

HAVE YOU BEEN TO THE WIRELESS SECTION AT OLYMPIA?

Popular Wireless

No. 42, Vol. III.

PRICE THREEPENCE WEEKLY.

March 17th, 1923.



FEATURES IN THIS ISSUE.

A Gramophone Loud Speaker.
Wave-Length and Interference.
The Licence Question.

A Wireless "Piano" Tuner.
The New Radio Danger.
Four Pages for Beginners.

Another Article by Sir Oliver Lodge, and a further
Review of the Wireless Section at Olympia.

A WONDERFUL RECORD BY A WONDERFUL RECEIVER
AMERICAN TELEPHONY RECEIVED IN LANCASHIRE.

The following letter, giving results obtained on one of our sets purchased from Mr. J. P. PARRY, 68, GEORGE STREET, OLDHAM (our agent for that town), conclusively proves the marvellous efficiency of "HESTAVOX" Broadcast Receiving Instruments :

21, Dundee Street,
 Oldham, Lancs.
 26/2/23.

Sirs,—I should like you to know that I possess one of your Broadcast Receivers—the Hestavox II—also a Hestia L.F. Amplifying Unit, this making a three-valve set.

The results I am getting are exceptionally good. I get 2 Z Y with loud speaker as loud as a gramophone; 2 L O (London) I get very well also with loud speaker.

At 5.45 a.m. Saturday morning, February 24th, I switched my set on and almost immediately received a carrier wave between 350 and 380 metres wave-length; when tuned in I heard a lady singing; after which I heard "W O R Radio Broadcasting Station, New Jersey," which was repeated several times; after that an announcement concerning what appeared to sound like "The Blackbird Song." I followed the concert until about 6.13 a.m., when the station closed down with the following: "WOR—COMPANY Radio Broadcasting Station, New Jersey, U.S.A. Good-night, all."

I am,
 (Sgd.) A. FORD.

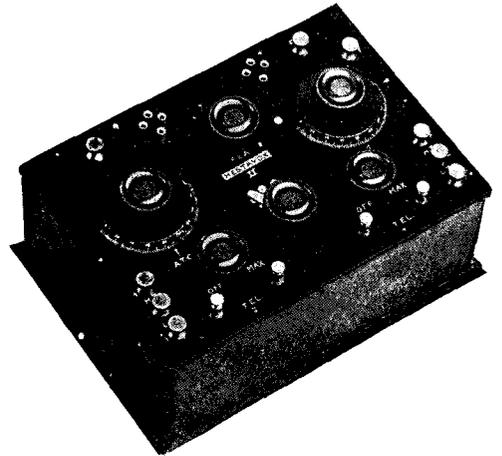
THE "HESTIA" ENGINEERING COMPANY,
32, Palmerston Road, Acton, London, W. 3.

1 min. South Acton Stn. (N.L. or District Rlys.)

Showrooms open : 9 a.m.—6 p.m.

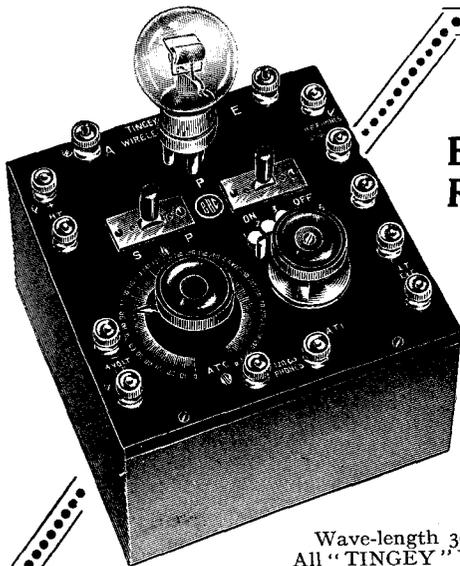
Telephone : Chiswick 586.

ON THE
 G.P.O. Reg. "HESTAVOX II" No. 2049.
2-Valve Broadcast Receiver



Price (Receiver only as illustrated) **£12-7-6**

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Single Valve Broadcast Receiving Set

PRICE,
 as illustrated
 (less valve)
£9-12-6

Including Broadcasting Fees.

Wave-length 300-2,800 metres. All "TINGEY" Valve Apparatus is duly licensed under Marconi Patents for Amateur Use in Great Britain.

All "TINGEY" Receivers bear the B.B.C. Stamp.

Illustrated Catalogue of 1, 2, 3, 4, and 5 Valve Broadcast and Experimental Unit System, with all accessories. Price 6d. Post Free.

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This price is for one pair of either 120 or 4000 ohm phones including cords of good quality.

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POPULAR WIRELESS

March 17th, 1923.

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

[Every Friday.]

TOPICAL NOTES AND NEWS.

Those "Experts."

I DON'T expect that I am the only one who has noticed it, but what a lot of "wireless experts" there are about nowadays. I was helping in the erection of a friend's aerial the other day, and no less than three friendly neighbouring "experts" supplied a continuously running stream of varying advice during the operations. These latter concluded, I retired, leaving them heatedly arguing among themselves as to the "pros and cons" of various crystals.

Proofs of Identity.

TALKING about "experts" reminds me of two very funny incidents. In the Tube one day last week I heard a man solemnly declare to an interested companion that it was possible to identify a receiving set by its aerial! During the same evening I was quietly enjoying a piano solo from the London Broadcasting Station through a friend's loud speaker when I was interrupted by a loquacious acquaintance who would insist upon enlightening me in various minor matters radio. While he was telling me how to identify a Brown loud speaker by its shape, pointing to the one in operation as a good example, how to locate the three L.F. valves by the size and shape of their bulbs, etc., my host strolled over and exclaimed, "How do you like my new Amplion loud speaker? It is working well on one L.F., isn't it?"

Not Deliberate.

I DO not believe for one moment that there was any deliberate interference during the broadcasting of Lord Robert Cecil's radio speech recently. In my opinion the rather severe heterodyning was caused by listeners-in unintentionally. This particular transmission, as observed in some districts, was not quite so good as usual, and, in any case, reaction is always more used, and also more greatly misused, during the transmission of speech, owing to the endeavour of everybody to bring it in as loudly and clearly as possible.

The Duke of York's Wedding.

THERE is a rumour floating about that the marriage service at the Duke of York's wedding is to be broadcast. Most rumours die a natural death—but I have hopes that this one will flower into actual fact.

The House and Broadcasting.

MR. BONAR LAW cast cold water on Mr. Ben Tillet's suggestion that debates in the House be broadcast from 2 L O. I can't help thinking that if Mr. Lloyd George had been Premier the suggestion would, at least, have received a little more sympathy. But readers may

rest assured that Mr. Law's dislike of the suggestion will not prevent the ultimate realisation of the scheme. "This 'ere progress—it goes on" as Mr. Wells once remarked in one of his books.

The "Spouter."

MR. G. W. REED, Cromwell Road, and Messrs. H. E. Daft and E. J. R. Cowles, Eastfield Road, received a concert from the broadcasting station at Newark, New Jersey, U.S.A. Except for some jamming by a spout station— (From the "Peterboro' Advertiser.")

Yes, we all know that "spout" station, only "spark" is more polite.

A Link With Home.

VOYAGING to Australia via Cape Town recently, the Aberdeen liner Themistocles—fitted with the latest Marconi wireless apparatus—was in touch with land stations in Great Britain the whole time, and was able to receive 65,000 words of news, representing 738 words per day, throughout the voyage.

Some Diaphragm.

AN enterprising firm in Mark Lane has introduced a very ingenious contrivance which converts their large plate-glass window into a diaphragm. A small instrument imparts the audio-frequency vibrations to the window, and one is able to hear the broadcast concert items quite clearly by

pressing one's ear against it. That, at least, is what I have been told; when I wandered down Mark Lane the other day to investigate, I discovered such a crowd assembled that I decided I would not endanger this enterprising firm's freedom from police intervention by adding to its number.

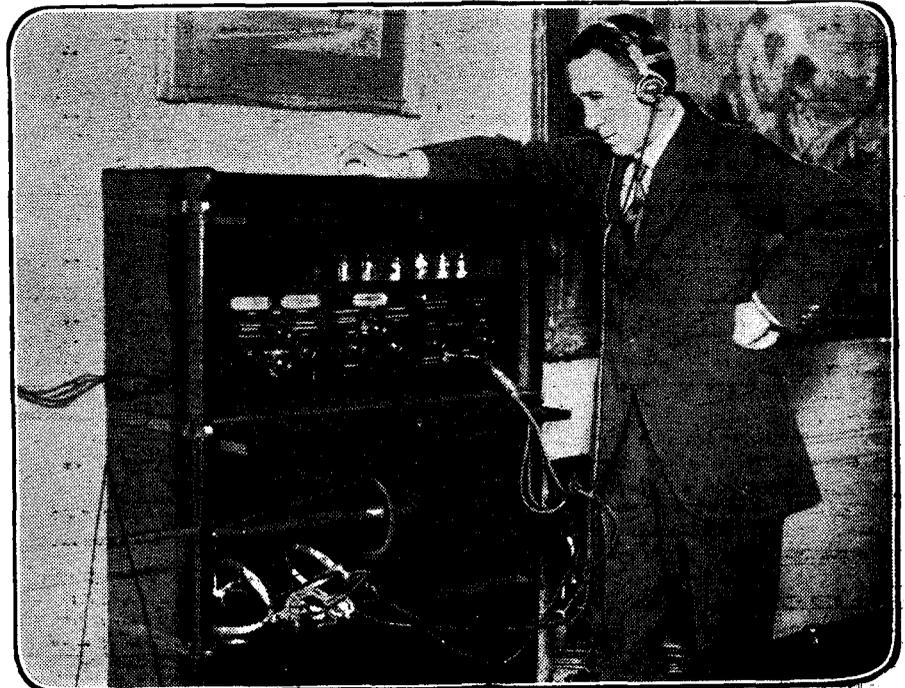
Direction-Finding and the S O S.

AFTER a strenuous battle with Atlantic storms during a tow of 750 miles, the Furness liner Schem brought the Norwegian ore-carrying steamer Capto safely to harbour at St. John's, Newfoundland. The Capto's wireless distress call, reporting the loss of a rudder and asking for assistance, was picked up by the Schem when the vessels were about 100 miles apart, and the Schem immediately steered in the direction given. A heavy gale was raging, and although the Schem searched thoroughly, she could not locate the disabled ship. The Canadian Pacific liner Montclare, equipped with Marconi direction-finding apparatus, plotted the exact position of the two ships from the signals they were sending out, and communicated the information to the Schem, which then soon came up with the Capto.

Imperial Wireless Chain.

THE Government have decided to issue licences for the erection of wireless stations in this country for communi-

(Continued on next page.)



Sir Gerald Du Maurier, the popular actor, and his fine Cabinet Set.

NOTES AND NEWS.

(Continued from previous page.)

cation with the Dominions, Colonies, and foreign countries, subject to the conditions necessary to secure British control and suitable arrangements for the working of the traffic. At the same time the Government have decided that it is necessary, in the interests of national security, that there should be a wireless station in this country capable of communicating with the Dominions, and owned and operated by the State. A station of this kind will therefore be erected as early as possible, and it will be available for commercial traffic as well as for service messages. Formerly it had not been intended that private companies should be allowed to participate in the State-operated wireless chain of communications, but such a restriction has now been abandoned.

THE Glasgow station commenced operations last week.

The first speaker to address a Scottish audience through the medium of the new station was Lord Gainford, chairman of the British Broadcasting Company, who was followed a few minutes later by the Lord Provost of Glasgow.

Immediately afterwards the programme of the first concert was opened with an orchestral selection, which, as was fitting, was of Scottish music.

In the course of the evening five-minute addresses were delivered by Principal Sir Donald MacAlister and Sir William Noble, and a news bulletin was given.

Speech and music alike were heard clearly and loudly throughout Glasgow and the neighbourhood.

The results achieved show that the Glasgow station will give a satisfactory service over a very large area.

"The Wireless Trader."

IN bringing forward their new publication, "The Wireless Trader," The Trader Publishing Company, Ltd., 139-140, Fleet Street, London, E.C.4, are only extending their field, which already covers the motor, motor-cycle, and cycle trades.

The new journal, which appears monthly, will, like the other organs of the house, be issued by subscription, to the trade only. There is no doubt that such a periodical will find favour with the trade.

The first issue maintains the high reputation of its issuing house, and if this quality is maintained I have no doubts whatever as to the immediate and well-deserved success of "The Wireless Trader."

A New Firm.

MR. ALFRED W. KNIGHT, late of Mitchells' Electrical & Wireless, is promoting his own wireless company in conjunction with Mr. H. J. Bywaters, the proprietor of Eiffel Tower Crystals. They have secured premises at 167, Rye Lane, and by this time will have their specialities ready for the market.

The Alfred Graham Cabinet Set.

ON page 61 in last week's issue of POPULAR WIRELESS, owing to an unfortunate error, a handsome cabinet type receiver, manufactured by Messrs. Alfred Graham & Co., was credited to another firm.

Daytime Concerts.

THE morning and afternoon concerts broadcast by the London Broadcasting Station for the "Daily Mail" Ideal Home Exhibition have been very fully appreciated in many other quarters, and it is to be hoped that during the summer we will be able to enjoy broadcast items in summer circumstances. Some of the "air liners" on the Croydon-Paris route have fitted up receivers in order that passengers can listen-in during these hours.

The Broadcasting of "Polly."

"POLLY" is not a play that lends itself to broadcasting; there is too much going on on the stage that is impossible to visualise unless one has actually seen it. Although the relaying and transmission from 2 L.O. was, as usual, excellent, I am afraid few listeners-in were able to hear it without developing that exasperating feeling of wondering exactly what all those crashes and bangs were. In fact, although it was an advertisement for the theatre proprietor it was rather a failure from the point of view of the listener-in, from what I can hear.

The New Game.

NOW that the Beaver craze has died a natural death, it looks as if an even worse craze is to take its place. Little boys have now picked on the interesting pastime of "spotting" aerials. Every time they see one of these gadgets in a back garden they scream out "HAERIAL!" I am not sure whether the "H" is part of the game or part of their accent. Anyway, owners of aerials are getting annoyed. "Frames" should enjoy a boom if this goes on.

A New B.B.C. Appointment.

MAJOR ARTHUR CORBETT-SMITH has been appointed Director of the Cardiff Station of The British Broadcasting Company, Limited. Amongst other things, Major Corbett-Smith is M.A., Oxon., F.R.G.S., barrister-at-law, major, R.F.A., officer de l'instruction publique, hon. secretary-general the Naval and Military Musical Union, editor The Journal of State Medicine, etc. Major Corbett-Smith is an accomplished musician, and has several operas and other compositions to his credit.

ARIEL.



Broadcasting Programmes

What you can hear every evening of the week on your set.

