experience that a "hook-up" assembled in haphazard fashion on the experimental bench gives better results than the same set and components after they have been neatly



housed in a handsome box! The explanation in the majority of cases lies in the fact that on the bench plenty of space was given between the various components, thus lessening losses by interaction, stray capacity effects, etc., which are often introduced by cramping and crowding within the confines of too small a cabinet.

The determining factor governing the dimensions of the box is too often the cost of same, together with that of the ebonite panel (two expensive items) rather than the provision of adequate room for the various components.

Of course, so far as the box is concerned, size can be obtained at the expense of quality and appearance, and where these are considered of absolutely no account, even a mere soap or sugar box would suffice. But, who would care to display so plebeian a device within the purlicious of the suburban dining or "drawing" room? And, after all, a good set is worthy of a decent setting. The writer proposes, therefore, in this short article, to indicate two or three ways of



THE PROBLEM OF BIG CABINETS AT SMALL COSTS.

By A. H. B. PAYNE.

effecting a fair compromise between the too small, high-grade, commercial cabinet and the big, but inferior quality, home-made case.

Using "Three-ply."

One way of cheapening the cabinet is to build it of common wood and decorate it by some suitable and inexpensive means. Another is to conceal it by a thin layer of superior wood.

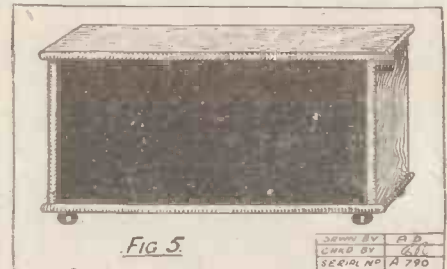


An attractive cabinet with doors made by the Caxton Wood Turnery Co., Ltd., for a "P.W." receiver.

The art of veneering, as practised so elaborately and successfully by our Victorian forebears, is not an easy one, but, fortunately, we have it ready performed for us by the three-ply wood manufacturers. Very beautifully figured mahogany, oak, walnut, and other choice woods are now obtainable in this material at a tithe of the cost per super foot of the solid material. This affords us a practical solution of the difficulty. These ply-woods, however, have an important disadvantage in being thin and very liable to warp. They therefore require a base or support to correct or prevent this tendency.

The ideal way is, of course, to frame them up as panels in the same way that a door-

maker does, but this method involves more skill and tools than are usually in the possession of the amateur cabinet-maker.



But quite a practical substitute exists in the mock panel, or tray, in which the supporting frame is built up on the three-ply sheet, as shown in Fig. 1.

The frame may be of the same kind of wood as the three-ply, or of ordinary deal, the edges of which are stained to match the panel or, better still, concealed by a moulding of the real wood. Fig. 5 is a sketch of a typical plain wireless cabinet, built up as suggested, and, when polished, requires an expert to tell it from the solid article by sight alone. Though lighter in weight, it is quite as strong and in every respect as serviceable as a solid case.

Small Mouldings.

The deal frames may be made very simply, either with the joints butted, glued, and screwed with fine screws, as in Fig. 2, or halved, as in Fig. 3. The three-ply sheet is glued to the frame and further secured by a few fine pins with the heads clipped off, these being punched slightly below the surface and the indentations filled in with a stiff paste of whiting and boiled linseed oil. Fig. 4 gives a clear idea of the constructional details of the carcass of such a cabinet, the grained portion representing the three-ply, and the white parts the deal baseboard and supporting frames.

The latter need not be of heavy stuff, 1 in. by 1/2 in. planed, being suitable for all ordinary cabinets. Fig. 5 represents the same cabinet finished by half-round moulding of the section shown in Fig. 6, which conceals the edges of both frames and

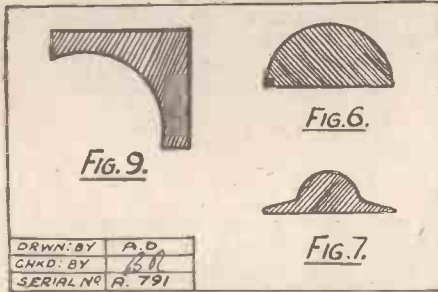
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HOUSING THE SET.

(Continued from previous page.)

three-ply, strengthens the junction, and gives a neat finish to the whole.

In making such a case only good results will be obtained by having all edges and ends true and square and accurately to size. A little extra time spent on these details will be amply repaid in the finished article. There are many patterns of small mouldings in oak, mahogany, walnut, etc., obtainable



at the shops that cater for the amateur woodworker. Fig. 7 is another effective section. Whatever pattern is used the moulding should be carefully and accurately mitred at the corners by means of a mitre block and fine tenon saw.

It is fixed to the case by thin, strong glue and pins. There is not space in this article to describe French polishing, but many excellent handbooks on the subject are available at the libraries or booksellers, and as the polishing of a plain cabinet such as this is not difficult, I advise readers to try their hands at it, as a considerable monetary saving can thus be affected.

Enough has been written to indicate the possibilities of three-ply wood, and we will now turn to the consideration of another method of making inexpensive but roomy cabinets.

An Effective Scheme.

This is to make the cabinet of solid deal and paint or stain it to a suitable colour. But common deal, stained and polished, however well done, always looks cheap, and a much more artistic effect (I use the word in its popular sense) is obtainable by the process of enamelling. If nicely smoothed and carefully done the effect can be both "good" looking and pleasing. Such an enamel as Robbialac, for instance, obtainable in a variety of pleasing and subdued colours, is ideal. Black, grey, white and ivory are all possible tints for this purpose. A good matt ebonite panel in a nicely enamelled white or ivory cabinet is a daring but effective combination suitable for some types of drawing-room or ladies' boudoir.

If the cabinet is designed on "Oriental" lines (a simple example of which is indicated in Fig. 8), a very good effect is obtained by a red enamel or lacquer decorated discreetly with gilt transfers and mouldings. These "Chinese" cabinets are very expensive to buy, but can be simulated quite successfully at small cost. In making a cabinet of this description simplicity of design and construction should be aimed at, anything of a "fretworky" nature being studiously avoided.

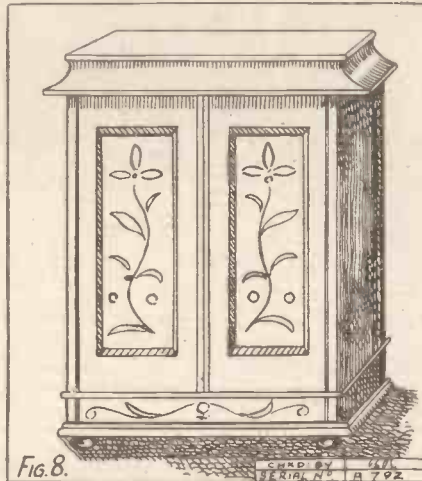
Proportion is a great point to be observed,

and, in the writer's opinion, a rather square plan suits this type best, the height being in the ratio of about one and a half times the width. That shown in Fig. 8 is a simple box of deal (free from knots and shakes). The doors are plain, unpanelled wood, neatly hinged to the sides, the panel effect being obtained by "planting" (that is superimposing) thin raised panels bevelled at the edges, on the doors. The canopied top of the cabinet, which supplies the "Oriental" touch, is built up of a mitred frame of moulding known as "coving" (section shown in Fig. 9).

This is obtainable very cheaply in several sizes at most timber merchants'. The plinth effect is obtained by a double moulding of 1/4-inch square stuff, while the four little knob feet give a pleasing and characteristic finish to the cabinet. If enamelled red or black, the edges of the canopy-top, the plinth mouldings and the feet would look well gilded, either with gold paint, or gold-leaf on gold-size, and a simple design in the same medium worked on the door-panels and the plinth front. It is believed that transfers of "Oriental" design are obtainable, but this decoration should not be overdone.

Ebonite Economy.

So much for the economies that can readily be effected in the cabinet proper, but what of that other expensive item, the ebonite panel? It has often struck me, as doubtless many of my readers, that quite an unnecessary amount of this material figures in most sets, particularly the home-constructed variety, because the practice of slavishly following conventional design is almost universal, and the whole front of the cabinet is fitted with ebonite. Most commercial components are self-insulated. In the "hook-up" on the



bench very little, if any, ebonite is used beyond that already incorporated in the components. A strip for terminals, perhaps. Yet, so soon as it is desired to house the same in a permanent home a large slab of ebonite is the first thing called for.

My advice, therefore, is to cut down this item to the minimum. Let your panel be of three-ply wood to match the rest. If you must have ebonite, divide the front into nicely-proportioned sub-panels, say three, letting the centre one be of the ebonite and the two outers of wood. The ebonite can then carry such components as it is deemed necessary to provide with this additional insulation.

By following the suggestions outlined in this article the keen constructor should be able to provide himself with a really roomy cabinet of good and pleasing appearance, and quite as utilitarian for less hard cash than would pay for a skimpy commercial article, which not only looks insignificant, but is inefficient because it cramps the contents to their disadvantage.

CORRESPONDENCE.

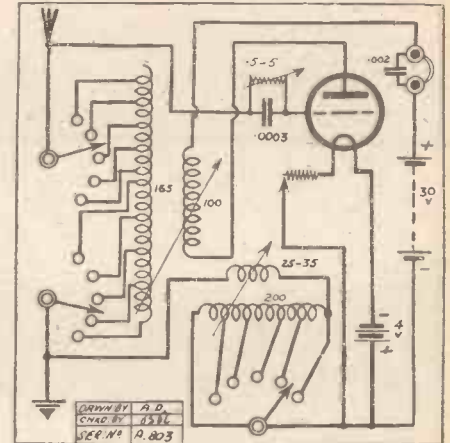
INTERESTING ONE-VALVER.

The Editor, POPULAR WIRELESS.

Dear Sir,—I have had such an amount of correspondence with regard to my set and its record, that I should be glad if you will publish the circuit and details.

The aerial coil is 165 turns duoheteral, wound on a 1-inch former with two rows of 11 pegs 3 inch apart; 15 consecutive tappings are first taken off, then 15 tappings of 10 turns each.

The reaction coil is about 100 turns wound in a similar manner and not tapped. This is coupled inductively to the aerial coil.



The third coil is 200 turns wound on a similar former to No. 1 coil, and tapped every 20 turns. Coupled with this third coil is a small coil of 25-35 turns, basket wound. All the coils are impregnated with wax and the wire used is No. 26 D.C.C.

To those who have not had any experience in making reflex sets, I should not advise this one, but in fairly expert hands this set gives good results which are far above the average.

Yours sincerely,
"Lynton," J. R. HARVEY,
Haynes Park, Hornchurch.

CALIBRATING A CONDENSER.

The Editor, POPULAR WIRELESS.

Dear Sir,—In a recent issue of your paper you gave a simple method for calibrating a condenser. The writer stated in his article that the resistance per inch of the wire AB must be known: I beg to state that this is quite unnecessary. The

writer gave a formula: $C_2 = \frac{C_1 \times R_1}{R_2}$

It will be noticed that all that need be known in this formula is the value of C_1 , and the ratio $\frac{R_1}{R_2}$. R_1 is the resistance of the length of wire between A and the slider H, and R_2 is the resistance of the length of wire between B and the slider H. But in the same wire the resistance of any portion of it is proportional to the length of that portion.

Therefore, $\frac{R_1}{R_2} = \frac{\text{length AH}}{\text{length BH}}$.

The formula now becomes: $C_2 = C_1 \times \frac{\text{AH}}{\text{BH}}$. AH and BH being, of course, measured in the same units. Therefore, it can be seen that AB may be of any suitable resistance, which resistance need not be known. This method of finding the ratio $\frac{R_1}{R_2}$ saves the unnecessary step of converting the lengths AH and BH into resistances.

Yours truly,
25, Jamaica Street, E. A. HARVEY,
Stepney, London, E.1.

THE much-advertised statement by the Postmaster-General on the future of broadcasting contained no news for readers of this page. There were points of real interest which he might have made, but these were carefully avoided. I have been following up some of the unintentional clues in the statement, and have discovered that the rumour about Lord Reading being the new chairman is quite unfounded. The new chairman has been chosen from the ranks of solid Toryism, and is believed to be a peer of the realm. The governing body of the Corporation will probably include a woman. But its constitution and composition will be subjected to prolonged and minute scrutiny before the Royal Charter is finally approved.

There are a number of important issues on which the present official policy is out of harmony with actualities and with public opinion. I refer in particular to the view that the appointment of Lord Gainford to the new board alone of the present board is sufficient to guarantee full continuity. This appointment is desirable; but with it should go the appointment of Mr. Reith. Nor should this be left to chance. Mr. Reith is the man who made British broadcasting, and his name should be inscribed in the Royal Charter.

The Ten Waves.

Captain Eekersley's announcement that the new international arrangement of wave-lengths would allot ten to Britain has come as a shock to many people, technical and otherwise. It means a complete revision of all existing plans for the more effective distribution of the British service. It means also that transmitters must be more centralised, and that several will disappear. But there is a great deal of experimenting to be done before the new plan can be decided upon. For one thing, the relay stations may be continued for a little longer, provided they can all be worked off the same wave-length. But, in any event, the elaborate system of alternative programmes must be modified. I am sorry about this, but it is obviously necessary to face the international problem. It is clearly better to have ten wave-lengths which are respected by other countries than to have twenty-five wave-lengths which are all more or less open to irritating interference.

Licence Money Again.

