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Popular Wireless

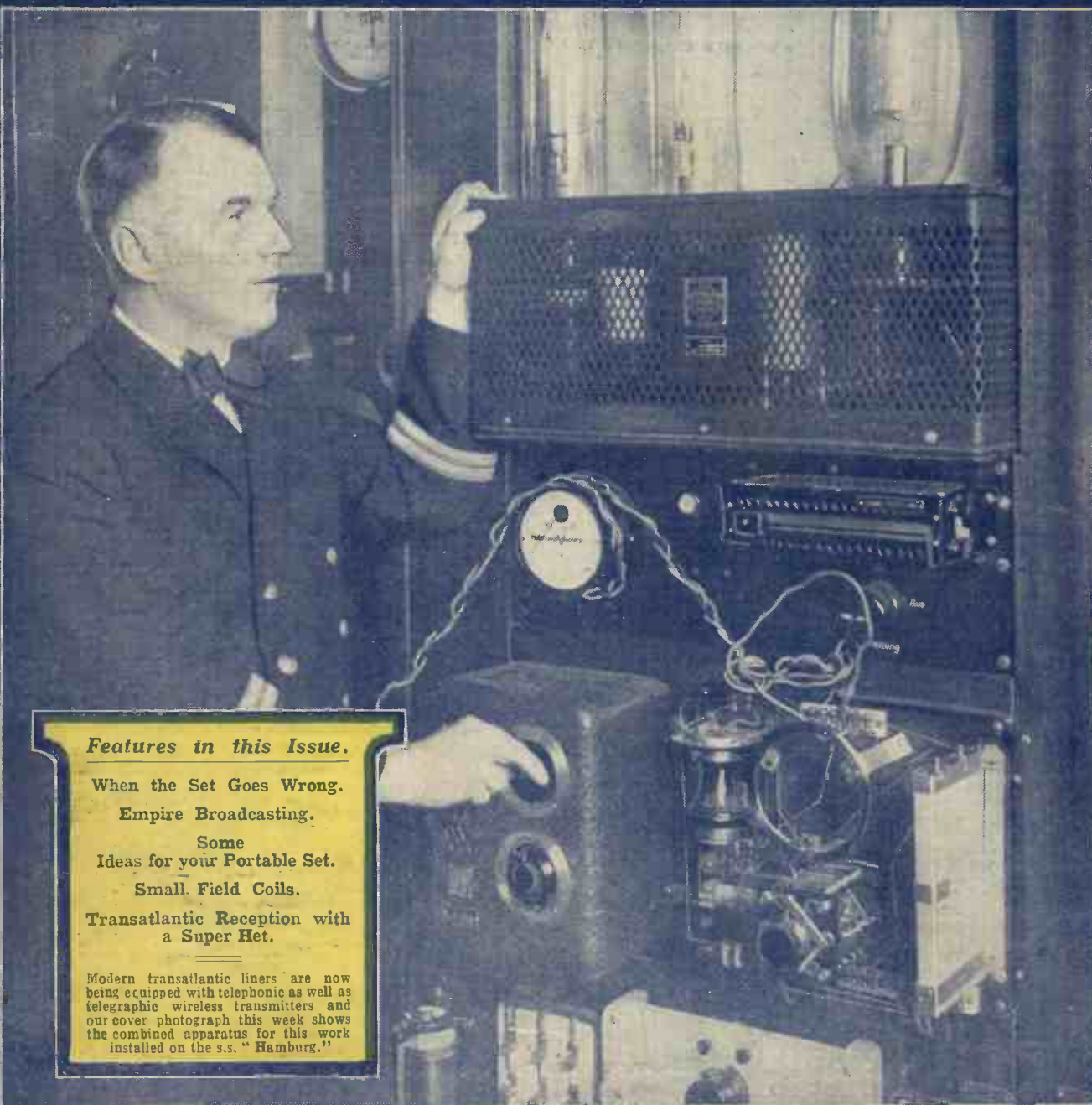
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and Wireless Review

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.

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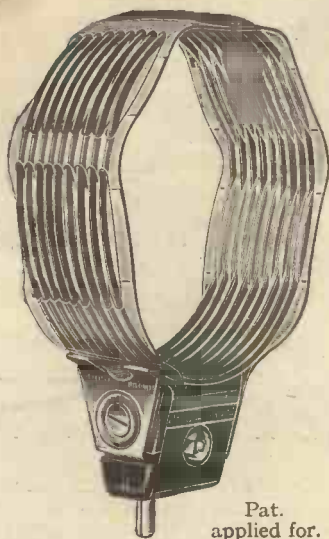
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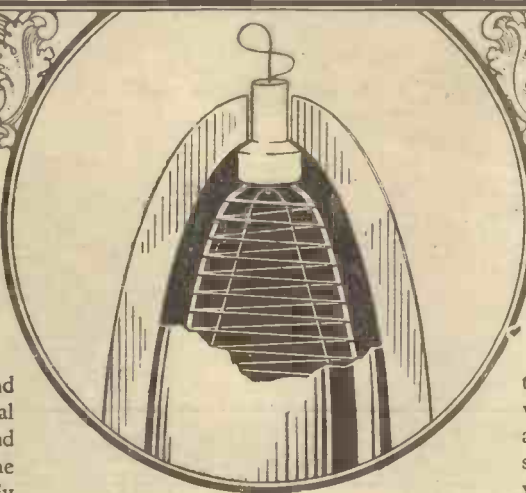
—Filament, Grid and Anode are now secured at top and bottom in the new Cossor Point One

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.

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—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. ('Smarvellous!')

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 atmospherics 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.

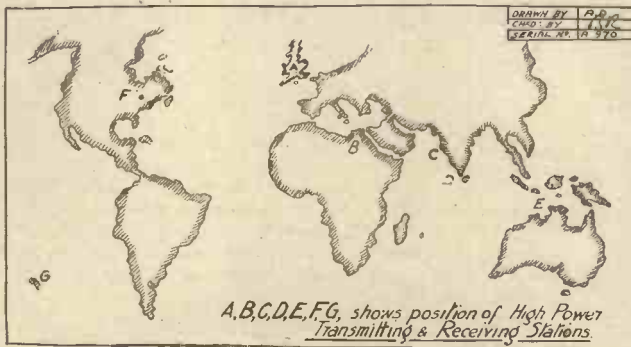
The high-power station in Northern Australia could be relied upon to supply New Zealand, where a receiving station in Auckland would S.B. the programme to the local broadcast stations via landline.