Station.	Call sign.	Wave-length in metres.	Remarks.
London Broadcasting Station, Strand	2 L O	369	Usually every evening, 5 to 5.45 p.m.; 7 and 9.30 News; 7.15 Orchestra; 8.25 to 10.30 Music. Sundays from 8.30 p.m.
Newcastle Broadcasting Station	5 N O	400	As a rule from 7 to 10 p.m.
Manchester Broadcasting Station	2 Z Y	385	Every evening, usually from 4.30 to 10 p.m.
Birmingham (Witton) Broadcasting Station	5 I T	425	Every evening, usually from 6.30 to 10 p.m. (News, Concerts, etc.).
Glasgow Broadcasting Station	5 S C	415	—
Cardiff Broadcasting Station	5 W A	353	5 to 10 p.m.
Croydon	G E D	900	Throughout day to aeroplanes.
Paris	F L	2,800	11.15 a.m. Weather report; 6.20-7 p.m. Weather report and Concert; 10.10 Concert.
Königswusterhausen	L P	2,800	4 to 6.30 p.m.
The Hague	P C G G	1,035	Sundays, 3 to 5 p.m. (Concert.)
Haren	O P V H	1,100	12 o'clock and 18.50 o'clock. Telephony.
Radio-Electrique, Paris	—	1,565	5.5 p.m. News Items; 5.15 to 6.10 p.m. Concert.
School of Posts and Telegraphs, Paris	—	450	Every Tuesday and Thursday, 7.45-10 p.m. Saturdays, 4.30-7.30 p.m.

Note.—See announcements in daily Press for last minute alterations in times of Broadcasting Programmes. No Broadcasting during hours of public worship on Sundays.

Note.—The Bar Lightship, Liverpool, sends telephony at 7 a.m., 9 a.m., 11 a.m., 12 noon, 1 p.m., and every two hours until 9 p.m. Calls "Dock Office." Liverpool answers "Bar Ship."

In addition to the regular transmissions carried on between the British amateur stations, much telephone conversation may be heard from St. Ingelvert (A.M), Le Bourget (Z.M), and Brussels (B.A.V). These stations are quite powerful, but they call for a little extra care in tuning. Wave-length, 900 metres.

All times given are G.M.T.

THE NEW RADIO DANGER.

By ALEXANDER W. SHARMAN.

IT is well known that new conditions call for new regulations if they are to be used to the fullest advantage and prevented from becoming a danger to the art which has called them into being. We have a new condition in radio and already much restrictive legislation, but a further trouble has arisen which was not foreseen, and the present regulations do not provide the remedy.

The chimney pots of Suburbia are becoming fairly festooned with aerial contraptions, good, bad and indifferent, but all aerials within the definition, "Insulated, elevated conductors," and it is obvious that if you increase the number of aerials within a given area the average distance between them will become less and less.

Already we have met a case of two "flat dwellers," one on the ground floor and one on the floor above. The male pillar of the house in each case is addicted to wireless amongst other domestic bad habits, and their activities have resulted in the erection of two aerials within about 18 feet of each other. Both of these gentlemen are suffering from radio disease in its acute form and both are in the second or crystal scratching stage of the malady.

Which became the host for the radio germ first and subsequently infected the other does not appear, but it is fair to assume that they mutually reinfected each other and will both become permanent chronics.

On the "Fading" Trail.

What brought me on the scene was a report from one of the victims concerned that the signals from 2 L O were showing unmistakable symptoms of rhythmic "fading." Now really genuine "Fading," the sort we spell with a well-merited capital F, has no excuse for its presence in London as far as signals from 2 L O are concerned. The genuine "Fading" is a mysterious variation in intensity or reduction in strength of signals from a distant station, and is thought to be due to clouds of misguided electrons which maliciously oppose the harmless and inoffensive ether ripples so melodiously and continuously produced (for financial consideration) by the British Broadcasting Company.

Now the presence of real "Fading" in London would be about as exciting as an authentic account of the presence of a super Usapia Palademo in the same locality; in either case I should forsake all and follow the trail. Armed, therefore, with my own pre-war crystal set and supported by a portable wave-meter, I sallied forth at the darkening hour to the wilds of Upper Tooting to hear this marvel. It is very dark in Tooting in the absence of light, and so I could not see the aerial, but I was given the terminal extremity of a piece of wire with the assurance that it was the aerial, and subsequent events entirely justified the statement.

I hooked up my set and in came 2 L O with normal clarity and volume. Triumphantly I passed the phones to my host,

and was about to expound upon the greater pleasure derived from a home-made set as opposed to the commercial indiscretion of buying one, when suddenly the signals dropped down in strength and finally vanished utterly, in spite of switching in a second detector and going over all adjustments.

Stealing Another's Energy.

Now, my own little portable set has an unblemished character for reliability and this result was astonishing, but facts are stubborn things and do not happen without a cause. I naturally asked rude questions concerning the earth, not the oblate spheroid on which we dwell, but the connection to my host's water-pipe. Was it possible that he had connected his earth wire, not in the rising main which must go to earth, but to a service pipe only connected to the metallic lining of the cistern, a mistake often-made by the novice? In this case the only real earth is of course through the high resistance water level, the ball-cock, and thence to the rising main, and if the water level drops and the main supply happens to be shut off the water fails to make contact with the ball-cock and the earth connection is a thing of the past.

This, however, was not so in the present instance. The earth connection was good and of the earth, earthy. We then paid a visit to the radio enthusiast residing in the flat immediately below and discovered, by comparing notes, that the moment our signals faded away was coincident with the moment that our competitor was tuning his adjacent aerial to the wave-length of 2 L O. Several experiments were made, and it was found that we could not both get good signals with our respective crystal sets at the same time.

We had hoped that readjustment of tuning would enable us to pull in 2 L O in spite of the activities of the adjacent set, but no success was obtained. When the second aerial is either put direct to ground or left on open circuit all is well, but if one of the two aerials is left without sufficient inductance to ground to tune

it to 2 L O there is nothing left for the second aerial to get. That was the explanation of the apparent "fading." It was simply due to the activities of the other flat dweller. The more signal energy he captured by readjusting his tuner, the less was available for ourselves.

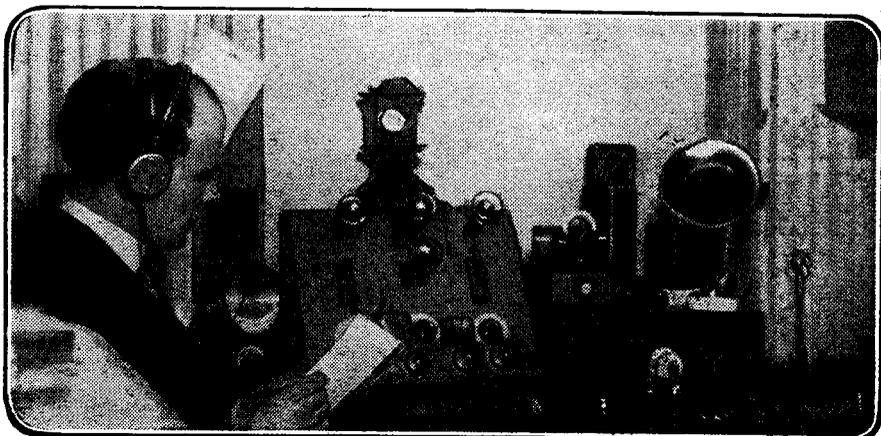
This fact is of course not so noticeable when the aerials are further apart, but aerials are cropping up in such close proximity that the danger of interference with reception from this cause is imminent. Each aerial seems to integrate the energy for some little distance round it, and the effect is certainly not limited to conditions as described above, although this is an extreme case.

Radio Eleventh Commandment.

At home I am using the standard Post Office twin-wire aerial and operate a loud speaker with a 2-valve set and occasionally a third note-magnifying valve is used. Next door but one another aerial has made its appearance, and although I have not paid a visit there I am certain that a crystal set has been installed, for since its appearance I received (unthankfully) on my loud speaker certain new and strange scratching, clicking and spluttering noises which are both new and nasty. These noises occur in spasms, two or three per session, due to the aforesaid crystal set being tickled up and readjusted.

What we really want is a new law, saying, "Thou shalt not readjust thy crystal contacts during the precious musical moments of 2 L O, neither shalt thou shove thy sliding contact violently along the turns of the inductance, lest horrible noises be produced in the ears of others and they become rampant."

The explanation is evident that in London the tuned aerial is energised by the carrier wave from 2 L O and re-radiation takes place. The aerial, in fact, acts as a very small power transmitter, and when the continuity of the circuit is interrupted or varied, noises are produced which seriously interfere with reception at adjacent stations. A limit range over which this effect is noticeable is now being investigated experimentally.



Mr. H. Cheesman's home constructed set, 11, Bushey Lane, Sutton

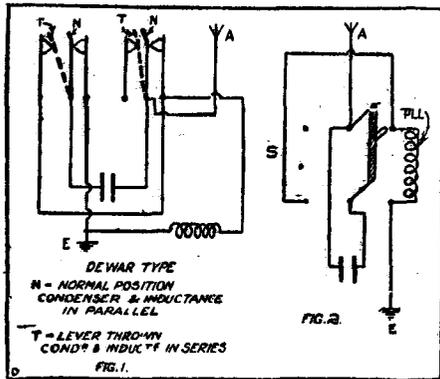
A FEW HINTS ON SWITCHING.

By ALBERT BULL.

LET us take the series-parallel arrangement as used in connection with the aerial tuning condenser and inductance. (See Fig. 1.)

A similar arrangement stands for the ordinary D.P. change-over switch. No explanation will be necessary *re* Fig. 2.

Whilst dealing with series-parallel arrangements, the following may interest the experimenter. We may save a few shillings

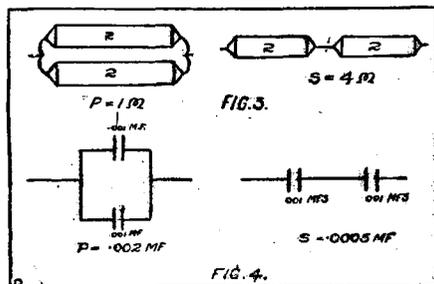


in arranging, say, grid leaks. (See Fig. 3.) It will be seen at a glance that two 2-megohm grid leaks joined in parallel equals 1 megohm, and when in series 4 megohms. The reverse applies to condensers. (See Fig. 4.)

Cells in Parallel.

By a very simple application of Ohm's Law the amateur can utilise his primary cells so that the maximum current may be obtained; the reason why certain series-parallel arrangements are necessary is due to the internal resistance of the cells. This resistance definitely limits the amount of current. The same applies to the secondary cell or "accumulator," but in the latter the internal resistance is in the order of .001 ohms.

We may very suitably apply the term "self-control" to the internal resistance of any cell or battery. Ohm's Law states the $C = \frac{E}{R}$, a "dry" cell of, say, 1.5 volts, with 4 ohms internal resistance or self-control, has a piece of thick wire connected to its terminals. This wire is of negligible resistance. At the most we can only get $\frac{1.5}{4} = 0.38$ approx. amperes flowing, so that we see that the dry cell has a very appreciable amount of "self-control." But in

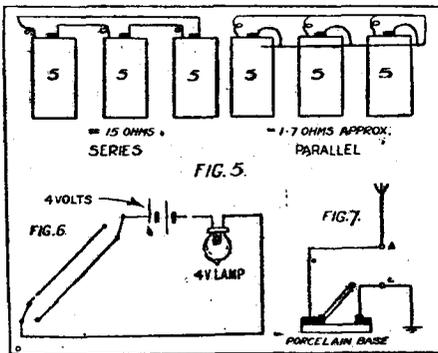


the case of the secondary cell or accumulator of, say, 4 volts, the result is vastly different. Let us prove it. $\frac{4}{.001} = 4,000$ am.

peres, or a short circuit, as it is generally called. Of course, the current stated is far above that given from the ordinary 4-volt accumulator, which, as a rule, is of 20-100 ampere hour capacity; but "self-control" is nil.

It will be clearly gathered from the above that in cases where comparatively heavy currents are required from primary cells it will be advantageous to join them up in parallel, so that we may reduce the internal resistance of the total battery in a similar manner to that applied to the grid leaks. (See Fig. 5.)

A most useful method of two point remote control up to the "laboratory," sometimes called the attic, may be adopted from the sketch shown in Fig. 6.



This combination enables one to switch "on" or "off" from top or bottom of staircase.

You can protect your aerial or apparatus when not in use by using a S.P.S.T. (single pole single throw) switch, as shown in Fig. 7.

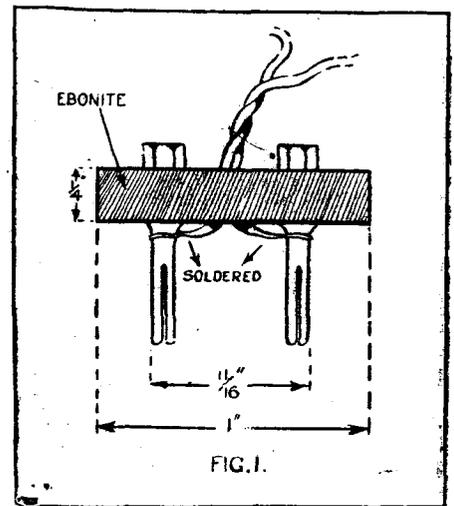
THE USE OF PLUGS.

By T. McL. GALLOWAY.

THE plugs and sockets which are about to be described are cheap (a two-pin plug and socket on ebonite costs about sixpence), easy to make, and have negligible self-capacity. They may be used to plug in and out H.F. or L.F. valves, for switching on filaments, for varying the high-tension voltage, for putting condensers in series or parallel, or out altogether, and for a thousand other purposes which the reader may think of.

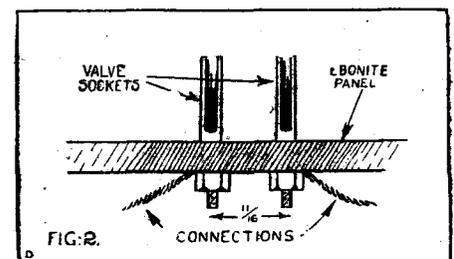
The "plug" part consists of a small piece of ebonite, one

inch in length and $\frac{1}{4}$ in. wide, with a thickness of $\frac{1}{8}$ in. to $\frac{1}{4}$ in. Through this, two holes are bored $\frac{1}{8}$ in. apart, which is the approximate distance between the grid and plate legs of a valve, and of slightly larger diameter than the end of a valve pin. Next, two valve pins are placed through the holes, and the nuts screwed down. Connection may then be made by soldering "flex" to each pin.