The Treasury view is still in the ascendant on the subject of the disposition of licence revenue. A few weeks ago there were signs of a more reasonable attitude at the Post Office, but any tendency there was to meeting the just demands of the B.B.C. has been promptly smothered. In view of the amazing loyalty of the B.B.C. to the Post Office, I cannot understand why the latter fails to support the B.B.C. against the Treasury. The result of the continued impasse over money is that programmes next season are seriously threatened. The change over from one authority to another is itself sufficient cause for some uncertainty and dislocation; but the withholding of money will entail paralysis.

I am very glad to hear that there is to be a repeat broadcast of Captain Reginald Berkeley's "White Château," the war play which was so conspicuously successful as the feature of last year's Armistice Day programme. The revival is to be on August

BROADCAST NOTES.
By O. H. M.
The New Chairman—The Ten Waves—Licence Money Again—The White Château—Forthcoming Attractions.

16th, the anniversary of the landing of the B.E.F. in France. There is no doubt that this is one of the most effective dramatic performances so far broadcast on either side of the Atlantic.

It seems a great pity that Captain Berkeley does not do more for the new medium for which he has displayed remarkable aptitude. I suppose the tremendous fuss and litigation about the first performance of "The White Château" had something to do with the suspension of Captain Berkeley's contributions to the programmes.

I hear that a petition has reached the B.B.C. on behalf of listeners who suffer from chronic insomnia, and who desire all-night programmes. The proposal has been considered, but would obviously be too costly for the results.

Mr. Sheppard, of St. Martin-in-the-Fields, is trying to arrange a special service on Armistice Day. His idea is to hold this not in a church but in a large hall, and have it broadcast from all stations. The B.B.C. have accepted the idea, and steps are being taken to complete the arrangements.

Among the novelties being worked out at Savoy Hill is one in particular which should provide an amusing evening's entertainment. Many songs and lyrics in literature, drama, and comedy terminate with "I love you." These are all being assembled and will be given together in September.

There has been a good deal of justifiable discussion concerning a remark by the Postmaster-General in the course of his parliamentary statement on broadcasting.



A corner of a Russian Radio Exhibition showing a number of amateur constructed receivers and components.

I confess I am looking forward with much interest to the approaching revival of "The White Château." I wonder if the same "cuts" will be made this time as in the first performance.

Forthcoming Attractions.

Europe and America are being scoured by the B.B.C. for conductors and artists for the twelve International Concerts at the Albert Hall next season. These should be a source of great pleasure to music-lovers in London and throughout the country. Incidentally they will be a demonstration of the power of broadcasting in direct competition with the concert industry. I think the B.B.C. has been unduly reluctant to carry the war into the enemy's territory. The concert industry will soon have good reasons to blame broadcasting for a decline of box-office receipts. But such a development followed inevitably from the policy of hostility pursued by the concert people. They have only themselves to thank if they find all doors to negotiations bolted and barred permanently.

He said he hoped the Corporation would take over the B.B.C. staff "in large part." In view of the strong recommendation of the Broadcasting Committee that the new authority should take over the B.B.C. staff as a going concern, the P.M.G.'s qualification has caused surprise. But it bears out the information I received from a prominent civil servant some time ago.

This was to the effect that it was the intention to dump a number of highly-paid civil servants on to broadcasting once the new authority was in power. The economy-axe is working insidiously in Government departments, and the new broadcasting corporation is hailed with a sigh of relief by those in danger. The B.B.C. officials to be displaced are to be compensated on a Treasury scale. Anyway, this is the nice little plan that has been hatched. But I feel sure it will not come off. The Civil Service pundits will find broadcasting much more difficult to manipulate than the ordinary department. It is too much in the public eye, and questions in Parliament are persistent and devastating.

CURRENT TOPICS.

By THE EDITOR.

Wave-length Changes—Geneva's Decision—Better DX Chances—The B.B.C. and Pronunciation—A Dangerous Job—The Post Office and Licences.

FOR some time now amateurs have been waiting for some statement from the office of the International Radiophone Bureau at Geneva concerning the wave-lengths to be allotted to British broadcasting stations. And last week a preliminary statement was issued apropos of the "exclusive" wave-lengths—that is, wave-lengths not to be shared by other stations.

B.B.C. Changes.

Great Britain is to receive not fewer than seven or more than ten of these exclusive wave-lengths, and they will be on the present broadcasting wave-band of 300-500 metres. It seems unlikely, moreover, that nothing more serious than minute alterations in the wave-lengths of one or two British stations will be made.

On the 300-500 metre wave-band there are nine main B.B.C. stations, and there seems to be a distinct possibility that no main B.B.C. station will have to share a wave-length with some European station or stations—a concession which multi-valve users will warmly welcome.

The definite number of exclusive wave-lengths to be allotted, and what they will be, has not yet been decided, but any alterations found necessary will operate as from the end of September. We understand that British relay stations will continue to operate, but upon wave-lengths which will be shared by low-powered European stations, and there is no likelihood that any of the B.B.C. stations will be closed down.

Improving DX Work.

On the Continent to-day there are at least two hundred stations at work, despite the fact that only about one hundred wave-lengths are available. The new Geneva plan, however, will affect about ninety per cent. of the nations of Europe who maintain a broadcasting service, and the plan, distinctly favourable to this country, will mean a sorting out of wave-lengths for other countries in accordance with their size, population, and general importance.

This new scheme, it is hoped, will go a long way to improving reception conditions, and in particular will improve the possibility of good DX reception without the interference which is so prominent to-day.

The B.B.C. is having a last fling. Like the bravo condemned to death, who eats a hearty breakfast before mounting the scaffold, and who cracks a joke or two with the warders, the B.B.C. has evidently made up its mind to make a good exit.

Before the noose tightens about its neck it has decided to act as the arbiter of pronunciation. "English as she is spoken" has many attractions for the reformer: there is a curious magnetism about the subject which appeals to those who dearly

love to dabble in reform. Phonetic spelling, synthetic languages, etc., etc., they have all attracted their followers, and we have no doubt that in starting a movement for uniform pronunciation the B.B.C. will gather in many disciples.

But why does the B.B.C. consult an Irishman (in the person of Mr. G. B. Shaw), who, although admittedly an expert in the more esoteric dialects of London (vide his "Pygmalion"), can hardly be acclaimed as the final authority on the pronunciation of the English language? We wonder what Mr. St. John Ervine thinks of the B.B.C.'s choice of Mr. Shaw?

Verbal Glory.

It must strike the reader as rather curious that, despite the B.B.C.'s selection of Mr. Shaw as an Irish judge of English pronunciation, the authorities state they will not allow the B.B.C. to broadcast Mr. Shaw's speech which he is to make on the occasion of a dinner given in his honour on his 70th birthday. Perhaps the Post Office has effected this ban on patriotic grounds,

undoubtedly expire at the end of the year in a blaze of verbal glory.

Here is an interesting announcement from the Post Office (not copyright in the United Kingdom, or to ships at sea). The Post Office states that "there is no objection to listeners' wireless receiving apparatus being used occasionally at a different address to that given on the licence. If, however, the apparatus will be used more or less regularly at the second address, or if a permanent aerial is erected, a second licence is necessary."

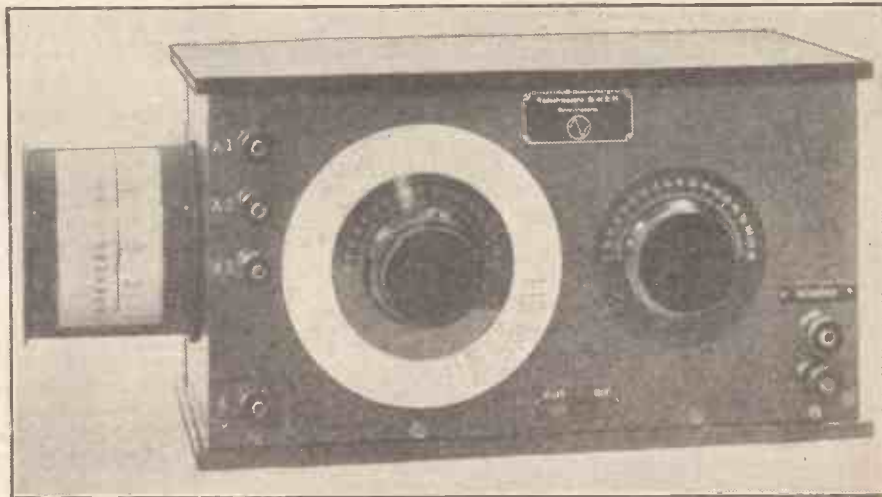
The Answer.

A gentleman who called at "P.W.'s" offices the other day with regard to this announcement was puzzled about it. He wanted to know whether, if he used his receiving set at his permanent address and occasionally used it at a friend's house across the road on a friend's aerial, what was the position if he took it to a third address and used it there occasionally? There is probably a catch in this, and we should suggest that the answer is a lemon.

The above query reminds us of a very interesting competition which our advertisers, Messrs. Dubilier, recently announced. They want to know if you are a patient man, and if you are, there is £200 for you—if you are lucky. This is what you have to do, and we quote from one of their advertisements:

"Let's see—five separate units give five capacities, taken singly. Then I can have the first two in series or parallel—total

THE LATEST GERMAN RECEIVER.



A novel two-valve set designed in Germany. An automatic scale bearing the names of various stations is provided.

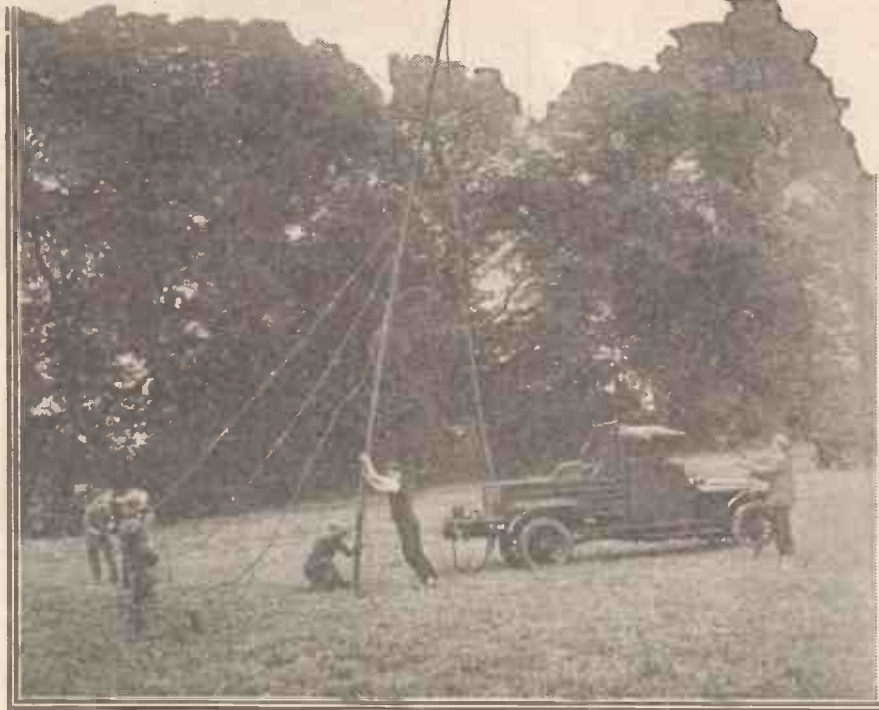
or perhaps because they are frightened of starting a real live controversy.

Dr. Bridges, the Poet Laureate, is another member of the committee set up by the B.B.C. to judge the rights and wrongs of English pronunciation. These gentlemen have a difficult task. As one wag in the "Daily News" remarks, it is hoped the B.B.C. will deliver itself of a verdict on the pronunciation of such words as "sandwich" and "sausage." Shall it be "san-which," "sam-which," "san-witch," or "san-widge"; and shall it be "sossidge" or "saw-sage"? The job is fraught with danger—but the B.B.C. will

seven. Then the first three all in series or all in parallel—two more. The first and third and second and third in series, total 9. Ditto, in parallel, 11. First and second in series, and in parallel with the third—12. And the total number of different capacities with the five units is —? What is it? If you get it right you win £200!

Personally, we are submitting this very interesting problem to the concentrated attention of our technical experts, but the news of success is not yet to hand. In fact, our readers will be interested to learn that Mr. Dowding, our Technical Editor, has departed for a short holiday.

AERIAL DEVELOPMENTS



This is the first of a two-part article on aerials which will interest every reader. The conclusion will appear in next week's issue.

By **SEXTON O'CONNOR.**

MARCONI'S invention of the elevated aerial dates from June, 1896. A few weeks previously Professor Popoff, the Russian physicist, made use of an earthed collecting wire for investigating the effects of electrical disturbances in the atmosphere—an experiment which has been held by some to have forestalled Marconi's discovery.

On the same grounds one might just as well claim the honour for Benjamin Franklin, who carried out his famous kite experiments with lightning; more than a century and a half ago.

Neither Popoff nor Franklin, in fact, were using an elevated conductor for the purpose of transmitting or receiving wireless signals. The credit for first doing this undoubtedly belongs to Senatore Marconi, who in his earlier experiments used a kite to carry his collecting wire, and afterwards suspended it from mast structures.

However obvious and simple this idea may now appear, it proved to be the starting point of wireless communication.

For eight years previously Hertzian waves, although well known to physicists, were regarded merely as a laboratory curiosity. By using an elevated aerial as a means of access to the ether, Marconi first made it possible to radiate these waves across considerable distances.

Sheet Aerials.

Figs. 1 and 2 show early forms of sheet aerial used by Marconi in the initial stages, for signalling over comparatively short distances. For transmission (Fig. 1) two similar metal sheets, suspended from a framework, are energised from an induction coil. The sheets are separated by a spark gap, one side of which is earthed, as shown. For reception (Fig. 2) a single collecting sheet is suspended from a pole and is earthed through a coherer shunted by an indicator or a pair of 'phones.