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 to-day. 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.



signal—and Rugby is certainly capable of doing that in Egypt—the atmospherics 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 footlights. 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 Siviglia" 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 Mephistopheles 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

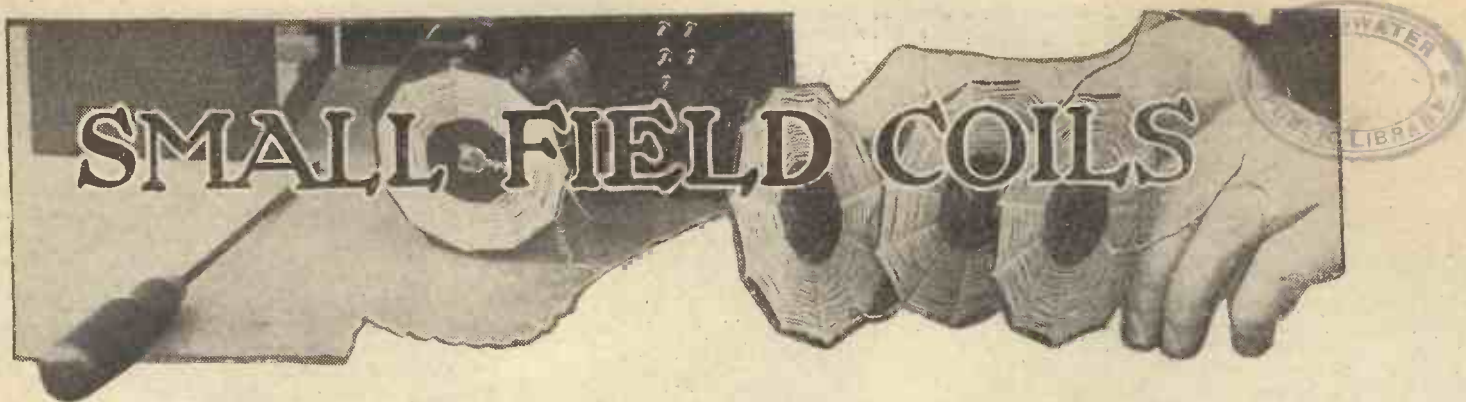
"SHARMAN"

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.)

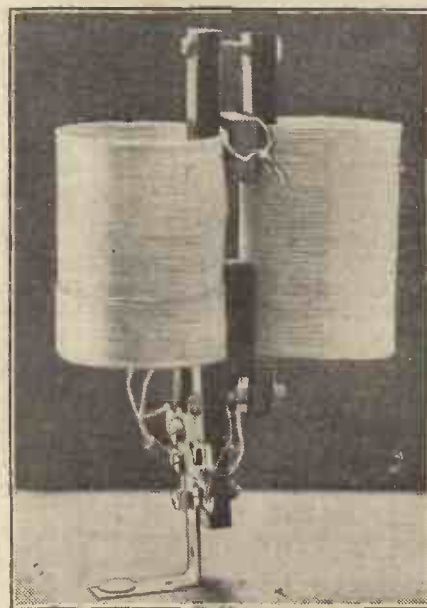


The Bodine coil described in this article.

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 $\frac{1}{2}$ 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.

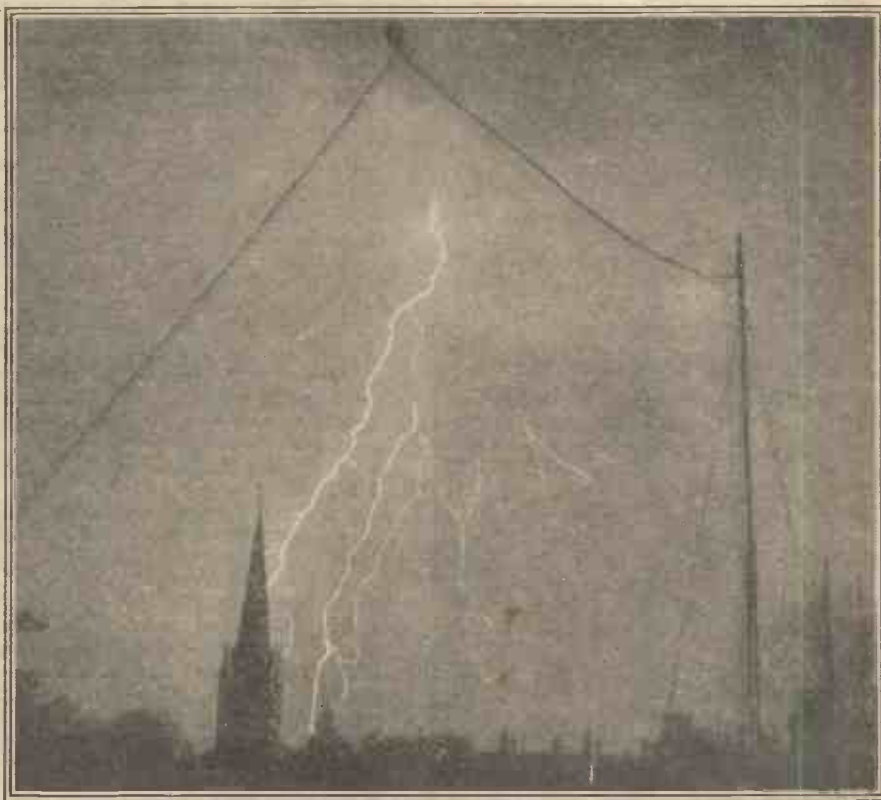
Using No. 26 D.C.C. wire, wind on one turn of wire in the shape of a figure eight. It will be noticed that at the point where the wires cross they touch only two faces of the square ebonite rod. Now wind on

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 to 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 painted 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,

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.