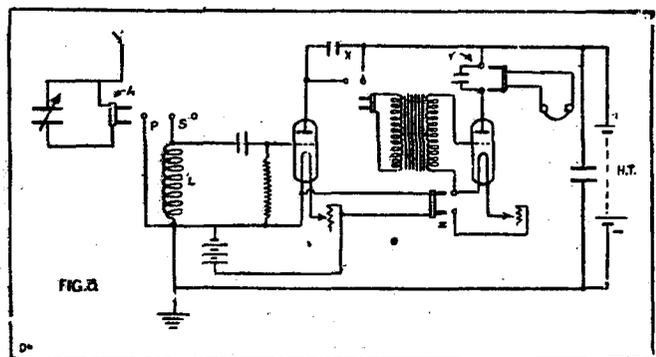


If a central hole be bored in the ebonite, the "flex" may be inserted, and the ends soldered to the pins on the opposite side of the ebonite from the nuts. The resulting plug will appear as in Fig. 1.

A suitable socket consists of two valve sockets mounted on the ebonite panel of the set on which the plugs are to be used, at, of course, a distance of $\frac{1}{8}$ in. apart. A complete socket is shown in Fig. 2.



In Fig. 3 is shown the method of connecting in or out a low-frequency valve, with a means of having the valve completely out of use, also showing how to use the plug to put a condenser in series or parallel, or earth the aerial. Care should be taken that the plugs are not left hanging loosely about the apparatus, otherwise there is always a risk of "shorts" causing irreparable damage.



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**IDEAL HOME
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Broadcast Reception without Complications

The above illustrations depict the series of "COSMOS" RADIOPHONES as manufactured by the Metropolitan - Vickers Electrical Co., Ltd., of Trafford Park, Manchester. They have been specially designed for reception from the British broadcasting stations. The outstanding feature of these sets is simplicity, without sacrifice of efficiency; all unnecessary complications are avoided, and the sets are, therefore, eminently adapted for the non-technical user, and can be operated without difficulty by anyone without special knowledge or skill. All the sets, Valve as well as Crystal, are entirely self-contained, the only wires that have to be connected up by the user being the aerial and earth leads.

"COSMOS" RADIOPHONE
Crystal Set
£4 : 17 : 6
complete ready for use.

"COSMOS" RADIOPHONE
2-Valve Cabinet Set
£28 : 5 : 0
complete ready for use.

"COSMOS" RADIOPHONE
4-Valve Cabinet Set
(not illus. above)
£41 : 15 : 0
complete ready for use.

"Cosmos" Radiophones are obtainable from all Electrical Contractors, Retailers, Opticians, Stores, etc.

WHOLESALE FROM:—

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LEEDS
MANCHESTER
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SOUTHAMPTON
SWANSEA

BE SURE YOU GET A "COSMOS" SET

SOME WIRELESS OBSERVATIONS.

By SIR OLIVER LODGE, F.R.S., D.Sc., M.I.E.E. (Scientific Adviser to "Popular Wireless.")

This is the third of a series of articles, primarily intended for the experimenter and research worker, written specially for POPULAR WIRELESS by our Scientific Adviser. The Editor will be glad to hear from experimenters giving their views on subjects suitable for future articles on this page.

PART 3.—COMPARISON OF THE ABSOLUTE MAGNITUDES OF CAPACITY AND SELF-INDUCTION.

I PROPOSE here to interpolate, among calculated and practical considerations, a little theoretical point of some interest. For wireless workers and amateurs surely like to think occasionally of the ether whose properties they are utilising.

In electro-magnetic waves the electric energy and the magnetic energy are equal; or, in more general terms, in every wave, or system of waves, the kinetic and the potential energies are equal. This is obvious, because (at any given spot) the energy alternates from one form to the other. At one instant it is static; at the next it is kinetic. Hence the two energies must be equal.

So it is, also, with the discharge of a Leyden jar, or any other capacity area. At one instant it is charged electrically, and at the next (that is, after a quarter swing) it is momentarily discharged, and all the energy is contained in the rushing current. Then, once more, the energy piles itself up statically in the opposite direction, and then swings back again. So it is even in a swinging pendulum: the potential energy at the end of the swing is equal to the kinetic energy in the middle. So it is, also, in a vibrating spring.

Controllable Electrical "Inertia."

Consider, then, a spring with a load on it which you can set vibrating. At the extremity of the swing the energy can be called elastic energy, or the energy of recoil. It is static. It depends on the elasticity of the spring; it does not depend on the inertia of the load. It does not depend on inertia at all; it would be the same if the spring was bent an equal amount and not loaded.

But now let the spring go, and consider what happens as the load is rushing past the middle position. The whole energy is now the energy of movement. It depends wholly on inertia—that is, on the massiveness of the load—it does not depend on the elasticity of the spring at all. It would be just the same for the same moving load if the spring were instantaneously abolished.

This energy may be called inertia energy, or the energy of current or movement. The elastic and the inertia energies must be equal. The spring adapts itself to them. Its rate of vibration is thereby determined. If it is a very stiff spring with a small load, it will vibrate with extreme rapidity. It must, in order that the motion energy can equal the elastic energy. If, on the other hand, it is a weak spring heavily loaded, it will vibrate very slowly; because, since the energy is small the motion of a massive body must be slow.

All this is very elementary and simple mechanics, but now apply it to the electrical analogy. Are we to regard a Hertz vibrator or a wireless sending station as represented by a stiff spring and a light

load, or a feeble spring and a heavy load? Or, again, should we not rather try to arrange it so that the spring is moderately stiff and the load moderately massive, the one being adapted to the requirements of the other, and neither being over-balanced by the other?

Now, in the electrical case, the oscillating thing is a group of electrons. They are very highly charged, but they are certainly not massive. They possess a kind of inertia due to the magnetic field which surrounds them when they are in motion. But the magnetic field due to a moving charge is but feeble, unless the charge is great and the motion exceedingly fast.

Now, the electrons, though not massive, are highly charged, and they are presumably moving very quickly. Hence their current or magnetic energy is by no means negligible. But to bring it up to the required amount we must magnify it by coiling up the path of the electrons into a close spiral, so that all the magnetic fields reinforce each other and give a large, combined result. In that way, by the use of a sufficient coil, we may make the inertia what we please, and obtain the required amount of kinetic energy.

Now, what about the static energy? Here we must regard the ether as strained, probably sheared, so as to call out what is analogous to rigidity. And the ether's rigidity is excessively high. We know that, because of the rate at which light travels. Its elasticity, compared with its density, is accurately determined as equal to the square of the velocity of light; that is to say, the ratio of the two is excessively great.

A Margin of Variation.

A very small amount of distortion will account for a great amount of energy. But, to make room for all the electrons which are to take part in the discharge, an extensive area is required. If we use only a small area, we can hardly get any charge in it. It is like trying to bend a very stiff spring.

A tuning-fork, for instance, can be excited by a blow, or by a succession of timed impulses in synchronism with its natural period, which is practically what a violin bow does. Such a bow grips and releases a string or a spring in a synchronous, and therefore effective, manner. But a tuning-fork hardly yields to a steady pull. The amount a small force can thus bend the prong of a stiff fork is insignificant. To be able to bend it sufficiently the spring must be long, and the greater the rigidity of the material the longer it must be. That means that, to get an effective capacity area, it must be of large extent.

It must be the most visible and conspicuous item in a telegraph station. On the other hand, the coil responsible for

the magnetic energy may be quite small; we might even say the smaller the better, within certain limits. The capacity area should be quite big; we might almost say the bigger the better, again within certain limits.

There is no doubt a best relation between the size of the capacity area and the size of the inductance coil, and this relation is determined by the fact that the electric and magnetic energies must be equal. A great margin of variation is permissible, just as is the case in musical instruments, which may vary from the stiffness of a tuning-fork to the laxness of the column of air in a flute, with all manner of strings and reeds as intermediaries.

The Practical Considerations.

So it is with a telegraph station. One person may be working with a small capacity and a big self-induction, while another one may be working with a great capacity and a small self-induction; and yet both may have the same period of vibration—and will have, if the product of capacity and inductance is the same for both. But there is sure to be a best relation between the two things which, however over-ridden in practice, it may be instructive to consider.

And it is specially instructive to realise that the great size of the aerial, as compared with the small size of the coil which is in circuit with it, is an immediate consequence of the relation which exists between the two properties of the ether, its elasticity and its density. One is incomparably bigger than the other. The ratio, in c.g.s. measure, is 10^{21} . Hence we may say that the ratio between the size of an aerial—which depends on the ether's elasticity—and the size of the little coil—which depends on the ether's density—is also of something like the order 10^{21} .

No; it can hardly be as big as that, even with the best possible arrangement. But it is legitimate to regard that as a sort of ideal, and to emphasise the importance of a big as well as of a high aerial, and of a small, compact coil.

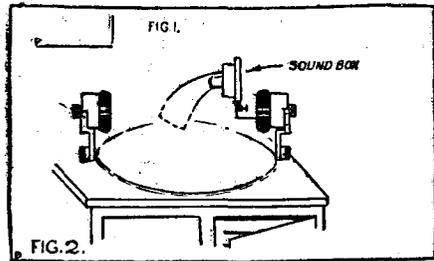
The size of the aerial has to be fixed by practical and often financial considerations. The size of the coil is at our disposal, and must be determined by the rapidity of vibration—that is, the wave-length that we want. And it must be adjusted so as to give this wave-length when worked in combination with the given aerial.

That, then, is the problem before us. Given an aerial of definite capacity, and required a certain wave-length, whether for receiving or for emitting—but especially we will consider receiving—what sized coil shall we use, and what wire shall we wind it with?

THE GRAMOPHONE AS A LOUD SPEAKER.

By B. H. J. KYNASTON.

IF we examine the grooves in a gramophone record in which the needle rests, we will notice that they are not straight lines but that they are in the form of waves, so that when the record revolves, and the needle lies in these grooves, it has to vibrate from side to side in order to follow the wavy grooves. This is what reproduces the speech, music, etc., in a gramophone. If we examine a wireless telephone, we shall see that the reed or diaphragm, according to the type of phone being used, also vibrates when music, speech, signals, etc., are being received. If



we can connect the telephones to the gramophone sound-box in such a manner that the vibrations of the diaphragm or reed cause vibrations of the gramophone needle in the same way or direction that the record goes, then the wireless signals will be reproduced by the gramophone.

The Adjustable Reed Type.

There are two types of wireless headphones in general use, the one being the adjustable reed type, and the other the ordinary flat diaphragm type. Methods of connecting the telephones to the gramophone sound-box are as follows.

The first method described is for the adjustable reed type of phone. If the ebonite cap of one of these phones is unscrewed a thin metal cone will be seen, in the centre of which is a small brass screw. This screw should be carefully removed. Next take a piece of stiff wire about two inches in length, and bend a very small loop in the end, just large enough to take the small screw. This piece of wire is now bent in the middle so that it is in the shape of a letter L (see Fig. 1), and the screw passed through the loop, and the whole screwed back into the centre of the cone. The two terminals on the earpiece not being used are now short-circuited with a piece of wire, so that the signals will pass through the one earpiece only.

The head bands should be opened out flat, so that the telephones will stand upright as shown in Fig. 2. The end portion of the wire L is now perpendicular, or, if not, it should be adjusted until it is. This piece of wire is placed in the sound-box in place of the gramophone needle and the screw tightened, and the instrument is then ready to receive signals.

Excellent Results.

The author used a bent pin with the head cut off for the wire L, and signals

from a ship 50 miles away were readable 120 feet from the gramophone. The Eiffel Tower Station, 250 miles away, could be heard 80 feet away. The receiver consisted of two V24 valves, and the gramophone used was a small portable one. Some very slight adjustments in the position and angle of the sound-box and telephone are usually necessary before the best results can be obtained.

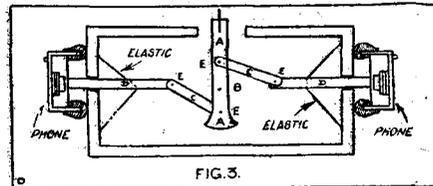
If the ordinary flat diaphragm type of head telephones are used, a separate instrument must be constructed. This instrument is contained in a small wooden box 9 inches long. The box and interior are shown in Fig. 3.

The distance between ordinary head telephones is about 8 to 8½ inches, so that on slipping the telephones over the box it will be found that they hold in place owing to the metal head band acting as a spring.

In Fig. 3 the centre rod A, which is perpendicular, is pivoted at B, and the two connecting rods C connect the two rods D. All these rods are made from wood, and hinged at the places marked E by means of pins passed through them, small glass beads being used as washers. A small hole is drilled through each rod D in the centre, and a thin piece of elastic passed through, as shown by the dotted line in Fig. 3. These pieces of elastic act as springs and tend to pull the rods D apart, and therefore move the centre rod A in a clockwise direction.

Flat Diaphragm Device.

This instrument should be so constructed that, when the centre rod A is perpendicular, the ends of the rods D project about ¼ inch through each end of the box. The top of the rod A projects about one inch through a slit in the top of the box. Before putting the headphones upon the box it is necessary to move the top of the rod A to the left, so that the ends of D become level with the ends of the box.



The telephones are now slipped on and the rod A released. The elastic springs will now pull D outwards until the ends of these rods rest lightly upon the telephone diaphragms. Now, when signals come through and the telephone diaphragms vibrate, these vibrations are transmitted

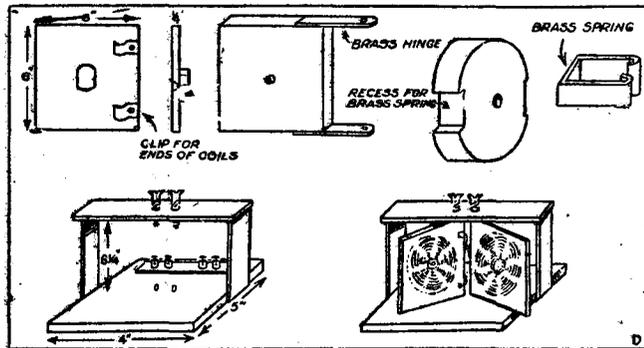
to the top of the rod A and through D and C. If a wire nail about the same thickness as a gramophone needle is obtained, and the head cut off and the nail fixed firmly in the top of the rod A as shown in the diagram, this nail will vibrate with the incoming signals. This nail then takes the place of the gramophone needle, and is connected to the sound-box in the usual manner.

This type of instrument does not give quite such good results as the one first described, but the author has received signals over 60 feet from the gramophone on this type, using only two valves in the receiver.

A SIMPLE BASKET COIL HOLDER.

EXPERIMENTING with basket coils becomes a troublesome matter if it is necessary to keep making two pin plug portions to attach to each coil. The following holder will allow of all sorts of experiments without the necessity of making such plugs at all.

The coils are mounted on two ebonite



blocks on hinges so that they open and close book fashion. Only one need have the hinge, and the writer, although showing two holders, suggests that a fixed one between the two will be found useful.

These dimensions need not be strictly adhered to, but a 6-in. carrier will permit of pretty long range coils being tested; broadcasting coils would have ample room on a 4-in. carrier.

The Coil Clips.