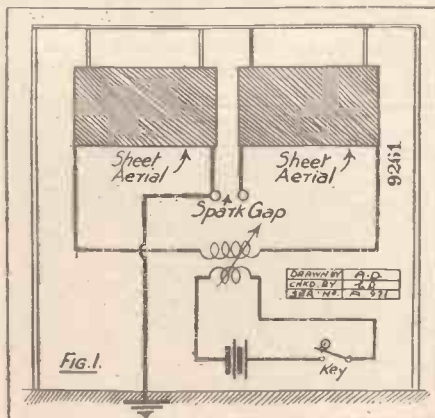


Fig. 1.

Network Aerials.

Sheet and single-wire radiators were quickly replaced for long-distance transmission by networks of wire arranged in some cases as an inverted cone or pyramid, as shown in Fig. 3, which illustrates an early form used at the Marconi station at Glace Bay. A somewhat similar arrangement was the umbrella antennæ, the shape of which is sufficiently indicated by its name.

In the inverted-cone type of aerial, it is found that waves radiated from one side of the network interfere to some extent at the receiving station with those from the other side, since they arrive slightly out of phase. To overcome this defect, De Forest recommended the use of a fan-shaped network facing the direction of transmission. The umbrella type is characterised by the fact that it has a small radiation coefficient, but, on the other hand, its "natural" period of oscillation is well sustained, a

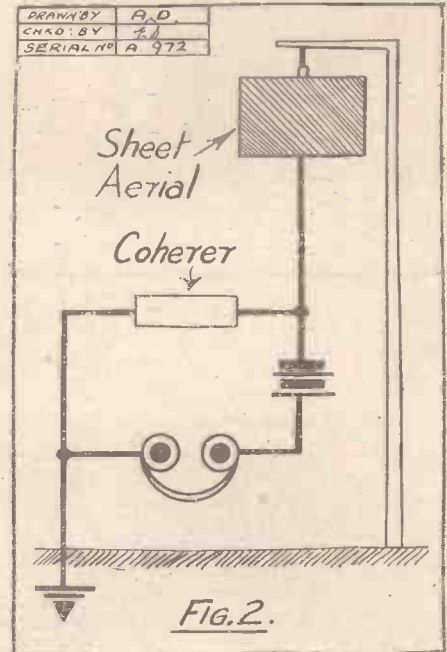


Fig. 2.

property which favours selective reception. For this reason it is still used to some extent in present-day practice.

Inverted-L and T-Type.

Amongst the simpler types, the inverted-L and the T-shaped aerial are the most familiar, the latter being widely used on board ship. One advantage of the former type is its well-known directional effect. This, however, is only appreciable when the horizontal limb is made at least three or four times the length of the vertical limb. It is due partly to the fact that the top of the received waves is inclined to the vertical, and partly to the combined effect of the induced currents and the external or free ether wave, as in the Beverage aerial, referred to below.

In the T-aerial the currents in the two horizontal limbs are in opposition, at any given instant, so that the main radiation comes from the vertical part of the wire, and is non-directional in character.

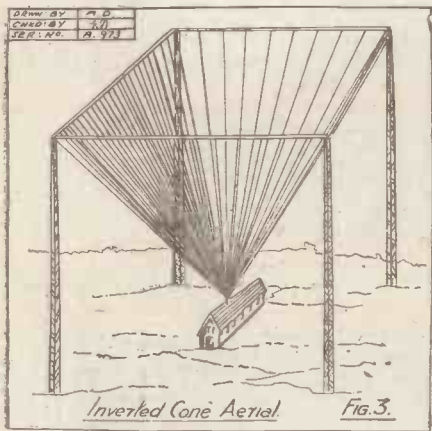
The Lodge Aerial.

An innovation of a striking character was the tuned aerial first developed by Lodge (Continued on next page.)

AERIAL DEVELOPMENTS.

(Continued from previous page.)

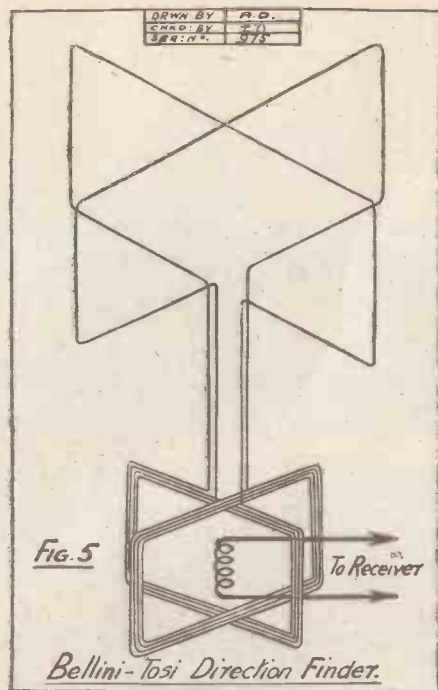
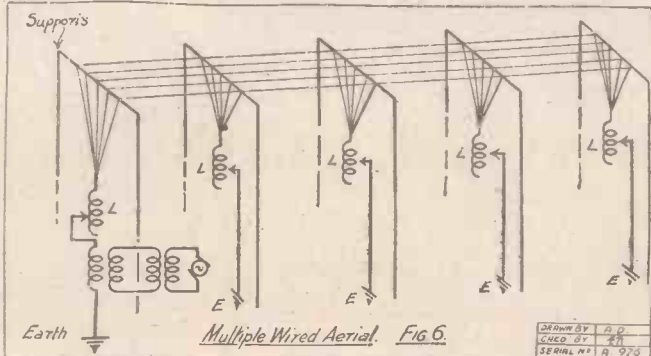
and originally used in the Lodge-Muirhead system. Apart from introducing the idea of tuning the radiated waves to a definite frequency, a characteristic feature of the aerial was the use of a balancing capacity or counterpoise B, as shown in Fig. 4, in place of a direct earth connection. Both



the counterpoise B and the flat upper portion A of the aerial were arranged in the form of a Maltese cross, one being a replica of the other.

Closed Circuit or Frame Aerials.

The development of the thermionic amplifier made it possible to utilise comparatively small loop or frame aerials for long-distance reception in place of the elevated wire. One essential difference between the closed circuit, or loop aerial, and the open-circuit or elevated aerial, is the fact that in reception the former is influenced mainly by the



electro-magnetic component of the ether wave, whilst the latter is energised by the electro-static component.

It is to this difference that the well-known directional property of the frame is largely due, the greatest signal strength being

obtained when the magnetic flux through the coil windings is a maximum. In the case of the ordinary earth-bound wave, where the magnetic component is at right angles to the direction of the wave front, and parallel to the earth's surface, the linkage of flux through the coil windings will be greatest when the plane of the windings is pointing towards the source of radiation.

Bellini-Tosi Aerial.

This fact was utilised at an early date, before the introduction of the valve, by Bellini-Tosi and others, who used closed loop aerials of large dimensions as radio-goniometers, or direction-finders. Fig. 5.

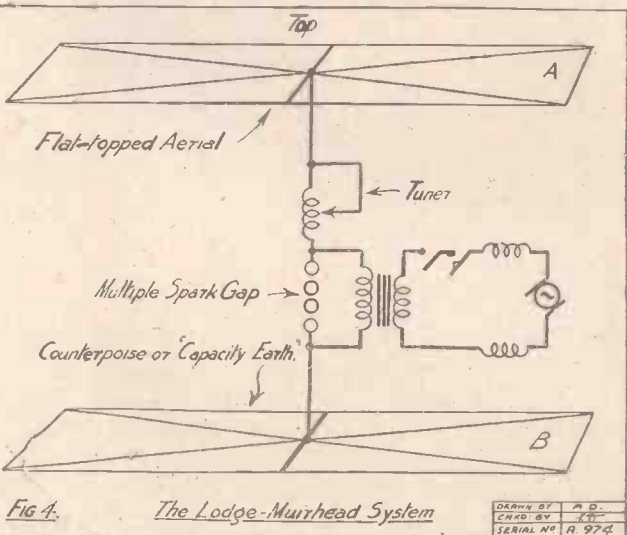
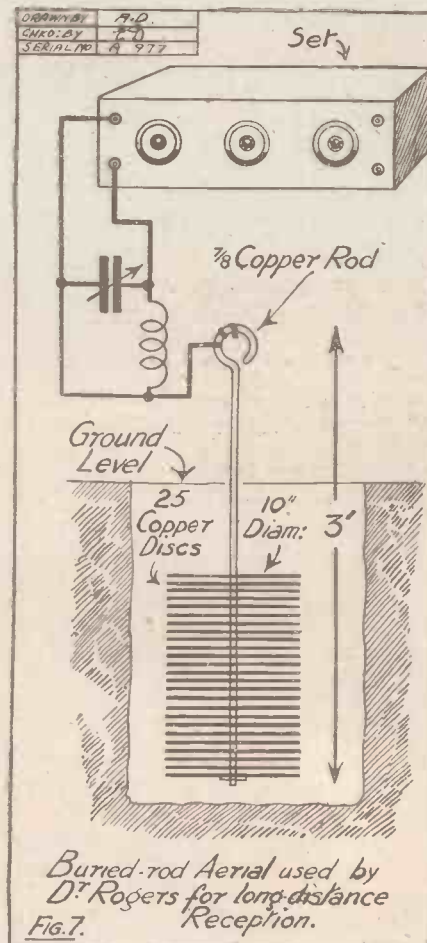
Nowadays comparatively small frames are used in combination with multi-valve amplifiers to compensate for the small "pick-up" of energy.

Multiple-Tuned Antennæ.

The question of reducing earth losses has always been an important factor in aerial design. Fig. 6 shows a system which in effect consists of a number of separate aerials in parallel, each being separately tuned by means of coils L. The result of providing separate earthing-points in parallel, as shown, is to reduce the overall earth and tuning-coil resistances in proportion. For instance, the total effective resistance of a system having five separate earths, as shown, is approximately only one-fifth of the resistance of each of the aerial units taken separately.

Buried Aerials.

The question as to the precise method in which ether waves travel from one



point on the earth's surface to another, is a long-standing subject of controversy. There are still many exponents of the theory that the earth itself is the conducting medium, and that even with short-wave radiation, where some proportion of the radiated energy is known to be propagated via the upper limits of the atmosphere as free "space" waves, there still remains a residual part which is confined to and travels through the ground.

Lee de Forest, Rogers, and others, have successfully utilised aerial lines lying on,

(Continued on next page.)

QUITE a useful little fitting for a small radio cabinet of the type which is usually constructed for fitting crystal sets and single-valve amplifiers into, may be made from a small strip of brass and a few small screws.

Procure a strip of springy brass about $\frac{1}{8}$ in. thick, $\frac{1}{2}$ in. wide, and approximately 2 or 2 $\frac{1}{2}$ in. long. Smooth all the surfaces of the brass strip well with sandpaper, and be careful also to remove any sharp edges by the same means.

Next, give the strip one or two coats of thin, clear shellac varnish, which will act as a lacquer and preserve the metal from atmospheric deterioration.

A Simple Device.

With a pair of pliers, bend up about half an inch of the strip to act as a thumb grip. The strip is now screwed to the cabinet in the manner indicated in the accompanying illustration. It will be noted that five holes must be drilled in the strip. These holes are necessary in order to allow the strip to be fastened absolutely rigidly to the cabinet lid.

A small projecting screw is placed on the lower side of the cabinet about a quarter of an inch from its upper edge. When the cabinet lid is closed, the lower hole in the brass strip allows the projecting screw to fit into it. Thus the whole arrangement acts as a satisfactory catch for the cabinet lid, and renders the contents of the cabinet reasonably dustproof. To open the cabinet, the thumb is placed under the bent portion of the strip, and the latter is pulled outwards very slightly. The lid will then open easily.

H.T. Troubles.

TH**ERE** is no perfect H.T. supply. An accumulator is heavy and it is troublesome to get it recharged properly.

The ordinary 60-volt dry battery is expensive, and if one cell goes the rest usually follow quickly.

Flash-lamp batteries are untidy, and one unit or other needs to be replaced every few days.

Wet primary cells have the usual disadvantages of Leclanché batteries.

But whatever type is used, good results will be obtained if proper precautions are taken, and the battery is tested sufficiently often to detect failure at the first possible moment.

A Cause of Distortion.

Testing is essential. The writer is acquainted with an experimenter who spoiled five valves, one after another, by overrunning the filaments when testing a new set, before he discovered that his

PRACTICAL IDEAS.

From a Correspondent.

poor reception was due to the H.T. In this case a comparatively new 36-volt battery, which was used in series with a 60-volt battery, proved to be dud.

The writer himself spent two long evenings testing for faults in a new four-valve set before he found the cause to be H.T. The symptom in this case was low-frequency howling.

A faulty H.T. battery is probably responsible for more occasional distortion than anything else.

The H.T. battery should never be left in a warm place or in the sun, or in a

damp place. Good wander-plugs should be used and good leads. If flash-lamp batteries are used, they should be separated by strips of waxed paper.

A separate H.T. terminal should be provided for each valve, and the voltages supplied should be those recommended by the valve manufacturers. The last L.F. valve will not work properly on 36 volts, nor will the detector (unless resistance coupled) give best results with 120 volts.

Condensers across the H.T. are to be recommended, but if there is any room for doubt regarding the quality of the condensers, they should be tested before use.

A SEVEN-VALVE "DX" RECEIVER.