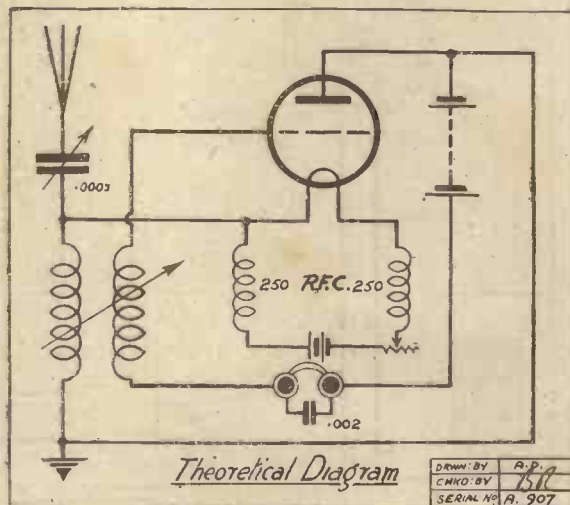
The panel should be drilled in accordance with the panel drilling diagram. Only those



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 (Lamplugh)	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 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

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.

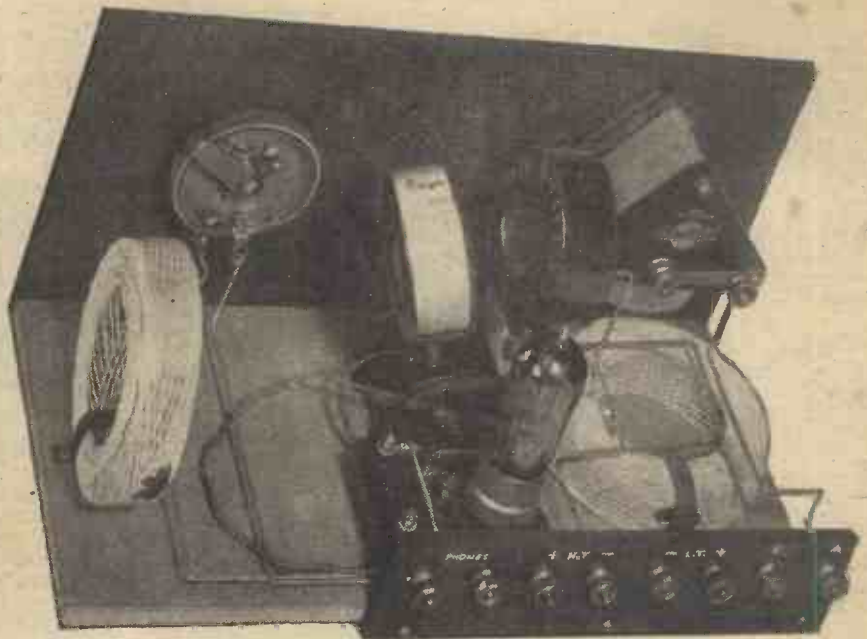
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The wiring should be carried out with square section tinned copper wire. The leads from the filament sockets of the valve holder to the choke should be kept well away from all other leads. The remaining leads to the chokes do not require such careful 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.

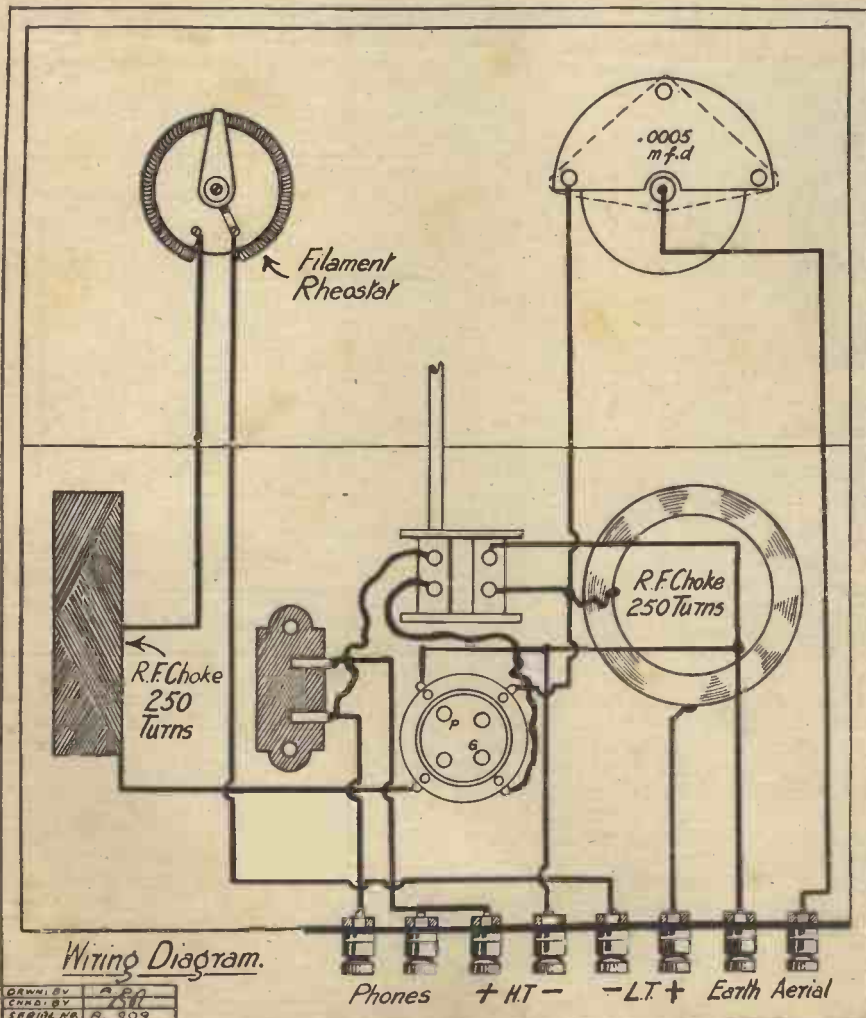
The two flexible leads which go to the moving block of the coil holder should be arranged so that they do not run parallel or lie across the choke-filament leads.