The carrying portion consists of a piece of square ebonite in the centre of which should be fastened a piece of round ebonite the size of the former on which the coil has been wound. This core should have two grooves filed as shown, to take the spring that grips the centre of the coil. This latter should have a piece of thin cardboard tube shackled to its centre. On the back two small copper or brass clips will have to be screwed to take the ends of the coils and also to take the flex-leads to the terminals. On the ends of the coils fasten a short piece of wire that will slip into the clips tightly. On the top and bottom supports two hinge portions are screwed for the ebonite to pivot on.

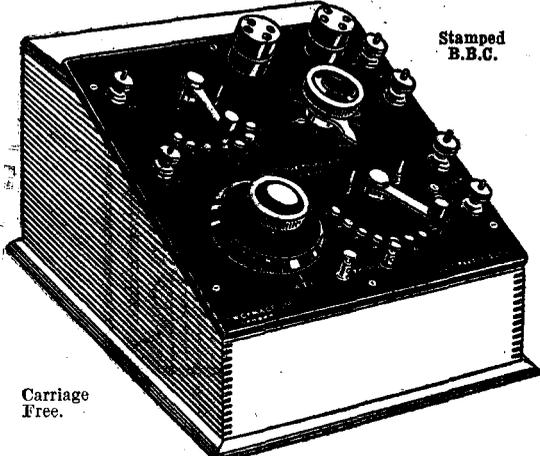
The baseboard to carry these holders is a very simple matter and the drawing shows all details.

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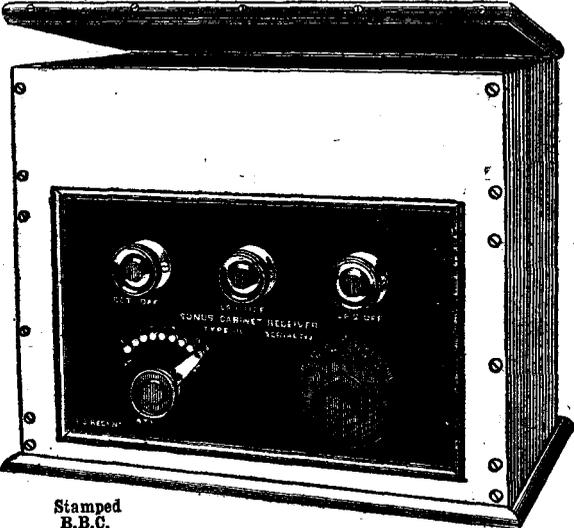


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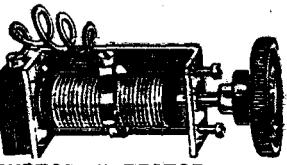
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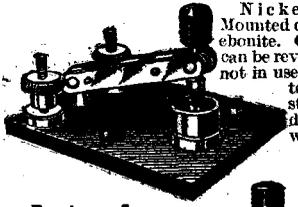
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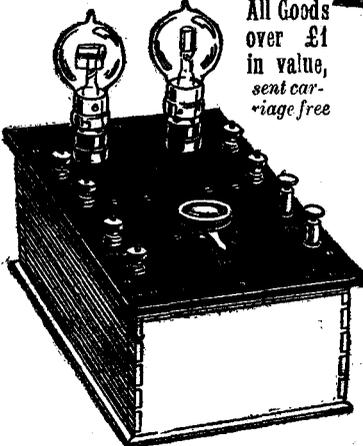
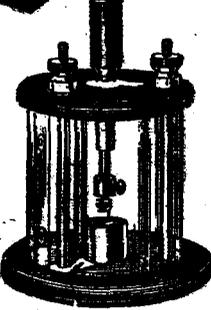
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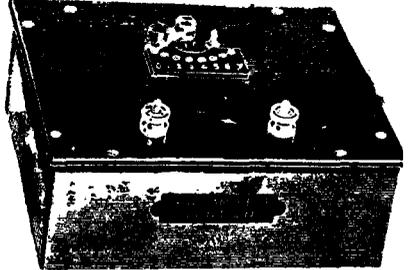


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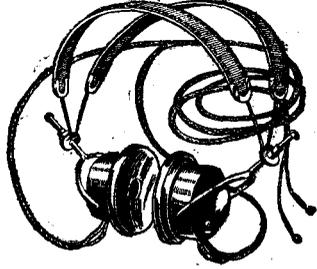
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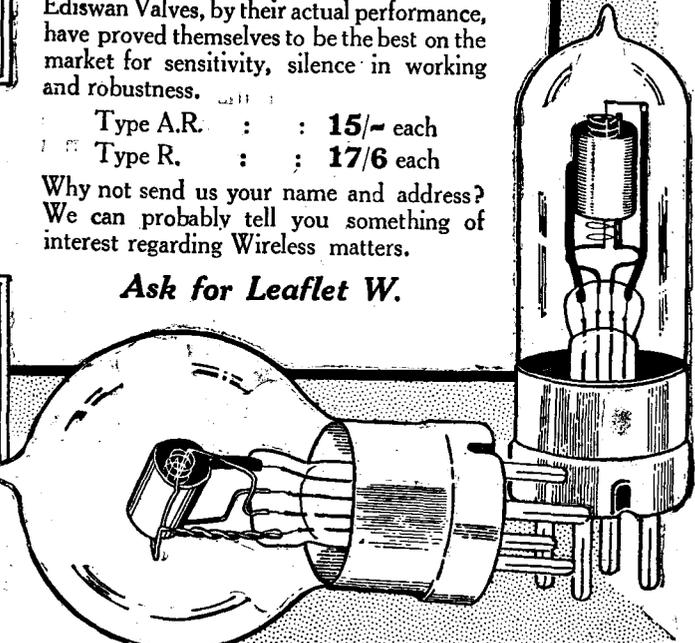
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BROADCASTING & THE THEATRES.

AN INTERVIEW WITH MISS PHYLLIS NEILSON-TERRY.

By "ARIEL."

I WAS fortunate enough last week to be able to introduce the delights of "listening-in"—by means of a six-valve Marconi portable receiver—to Miss Phyllis Neilson-Terry, the distinguished actress now appearing in Mr. Temple Thurston's play, "A Roof and Four Walls."

Miss Neilson-Terry was both astonished and delighted with the novel experience of hearing a first-class concert arranged by the B.B.C., and, as she aptly put it, "all within a roof and four walls!"



Miss NEILSON-TERRY.

I was anxious to hear Miss Neilson-Terry's views on what effect she considered broadcasting would have on theatres generally, and whether, as the number of "listeners-in" increases, material damage would be done to the box-office receipts. It appears that Miss Neilson-Terry's

attention had been drawn to a pessimistic feeling expressed in the theatreland that the enormous and ever-increasing interest in wireless existing in this country would eventually lead to the definite discomfort of theatres and other places of amusement.

Just the Difference.

"Frankly," said Miss Terry, "I do not agree. Without wishing in any way to belittle what is probably the most marvellous achievement of modern brains and science, I cannot think that even the magic fascination of 'listening-in' will alter the fundamental fact that humanity, gregarious by nature, will ever lose the desire to use the most precious of God-given senses. To capture to the full the rich glory of magnificent music, the true beauty of the spoken word, the average human being must thrill with the multitude of fellow-enthusiasts and see the accompanying scene enacted before his very eyes."

"Then you consider," I asked, "that wireless as a means of supplying an entertainment heard from the depths of an armchair, by a cosy fire and minus the fatiguing journey to and from the theatre, will not in any way diminish the popularity of the existing public amusements?"

The Real Thing.

"As a home entertainment, probably relegating the once-beloved gramophone into a very back seat, the wireless installation is a boon. But, after all, what human imagination could be miraculous enough to visualise a scene from, say, 'Tristan and Isolde,' with the aid of a pair of headphones, an armchair, and a cosy fire? The wildest of applause helps the illusion not a whit," said Miss Terry.

"But it is a glorious thing to realise that, during the past few months, tens of thousands of all classes have been privileged to

hear Melba," she went on, "the majority for the first time in their lives, easily, inexpensively, and in comfort; and yet I seem to remember reading of enormous queues of Londoners willing to endure the chill and discomfort of an all-night wait in the open street in order to get a few hours of the 'real thing.'"

Not Competitive Rivals.

"Nevertheless, the broadcasting system is an epoch-making innovation—to country people an incalculable blessing; to the bedridden and sightless, a godsend. There is room in this world for everything new, beneficial, and splendid, without the slightest fear of shaking the foundations of existing things; and so, with wireless, the mighty millions of London absorb it into their daily life, and carry on as usual.

"Aerials may rise from every roof and gable in the metropolis, but, in my opinion, the world of entertainment need scent no hated rival in the now ubiquitous wireless-set."

And then the call-boy was heard announcing that the curtain would shortly be going up, and so I had to put away my portable box of magic lamps and depart, more than interested in Miss Terry's views on Broadcasting v. The Theatres.

HOLES IN WOOD.

By G. SUTTON, A.M.I.E.E.

HOW very often has the sharp sound of cracking wood been accompanied by a noise somewhat more vocal but equally expressive; as one has driven a bradawl into the edge of the boxwork of the newly constructed set, to make a hole for the brass screw which was to hold on the ebonite top.

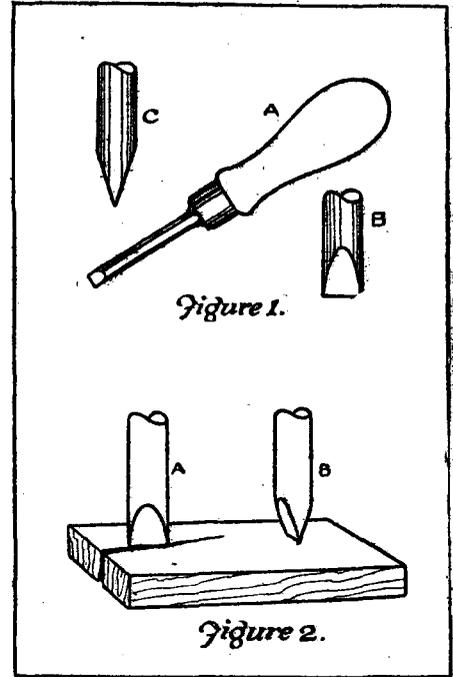
And yet a little forethought would have avoided the catastrophe. Fig. 1 shows a bradawl, and if its chisel point is driven into the wood in such a manner as to sever the fibres—that is, to cut across the grain and not along it—there is little danger of splitting the work.

The "Wedge" Principle.

Fig. 2.—A and B shows the wrong as well as the right way. If driven in as at B, the fibres are cut and telescoped up endways, thus compacting the wood into a better hold for the screw. If driven in as at A, the wedge-shaped point can hardly fail to have a splitting action as illustrated.

Londoners will often have seen the principle used by the roadmakers, driving in wedges to displace the granite "sets" in the street, and all country people will have seen wedges driven into a tree-log to split it up into smaller pieces. Yet we go thoughtlessly and merrily away, and do not apply the lesson of what we have seen, till the ruined piece of wood enforces consideration.

Another point is to use a bradawl a little smaller than the size of the screw, so as not to make too big a hole, and make the hole rather deeper than the screw is long, so



that the screw, if of brass, shall not jam in the bottom of the hole, and, in trying to drive it home, break off in the hole.

This latter accident is worse in a hard wood than it is in metal; for a metal screw broken in metal can generally be drilled out, but a metal screw broken off in wood is much more difficult to deal with.

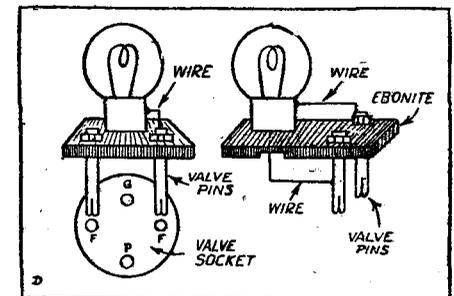
Better than Drills.

A small twist-drill might be used for making your holes, but it needs more care and skill than the bradawl, and the writer recommends the latter tool in preference, on account of the greater command that a grasped awl-handle gives, and the blunting and risk of breaking a small-twist-drill used in a brace. It is also much more liable to wander from the exact spot where the hole is wanted.

A SAFETY DEVICE.

THE diagram illustrates a simple device for testing the filament connections of a valve set.

Two valve legs are screwed to a small base of ebonite to which also is attached a small



4 volt pocket-lamp globe. Thus when testing connections this small "gadget" can be plugged into the filament sockets, and the effect of varying the rheostats noted. It is better to risk burning out a cheap bulb than an expensive valve.

A "PIANO" TUNER FOR WIRELESS.

THE types of tuner used by most wireless amateurs either consist of large coils with sliders or tappings taken to studs, or else a set of honeycomb or slab coils.

These methods of making tuners do not give the best results. This can be easily proved by using a coil with tappings, and when signals are heard, cutting off the part of the coil not used. It will then be noticed that the signals increase greatly in strength. This is known as the "dead end" effect of the coil.

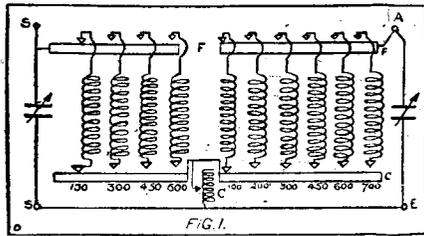


Fig. 1 shows how the coils are connected, the first coils being shown in circuit. In the instrument made by the author there were 10 coils, 6 for aerial tuning and 4 for secondary tuning. These coils were wound on wooden formers, and mounted on the back of the box, as shown in Fig. 2. The diameter of these coils was 2 inches, and the wire No. 30 d.c.c.; the number of turns used are shown in Fig. 1 in figures under each coil. The method of coupling, it will be noticed, is different from the usual method. The coupling coil C consists of a coil 2 inches in diameter, of 200 turns, with tappings off each 20 turns.

Constructing the Keyboard.

The two condensers used are rather large, having each a capacity of .001 mfd. It will be found that 57 plates of standard dimensions are necessary in each condenser to obtain this capacity, 29 fixed plates and 28 moving.

The one condenser is placed directly between the aerial and earth terminal, and the other between the terminals marked secondary.

These secondary terminals go direct to the valves or crystal detector. The keyboard is the most difficult part to make; this is shown in Fig. 3. The keys are made from 1/2 inch square wood about 4 inches long. A hole is drilled through them at A, and a metal rod passed through them all. Three strips of 3/8 inch brass are screwed to the bottom of the key, as shown in the diagram; these are marked C, D, and E.

The two ends of the coils come to C and D, and these make contact with the two strips of brass, F and G. These strips run the length of each keyboard, the two sets of keys being separated by a dummy key. Fig. 4 shows the key pressed, and it can be seen how the catch K holds the key down. When another key is pressed, the catch is pushed back by E, and thus releases the key previously held down. The bottom of the catch K is weighted so that it returns to its original position after being pushed back by E, and thus holds down the key, whilst the spring H forces any key that had been previously held down to return to its normal position.