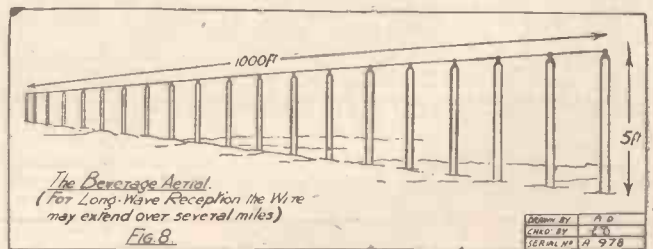
This American seven-valve receiver employs five stages of tuned high-frequency amplification, but is stated to be quite stable and easy to handle.

AERIAL DEVELOPMENTS.

(Continued from previous page.)

or buried beneath, the surface of the earth for long-distance reception, even on short wave-lengths, and it is a peculiarity of such collectors that they are remarkably free from static or atmospheric disturbances.

Fig. 7 shows a simple aerial device with which Dr. Rogers has succeeded in obtaining long-range reception at distances covering several hundred miles on wave-lengths varying between 35 and 100 metres. The aerial consists simply of a $\frac{3}{8}$ in. copper rod, 3-ft. in length, fitted with 25 copper discs 10 in. in diameter, and spaced about an inch apart. The rod is sunk into a hole in the ground, which is preferably half-filled with water, as shown, in order to improve reception.



Beverage Aerials.

Another aerial development of notable interest is the co-called Beverage aerial shown diagrammatically in Fig. 8. This consists of a long wire, at least several times the wave-length to be received, supported on short poles a few feet above the level of the earth. It is erected so as to lie in the plane of the transmitting station, and is found to possess remarkable directional properties.

or, alternatively, several messages can be received from different stations simultaneously.

NEXT WEEK.

How to Make a "P.W." FILADYNE TWO-VALVER.

This receiver employs the new filament input circuit.

ORDER YOUR COPY NOW.

THE late Mr. William Shakespeare of Stratford-on-Avon, a gentleman of some international repute in the profession of Mr. Bernard Shaw—is often quoted as an authority on various matters ranging from the technical aspects of courtship down to the art of applied assassination in all its multifarious branches. But despite the many-sided interests of the Avon bard to which attention has been called time after time, the present occasion is really the very first one on which the claims of the immortal William for consideration as one of radio's earliest practical pioneers have been put forward.

Early Days.

It is now, therefore, with the greatest amount of satisfaction that I am able to communicate to the Shakespearean world, and to the general public at large, through the medium of this journal, the results of a prolonged and arduous literary investigation which go to prove that Shakespeare must have been in reality one of the most resolute and enthusiastic adherents of the science of radio of his day! Astounding as these revelations may appear to the reader, they are nevertheless conclusions which have been drawn only after a most careful and patient study of the Shakespearean Folios, and they are fully substantiated by the many passages which I am now able to set forth for the first time in this connection.

Naturally, wireless science in Shakespeare's day had not reached the acme of perfection which it has attained in our own time. There was no B.B.C. when Shakespeare was alive. Television was unthought of. Simultaneous broadcasting, the Savoy bands, Captain Eckersley, and the News Bulletins were inventions of the future at that period. Yet, despite all these drawbacks, Shakespeare seems to have got plenty of fun out of his radio interests and activities.

"Tune Your Instrument."

Tuning, of course, was a very imperfect art in Shakespeare's time. But the Bard fully understood the vital necessity of having a set carefully tuned before it can be expected to produce efficient reception.

"Tune your instrument!"—*Taming of the Shrew*, III., i.,

is his fundamental advice to all radio beginners who are out for practical results with their receivers.

One can very well imagine Shakespeare's enthusiasm over his first set.

"My ingenious instrument. Hark, it sounds!"—*Cymbeline*, IV., ii., was the exclamation of the poet on bringing in his first reception. A feat well worthy of enthusiasm, too, in those days of no blue prints and no constructional articles!

The valve is popularly supposed to be an invention of recent date. But in Shakespeare's writings many perfectly clear references to this device are to be seen. Shakespeare has in reality immortalised the valve in his passage:

"The lamp that burns by night Dries up her oil to lend the world her light."—*Venus and Adonis*.

And again, the following reference to multi-valve receivers is a perfectly plain one:

"Were never four such lamps together mix'd."—*Venus and Adonis*.

But valves were very far from being per-

SHAKESPEARE ON WIRELESS!

The National Bard as a Radio Enthusiast.

By "ARIEL."

Our (un)learned contributor makes some remarkable disclosures in this article, and he proves (to his own satisfaction) that the renowned William was undoubtedly a keen radio "fan."

fect in those days. Nor were accumulators any more efficient. An hour or two's use, after which, laments Shakespeare:

"My wasting lamps some fading glimmer left—

My dull, deaf ears a little use."—*Comedy of Errors*, V., i.

The First Classical Set.

It is very easy to imagine the degree of patience which our poet had with his receivers.



Shakespeare, the Sixteenth-Century Radio Fan.

Early constructed instruments, they must undoubtedly have proved to be tremendously inefficient and troublesome in actual use. They gave, says the praiseworthy William:

"One fading moment's

mirth, with twenty watchful, weary, tedious nights."—*Two Gentlemen of Verona*, I., i.

And components! Without a doubt they were indeed scarce at that time. Still, we find Shakespeare rallying together his radio friends in order to assist in the construction of a newly devised receiver.

"We'll make an instrument of this: omit Nothing may give us aid."—*Winter's Tale*, IV., iii.

exclaims Shakespeare the radio constructor to his brother radioists. And, verily, these early constructors must indeed have produced that first classical wireless set which the poet himself likens to:

"A cunning instrument, cased up."—*Richard III.*, I., iii.

Dire Punishment for Oscillation.

Atmospherics troubled the early radio pioneers of the period just as much as they cause annoyance to modern radio amateurs. Shakespeare was an adept in the art of recognising:

"Idle sounds resembling parasites."—*Venus and Adonis*,

but, nevertheless, despite his genius, he was unable to devise any method of eradicating them,

Even the oscillator existed in Shakespeare's day. But the poet was well up to the wiles of these individuals, and his proposed drastic remedy for this sort of annoyance is characteristic. Says he:

"He that interrupts, him shall not live!"—*Henry VI.*, III., I., i.

Whether there was anything in the nature of a wireless licence during Shakespeare's time, or whether our national bard enrolled himself in the band of broadcast pirates is a question which will perhaps never be answered. But, nevertheless, we find the poet rejoicing over the fact that

"This will prove a brave kingdom to me, where

I shall have my music for nothing!"—*Tempest*, III., ii.

A Little DX Work.

As a DX experimenter, Shakespeare must have attained to some degree of local renown.

"Gentlemen, take up some other station!"—*Coriolanus*, IV., v.,

he cries, which exclamation probably originated among his utterances at a DX meeting of the local radio society.

Daylight fading was also a radio phenomenon not unknown to Shakespeare. The poet appears to have thoroughly well studied the effect of daylight on wireless signals. At any rate, his following remark is significant even in the ears of the modern radio enthusiast. Obviously referring to reception by night, he says:

"Methinks it sounds much sweeter than by day."—*Merchant of Venice*, II., i.

And finally, although much of the above quoted advice of Shakespeare on the subject of wireless may appear platitudinous in modern ears, there is one utterance of the poet which, I think, still holds in the modern radio world, and which could be quite usefully emblazoned in golden characters on the walls of every broadcasting studio in the country for the benefit of long-winded and grandfatherly announcers in particular. It is:

"Speak, breathe, discuss: brief, short, quick, snap!"—*Merry Wives of Windsor*, IV., v.

CLEANING YOUR CRYSTALS.

By Victor Hamilton.

IT has frequently been stated in wireless periodicals that crystals which have lost their sensitivity through frequent handling, may be cleaned and revived by the aid of methylated spirits or turpentine. It may not be generally known, however, that much of the commercial spirit is far from pure, and contains resinous substances.

When a crystal is dipped in this impure spirit, and allowed to dry by evaporation, a film of resin is left on the surface of the crystal. This has the effect of preventing proper contact between the crystal and the cat's-whisker, so that the last state of that crystal may be worse than the first.

The remedy is to use only the purified spirit, which is readily obtainable, and to keep it in a bottle which has been rinsed out with a little of the spirit, to ensure that it shall be free from grease.

This hint may solve the difficulties of those who have found that "cleaning" a crystal does not restore its sensitivity.



Mercury outdone!

MERCURY is a back number nowadays. For years his supremacy as a swift bearer of tidings went unchallenged. But then came railways and motor-cars, aeroplanes, and the telephone, and Mercury was outdone. His real death-blow came with CLEARTRON VALVES—the most faithful, the swiftest, and the most pleasing form of message transmission ever devised.

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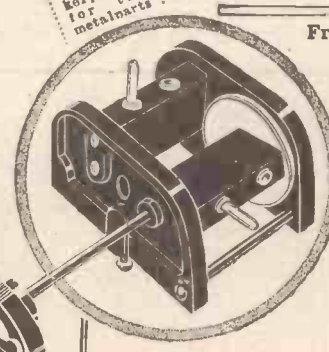
Two Types:

- For outside panel mounting:
- Two-way 7/-
- Three-way 10/6
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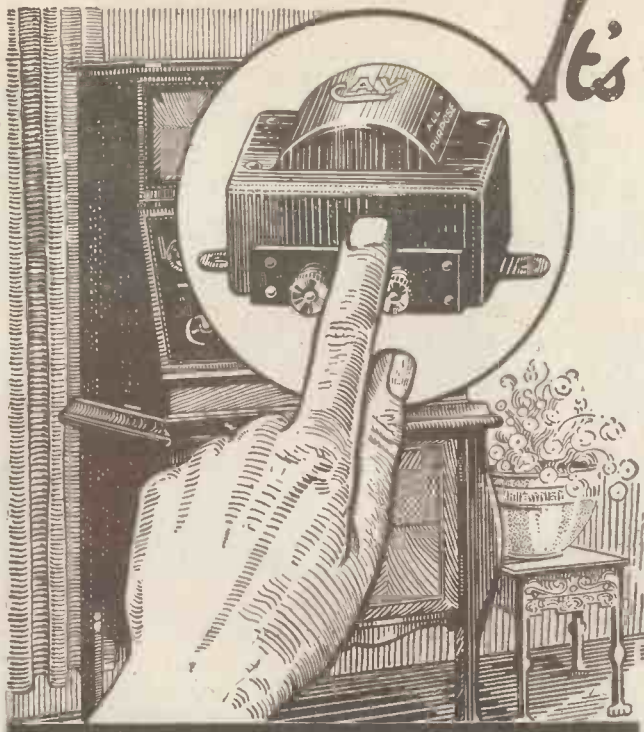
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Hum entirely eliminated.

To ensure your complete satisfaction we will send an instrument for 14 days' free trial. Advise us your mains voltage and periodicity and a suitable instrument will be forwarded without delay. Try it at your own leisure for two weeks. If you do not find it entirely satisfactory, return to us with its seal unbroken and your money will be refunded in full. For three years after purchase of instrument we undertake to repair or replace if necessary without charge, providing seals are intact.

Standard Model in oak cabinet, 3 H.T. + tappings, arranged to give any voltage up to 150. **£6 : 6 : 0.**
Extra + tappings 5/- each.
Complete set of components for home constructors (without cabinet) and wiring diagram. **£5 : 0 : 0.**

(See page 768 of this issue.)

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This one has two windings!

Two windings, one of a resistance of 6 ohms and a continuation of this on to a 30-ohm strip winding. Made specially to meet demand for a rheostat covering needs of both bright and dull emitter valves. Resistance wire wound on hard fibre strip under great tension



THE "PEERLESS" DUAL RHEOSTAT
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and immune from damage. One-hole fixing, terminals conveniently placed. Contact arm has smooth silky action. All metal parts nickel-plated. Complete with ebonite combined knob and dial.

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THE FORMER OF THE FUTURE.

Low Loss. Size 3 ins. diameter to outside of wings. Made from the famous BECOL EBONITE. Specially designed for low loss. Large air space between wings. Easy winding. Thoroughly dependable and British made.

From all dealers, in 6 inch lengths, 3/-
THE BRITISH EBONITE CO., LTD., HANWELL, LONDON, W.7.
Rods, Tubes, Sheets, Panels, Mouldings, etc.

THE writer approaches the task of describing what might be called a novel type of crystal set with timidity.

The number of "super" crystal receivers which have been designed and published from time to time is legion, and, whilst most of them are undoubtedly very fine instruments and possess all the characteristics claimed for them, there is still the section of "broadcatchers" who get poor results.

Some people rig up contraptions of clothes-props and wire of a kind and dub the result aerial; they then construct the first "super" set which they find described, and, having tried it out on the aforementioned "aerial," at once condemn the

A LOW-LOSS VARIO-METER CRYSTAL SET.

Some Detailed Instructions for Constructors.

FROM A CORRESPONDENT.

Should the reader decide to build the instrument now detailed, he would be well advised to collect every single component required before a start is made on the construction, as, apart from accuracy in marking out the ebonite parts, it will be found that the making of this set is a most fascinating job, which can hardly be left unfinished, and to discover at midnight that twopenny-

will supply the end plate for a fixed and moving coil. To cut out the centre portion of the ebonite a $\frac{1}{8}$ -in. hole should be drilled in the $\frac{1}{2}$ -in. space between the two circles to admit a stout fretsaw blade, which will be found to cut the ebonite easily, and if any lubricant should be found necessary use only pure turpentine.

The rough-cut edges must now be trimmed off exactly to the scribed lines with the aid of a medium-cut, half-round file and fine glass or emery paper. Diagrams E and F show the two runner supports, which are to be trimmed up and marked off in exactly the same way. When the various parts are ready for drilling, the centres for all kinds of holes should be popped with a centre punch to form a guide for the drill-point, which otherwise would tend to creep away from the true centres, and exactitude must be the order for the day.