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.

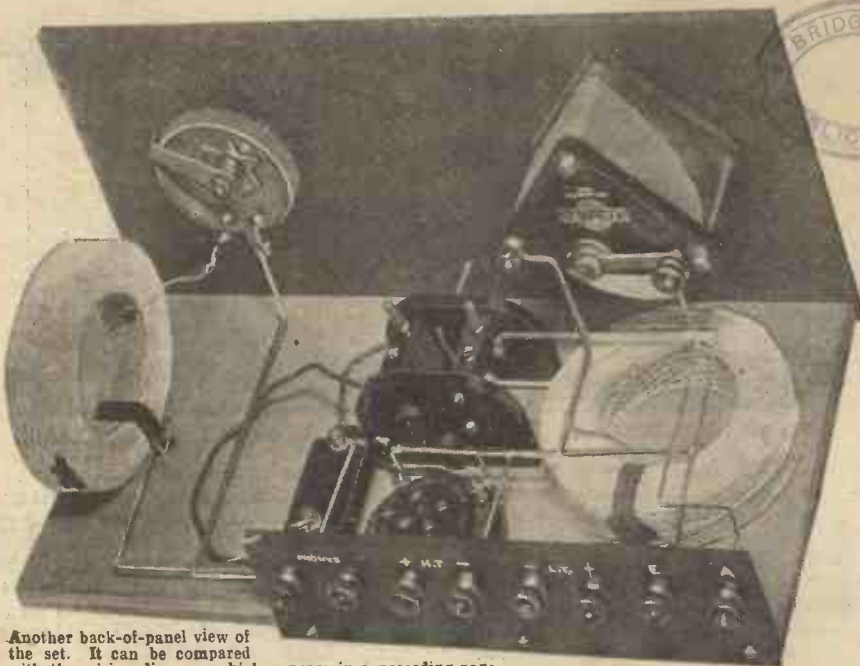
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The present 250-turn chokes can be "loaded" by placing in series with each one another choke of a similar number of turns. The additional chokes can be clamped on to the others, and this is perhaps a better method than winding 500 turn chokes "all-in-one." 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 B 5 and B 6 above most others. Some valves, it should be noted, fail to work at all in this circuit. A B 5 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 B 5 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.

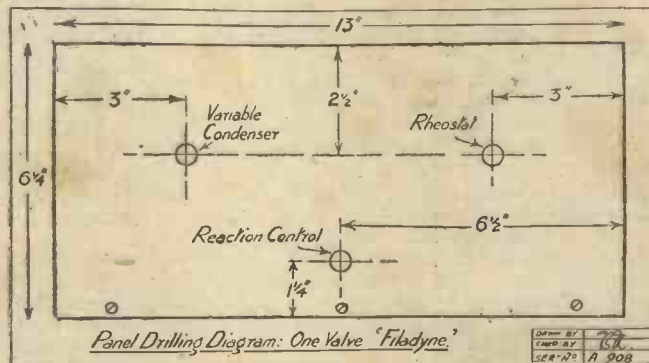
Very loud clicks are produced in the telephone receivers when the H.T. circuit is broken by extracting the reaction coil or altering the H.T. tapping while the filament is alight, and this is quite normal behaviour and not indicative of "shorts."

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.

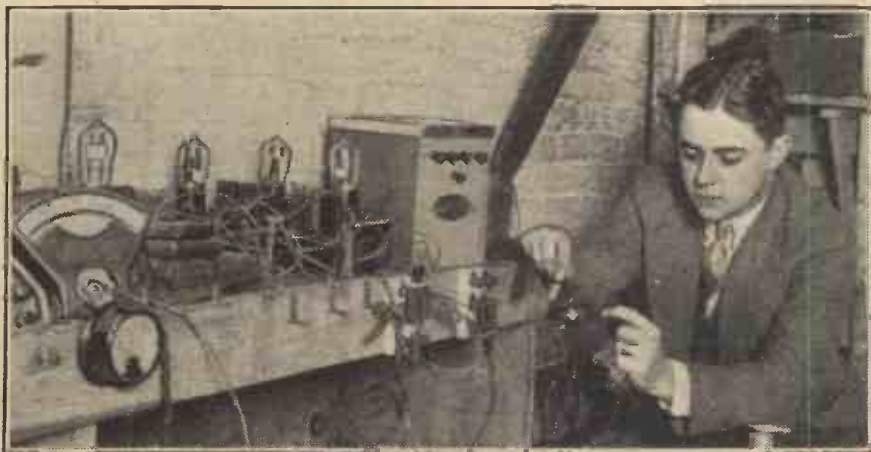
The control of the operating characteristics of the valve is probably the most important and should be attended to first; once this has been made most effective, the use of the geared coil holder or a capacity control for the reaction is a refinement which though useful, is not absolutely necessary.

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 tapings, 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.

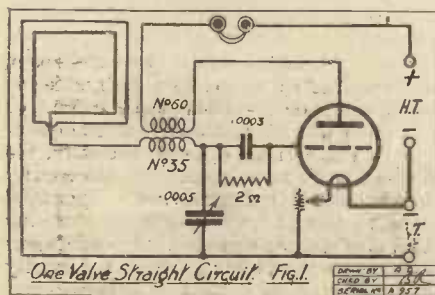
Concerning Portability.

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.

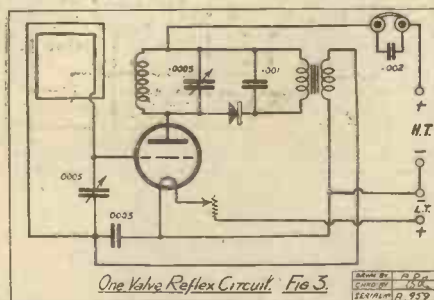
To deal fully with all the points in portable set design would doubtless take more space than our esteemed editor is likely to permit, but a thorough survey of the more salient features will, it is hoped, be of considerable assistance to intending constructors.