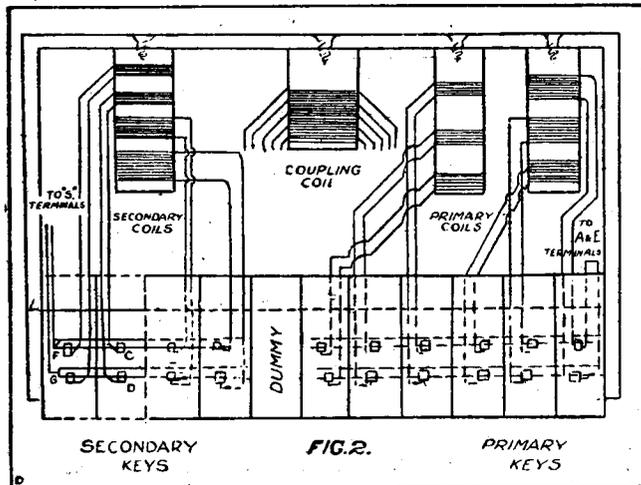
The second method of making a tuner, by using separate coils and tuning with a condenser, does not give the best results, although it gives better results than the coils with tappings or sliders do.

The reason these coils do not give the best results is because for certain wave-lengths a large condenser capacity is necessary, and, as valves and crystals are potential operated devices, it is necessary to keep all capacities as small as possible.

General Principles.

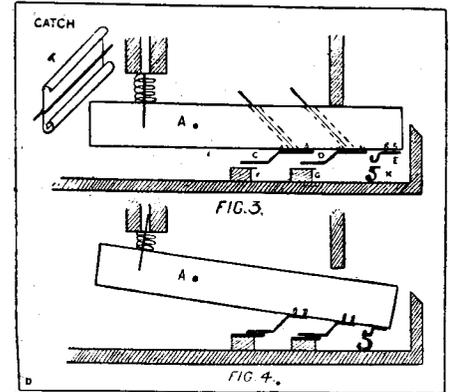
The "piano" tuner was designed and brought into use by the Marconi Co., and is known as the tuner "Type 127." It is practically beyond the power of any amateur to make an exact copy of one of these instruments, so an instrument working on the same principles will be described.

This tuner contains two sets of keys—one for aerial tuning and one for secondary circuit tuning. Each key controls a coil, so that one or more coils can be used in parallel if desired. The final tuning is done by means of the two condensers.



coil is in circuit the condenser in that circuit is in parallel with the coil.

In the instrument made by the author, the keys are marked with the wave-lengths they cover, so that the instrument could be used by anyone, whether they had a knowledge of wireless or not. Using a hundred-foot single-wire aerial, and condensers of .001 mfd., the range of the tuner made was from 200 to 20,000 metres. The keys were worked as follows: Commencing from the left of the instrument

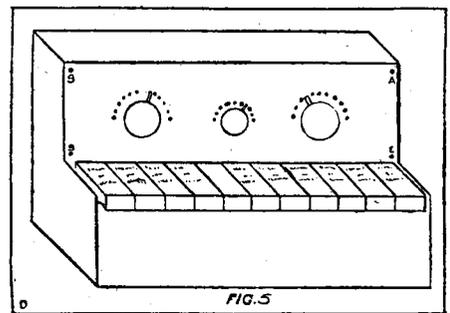


—this is the tuned circuit—the first key gave 200 to 2,500 metres, the second 2,200 to 6,500, the third 5,500 to 12,000 metres, and the fourth 11,000 to 20,000 metres. The fifth key is a dummy key, and only used to separate the two sides of the tuner. The sixth key is the first key on the aerial side of the tuner, and has a range from 200 to 2,000 metres. The range of the seventh key is 1,800 to 4,000 metres, the eighth 3,500 to 9,000 metres, the ninth key gives from about 8,500 to 13,000, the tenth from 12,000 to 16,000, and the last from 15,000 to 20,000. This range of wave-lengths was obtained using the number of turns given in Fig. 1 in the coils.

How to Apply Reaction.

The range of the aerial circuit will probably vary slightly with different aeriels. The condensers, keys, and coils were all enclosed in a box or cabinet, so that when the instrument was finished it appeared as shown in Fig. 5. The centre knob on the front of the instrument controls the coupling coil, and the other two knobs are the aerial and secondary condensers. The two terminals on the right-hand side are the aerial and earth terminals, while the two on the left are the secondary terminals to which the valve or crystal are connected.

For C. W. reception, when using this tuner it is necessary to either use a separate (Continued on page 111.)



It will be noticed that two holes are drilled through the keys to allow the wire from the coils to be connected to C and D. F and G are connected to the aerial and earth terminals on the aerial side of the tuner, and to the two secondary terminals on the tuned side of the instrument.

When C and D are in contact with F and G the coil connected to C and D is actually connected to either the aerial and earth or the secondary terminals, depending, of course, on which set of keys are pressed. It will be noticed that when a

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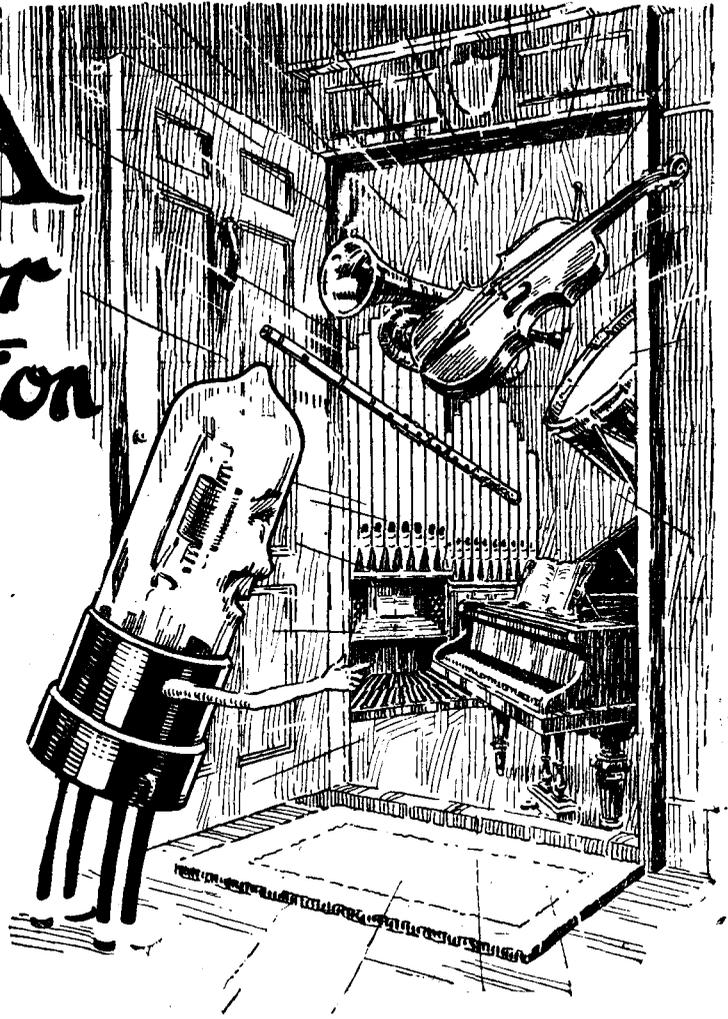
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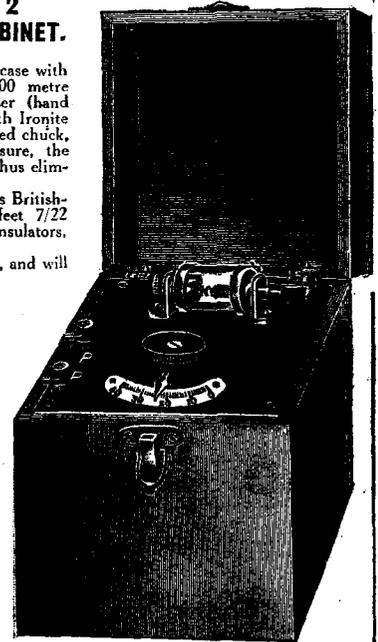
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WAVE-LENGTH AND INTERFERENCE.

By B. R. CUMMINGS (Radio Engineer, General Electric Co.)

IN the adjustment of radio receivers, we know that we can "tune-in" different stations which are transmitting on different wave-lengths by an adjustment of the control of controls provided in the receiver for this purpose. We know that, even though a number of stations are transmitting simultaneously, if their wave-lengths are sufficiently different we can tune one station out and another in.

In order that the term "wave-length" may have somewhat more meaning than that of an arbitrary term, it may be explained that the energy which actuates a radio receiver, and which is transmitted through space from the transmitting station, is transmitted in a series of pulses. These pulses are so frequent that they cannot be individually detected by the ear, and they generate an electric current in the receiving antenna, their nature being such that each pulse generates a current in the opposite direction from that generated by the preceding pulse.

If we can mentally picture these pulses in space at a given instant, between the transmitting and the receiving station, the distance in metres between one pulse and the second pulse ahead of or behind it is known as the wave-length of the transmitted signal. The majority of broadcasting stations are operating on wave-lengths between 350 and 450 metres, which is very nearly one quarter of a mile. For long distance commercial radio work, the wave-length is frequently as long as 20,000 metres or approximately 12½ miles. The speed of transmission is so great, however, that, even at this wave-length, approximately 30,000 pulses are picked up at the receiving station each second.

Simple Explanation of Tuning.

For an analogy of what takes place in a radio receiver when it is tuned to a particular wave-length, let us picture a swing suspended from a branch of a tree, say, and that two people, one at each end of the swing's travel, are alternately pushing the swing and keeping it in motion. Their pushes are timed to the natural period of the swing, so that each push is delivered at a time when it will add to the motion of the swing.

In this case, the energy given to the swing by the two people alternately pushing it is analogous to the energy put into the radio receiver by an incoming signal, and the motion of the swing is analogous to the current flowing in the receiver, flowing first in one direction and then in the other. If, however, the people pushing the swing do not time their push so that it coincides with the natural period of the swing, the amplitude of the swing will decrease more and more as the pushes become more and more out of step.

We know that the shorter the length of the swing, the quicker it will swing back and forth, and that as it is made longer, the time required for it to travel back and forth is increased. In the case of a radio signal we have no control at the receiving station over the frequency of the pushes or pulses of energy, the frequency being

established at the transmitting station; but we must tune our receiver so that the flow of current in the receiver will be a maximum. When we tune the receiver, it is analogous to shortening or lengthening the swing so that it will have a natural period which will coincide with the frequency of the pulses transferred to it, under which conditions the travel of the swing and likewise the current in the radio receiver will be at a maximum. Since all radio signals, regardless of their wave-length, travel through space at the same speed, the shorter the wave-length the greater will be the number of pulses received per second.

The fact that a great number of transmitting stations can transmit simultaneously on different wave-lengths, and that any one of these stations can be received without interference from the others, providing the wave-lengths are sufficiently separated, is one of the most interesting phenomena encountered in radio. The signals from all of these stations exist in space simultaneously, but none of them is effected by the others, each communication retaining its individual characteristics.

Congestion in the Ether.

Although very incomplete, a simple analogy to this condition can be made by dropping two stones simultaneously in a still body of water, at a separation of several feet. Waves in concentric circles will emanate from both points at which the stones enter the water. These waves will increase in diameter, and the waves set up by one stone will cross those set up by the other, but after they have crossed they will emerge intact, and neither one will be distorted or changed in form by having come in contact with the other.

In the foregoing it has been carefully stated that stations can be received without interference from other stations, "providing there is a sufficient difference in wave-length between the station received and other stations."

A study of this condition has recently been made, and in one town, which is typical of a great number of the small towns in the eastern part of the United States, a total of thirty-nine broadcasting stations were picked up, in one evening, all operating on wave-lengths between 350 and 400 metres. In many cases, two stations were found to be working on exactly the same wave length, so that, even with the most refined receiving equipment, it was not possible to differentiate between them.

An Unavoidable Evil.

Super-imposed upon this condition is interference caused by static disturbances, and by receiving equipment in the hands of people not cautious in its manipulation. It should be remembered that, whenever a vacuum-tube receiver is allowed to oscillate, it itself becomes a low-power radio transmitter, and causes interference with reception being carried on in the immediate vicinity. In receiving telephone signals, it is not necessary to have the receiver oscillate

at any time, and any operator who carelessly permits his receiver to oscillate is increasing the difficulty of obtaining satisfactory broadcasting reception.

The elimination of static interference is, at the present stage of radio development, beyond the hope of the average receiving station, and must, therefore, be accepted as an unavoidable evil. More refined receiving equipment can be built which will increase considerably the selectivity of radio receiving equipment, but such equipment is comparatively expensive, and requires more technique in its operation than the receiving equipment now being built for radio broadcasting reception.

This condition will doubtless be remedied in the near future, and any apparent delay in accomplishing such improvement is merely an indication of the difficulties which are being met in making it.

A "PIANO" TUNER FOR WIRELESS.

(Continued from page 108.)

oscillator or to employ capacity reaction between the valves if an amplifier is used, although a separate oscillator will usually be found to give much better results. It is necessary to use these methods for C.W. reception because reaction cannot be obtained without altering the tuner, and if this is done so that the tune slide coils act as a reaction coil, it will be found that when the circuits are oscillating the set will be radiating a certain amount of energy into the ether, which may cause interference with other stations, trying to receive on that wave-length, which are somewhere in the vicinity.

"Tuning" the "Piano."

When the instrument is finished it is only necessary to press the two keys marked for the wave-length required and to vary the condensers until signals are heard. The catch K, which is shown in Fig. 3, can be made from tin, the one end rolled up to act as a weight. One catch sufficiently long to reach from end to end of the keyboard is all that is necessary, but two can be made instead if desired, so that there is one for each set of keys.

If only one catch is made, it will be necessary to press the aerial side and tune side keys together, otherwise the first key pressed will be released on pressing down the second. This will not happen, however, if two catches are made, as each catch then controls the keys for its respective side, viz., aerial or tune circuit.

A steel wire, such as a steel knitting-needle, is soldered to the centre of the catch, as shown in Fig. 3. This forms a hinge for the catch. Care must be taken to make the bottom portion of the catch considerably heavier than the top, so that it will always hang perpendicularly, as shown in the diagrams.

A TELEPHONE PANEL.

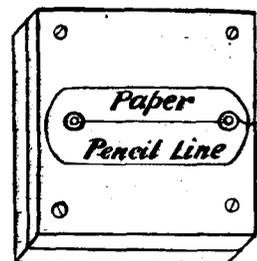
By W. G. RICKETT.