All the drilling should be done at once, and the holes countersunk as necessary, and if the constructor should not possess a $\frac{1}{2}$ -in. twist drill for the runner rod holes it will be sufficiently accurate to run a smaller drill through the true centre and afterwards rime out the holes to the necessary size.

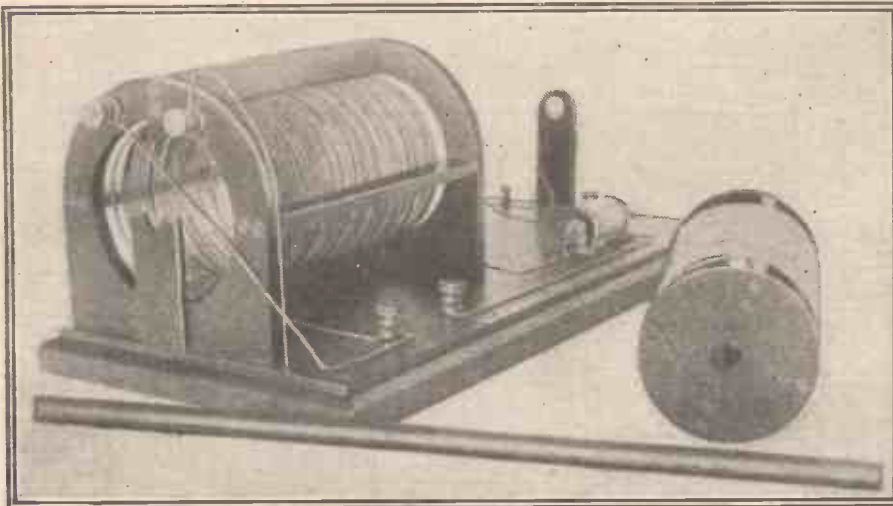
The Coil Supports.

This will complete the parts for the skeleton framework with the exception of the eight coil-supporting strips.

It is essential that these eight ebonite strips be exactly of the sizes given and that they be cut dead true on all faces, as the symmetry of the structure depends on this operation being properly carried out.

The two 4 B.A. tapping holes at each end must be drilled to exactly coincide with those on the end plates, as any ill-fitting and consequent straining of the screws on assembly would be certain to fracture one or other of the parts.

Having completed the blank strips as above, they are to be notched to receive the wire spirals forming the windings. This will be best accomplished by clamping the eight strips together in the vice in the manner shown on the accompanying sketch



The crystal set before the inner coil has been mounted on the ebonite support. The ebonite rod is seen in the foreground.

set as useless and the person who described it as a worthy follower of Ananias—which is, of course, hardly fair.

A certain wireless engineer of repute is stated to have said that "the be all and end all of a crystal set is the aerial," and although the writer does not agree that the aerial is the "end all" of the matter, it is undoubtedly the beginning, and be it a good one or a bad one depends entirely on the efficiency of the aerial and earth system in use. It is essential, if good results are to be obtained with this set, or indeed any set, that the aerial be also of the low-loss class.

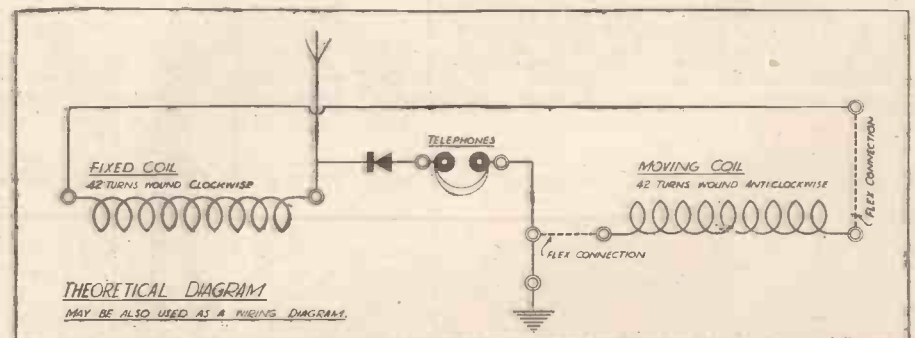
The results obtained from any crystal set are, naturally, strictly limited by the amount of energy collected by the aerial, and if this very small amount of energy is allowed any leakage path to earth, then the results to be looked for can only be very ordinary.

Commencing Construction.

Back numbers of this journal have from time to time contained most excellent advice and instructions for the use of those contemplating erecting an aerial, and should the reader be in any doubt as to the efficiency of his present installation a look over these ancient pages will well repay the time expended.

worth of the necessary screws to complete the job are missing is, to say the least, most aggravating.

The ebonite base must first of all be marked off exactly according to the dimensioned Diagram G supplied, particular care being taken to have it perfectly square.



If a different detector from the one specified is used, the holes must be marked out to suit the substitute.

Next take the two 5 in. x 5 in. x $\frac{3}{8}$ in. pieces of ebonite and mark them out according to the Diagrams A and B. Each piece

and making the necessary cuts about $\frac{1}{8}$ in. deep with a coarse-set hacksaw blade, the use of a square being advocated to form a guide for the saw blade and to ensure that all the cuts shall be parallel to one another.

(Continued on next page.)

A LOW-LOSS VARIO-METER CRYSTAL SET.

(Continued from previous page.)

If the spacing and cutting are carefully done and the strips assembled in the order as marked, a perfectly symmetrical ebonite skeleton and wire spiral will be the final result. Care must be taken to assemble the notched edges of the coil-holding strips of the fixed coil facing inwards, as the coil is internally wound, the idea being to secure tighter coupling between what are actually in effect the rotor and stator of the vario-meter.

The notched edges of the strips for the moving coil are assembled facing outwards, the coil being externally wound.

If the isometric projection illustrating the assembly of the parts is consulted there ought to be no difficulty experienced. We now approach the most ticklish operation of all—the winding and inserting of the fixed coil into its carrier. The method adopted by the writer was as follows:

A 3 1/4-in. former was procured and on it fifty turns of 14 S.W.G. tinned copper wire were wound in a clockwise direction, both ends of the winding being secured with string.

Mounting the Coils.

Former and winding are then inserted into the carrier and the commencing end of the winding released; the natural spring of the wire then automatically opening out the winding into the grooves provided for it.

The commencement of the winding was secured to the terminal on the front of the outer end plate, and then by turning the former, with the finishing end of the winding still attached to it, it was found a simple matter to thread all the turns of wire into their respective grooves, and the end of the winding was cut off at the proper length and secured to the terminal on the inner end plate, which is also the aerial connection.

For the moving-coil winding a 3 in. diameter former is required, with, say, 45 turns of wire wound as before, but in the opposite direction, and when the ends are released the resulting spiral is slipped over the moving-coil carrier.

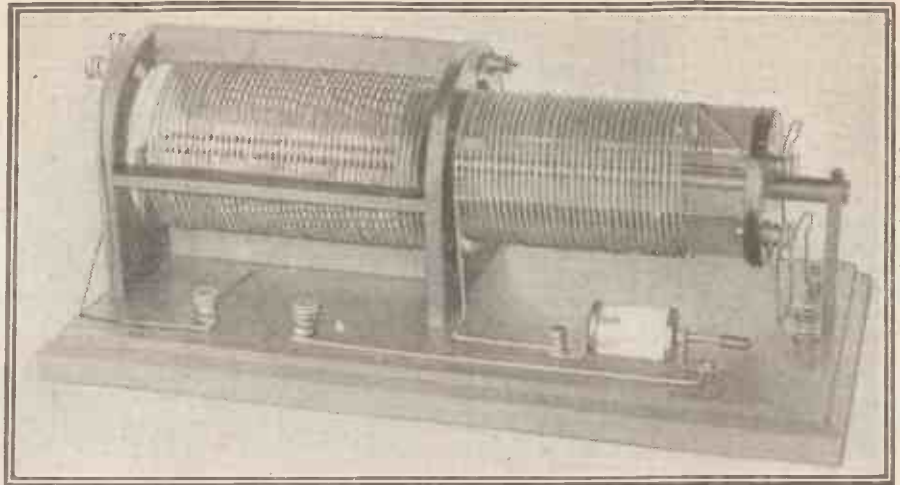
The winding is hooked over the 3/4 in. x 1/2 in. notched bar at the starting end, C, and, carefully retaining the shape of the wire, the turns are smoothed down into position in the slots and the end of the wire secured to one of the terminals situated on the inner end plate, the remaining terminal being joined to the starting end of the winding by means of a length of the same wire, passing through the centre of the winding so as to clear the ebonite carrier rod.

Wiring Up.

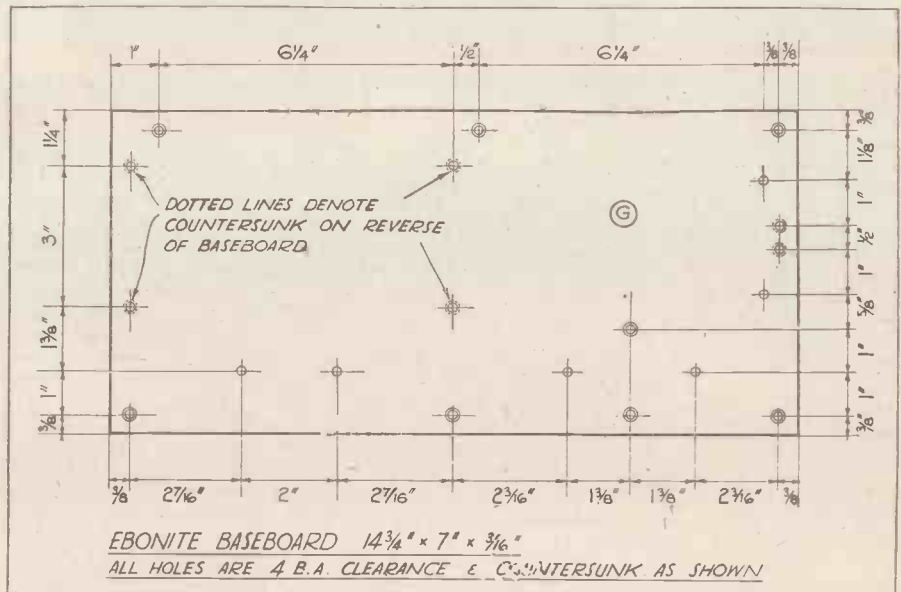
After the successful completion of the windings the moving coil is to be placed inside the fixed one and the 1/2-in. ebonite rod threaded through the moving-coil end plates and the runner supports, the rod being held in position by means of two 4 B.A. x 1 in. cheesehead screws in the runner supports, the rod having been previously drilled to accommodate the screws.

The instrument is now ready for wiring

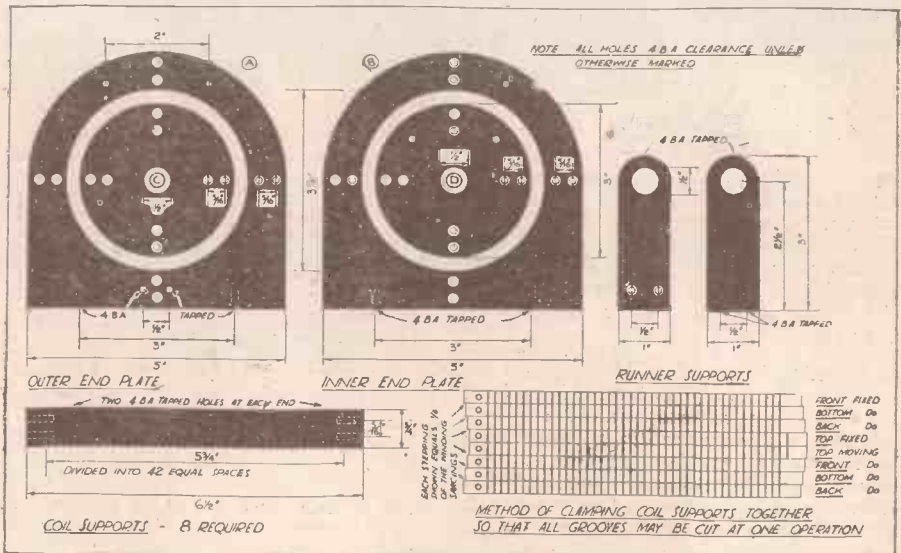
(Continued on next page.)



A photograph of the complete receiver. The even spacing of the turns on both the coils should be noted.



Full details of the drilling of the baseboard are given above.



This diagram shows the dimensions of the end pieces and supports of the crystal set.

MAKING THE VALVE IMMORTAL.

By A. J. BOYINGTON.

VALVES—as every amateur knows—possess a wonderful propensity for going on strike when their services are most needed. A favourite time, apparently, for a valve to burn out or to go dead, is when you are trying to demonstrate the remarkable qualities of your receiver to some friend. The music starts off with a grand flourish—and then suddenly stops or simply fades nearly away.

For the burnt-out valve, of course, there is no hope. Either it must be scrapped—however reluctantly—or it must be sent for filament repairs. But thousands of valves that have simply gone “dead” will react wonderfully to the right kind of stimulant, and a dose of artificial respiration (in the wireless sense of the term) will often give a new lease of life to an expiring “tube.”

The foregoing applies both to valves that have worn out in service, and to valves that have become paralysed through the use of too much high-tension, or from forcing the filaments by burning them too brightly—both expedients frequently adopted in an effort to obtain increased volume of signals.