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-

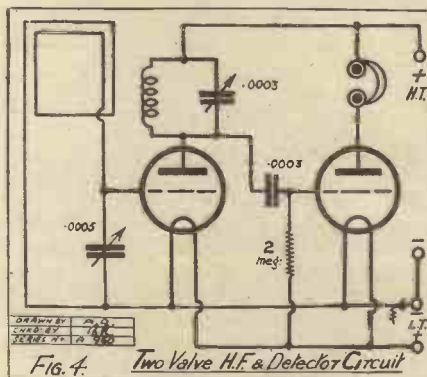


Fig. 4. Two Valve H.F. & Detector Circuit

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.

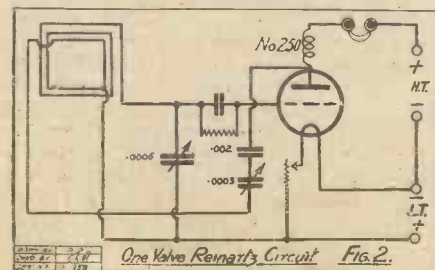
Two-valve straight H.F. and detector—25-30 miles.

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-

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One Valve Reinartz Circuit. Fig. 2.

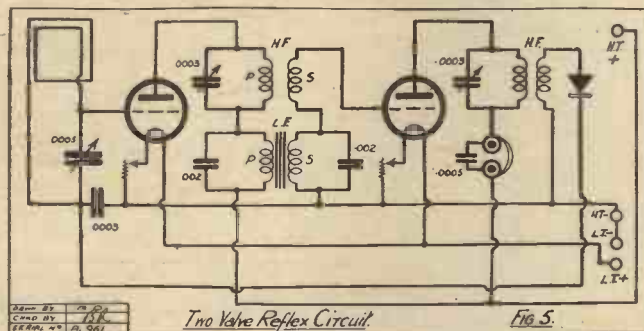
SOME IDEAS FOR YOUR PORTABLE SET.

(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.



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.

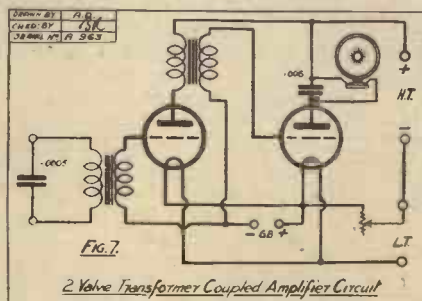
As far as frame aerials are concerned, where damping losses are small and remain constant, reaction may be set during the first trial and then fixed for all time. Many commercially built sets are designed in this manner. A word in connection with the use of reaction, however—never force reaction to extreme 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.

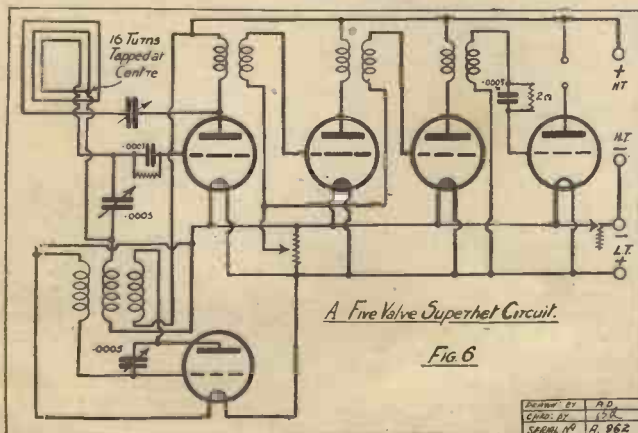
With care in the choice of instruments, and judicious spacing of wiring and components, much of this trouble may, however, be obviated.

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



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.



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

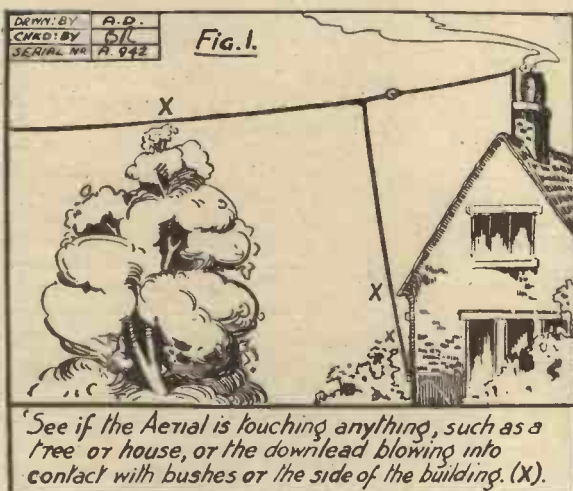
signals are heard, and everything in the set is adjusted properly, the telephones should be examined carefully. The listener should look at each earpiece and see that the wires are making good contact. The small terminals of each earpiece being screwed up tightly, make sure that pieces of the leads which 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.



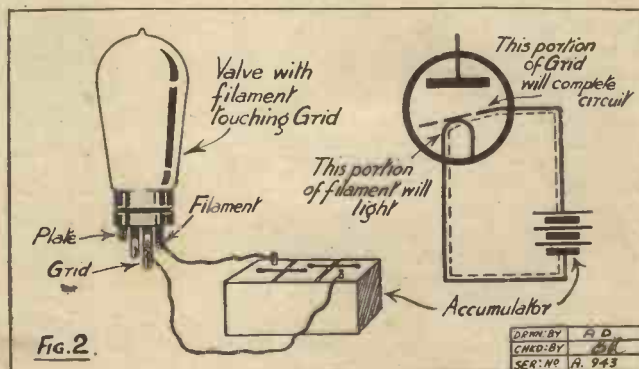
presence known to the listener. These can be classified under the following headings:

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)).

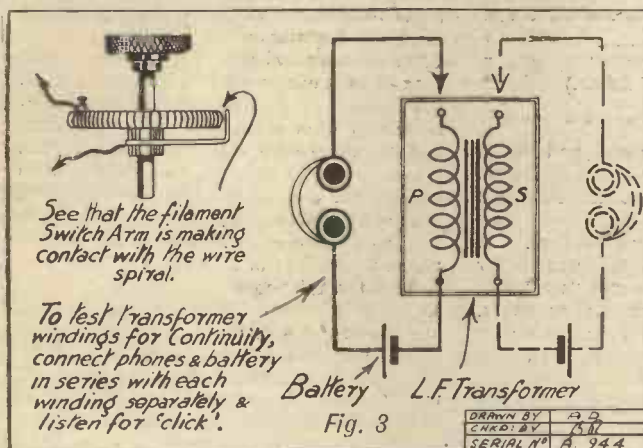
In the latter event there is only one (Continued on next page.)