I NOTE with great interest Mr. F. B. Lidstone's letter published in the current issue of POPULAR WIRELESS, and would like to add that I have for some time used with great success a telephone panel as per enclosed diagrams. I also find that I can successfully take it to any part of the house, and, in addition, the signals received in this way have often proved stronger than when the telephones were placed directly on to the set. Its advantages are at once obvious. Besides being of service for taking the phones to a room other than that in which

heavy wood, to ensure it standing firmly. The middle portion is cut away as shown to provide a clearance for the terminals also, two holes are drilled through the side as represented by the dotted lines, through which the flex passes to connect with the two end terminals. The outside of the wood is afterwards stained black, and the whole assembled.

done tightly. Another extra nut will be wanted on each bolt to act as terminals.

Wax the heads of the bolts in the bottom plate and the instrument is now ready. All that has to be done is to



connect it up to your set, and with a soft pencil draw a line between the terminals.

HOW TO MAKE A GRID LEAK AND CONDENSER.

THE amateur who has a valve set may greatly improve it, and at the same time amuse himself, by making up a grid leak and condenser. It is a very simple matter and not at all beyond the ordinary amateur. The following can be made out of a few odds and ends.

All that is required is a few bits of tin or copper foil, ditto mica, and a couple of pieces of ebonite. The ebonite should be 2 ins. square. Clamp them together in the centre, one and a half inches apart, as in Fig. 1.

The ebonite will be $\frac{1}{8}$ in. thick and the top 3-16 in. Next drill with a larger drill a recess that will allow the head of the $\frac{1}{8}$ in. bolts to go in flush.

The next process will be cutting the plates of the foil. Fig. 2 shows all sizes and does not need further explaining. The same applies to the mica.

Shellac the mica and stick a foil to each of the 4 in. pieces of mica; then place the first plate on the ebonite base so that the lug will lay over the $\frac{1}{8}$ in. hole. The next plate goes on top, but the lug in this case goes over the other hole. The following plate has its lug over the first one, and the last over No. 2.

Ready for Use.

A little shellac will help to keep them from slipping. Lay a piece of mica on the last plate and then screw on the top plate.

Next, push the $\frac{1}{8}$ in. bolts right through the foil and the bolt will make contact as it goes through. Before putting on the nuts get a piece of soft paper and make two holes one and a half inches apart and place it over the bolts. Two small washers will be required to drop on first, but before doing so, scrape some lead from a soft black lead pencil, and rub it well round the bolts so that the washers will make good contact with it.

After this the nuts may be screwed

THOSE TWO VOLTS.

THE ordinary or normal thermionic valve requires, in order to light up its filament to the proper state of incandescence to emit a copious stream of electrons, a current of about .75 of an ampere.

Now it does not matter where that ampere comes from, or what its quality. If it has to be slowed down to turgidity through the resistance of the filament rheostat, or flows pure and free from the bright terminals of a new celluloid-cased, four-volt accumulator. An ampere is an ampere for all that.

Now, one amateur constructor of apparatus will have in his home-made set short, thick, straight-run wiring for his low-tension current circuit, and will find that he can apply from his four-volt battery sufficient voltage at the terminals of his valves to ensure that they get the necessary .75 of an ampere right up to the time that his battery voltage drops to 2.9 per cell, below which figure it should never be allowed to go.

A Comfortable Reserve.

Another experimenter, with a wealth of fine, rubber-covered or systoflex-tubed wires festooning the inside of his set, positively must have six volts or his valves refuse to glow any brighter than the end of a blown-out match.

We need not now explain why, but any battery delivering current loses some of its terminal voltage in proportion to the current taken from the battery.

If the battery is a new one, or in good working condition, and has large plates, it will have a smaller fall of voltage at its terminals while delivering any current than will an old, badly used, or smaller-plated battery. This will probably account, in the great majority of cases, for much which at first would seem obscure. A good big four-volt battery ought, with skilful use, to be ample for the filaments; but it is extremely useful to have a "bit up one's sleeve." To have to increase from four to six volts, or a fifty per cent. increase, seems wasteful.

A five-volt accumulator would be ideal, but the ordinary lead plate battery advances by two volts for each added unit, and as five is not a "gozinter" for two, most people go for six volts, and waste the surplus in heating up the rheostats or over-running the filaments of their valves.

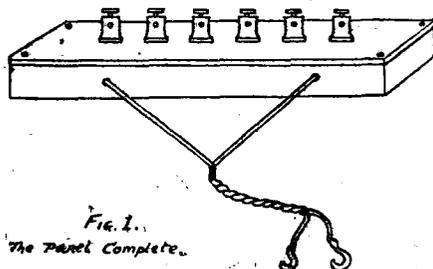


Fig. 1. The Panel Complete.

the set is working, I find that it is a great convenience in the same room, inasmuch that three listeners-in can sit in any position they choose, instead of being "chained" to the set.

Connected in Series.

Fig. 1 on the enclosed diagram shows the panel complete for use. The twisted flex (which is shown very short for the sake of illustration) is connected to the phone terminals of the set by two brass lugs as shown, these being soldered on to the flex to secure a good joint.

Fig. 2 shows the ebonite panel drilled ready for the mounting of terminals, and it is secured to the wooden base by a brass screw at each corner. For three pairs of phones I find that a convenient size of this panel is 6-in. by 2-in. by $\frac{1}{8}$ -in.

Fig. 3 shows the under-side of the panel, the terminals being connected in series.

Fig. 4 shows the wooden base, 6-in. by 2-in. by 1-in. This should be of fairly

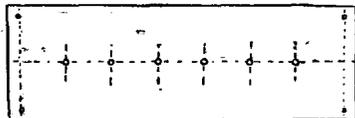


Fig. 2. Ebonite Panel as drilled.

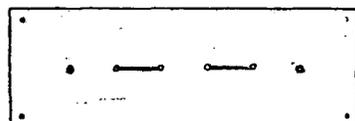


Fig. 3. Underside of Panel Showing Connection in Series.



Fig. 4. Wooden Base (Shaded portion cut away). Dotted lines show passage of flex through wood.

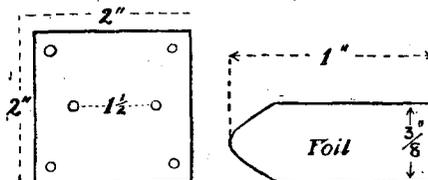
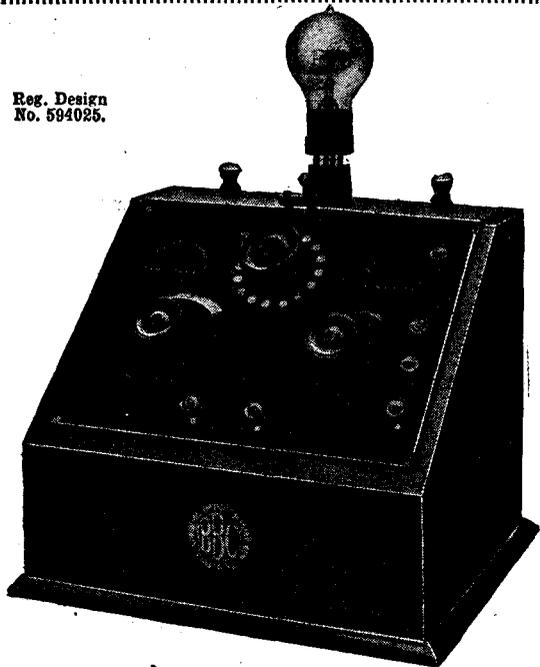


Fig. 1.

Fig. 2.

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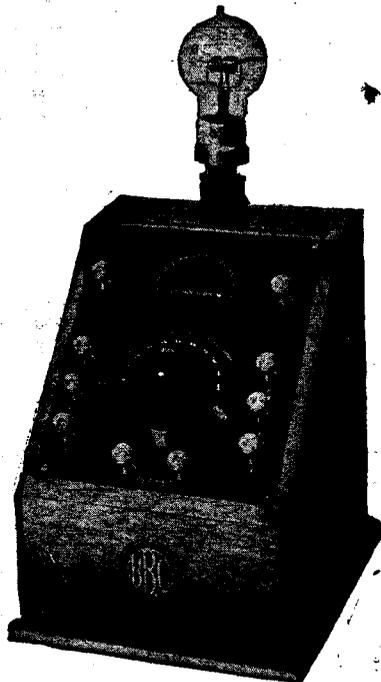
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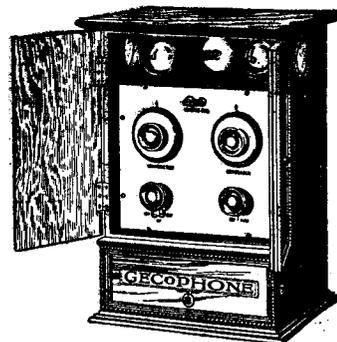
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"Have had six pairs of Phones on your Crystal Set without reducing volume or clearness of tone."

"The Crystal Set with your Two-Valve Amplifier operates the loud speaker perfectly."

When sending cash for your "Melohay" ask for particulars of amplifiers which enable you to use a Loud Speaker for the simultaneous entertainment of a room full of people.

"Melohay" Valve Sets (Prices from £6-6-0) are by far the best value offered. This is agreed by all who have tested them.

Splendid lines of English-Double Headphones from £1-1-0
Accessories and parts of every description in stock.

Cheques, Postal & money orders should be crossed and made payable to

HAYES, LIMITED,

342-344, EUSTON RD., LONDON, N.W.1.

Telephone: Museum 3541.

NOTE: The "Melohay" Wireless Motor Van which recently gave street demonstrations in London at the request of the Press is travelling to Leicester and the Midlands during the week giving demonstrations en route.

Hello Everybody!

Look at these special offers of

ACCESSORIES

- Valve Holders, solid rod, accurate, complete with washers and nuts 1/3
 - Ebonite Dial and Knobs 1/6
 - Filament Resistances 2/6
 - Crystal Detectors, mounted on ebonite base 2/6
 - Do. do. better quality, with crystals complete 5/-
 - Aerial Wire 7/22 per 100 ft. 3/-
 - Lead-in Cable, heavily insulated with rubber, per yd. 6d.
 - Screwed Rod, 2 B.A. 12 in. lengths each 3d.
 - Telephones, 4,000 ohms, leather head-bands 22/6
 - Our "Hello" Crystal Set (all Royalties paid) 45/-
 - A few Ex-Govt. Crystal Sets (worth double) 45/-
 - Lead-in Tubes .. 12 in. 1/6, 9 in. 1/3, 6 in. 1/-
- Carriage extra on above prices.

Orders will be executed by return of post and money promptly returned if not completely satisfied.

THE CENTRAL RADIO CO.,

6, LITTLE RUSSELL STREET,
BRITISH MUSEUM, LONDON, W.C.

Phone Museum 5604

—Near Mudie's Library—

POPULAR WIRELESS EXHIBITION REVIEW.

A further summary of the wireless exhibits at the Ideal Home Exhibition, Olympia.

WATES BROTHERS.

Beginners who are taking up wireless will find many interesting and useful articles displayed by Messrs. Wates Brothers.

One of this firm's specialities is an accumulator constructed for wireless purposes, and designed to give about 25 hours of actual lighting on one valve. It is sold in two sizes, a 4-volt and a 6-volt, complete with a wooden case. The cells are claimed to be practically immune from sulphating, the great bugbear of all who use accumulators.

Several types of crystal and valve sets are also on view, and a large number of accessories, for all kinds of wireless sets.

A neat high-tension battery case is being introduced, which will hold a 60-volt battery, with a Wanda plug on the lid whereby the potential across the valves may be varied at will. The whole outfit forms a very compact and neat accessory, and vastly improves the usual untidy appearance due to H.T. batteries and their connections.

* * *

J. A. COOMES & CO., LTD.

Exhibits at Stand 25 include a complete range of our famous Ionophone Variometer Tuned Broadcasting Sets.

Five-valve set, consisting of 2 H.F. valves, 1 detector, 2 L.F. valves.

Three-valve set, consisting of 1 H.F., 1 detector, 1 L.F.

Two-valve set, consisting of 1 H.F. and 1 detector.

(All above sets have a wave-length range from 300—3,000 metres.)

Two-valve Amplifier for either two or three-valve sets.

Valve and Crystal Set.

Loud-speaker Adaptor, consisting of ebonite horn with phone attachment.

A.C. Battery Charger. A new device enabling small batteries to be charged direct from A.C. mains of ordinary voltages and any frequency up to currents of 2 amps., especially suited for L.T. wireless batteries.

* * *

MARCONI'S WIRELESS TELEGRAPH COMPANY, LIMITED.

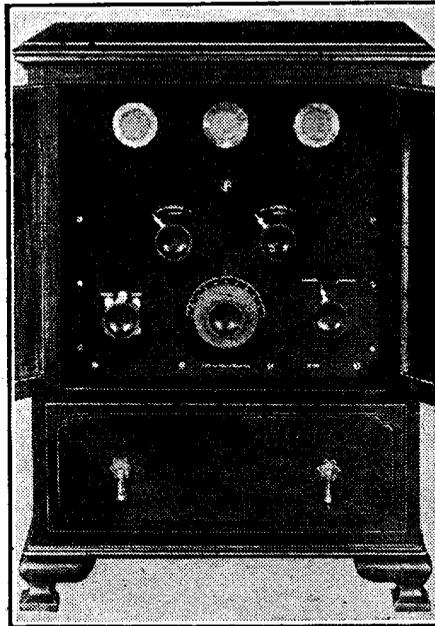
This company is showing a full range of Marconiphone wireless receiving models and loud-speaking equipment at Stand No. 37, Gallery (New Hall).

The special details are as follows:

Marconiphone Valve-Crystal.—A unique model. A new and improved receiver employing a crystal detector and a special low current valve as amplifier. This combination gives an increase in range to at least 50 miles, without sacrificing any of the clearness of speech and simplicity of the crystal models.

Marconiphone V.2.—A new and improved type of this popular receiver which incorporates special features, increasing its range up to 100 miles and over.

Marconiphone Multivalve. Type R.B. 7.—A long-range receiver designed primarily



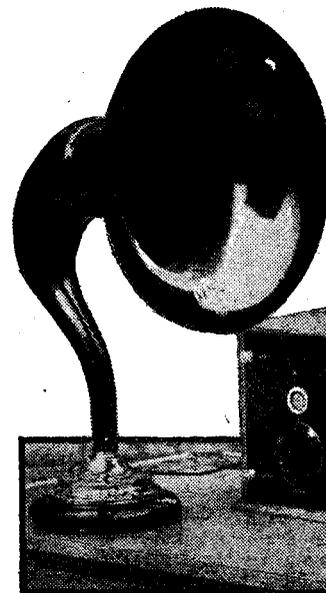
Three-valve cabinet set, by Gambrell Bros.

for use with an outside aerial. Range 200 miles and upwards.

Also suitable for use with frame aerial. Approximate range 40 miles.

Marconiphone Multivalve. Type R.B. 8.—Specially designed for use with frame aerial. Used with Marconiphone table aerial, gives ideal combination for short-range reception. Approximate range 40 miles.