The majority of standard British valves now in use are “dull emitters.” In other words, the filaments are coated with a substance which ensures a plentiful flow of electrons when heated only beyond the point of dull redness. The filament, fine as it is, is, in many cases, built up of several exceedingly thin layers of the coated metal, and if the valve is forced beyond its proper limits the surface material is dissipated at a greater rate than it can be replaced from within the filament itself.

“Reviving” the Valves.

Curiously enough, the way to rejuvenate these paralysed valves is to force them—a proposition which sounds very much like fighting fire with fire.” The forcing process, however, is confined to the filament alone and the H.T. battery must be disconnected entirely.

In theory, at least, the way to revive radio valves is to heat the filament to a temperature considerably above the normal. This excess heat appears to have the effect of forcing more of the active material to the surface, and since the anode battery is disconnected, the material is not used up, and accumulates where it can be of service when the valve is restored to normal service.

Obviously, no valve will last indefinitely. Some will stand the rejuvenation process several times, others only once or twice; but it is safe to predict that the average life of a modern vacuum tube can, by this method, be prolonged greatly beyond the point of its first collapse.

There are one or two devices, especially manufactured for the purpose, on the American market which are sold as “tube rejuvenators,” although I have never seen such devices appearing under the auspices of our own manufacturers. They consist essentially of an alternating-current trans-

former arranged so that a potential of 17 volts may be applied to the filament of the standard valve.

The filament is operated at this voltage for 15 seconds, when a switching arrangement brings in another tapping on the transformer giving 8 volts. Ten minutes’ treatment is specified at this temperature, after which the filament has taken to itself a new lease of life. The unit operates from the ordinary house supply by plugging into the electric-light socket.

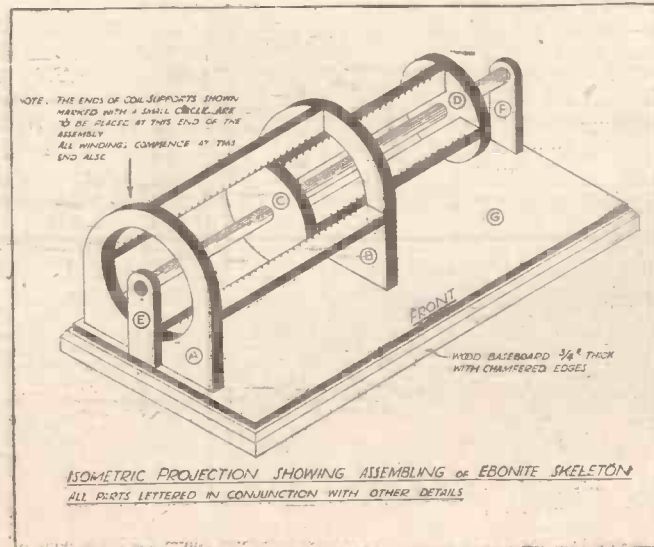
A Successful Treatment.

Following the instructions given above and using the high-tension battery as the “rejuvenator,” an old friend—in the form of a Dutch 3 volt—0.6 amp. amplifier which had suffered a paralytic seizure after some months of usefulness—was successfully coaxed back to reason. In its devitalised state the plate current on 90 volts had dropped from 7.5 to 0.1 milliamperes. After the treatment, and within half an hour of being put into commission again, the plate current was 8.4 milliamps, and the “Dutch bulb” was even better than before!

Since then, I have been successful in restoring quite a number of dull emitters, of various types and makes, by similar treatment. In a few cases it has not proved successful—there have been some valves apparently too far gone for remedial measures, and there have also been some brilliant “burn-outs.”

A safer plan—though possibly less productive of best results—consists in running the valves at normal filament voltages for several hours with the high-tension battery disconnected. With this method there is certainly no risk of burning out the filament.

Even so, a “dud” valve is of no practical value while it remains a “dud,” so perhaps the more heroic treatment will find greater favour with our readers.



A LOW-LOSS VARIOMETER CRYSTAL SET.

(Continued from previous page.)

up, the point-to-point connections being as follows:

Starting end of fixed coil to terminal for flex connection to moving coil.

Remaining terminal for flex connection to earth and one telephone terminal.

Remaining telephone terminal to cat-whisker.

Crystal to aerial terminal and finishing end of fixed coil.

The two terminals for connection to moving coil are joined to the two terminals on the end of the moving coil holder by means of two lengths of rubber-covered flex, the connections being reversed to find the correct position.

COMPONENT PARTS REQUIRED.

	s.	d.
1 Wood baseboard, 15½ × 8 × ¾ in.	1	6
1 Ebonite baseboard, 14½ × 7 × ¾ in.	8	2
2 Ebonite 5 × 5 × ¼ in.	5	0
2 Ebonite 3 × 1 × ¼ in.	0	8
8 Ebonite ½ × ¼ × ¼ in.	0	7
1 Ebonite tube, 14½ × ½ in., external diameter	0	10
38 4 B.A. × ¼ in. C.S. head screws	2	4
2 4 B.A. × 1 in. cheesehead screws	0	1½
8 No. 6 × ¾ in. C.S. head brass wood screws	0	6
9 4 B.A. terminals	0	9
18 in. rubber-covered flex	0	2
30 yds. 14 S.W.G. tinned copper wire	4	2
1 Glass-enclosed detector	3	0
1 Selected synthetic galena crystal and cat-whisker	1	6

As to results obtained, the writer, situated 12 miles south of 5 N O, gets reception such that orchestral items can be clearly understood at a distance of eight feet from the phones in quiet surroundings.

Aberdeen has been received in a perfectly legible manner, and Glasgow used to come in well last year, but has not been heard this year for some unknown reason. Several other stations have been heard, but not at what could be truthfully called legible strength.

The set has never been tested at a greater distance than twelve miles from a main B.B.C. station, so that no information can be given as to its probable maximum range, but at a guess 30 miles would be a fair distance for clear reception.



Apparatus Tested

Traders and manufacturers are invited to submit wireless sets and components to the "P.W." Technical Dept. for test. All tests are carried out with strict impartiality in the "P.W." Test room under the supervision of the Technical Editor, and the general reader is asked to note that this weekly article is also intended to provide a reliable and unbiased guide as to what to buy and what to avoid.—EDITOR.

H.T.C., A.C., H.T. UNIT.

THE H.T.C. Electrical Co., Ltd., 2, Boundaries Road, Balham, London, S.W.12, recently sent us one of their new A.C. H.T. units. It is designed to operate on 200/220 volts, 50 period mains, and provides three anode voltages of approximately 60, 120 and 140 volts. Contained in a solid, well finished oak cabinet, it is both compact and pleasing in appearance. The transformer used, which steps down voltage for the filament of the rectifying valve as well as "passing over" the H.T., is one of the most substantial and cleanly built components of this nature that we have ever seen.

From the foregoing it will be observed that the unit employs valve rectification. The valve is accommodated in a recess provided with four safety valve pins, a rheostat for controlling filament temperature being situated on the side of the case.

A long flexible lead to which is fitted a plug adapter, enables the instrument to be connected to any convenient light point in the house.

An L.S.5 is recommended by the makers of the unit although, of course, other valves can be used. The valve is used as a two electrode rectifier, the plate and grid sockets of the holder being connected together. Among others we discovered that a B.4 operated well in the unit. Naturally, whatever the valve used, its filament must not be overrun or otherwise its life will be as much shortened as if it were overrun in an ordinary receiving set.

The H.T.C. unit gave excellent results and on none of the several sources of supply with which it was tested was trouble from "humming" experienced, employing a straight three-valver of the Det-2 L.F. type. The filament control proved to be fairly critical, but only in initial adjustment, for once a suitable setting was located a condition of excellent stability resulted.

The H.T.C., A.C., H.T. unit costs £6 6s., but is a high-class instrument and well worth the money. The design is straightforward, and good components and careful assembly combine to make it an efficient, dependable unit.

BRETWOOD AUTO-AUDIO AMPLIFIER.

Messrs. Bretwood Ltd., 12-18, London Mews, Maple Street, London, W., recently sent us two of the new "Bretwood" Auto-Audio Frequency Amplifiers. They are complete units designed to take the places of L.F. transformers in L.F. amplifying stages. They are cylindrical in shape, are provided each with four terminals similarly marked (Continued on page 770.)



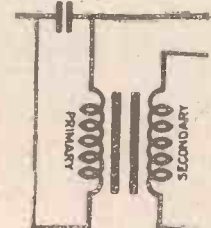
An "Amplion" portable loudspeaker brings music into a sylvan glade.

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L.F. TRANSFORMER

incorporates this BY-PASS CONDENSER WHICH IS INCLUDED IN THE PRICE.



Type AF4 17/6

Type AF3 25/-

The "Nearly Perfect" Transformer.

Ask your dealer for leaflets Wa 401 and Wa 402.

FERRANTI LTD. HOLLINWOOD, LANCASHIRE.

...lower H.F. resistance than any other commercial plug in coil!

Made by the manufacturers of Glazite.



TESTS carried out by the National Physical Laboratory show that the LEWCOS COIL has a lower H.F. Resistance than any other coil on the market. Its low H.F. resistance combined with great selectivity and mechanical strength make the LEWCOS Coil the finest you can buy. Try a LEWCOS Coil in your set—it makes all

the difference! Descriptive leaflet sent free on request to:

THE LONDON ELECTRIC WIRE COMPANY & SMITHS LTD. Playhouse Yard, Golden Lane, London, E.C.1.

No.	25	35	40	50	60	75	100	150	200	250	300
Price	4/6	4/6	4/6	5/-	5/6	5/6	6/9	7/6	8/6	9/-	10/-

LEWCOS Inductance COIL

Ask your Dealer for the Edison Folder "2 New Valves"

TWO NEW DULL EMITTERS

For use with 4-volt Accumulator

When the selected teams take the field—listen to the scores on the popularly selected valves; the dependable, long innings valves with the team work reputation.

G.P. 4

General Purpose DULL EMITTER for use with 4-volt accumulator. Lower current consumption. Clearer reception. Louder volume. Microphonic effects reduced to minimum. 16/6 each

Volts	..	..	..	..	3.5-4
Amps.	..	..	..	..	15
Plate Voltage	..	..	..	..	60-120
Amplification Factor	..	..	..	..	12
Slope	..	..	..	..	55 Ma/v
Impedance	..	..	..	..	22,000 Ohms

P.V. 4

Power Valve for use with 4-volt accumulator. It is the ideal companion to G.P. 4. Loud Speaker volume with extreme purity of tone. 22/6 each

Volts	..	..	..	..	3.5-4
Amps.	..	..	..	..	35
Plate Voltage	..	..	..	..	60-120
Amplification Factor	..	..	..	..	6
Slope	..	..	..	..	65 Ma/v
Impedance	..	..	..	..	9,500 Ohms

The following table indicates the combinations of Edison Valves for PERFECT RECEPTION

Receiving	Price	Accumulator of Battery Volts	Power	Price
G.P.4	16/6	4	P.V.4	22/6
A.R.	8/-	4	P.V.4	22/6
A.R.		6	P.V.5	22/6
*ARDE	14/-	2	P.V.6	18/6
*A.R.'06	16/6	3	P.V.8	22/6

* Made in L.F. and H.F. types.
All DULL EMITTERS except A.R.

FIT

EDISWAN

The Edison Swan Electric Co. Ltd

VALVES

123-5, Q'n Victoria St London E.C. 4

AND NURSE

YOUR SET

S.V. 3



Opera in your Garden

ON many an evening just now you can hear the strains of a Loud Speaker in someone's garden; more and more is Radio welcomed as an added joy to the pleasures of outdoor life. Bring the opera to your Garden—with the Brown.

For absolute fidelity of reproduction, pure, mellowness of tone—with an entire lack of "tinny" or metallic effects—and perfect volume, can only be found in an instrument upon which extreme care has been lavished, and behind which is the experience of years of telephonic work. That is what you get when you buy a Brown—England's first and leading Loud Speaker. Prove this for yourself by getting your Dealer to demonstrate Brown Instruments to you.

There's a Brown for everyone!

Brown Loud Speakers are made in the following types—H.1, 120 ohms £5 5 0, 2,000 ohms £5 8 0, 4,000 ohms £5 10 0. H.2, 120 ohms £2 5 0, 2,000 ohms £2 8 0, 4,000 ohms £2 10 0. H.3, 2,000 ohms £3 0 0. H.4, 2,000 ohms £1 10 0. H.Q, 2,000 or 4,000 ohms £6 0 0. Type Q, 120, 2,000 or 4,000 ohms £15 15 0. Cabinet Type, 2,000 or 4,000 ohms £5 6 0, and Crystavox £6 0 0.

There is also a range of Brown Headphones. They are priced from 20/- to 60/- Ask your dealer!

Brown

Loud Speakers and Headphones.

S. G. BROWN, Ltd.,

Western Avenue, North Acton, London, W.3

Retail Showrooms:—19, Mortimer Street, W.1; 15, Moorfields, Liverpool; 67, High Street, Southampton.

Wholesale Depots:—2, Lansdown Place West, Bath; Cross House, Westgate Road, Newcastle; 120, Wellington Street, Glasgow; 5-7, Godwin Street, Bradford; N. Ireland: Robert Garmany, Union Chambers, 1, Union Street, Belfast.

APPARATUS TESTED.

(Continued from page 768.)

to those on an L.F. transformer, and are fitted with substantial bases, these being moulded on the main insulation casing.

In principle the Bretwood Auto-Audio Frequency Amplifier comprises the choke-capacity method of coupling and employs the usual condenser and grid leak together with a specially wound choke. All these components are packed away in the insulating casing and the whole forms a very neat compact assembly.