WHEN THE SET GOES WRONG.

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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.

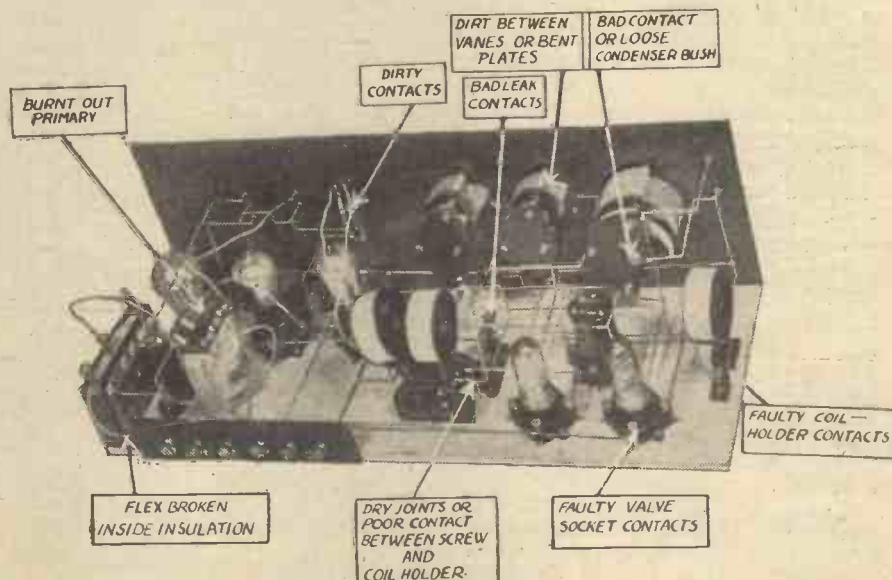
Another cause of bad fading may be a leaky condenser or a faulty grid leak, and all condensers should be tested with a battery and a pair of 'phones.

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

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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 atmospherics 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.

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

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.

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

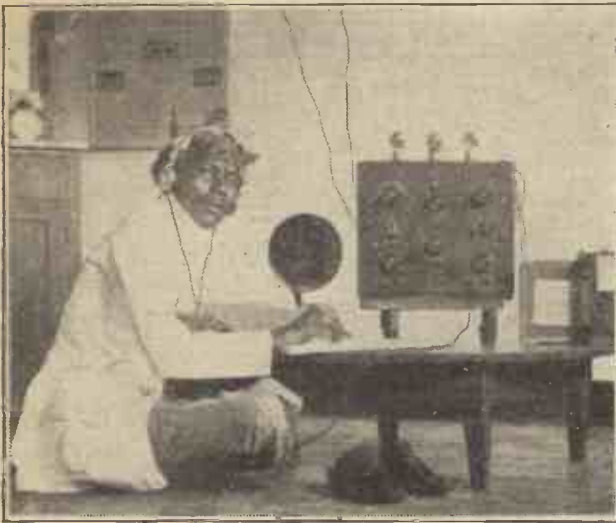
WIRELESS VALVES

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.,

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.

EDISON 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
Amps15
Plate Voltage ... 60-120
Amplification Factor ... 12
Slope55 Ma/v
Impedance 22,000 Ohms.

Volts ... 3.5-4
Amps35
Plate Voltage ... 60-120
Amplification Factor ... 6
Slope65 Ma/v
Impedance 9,500 Ohms.

The following table indicates the combinations of Edison Valves for PERFECT RECEPTION

Receiving	Price	Amplification or Service	Power	Price
G.P.4	16/6	4	P.V.4	
A.R.	8/-	4	P.V.4	2/6
A.R.		6	P.V.5	2/6
*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 Edison Folder "2 New Valves"

The
**EDISON SWAN
ELECTRIC Co. Ltd.**
123-5, Queen Victoria
St., London, E. C. 4



S.W.

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

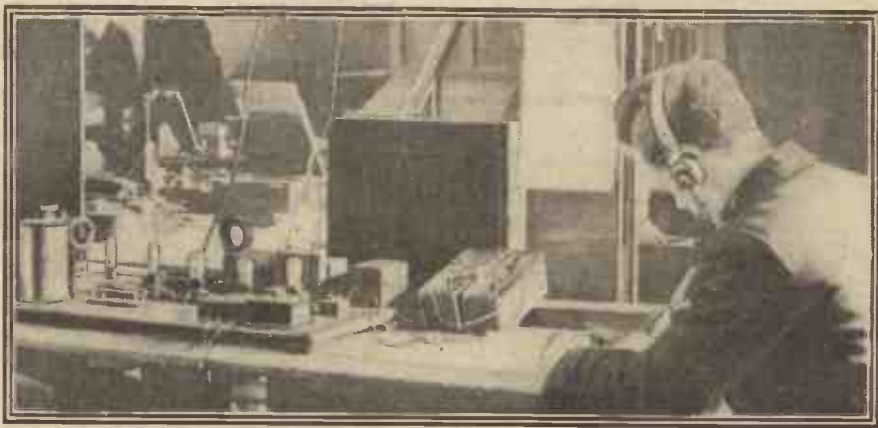
cuit has been deliberately ignored. Another example is the way the short wavelength transatlantic experiments have been scorned. I should think that the B.B.C. engineering department, although admittedly efficient, has become too self-contained and perhaps also too self-satisfied. Captain Eckersley, 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

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 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

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 unbiassed 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.