Marconiphone Voice Amplifier (2 Stage).—Expressly designed for use in moderate sized rooms, entire elimination of distortion having been the chief aim rather than production of great volume of sound. An amplifier unrivalled for purity of tone and clearness of reproduction.



Complete receiver and loud speaker set, by the Automatic Telephone Manufacturing Co. Ltd.

Cabinet Models.—Self-contained models, fitted with the Multivalve types and incorporating all batteries, amplifiers, etc., both with and without Amplion loud speaker.

* * *

THE WIRELESS PRESS, LTD.

A complete range of over seventy books on Wireless Telegraphy and Telephony will be open to the inspection of all visitors to our Stand, No. 7. For the beginner desirous of making his own apparatus, for the experimenter who wants a reliable guide, for those anxious to study the subject thoroughly from a theoretical standpoint—in fact, for all interested in wireless, elementary or advanced—we have just the books required. For ten years we have been publishing wireless literature, and have no hesitation in stating that any book bearing the name of the Wireless Press, Ltd.—the pioneer house for wireless publications—can be relied upon.

* * *

AERADIO, LTD.

The name of this firm, although now well known to the trade, is perhaps new to the public, but their trade-mark, "Melbaphones," strikes a familiar chord.

An interesting selection of "Melbaphones" is shown, ranging from one-valve receivers to three-valve power amplifiers. In each case the manufacturers have avoided "freak circuits" when designing, and have constructed their instruments upon conventional, thoroughly tested and proved lines. It is claimed, however, that "Melbaphones"

"Are as good as the best

And better than the rest,"

and for the reason that the manufacturers have adopted the policy of using only the best materials, expert labour, and simplicity in design of control, together with a first-class finish.

It is interesting to note that the managing-director of this concern claims to have been first in this country with "broadcast" sets, having advertised same as early as April, 1922. Much water has passed under bridges since then, and the proud owner of a "Melbaphone" installation alone can appreciate the months of work and the amount of money expended on the production of his instrument.

We would specially draw attention to the two-valve "Melbaphone" Cabinet de Luxe.

(Continued on next page.)

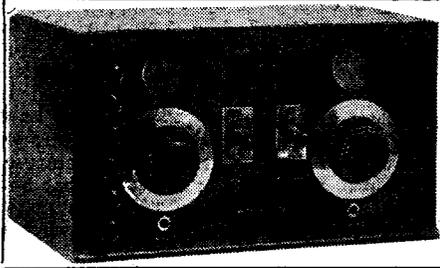
POPULAR WIRELESS EXHIBITION REVIEW.

(Continued from previous page.)

This cabinet is completely self-contained, with 6-volt 40-amp. accumulator, 60-volt H.T. battery, valves, and two pairs of headphones, and is dispatched complete with aerial equipment. The price is only £20.

To the best of our knowledge, it is the only completely self-contained two-valve cabinet on the market.

Other valve panels are on sale from £5 10s. The excellent "Melbaphone" one, two, and three-valve amplifiers (note magnifiers) must not be missed.

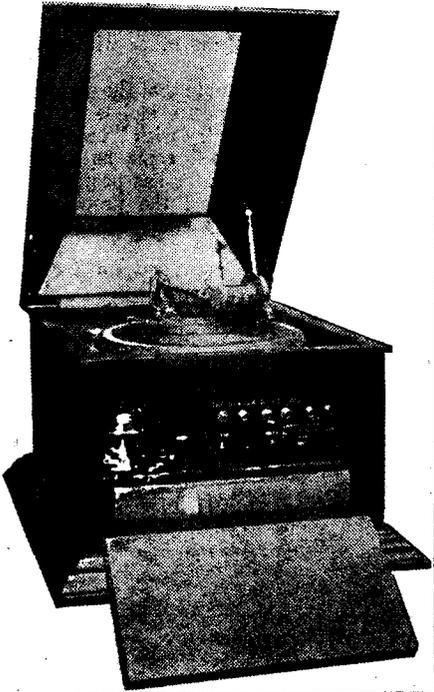


General Radio Company's Two-Valve Set.

AUTOMATIC TELEPHONE MANUFACTURING COMPANY, LIMITED.

At this stand will be found the joint exhibit of Messrs. Automatic Telephone Manufacturing Co., Ltd., Milton Road, Edge Lane, Liverpool, and their sole distributing agents, Messrs. Ashley Wireless Telephone Co., Ltd., 69, Renshaw Street, Liverpool.

Outstanding features of the exhibit are the Ashley 2 and 3 Valve Receiving Sets and the Ashley 2-Stage Low-Frequency Amplifier, together with combinations of the two first-named sets with the Ashley 2-Stage Amplifier, representing 4 and 5 valve installations respectively.

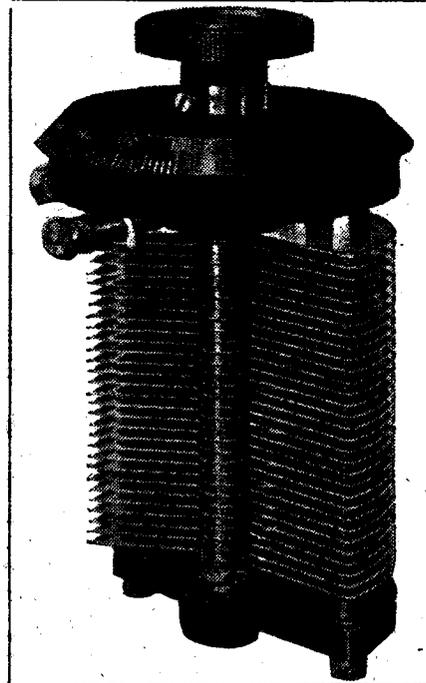


The "Graham" Electravox.

These Ashley Valve Receiving Sets are designed for reception on unlimited wave-lengths up to 3,000 metres. They embody approved adjustable reaction, and are furnished complete with sets of interchangeable aerial tuning coils and H.F. Transformers to vary the wave-length in conformity with the station it is desired to pick up.

There is also exhibited an Ashley 3-Valve Broadcast Receiving Set of special interest.

In crystal sets, the Automatic Telephone Manufacturing Co. are showing their well-tried popular model which has established an enviable record of receiving clearly at 32 miles radius from the broadcasting centres. It is equipped with specially selected Perikon detector, tuning inductance, with single slider and fixed condenser.



Dubilier "Vanicon" Condenser for Panel Mounting.

Each set includes A.T.M. 2,000-ohm long-distance radio headphones.

An outstanding exhibit at this stand is the now famous A.T.M. "Claritone" Loud Speaker, literally "the best-spoken fellow in the radio world." Moreover, experts are agreed, and the manufacturers hold testimonials confirming this view, that the A.T.M. "Claritone" Loud Speaker is the best yet placed on the market for clearness, combined with volume and musical tone.

The Automatic Telephone Manufacturing Co. also make an effective display of their well-known Long Distance Radio Headphones, which are of light weight, comfortable in prolonged wear, have a high effective impedance, and are generally recognised as among the most efficient headphones now being offered.

(Conclusion of Exhibition Review.)

THE EXHIBITION.

Don't fail to visit Olympia and see for yourself the attractive Wireless Exhibits in the Wireless Section.

A CRITIQUE OF THE WIRELESS SECTION.

By the TECHNICAL STAFF of POPULAR WIRELESS.

Peto & Radford, Ltd., are exhibiting a large assortment of accumulators specially constructed for wireless purposes. A point worth noticing with regard to these accumulators is that they are all marked with the actual capacity instead of the more usual ignition capacity. This feature will appeal to the wireless amateur, as the ignition rating of batteries has been a stumbling block to a great many beginners in wireless. Among the many accumulators is shown a type embodying a hydrometer in the battery itself. Each cell contains three "gravity floats" coloured white, blue, and red. These floats are calibrated to sink as the gravity of the acid falls. At 50 per cent. discharge the white one sinks, at 75 per cent. the blue follows suit, and at 95 per cent. discharge the red one sinks. At this point the cell is not quite empty, but another hour or two will see the end of that charge. Thus the amateur can see at a glance how much longer his "juice" will last, and need never be let down by a run-down accumulator.

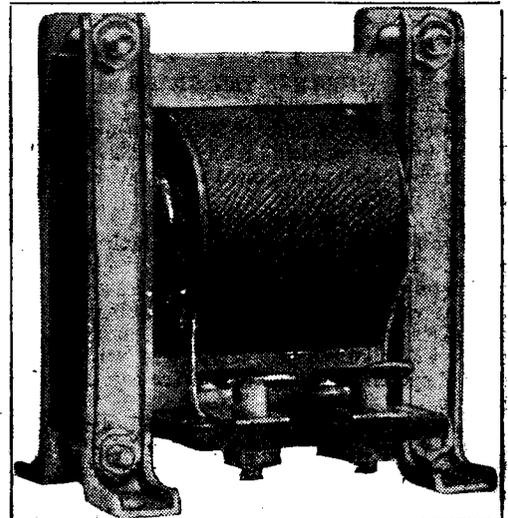
An Interesting Exhibit.

The Sterling Telephone and Electric Co., Ltd., has a goodly array of valve unit panels and power amplifiers. The unit sets are very neatly encased in black metal, and are so arranged that the separate panels can be plugged together instead of being strapped in the usual way.

A combined valve and crystal set is also manufactured by this company, and is said to give dual amplification so that the one valve plays the part of H.F. and L.F. amplifier. The range for broadcasting is about 150 miles. Dull Emitter valves are used, so that an accumulator is not needed.

The most remarkable exhibit on the stall of Abbey Industries, Ltd., is a tiny crystal set which will easily go on the palm of your hand; in fact, two or more would find room there.

(To be continued next week.)



Inter-Valve Transformer, by the Igranic Electric Co.

RELIANCE ONE VALVE SETS

RELIANCE TWO VALVE SETS

RELIANCE THREE VALVE SETS

HERE'S YOUR OPPORTUNITY

FOR A LIMITED PERIOD ONLY WE ARE PREPARED TO SUPPLY DIRECT OUR CELEBRATED RELIANCE BROADCAST RECEIVERS AT VIRTUALLY HALF STANDARD PRICES.



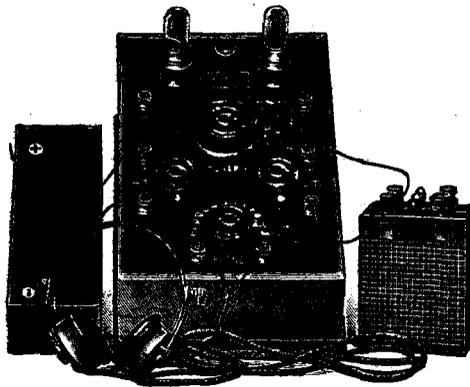
Our only stipulation being that we reserve the right of delivery, which must be strictly in rotation. It is only feasible that many would-be "listeners-in" will take advantage of this unique offer to obtain a First Class Wireless Receiver, and we have therefore made arrangements for dealing with orders first received by return.

RELIANCE ONE VALVE

Mahogany Upright Slope Cabinet panel, 9 in. x 6 in. Variometer Tuning covering Broadcast wave-lengths. Equipment: 1 pr. H.R. Headphones, 4 V. 40 Accum., 36 V. Battery, Ediswan Valve, 100 ft. Aerial Wire.

Price: £6 6 0
Standard Price: £10 10 0
 Plus Taxes, £1 12 6

RELIANCE TWO VALVE



Mahogany polished Cabinet, 12 in. x 8 in., 1 Detector, 1 L.F. Valve, Studs Switch Inductance, Tuning Condenser, etc. Equipment: 1 pr. H.R. Headphones, 4 V. 40 Accum., 36 V. H.T. Battery, Ediswan Valves, 100 ft. Aerial Wire.

Price: £8 8 0 Standard Price £15 0 0
 Plus Taxes, £3 0 0

RELIANCE THREE VALVE

Superior Upright Mahogany Slope Cabinet, panel 14 in. x 12 in. 1 H.F., 1 Detector, 1 L.F. Valves, Separate Controls. Stud Switch Inductance with additional holder for Loading Coils to obtain all wave-lengths.

Equipment: 1 pr. H.R. Headphones, 6 V. 60 amp. Accumulator, 63 V. H.T. Battery, Set of Loading Coils, 3 H.F. Transformers, Ediswan Valves, 100 ft. Aerial Wire.

Price: £12 10 0
Standard Price: £22 10 0
 Plus Taxes, £4 2 6

One-Valve Note Magnifier, in Cabinet to attach to One-Valve Reliance.

Price (includes Valve): £4 5 0

Two-Valve Amplifier.

Price (includes Valves): £7 15 0

TERMS

Nett Cash with Order. Delivery Free London Radius Packages & Packing, 2s. 6d.

A FEW TESTIMONIALS

Birmingham.
 "We have tried Two Valve Set and reception of Broadcasting was excellent, in fact with filaments fairly well over is too loud."

Maidenhead.
 "Re Two Valve Set supplied, I am getting magnificent reception of Operas, etc., and have also picked up Birmingham, Manchester, Writtle, The Hague, and Eiffel Tower."

Nelson.
 "Reference Valve Set supplied, it is giving every satisfaction. Manchester comes in loud and clear."

Dowlais.
 "I have great pleasure in advising you that I heard Cardiff last Tuesday very well, speech and music quite clear."

NOTE

These Sets do not differ from our Standard products in any way; our Guarantee is behind each and every one, all of which undergo strict test to give clear, strong Telephony Reception.

Letters containing cash should be registered

ORDER FORM.

To Henry J. Brewster & Co.
 Please forward per
 one Reliance.... Valve Set, for cheque

which I enclose money order value £....., on condition that this Set will give me efficient reception of speech when installed.

Name

Address.....

Date.....

Phone:
 CITY 768.

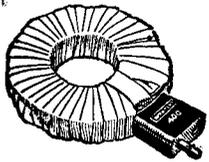
HENRY J. BREWSTER & CO.,

Proprietors of the well-known Aerovape Crystal Receiver.

11, QUEEN VICTORIA STREET, LONDON, E.C. 4.

Telegrams:
**AEROWAVA,
 PHONE,
 LONDON.**

Build your own set with BURNDIPT Accessories



BURNDIPT PATENT COILS
(Patent No. 168249)

are wound with ample air space between each layer, thus ensuring a minimum self-capacity. Coils 75-1500 multilayer coils with wave length range 750-26000 metres.
Set of 9 £4 10 0 A

VALVE HOLDERS,

turned out of solid ebonite rod, fixed to panel by single screw.
No. 241 £0 2 0 A
No. 280, mounted on ebonite panel and boxed £0 10 6 A
No. 284, complete detector unit. £1 0 0 A

ANTICAPACITY SWITCH,

specially designed for use in Radio Circuits. Capacity reduced to a minimum.
No. 235, 1 pole change over £0 12 6 A
No. 236, 2 £0 15 0 A
No. 237, 3 £0 17 6 A
No. 238, 5 £1 0 0 A

TELEPHONE TRANSFORMERS.