Choke-capacity coupling, when inefficient, or when unsuitable components are used, can prove very disappointing both in point of tone and volume, but given carefully selected apparatus it will almost equal the transformer for the latter quality, and the resistance method for the former. But Messrs. Bretwood's have introduced a step-up effort by designing a choke on the auto-coupling principle, and in this respect they have introduced an element of novelty into the scheme. How exactly this operates is rather baffling for it is easy enough to understand voltage amplification with double winding transformers, but difficult when a common impedance figures in the circuit, for the functions of two such components differ.

However, on test, the Bretwood Auto-Audio Frequency Amplifier in a first-stage position gave very good results. There was almost negligible wave distortion over a comprehensive frequency range while volume was not far short of that given by a

first-class transformer. Two stages functioned together perfectly and it was here that the component proved its worth to a really marked degree. Amplification was full and distortionless and there was a commendable absence of audio irregularities. This Bretwood unit costs £1, and can be recommended to the attention of our readers.

A PRICE CORRECTION.

In the article describing the construction of the One-valve Filadyne Receiver, which appeared in "P.W." a week or two ago, the price of the Burndept 30-ohm filament rheostat was given as 7s. This was an error; actually the component costs but 5s., a moderate figure for a high-class article.

THE VARLEY MAGNET CO.

We have been asked by Oliver Pell Control, Ltd., to point out that there is absolutely no connection between their subsidiary

company, the Varley Magnet Co., and the Varley Radio Co., which they state is now defunct. There has been a certain amount of confusion between the two, and this they consider is hardly fair to the Varley Magnet Co., whose well-known Varley Bi-Duplex Wire-Wound Anode Resistances are so popular, and who are so firmly established in the trade.

HIRING H.T. ACCUMULATORS.

The Radio Service Company, of 105A, Torriano Avenue, Leighton Road, Kentish Town, N.W.5, have inaugurated a high-tension accumulator service in addition to their ordinary battery hire and maintenance service. Terms are very reasonable, ranging from 7/6 per quarter for 24 volts to 16/- for 72. Thus it is now possible for quite a low figure to hire both L.T. and H.T., and be kept entirely free from all charging and renewal worries.



An "Amplion" portable loud speaker entertaining a picnic party on the banks of the Thames.

Another SHORTPATH Valve

S.P. 18/B (BLUE SPOT)

This new S.P. 18 Valve supplements the well-known S.P. 18 Red Spot and Green Spot Valves. It is designed especially for use in resistance-capacity coupled sets and for use as a Detector and in H.F. neutrodyne tuned anode stages using 80-120 Volts H.T., so that where this H.T. is employed in the last stage, the difficulty of two H.T. supplies is avoided.

In addition, it gives still more amplification and consumes very little H.T. current.

The S.P./B (Blue Spot) is an excellent valve for anode bend detection. Designed to work in parallel with the S.P. 18 Red Spot and Green Spot Valves, it operates from a 2-volt accumulator and consumes only 0.09 amp. filament current.

PRICES OF "COSMOS" SHORTPATH S.P. 18 VALVES.

RED SPOT	: GREEN SPOT	: BLUE SPOT
12/6	: 12/6	: 12/6

METRO-VICK SUPPLIES, LTD.

(Proprietors: Metropolitan-Vickers Electrical Co., Ltd.)
METRO-VICK HOUSE, 145, Charing Cross Road, LONDON, W.C.2

"Cosmos" SHORTPATH S.P.18 Valves are recommended for use as shown below with alternative H.T. values:

Stage	Coupling	Recommended Valves H.T.	
		20-80 V.	80-120 V.
H.F. Amplifier	Tuned Anode (neutrodyne)	Green	Blue
	Tuned Anode (not neutrodyne)	Green	—
	Transformer (tight coupled)	Red	—
Dual or Reflex	Transformer (loose coupled)	Green	—
Detector (Grid Leak)	All Couplings	Red	Red
	Resistance Coupling	—	Blue
Detector (Anode Bend)	L.F. Transformer or Choke	Green	Blue
	All Couplings	—	Blue
L.F. Stages	All Couplings	—	Blue
	Resistance L.F. Transformer or Choke	Green	Green
Last Stage	All Couplings	Green	Green
	—	Red	Red

Cosmos

RADIO VALVES

R V39

RADIOTORIAL.

The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with every article. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

TECHNICAL QUERIES.

Letters should be addressed to: Technical Query Dept., "Popular Wireless," The Fleetway House, Farringdon Street, London, E.C.4.

They should be written on one side of the paper only, and **MUST** be accompanied by a stamped addressed envelope.

Queries should be asked in the form of the numbered questions: (1), (2), (3), etc., but may be accompanied by a short letter giving any necessary additional particulars as briefly as possible.

For every question asked a fee of 6d. should be enclosed. A copy of the numbered questions should be kept, so that the replies may be given under the numbers. (It is not possible to reproduce the question in the answer.)

BLUE PRINTS. A series of 20 Blue Prints can be obtained from the Query Dept., price 6d. per Blue Print. (A stamped addressed envelope should be sent.)

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

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

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

Wiring diagrams of commercial apparatus, such as sets of any particular manufacture, etc., cannot be supplied. (Such particulars can only be obtained from the makers.)

Readers may submit their own diagrams, etc., for correction or for criticism. The fee is 1s. per diagram, and these should be large, and as clear as possible.

No questions can be answered by 'phone.

Remittances should be in the form of Postal Orders.

Questions and Answers

HAND CAPACITY.

P. E. F. (Earlsdon, nr. Coventry).—I am greatly troubled when tuning in distant stations by the fact that my hands seem to affect the set.

As soon as I have made all the adjustments for receiving a weak programme, I lose it because I move my hand. I am told that this is "hand-capacity." What is the cure for this troublesome fault, which is completely spoiling my chances of DX reception?

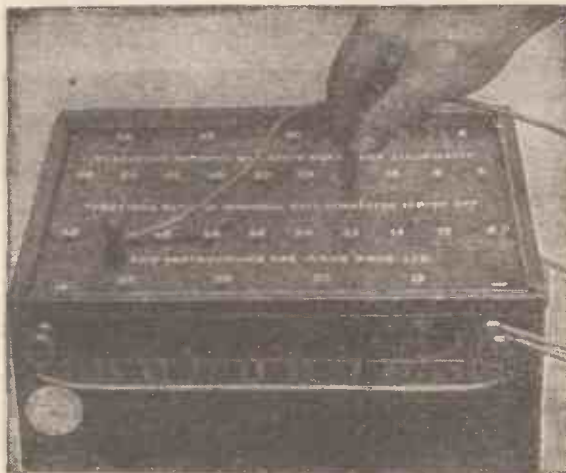
The trouble is probably caused by the internal connections of your set, which are at present so arranged that the H.F. wiring or one of the components in the grid circuit is too near the panel. When tuning in, your hand—which is at earth potential—gets close enough to this part of the set to act like the vernier-plate of a condenser.

The trouble can be cured by wiring the set so that the components and the wiring nearest the front of panel are at earth potential. Reversing the leads to the variable tuning condenser may be sufficient in many cases, but sometimes it is necessary to interpose a metal shield between the hand and the wiring, this shield or "screen" being connected to the earth terminal.

TUNGSTONE 60 VOLT 3 A.H. HIGH TENSION FOR WIRELESS

NO CRACKLING OR PARASITICAL NOISES ON WIRELESS PHONES OR LOUD SPEAKER. NO FROTHING, FOAMING, HEAT and OTHER TROUBLES

Tungstone (Patented) Tapping-Off Cell-Connector. By means of the Wander Plug supplied free, Tappings can be taken off as required at any two-volt cell, or any varying series of cells.



**TUNGSTONE
60 Volt 3 A.H.
is more efficient
than a 100 Volt
Dry Battery.
Will outlive
hundreds of
Dry Batteries.**

TUNGSTONE at £5 15s. includes a Free first partial charge and a Polished Teak Box, also Glass Filler—only 1/11 a volt for a 3 a.h. Inclusive weight 23 lbs. only. Carriage Paid in U.K.

SAVES BUYING A SELECTOR SWITCH COSTING £1-17-6. SAVES COST OF FIRST CHARGE

COMPETITORS sell at 3/3 per volt, including a first charge; also a Selector Switch necessary costing £1 17s. 6d. making total cost of £9 15s.

TUNGSTONE creates a World's record for lowest price, minimum weight (only 23 lbs.) portability, accessibility, compactness, perfect rubber insulation, long periods between re-charges, no self-discharge nor sudden drop of voltage. Ideal for Hot Climates, and can be sent Overseas with Free first partial charge, without acid.

Under normal working conditions the calculated plate life is at least Four Years, and for a 3 or 4 valve set estimated to require recharging about every three months. First FREE charge lasts one month.

TUNGSTONE High Tension 60 Volt Battery 3 a.h. is sold in the United Kingdom on monthly payments over extended period. Apply for particulars. Further interesting information on points of this advertisement are to be found on pages 58, 59 and 67 to 73 of the Illustrated Booklet "Photography tells the Story" which will be sent free on application to the— T.A. 41

TUNGSTONE ACCUMULATOR CO., LTD., St. Bride's House, Salisbury Square, London, E.C.4.

PICKETTS CABINETS

:: For every Wireless Constructor ::
Send for Cabinet Designs and Lists Free
CABINET WORKS, BEXLEY HEATH (nr. London)

WET H.T. BATTERIES

British made round or square Leclanché Glass Jars, 24 x 14 x 1 1/2 for wet H.T. Units. Waxed, 1/3 doz.; plain, 1/2 doz. Carriage and packing extra. 'Phones and Loud Speakers reconditioned, 4/6 & 5/-. The H.R.P. Co., 46, St. Mary's Road, Leyton, E.10.

Valves Repaired AS GOOD AS NEW!!

(Except Veco, S.P.'s, and low capacity types). Minimum D.E. Current 0.15 amps when repaired.
ALL BRIGHT & DULL EMITTERS
Listed at less than 10/-.
Minimum charge . . . 5/-
VALCO LTD., Dept. P.W., Tabor Grove, Wimbledon, S.W.

**HALF
LIST
PRICE**

HEADPHONES REPAIRED

Re-wound & re-magnetised 5/- per pair. Loud Speakers repaired 5/-. Transformers re-wound 5/- each. All work guaranteed and tested before delivery.
Write for Trade Prices. Phone: Olerk. 1795
MASON & CO., 44, East Road, City Road, N.1.

EBONITE BUSHES

FOR MOUNTING ON WOOD OR METAL. Perfect Insulation assured
Orders under 1/- send 1d. postage. Two required for each hole.

"Darex" Bushes are turned from Best Ebonite Rod—NOT MOULDED. As good as the best panel at fractional cost.

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

Special sizes made to order at slight additional cost.
DAREX RADIO CO.,
Waldram Road, Forest Hill, London, S.E. 23
TRADE SUPPLIED

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Knock!!!

Let the Postman bring you that Radio Bargain you want!

It is sure to be among the thousand listed in our large revised Catalogue. Send 4d. stamps and then order your bargain by post.

You are perfectly safe in dealing with

ELECTRADIX RADIOS,

218, Upper Thames St., London, E.C.4.

REPAIRS SETS, PHONES. TRANSFORMERS

Officially Approved by Radio Association.
ALL WORK GUARANTEED LOWEST RATES 24 HOUR SERVICE
Cash on Delivery if Desired
JOHN W. MILLER, 58, Farringdon St., E.C.4.
Phone: Central 1950.

BARGAIN. We have bought a manufacturers' stock of Motor Generators for charging wireless and motor car accumulators, and offer them below manufacturers' cost. Input from 100 to 250 volts. A.C. or D.C. Output 75 watts. Complete with switchboard containing volt and ammeter, switch and fuses. Mounted on cast bedplate, handsome in design, thoroughly efficient, silent running and a highly finished piece of electrical machinery. A perfect home or garage installation. Ordinary price £18 18 0. Bargain price £9 19 0. Send for further particulars to CHIPMAN & PEDDLEY, 141/143, ST. MARY'S ROAD, ILFORD, ESSEX.

Pleasure now—Payments later

SINCE the sets, guaranteed Components and Accessories which we sell can be provided on a system of easy payments, you can start enjoying your radio at once. Write for our Catalogue "P" and tell us what you want.

New Times Sales Co. Ltd.,

Vulcan House, Ludgate Hill, E.C.4. 5549

COMPETITIVE ESSAYS ON BROADCASTING

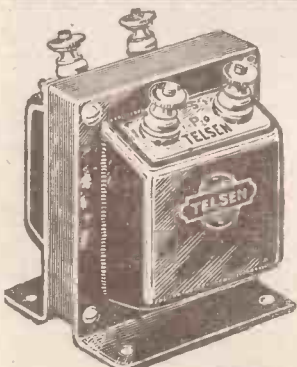
The Dorset Field Club announce that the Cecil Medal and Prize of £10 will be awarded in May, 1927, for the best Paper on "The Wireless Transmission of Power, its Position and Prospects." Open to persons between ages of 17 and 35 on May 31st, 1927, and either born in Dorset or resident in the County not less than one year between May 1st, 1925, and May 1st, 1927. For particulars apply to—

F. H. HAINES, Appleslade, Ringwood, Hants

ACCUMULATORS ON EASY PAYMENTS

60-volt High-Tension Accumulator complete in varnished case, built up in 20-volt sections. Tapping arranged every 10 volts. 15/- CASH, or 12/6 DOWN and 6 monthly payments of 6/-. Carriage Paid. Satisfaction or money back. Write for Lists to DEPT. 11.

COVENTRY DIRECT SUPPLIES Ltd., Coventry.
Any Wireless Goods supplied on easy payments.



BRITISH MADE.
The L.F. TRANSFORMERS that give maximum volume without distortion.