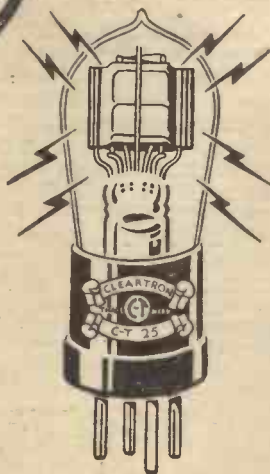
THE KAY-RAY S.L.F. VARIABLE CONDENSER.

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.

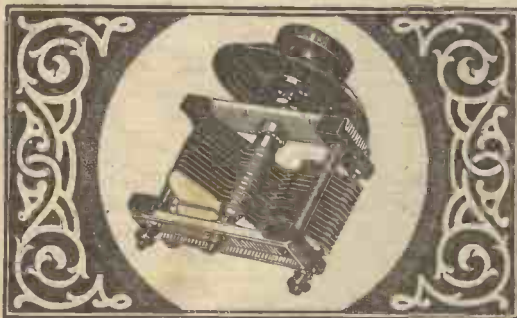
Full technical data of all types obtainable from your dealer or from

CLEARTRON RADIO, LIMITED
1, CHARING CROSS, S.W.1, AND BIRMINGHAM
Phone: Regent 2231/2. Grams: "Cleartron, Westrand, London."

CLEARTRON

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.

0003 MF **10/-** **TESTED RADIO** **10/6** 0005 MF

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:

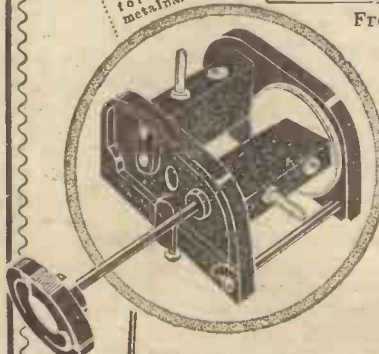
Two-way .. 8/-

Three-way .. 12/6

Garnett, Whiteley & Co., Ltd.,

Lotus Works, Broadgreen Road, Liverpool

Makers of the new improved "LOTUS" Valve Holder.



Patent for the side plates, coil blocks 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.

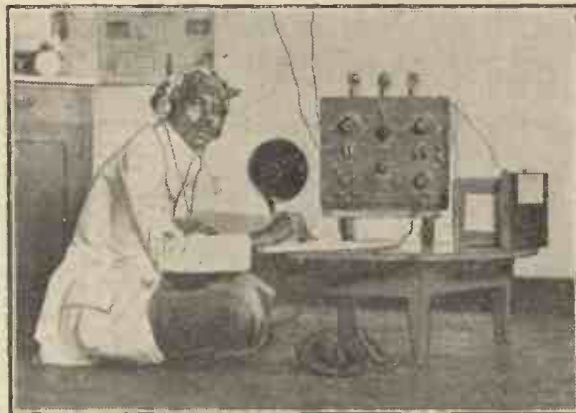
Messrs. Ward & Goldstone, Ltd., Frederick Road, Pendleton, Manchester, recently sent us a sample of their new "Enhansa" indoor aerial. It consists of a twelve-foot length of thick braided flexible wire at each end of which an insulator is fitted. It can easily be hooked up, and should prove useful both 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.).

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

P10

Description	Ohms	Carrying Current	Price
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

FERRANTI LTD., HOLLINWOOD, LANCASHIRE



25/-

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. Narriage, P.S.—Birmingham and Brussels on thirty foot indoor aerial.

Price of the Ormsby Receiver is **£25**
This price does not include Valves or Batteries.

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.

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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

E. K. COLE (Dept. A), 513, London Road, WESTCLIFF-ON-SEA.

ALL SPORTS FOOTBALL ANNUAL



Accurate and Up-to-Date

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.

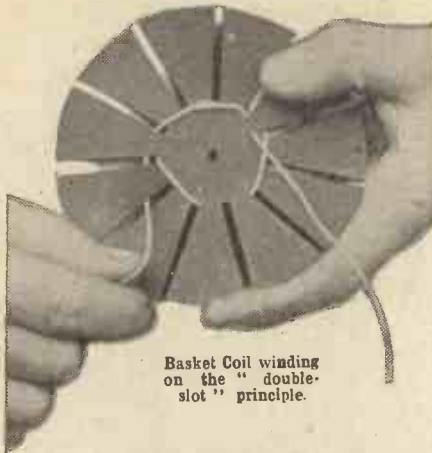
On Sale Everywhere!

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 "duolateral" 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.

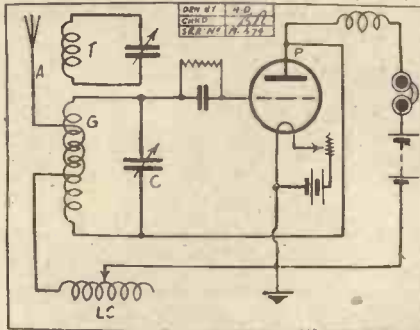
This will be clear from the accompanying photograph. Near the thumb on the right is a hole in the former which holds the beginning of the wire. After passing through this hole, the wire emerges at the slot above, and then crosses two sections before being passed down the slot. It remains behind the former 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 $3\frac{1}{4}$ in. diameter are used. The aerial coil L.C. is bank wound on a $3\frac{1}{4}$ in. by $1\frac{1}{4}$ 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 $3\frac{1}{4}$ 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.

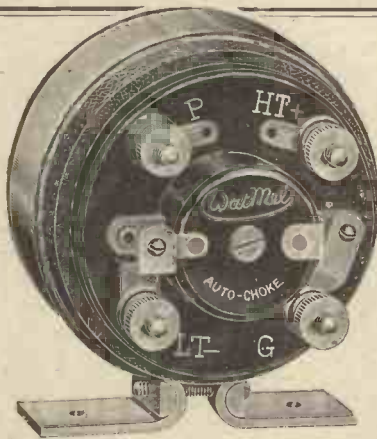
(f) "Metal-working" drills should be chosen, and only a light pressure employed.

(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 whistles 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.

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Lancashire and Cheshire Representative:

Mr. J. B. LEVEE, 23, HARTLEY ST., LEVENSHULME, MANCHESTER.

Telephone: 475 Heaton Moor.

...lower H.F.
resistance than
any other com-
mercial 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

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 "Undyne" inventors and "Popular Wireless" U.C.5 and Thorpe K.4 (both 4-electrode 5-pin valves), each, post free.....

Order direct from—

LUDGATE RADIO CO.,

56, LUDGATE HILL, LONDON, E.C.4.

10/6



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),
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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). **FRICITION GEARED.** 0005, 15/-; 0003, 14/6; 00025, 13/6. **STRAIGHT LINE FREQUENCY TUNING GEARED.** 0005, 20/-; 00035, 19/6. **FILAMENT RHEOSTATS DUAL.** 2/6; 6 ohms or 30 ohms. **POTENTIOMETER.** 400 ohms, 2/6. L.F. SHROUDED, latest model, 17/6.

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WONDERFUL VALUE IN STRAIGHT LINE FREQUENCY CONDENSERS NEW MODEL READY

005 - 8/11
003 - 8/3.



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. 60v. 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 aereals. Specification as above. **£5:10:0**

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. T.E.E. FUNKEN** (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 CON.** TIENTAL, still as good as ever, exquisite tone, sample pair, 7/11. **ALL 4,000 OHMS.**

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DUAL VARIABLE CONDENSERS FOR ELSTREE SIX

0005 Square Law 12/11
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(Both with Knob and Dial.)
ALL PARTS SOLD.

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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

40, 7/11; 2, 60, 9/6; 2, 80, 12/6; 2, 100, 14/6; 4, 40, 13/11; 4, 60, 17/11; 4, 80, 23/6; 6, 60, 26/6; 6, 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 1 1/2d. Red or Black, 3d. pr. Ins. staples, 5 a 1d. Ormond screws and nuts, 2 a 1d. Switch arms and studs, 1/- Nickel, 1/- 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 1 1/2d. 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; 100 v. 12/11. 60 v. B.T.O. 100 v. 12/11; 100 v. 13/9. 4.5 Flash Lamp Batteries, 6d. line, 6 for 2/9. A.B., 3 for 1/-; 4 for 1/3. Various pr. 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

12/6; 103 v. 21/- L.T.3 for D.E. Valves 7/6.

SIEMENS H.T. 60 v.

12/6. Helleson's 60 v. 14/6. Various, 1.5 D.E. Batteries, 2/6 to 2/8.

GRID BIAS (tapped 18 volts), 6 v. 1/3, 9 v.

1/8, 1/9, 2/-. **EBONITE** "Grado A." cut while you wait, 3/16 at halfpenny per sq. inch. 1 in. three farthings. Scrap ebbonite on sale.

RADIO MICRO. .06

Special, 6/11; Power, 8/11. 2 volt, 6/11.

Various .06 valves, 4/11. 5/11. Power valve D.E. 7/11, etc. 1 valve L.F. Amplifier in polished box, beautifully made, 18/11.

2 valve do., 31/11. Hand-some crystal sets, variable tuning, 10/11, 12/11.

"ESSANCO" Mounted Coils.—Made under Burnet Licence, Patent No. 168248. No. 25, 35, 50, each 2/-; 75, 2/6; 100, 3/-; 150, 3/-; 200, 250, 300, each 4/-.

PLACE OF PAYMENT LONDON, W.C.2.

Correspondence

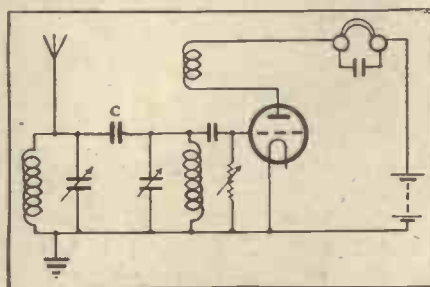
Letters from readers discussing interesting and topical wireless events or recording unusual experiences are always welcomed, but it must be clearly understood that the publication of such does in no way indicate that we associate ourselves with the views expressed by our correspondents, and we cannot 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 Rehnartz, and the best of luck to him.

Yours faithfully,

Cambridge. 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.

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

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WET H.T. BATTERIES

British made round or square Leclanché Glass Jars, 21 x 1 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 & 5/6. 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.

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.

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REPAIRS SETS, PHONES, TRANSFORMERS

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ALL WORK GUARANTEED. LOWEST RATES. 24 HOUR SERVICE.

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(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.

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.

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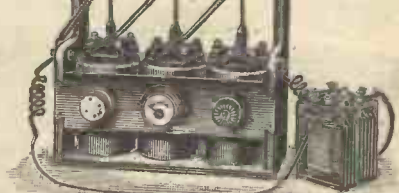
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Ready for use. Splendid results. 12" diam. 1/6.

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

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EE209 NV 15402

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 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 & 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.

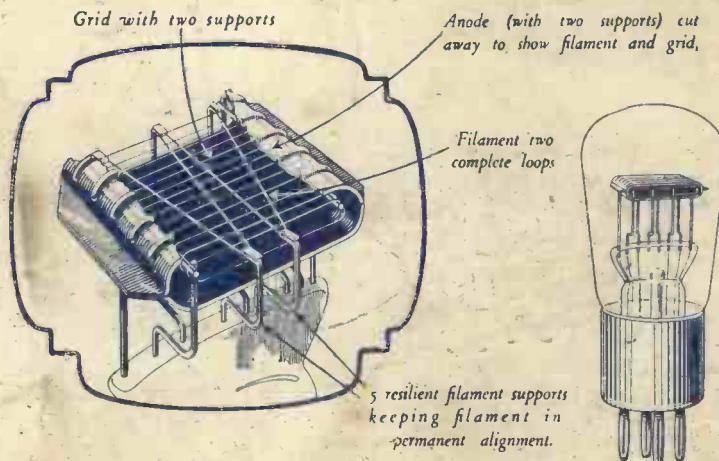
6 NO MICROPHONIC NOISES.

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.



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.

The man who knows about valves will tell you that it is the filament that counts and this is what you pay for. He will tell you that a filament with P.M. advantages will give you 33% better results, reduce your maintenance costs and last you many times longer than any other, no matter what new constructional features are employed.

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 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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