Other types —
Standard Open - - - 14/-
TELSEN "ACE" - - - 9/6
Guaranteed (all models) for 12 months.

TELSEN ELECTRIC CO.,
207, Aston Road, Birmingham

Shrouded Popular 15/6

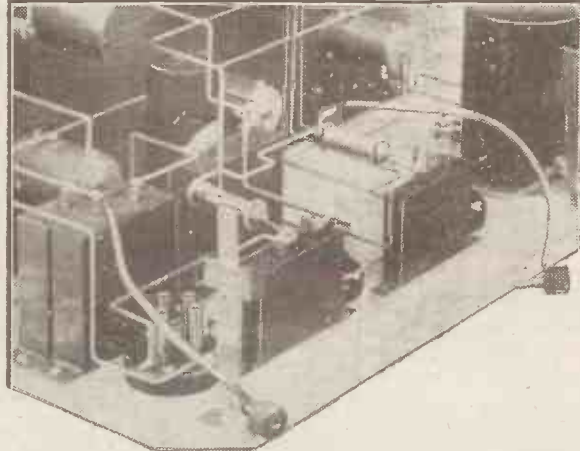
RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from previous page.)

GRID BIAS CLIPS.

"CONSTRUCTOR" (Pendleton, near Manchester).—I wish to insert a grid bias battery inside my portable set, which employs a baseboard. What is the easiest method of fixing it in position?

A good method is that shown in the photograph, where brass strip has been employed. The strip is bent to fit over the top of the grid bias battery, and to form a foot for fixing by a screw to the baseboard.



A short piece of strip is soldered in place across this, to form a cross-arm of the width of the battery. If good springy brass strip is used the battery will be safely held in any position, and it can be taken out quite easily when desired.

DISREGARDING THE RULES.

W. J. S. (Islington), M. E. B. (Brooks Bar, Manchester), and others, have forwarded inquiries or requests, but as these are not in accordance with the rules of the Query Dept. no replies can be sent.

SEPARATE H.T.

J. F. I. (Lichfield, Staffs).—I have a 2-valve receiver built from the "P.W." Blue Print No. 9 (H.F. and Detector, Tuned Anode Coupling, with reaction upon Anode Coil). This set has given excellent long-distance results, but I am told I can get still greater range by having a separate H.T. lead fitted for each of the valves. Is this correct? I am very loth to alter the set as it is now giving really first-class long-range results. But if it is worth the trouble, I should like to know the necessary connections for separate H.T.

☐ The use of separate H.T. for different valves is essential for powerful L.F. amplification, but it is hardly necessary or worth while to provide separate leads for valves which require the same H.T. voltage, as is nearly always the case with a straightforward H.F. and Detector set, of the type named.

On the whole, we do not think you would find any improvement, but if you desire to try, the following are the alterations necessary:

Disconnect the upper phone terminal from H.T. +, leaving all other connections unaltered. Then connect a flexible lead to this terminal, with another red plug for making the second connection to H.T. +.

WIRELESS AND THE LANDLORD.

"AERIAL LAW" (London).—I have received a communication from a solicitor representing my landlord demanding the immediate removal

of my aerial. Can you advise me as to the position I am in? These are the facts: The aerial has been attached to the roof for the last three years, with the verbal permission of the landlord, and the other day I happened to go on the roof to renew the string supporting the aerial, and the landlord has apparently objected to this, hence the solicitor's letter. The solicitor describes it as the unwarrantable trespass committed by me in going upon the roof and fixing a wire. I do not doubt that the landlord will now deny giving permission for the aerial to be fixed in the first place, but the fact remains. Finally, the letter adds that

proceedings will be commenced to compel removal, etc.

If you are the sole occupier of the premises we should feel disposed to disregard the threat of proceedings. To speak of trespass on the part of a tenant who goes on the roof of the premises he occupies is absurd. Strictly speaking, the landlord may object to the fixing of an aerial without his consent, but if the tenant offers to pay any increase in insurance premiums which may be demanded in consequence of the affixing of the aerial it is difficult to see what reasonable objection the landlord could raise.

PERIKON DETECTOR.

J. P. (Manchester).—Will an applied potential through a potentiometer increase signals on a receiver employing a perikon detector, copper pyrites and zincite?

Sometimes this does so, but not in every case. Any way, the applied potential must be very small. A single dry cell would suffice as an experiment.

GAS-PIPE EARTH CONNECTION.

F. B. (Leyton).—Can the Gas Co. object to my using the gas-pipes as an earth? Yes, certainly; and in any case, a gaspipe does not make an efficient earth. The waterpipe or a direct ground connection is far better.

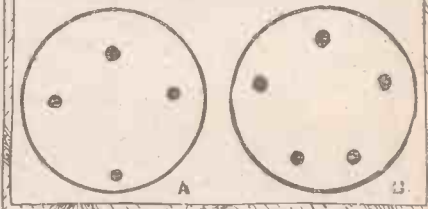
For the Constructor

No. 1. TEMPLATES

for Valves and H.F. Transformers.

TO the left (A) is shown the spacing for an ordinary 3-electrode (4-pin) valve, or for a plug-in H.F. Transformer. The exact drilling positions can be determined by cutting out the paper template, and carefully pasting it to the panel in the required position. A better plan, which does not entail cutting the page, is to pin a piece of paper underneath the template, and then prick through the centres of the dots with a pin. The marks are then transferred to the panel with a centre-punch.

The right-hand template (B) shows a Unidyne valve (4-electrode, 5-pin), of the U.C.5 or K.4 type.



WHY NOT MAKE YOUR HOBBY YOUR PROFESSION?

The Marine Wireless Service offers good prospects to Youths and Young Men 16 to 25. Apply for Prospectus. LONDON RADIO COLLEGE LTD., Stafford House, 82-3, High Street, Brentford.

4 - ELECTRODE VALVES

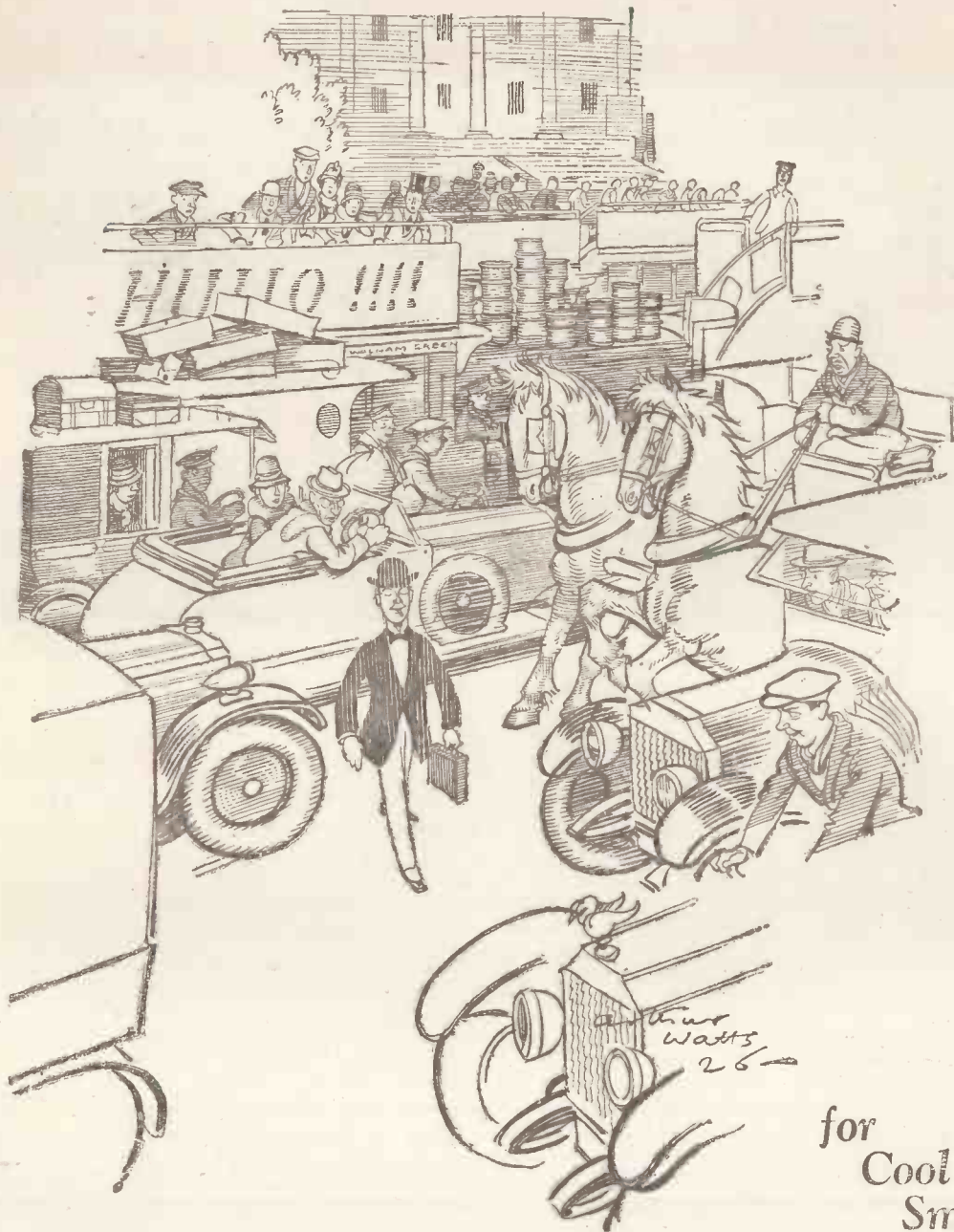


We are the suppliers of the genuine U.C. and Thorpe valves, as specially tested and recommended by the "Unidyne" inventors and "Popular Wireless" U.C.5 and Thorpe K.4 (both 4-electrode 5-pin 10/6 valves), each, post free.....

Order direct from—

LUDGATE RADIO CO.,
55, LUDGATE HILL, LONDON, E.C.4.

PLAYER'S "MEDIUM" NAVY CUT CIGARETTES WITH OR WITHOUT CORK TIPS



for
Cool
Smoking



PLAYER'S

Navy Cut

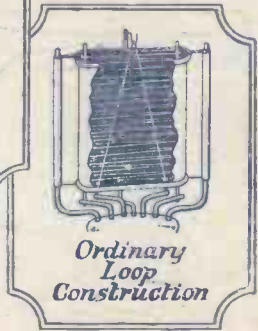
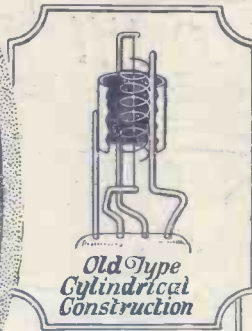
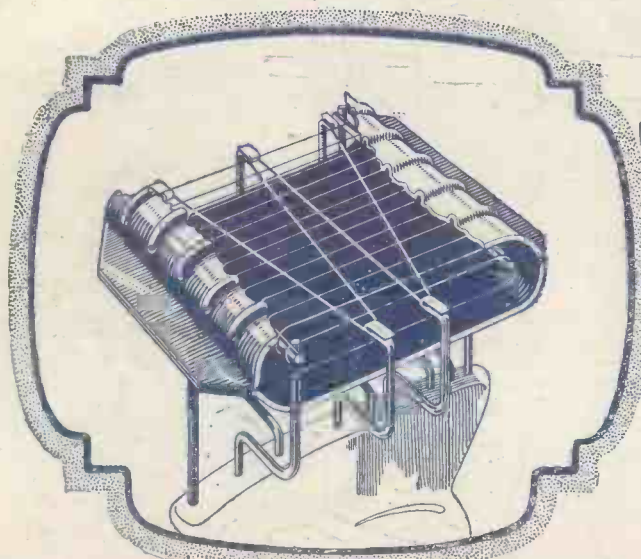
CIGARETTES

10 for 6d. 20 for 11½d.
50 for 2/5 100 for 4/8



All Valves

have constructional features but only P.M. Valves have the P.M. Filament



Which valve construction gives you the most for your money

Look at the length, thickness and design of the Mullard P.M. Filament and you will appreciate why those who understand valves place its results 33% higher than any other on the market.

This wonderful P.M. Filament

Is supported by 5 strong but resilient hooks.
Cannot be broken except by the very roughest handling.

Has up to 5½ times greater emission surface.
Requires only one-tenth ampere.

Has the abundant flow of electrons entirely controlled.

Remains ductile even after 1,000 hours life.

Wastes no heat by glowing.

Is free from microphonic noises.

Gives majestic volume.



- For 4-volt accumulator or 3 dry cells
 - THE P.M.3. (General Purpose) 0.1 amp. 16/6
 - THE P.M.4 (Power) 0.1 amp. 22/6
 - For 6-volt accumulator or 4 dry cells
 - THE P.M.5 (General Purpose) 0.1 amp. 22/6
 - THE P.M.6 (Power) 0.1 amp. 22/6
 - For 2-volt accumulator
 - THE P.M.1 H.F. 0.1 amp. 15/6
 - THE P.M.1 L.F. 0.1 amp. 15/6
 - THE P.M.2 (Power) 0.15 amp. 18/6
- These prices do not apply in Irish Free State*

ASK YOUR RADIO DEALER FOR THE VALVES WITH THE P.M. FILAMENT.

Mullard

THE MASTER VALVE

ADVT. THE MULLARD WIRELESS SERVICE CO., LTD., BALHAM, LONDON, S.W.12

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All applications for Advertisement Space in POPULAR WIRELESS to be made to JOHN H. LILE, LTD. (Sole Agents), 4, Ludgate Circus, London, E.C.4. Phone: City 7261.