For use with 120 ohm telephones and loud speakers. Each tested at 500 volts winding to winding. Distortion and leakage noises reduced to a minimum.
No. 227, unmounted £1 0 0 B
No. 285, in polished walnut box £1 10 0 B

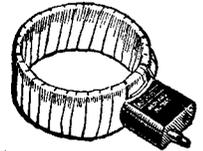
BURNDIPT WIRELESS APPARATUS

MANUFACTURED BY US IN OUR FACTORIES AT BLACKHEATH AND USED IN OUR :: FAMOUS RECEIVERS. ::

Write for our Catalogue, sent post free. Section I: Amateur and Experimental. Section III: Broadcast.

BURNDIPT, LTD.
London Office and Showrooms:
15, Bedford St., Strand, W.C.2,
AERIAL & EASTNOR WORKS:
Blackheath, S.E.3.

London Assurance House, Bond Place, Leeds.
61, Bridge St., Manchester.
133, New St., Birmingham.
93, Holm St., Glasgow.
Playhouse Arcade, Guildford.
Bank Bldgs., Middle St., Yeovil.
246, George St., Aberdeen.



CONCERT COILS

are single layer coils wound on ebonite, and are the most efficient coils for the reception of wireless speech. Set of 4 concert coils S.1-S.4 £1 0 0 A

RHEOSTATS,

moulded block of special heat-resisting composition, ebonite knob.
No. 270, 7 ohms, 1 amp £0 5 0 A
No. 275, as 270 in walnut box £0 12 6 A
Also supplied at same prices:
No. 271, 3 ohms, 2 amps
No. 272, 1.4 ohms, 3 amps.

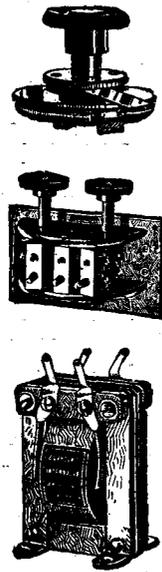
COILHOLDERS,

a well-designed coilholder of handsome appearance, moving holders geared 5-1, very smooth action, enabling fine adjustments to be made.

No. 135, for mounting £1 10 0 A
No. 136, on oak base with terminals £2 15 0 A

INTERVALVE TRANSFORMERS,

designed to give maximum amplification with minimum distortion. Tested at 500 volts winding to winding and frame. Minimum resistance 250 megohms.
No. 226, in cardboard box with diagram of connections £1 5 0 B
No. 283, in polished walnut box, ebonite panels and terminals £1 17 6 B



WIRELESS

Head 'Phones from 18/6 per pair. Valve Holders, 1/- and 1/3 each.
Leading-in Tubes, 1/-, 1/3, 1/6 each. Switch Arms, 1/- and 1/3 each.
Pocket Crystal Set, 17/6 each. Egg Insulators, white, 3d. each, 2/6 per dozen.
Inter-Valve Transformers, ratio 5-1. Finest Manufacture, 14/6 each.
Filament Resistances. Extraordinary value. Velvet action, 2/-, 2/6 ea.
Slider Plunger, complete, 4d. ea., 3/6 doz. Hertzite, 1/-, 1/3, 1/6
Aerial Wire, 7/22 hard drawn copper, in 100 ft. lengths, 2/8
4-Volt Batteries, 4d. each, 3/6 per dozen.
Crystal Detectors, 1/6, 2/3 and 2/6 each, also all voltages in Ever Ready
Wireless Batteries in stock; 16-volt, 3/6 ea., 36-volt 8/6 ea., 66-volt 15/- ea.
We have just received a large quantity of Ebonite in all sizes.

We Have a Large Stock of MULLARD and EDISWAN VALVES.

CRYSTAL SETS, Stamped B.B.C., 3/6 each

THE HOUSE FOR EVERYTHING ELECTRICAL,
Trade] **WHOLESALE AND RETAIL** [Supplied

L. APPLE, LTD., Electrical Engineers,
13, BREWER STREET, REGENT STREET, LONDON, W.1
(Telephones: 1531 Regent.)

R. EGERTON-GREEN & Co.,

Manufacturing Electrical Engineers.

ESTABLISHED IN 1913

WATCH THIS SPACE
for a new Cabinet
CRYSTAL SET.

In the meantime **WRITE** or **'PHONE** for our **FREE LIST.**
22, Dyott Street, New Oxford Street, London, W.C.1
(A few yards from Henry Glave).
Telephone: - - - - - Museum 1249.

"THE BROWNIE" Wireless Receiver

Patent 2055/23 applied for:

7/6 COMPLETE
by post 8/6

SPECIFICATION.
Set comprises solid best ebonite drilled detector panel, wound induction coil, tuning slider, screw clamp crystal cup, best jointed detector giving quality crystal, universally accurate and easy adjustment, terminals, screws, and all parts for assembling by our patent method.

Contains every part necessary for simple assembly.
A Scientific Achievement.
Guaranteed equal to sets costing many times the price.
Full and complete instructions enclosed with each outfit.
London make.
Money returned if not as advertised.

Read what the Trade Press says:

"Electricity," Feb. 23rd.

"The voice might have been that of a speaker in the same room . . . The set is a marvel of value . . . We anticipate that it will make quite a stir in the wireless world."



J. W. B. Wireless Supplies,
19, GARRICK STREET,
LONDON - - W.C.2

(First Floor)

Near Leicester Square Tube Station

(When writing mention "Popular Wireless.")

RADIO HOUSE.

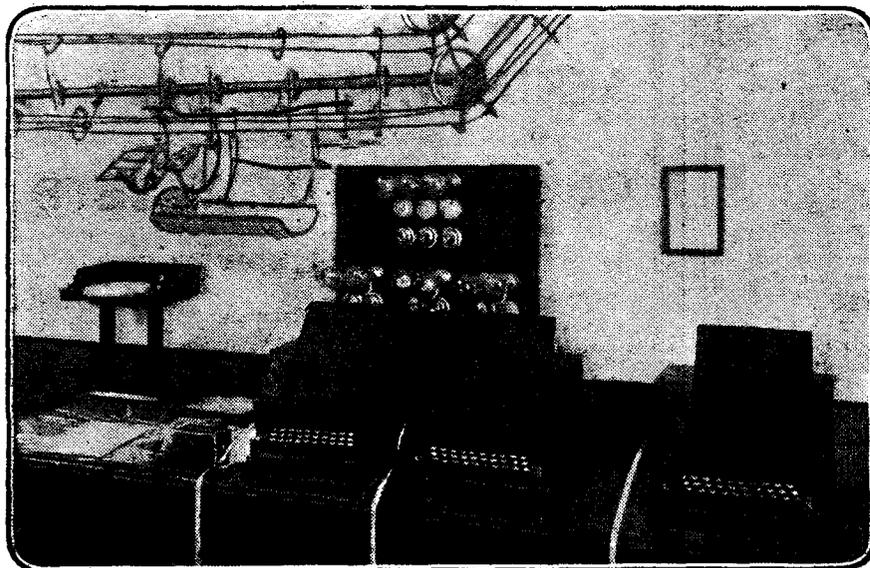
THE NEW CITY PREMISES OF THE MARCONI COMPANY. A FLYING SURVEY.

FROM time to time reference has been made in these columns to the new City quarters of the Marconi Company, in Radio House, Wilson Street, E.C., where every modern convenience has been installed for the rapid transmission and reception of wireless messages to and from many parts of the world.

ignores every tray on its circuit except one at which it makes a dive, picking up any sheet that an operator may have placed there. If there is none, it passes on, empty. Similarly it is arranged so that it drops the sheet into another tray at a pre-determined point. Other carriers deal with other points on the circuit.

paper tape, perforated in a keyboard perforator, which is passed through a Wheatstone transmitter in the usual manner.

Conversely, messages received and printed in English letters and figures by the automatic high-speed printer are delivered by automatic carriers to the telephone department, or to the messenger-room for dispatch to their destination.



The machines on which the messages are punched in tape form.

Those who, like the writer, have had the privilege of visiting both the old offices in Fenchurch Street and those now under review could not fail to be impressed with the immense improvements that have been effected. There is now almost complete automatic control of all distant wireless stations, and facilities for reducing to a minimum the time lost after a message is handed in and before it is dispatched, and also after receipt of a message and before it is delivered at its destination.

The Automatic Carrier.

In addition to a receiving depot, there is a private telephone exchange at Radio House, for the convenience of any client—and there are many such—who makes use of wireless to such an extent as to warrant being connected up by a private wire. By this means he is enabled to phone his instructions, and conversely, to receive messages within two minutes of their reception by the company. Connecting up the various rooms on different floors is a system of automatic dispatch carriers, by means of which messages are conveyed from one department to another. The carriers are attached to continuously running cords, and are so designed as to pick up and grip sheets of paper laid in trays, as they pass.

They also drop messages at the same point at which they pick messages up. The carriers possess the gift of discrimination; in other words, each individual carrier

Incoming messages for wireless dispatch are passed into the hands of an officer on one side of a frame, on the other side of which are clerks waiting to receive them.

They are then delivered to an operator who transcribes them into morse code on a

Distant Control.

Between Radio House and certain other stations, the duplex system of operation is in use. Since there is quite a common misconception as to what is meant by duplex working, it is as well, perhaps, to explain that this does not imply transmission and reception of wireless on the same aerial.

It is said that this has been done experimentally, but on a commercial scale over appreciable distances, hitherto it has not proved practicable. What can be and is done, however, is to transmit simultaneously from the same aerial, messages to different stations on different wave-lengths. Thus from the same antenna at Ongar transmission is effected to France and Switzerland simultaneously.

The transmitting stations in Essex, for the Continental Services, are already controlled direct from Radio House, so that no transcription of messages takes place, the transmitting telegraphists automatically governing operations at the wireless stations. Arrangements are now almost completed for including Carnarvon transmitting station under the same central control, and it is anticipated that, in a few months, that great station will present the same apparently lifeless and uncanny appearance as the others.



Mr. Shayle Gardener and Mr. Hubert Carter broadcasting the quarrel scene from Julius Caesar at 8 LO.

RADIAX

WE SATISFY YOU

SETS & UNITS
Magnificent results

are achieved by Radiax Receiving Sets at economical cost and without sacrificing good appearance. High quality material only goes into the make up, and the substantial, well finished oak case is typical of the job. Every unit is tested.

CRYSTAL SET, in sloping mahogany cabinet, enclosed crystal, tipped inductance, with 10-point switch. This set is so efficient that we have used **four pairs** of 'phones with loud reception. PRICE (including B.B.C. licence) **£2 2 6**

ONE-VALVE SET, gives splendid results in broadcasting areas. 10-point switch and variable condenser gives accurate tuning; oak case. Wonderful value. PRICE **£3 10 0** (Licences extra **£1 12s. 6d.**)

TWO-VALVE SET—and undoubtedly the best and most popular all-round set. Specification as above, but includes note magnifier, necessary condensers, and etc.; tunes to 1,100 metres, and has loading terminals for greater wave-lengths. PRICE **£7 10 0** (Licences extra **£3.**)

UNITS FOR BUILDING UP SETS, INCLUDING POLISHED OAK CASE, DIAGRAM AND ALL DETAILS.

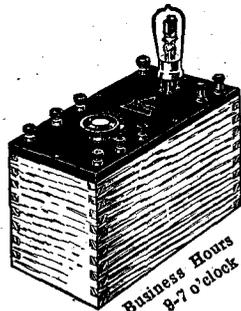
No. 1 Detector, forming a 1-valve receiver if a tuned circuit is added. Complete parts (unassembled), **21/-**. Complete in case (assembled), **28/6**.

No. 2 L.F. Amplifier, for increasing the power of a crystal or valve set. 1-valve. Complete parts (unassembled), **38/6**. Complete in case (assembled), **48/6**.

If to be used under broadcast licence, add 10/- per valve. 2-valve. Complete parts (unassembled), **55/-**. Complete in case (assembled), **70/-**.

No. 3 Tuner, to 1,100 metres, with loading terminals. Complete parts (unassembled), **38/6**. Complete in case (assembled), **52/6**.

No. 4 H.F. Amplifier Panel. Complete parts (unassembled), **18/6**. Complete in case (assembled), **26/6**.



Business Hours
9-7 o'clock

RADIAX LTD.

4, Percy Street, London, W.1.
3 minutes Tot. Ct. Road Tube.

Phone: Museum 490.

MODERN WIRELESS
THE GREAT NEW MONTHLY WIRELESS MAGAZINE

—teeming with
constructional
Articles—

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POPULAR WIRELESS Beginners' Supplement

PART IX.—RECTIFICATION AND AMPLIFICATION.

By MICHAEL EGAN.

THE two important looking words which swell the title of this article need not frighten the beginner unduly. It seems inevitable that many of the names adopted by science should convey the least possible amount of information concerning the things, or processes, for which they stand. These particular words, however, are not nearly so bad as they might be. The root meaning of the verb "to rectify" is "to make right," i.e., "to correct." And the root meaning of the verb "to amplify" is "to make large," i.e., "to increase." Let us see what it is we have to correct, and what it is we have to increase in connection with the reception of wireless signals.

Two Difficulties.

When wireless waves flow past a receiving aerial, small electric currents are set up in that aerial. These currents flow alternately in opposite directions, up and down the aerial wire, at exactly the same rate as the currents in the transmitting aerial which sends out the waves. Now, this rate is very high, though it varies in the case of different transmitting stations, of course.

The currents set up in the aerial of a broadcasting station, for instance, occur at the rate of nearly 1,000,000 per second, the actual number being slightly different for each broadcasting station. The currents set up in a receiving aerial must therefore flow up and down the latter at the same stupendous rate. How are these high rate, or "high frequency," currents to be converted into sound in the telephones?

Two important difficulties present themselves at once. In the first place, the diaphragms of the telephone are incapable of being vibrated at this stupendous frequency. Secondly, even if they could be vibrated at this rate, we should not be able to hear any "sound." The human ear is incapable of sensing air vibrations of more than a certain frequency—and this maximum frequency is considerably lower than that at which currents usually flow up and down a wireless aerial.

"Group" Frequency.

The first thing to be done, therefore, is to (figuratively speaking) *slow up* the currents that flow from the receiving aerial into the telephones. The frequency at which they occur in the aerial is too high for the purpose of actuating the telephones; they must therefore be *corrected*, or *rectified*, to a suitable frequency before being applied to the task of vibrating the diaphragms of the latter.

The main difficulty involved in carrying out this rectifying process is due to the fact that the currents in the aerial flow alternately *in opposite directions*. It is this *changing of direction* that causes the trouble. If there were 1,000,000 small currents flowing *in the same direction*, the matter would be quite simple. They could be collected together in *groups*, and each group, acting collectively in the same direction, could be

made to effect one pull on the telephone diaphragms.

So far as reception is concerned, there is only one process involved here, i.e., that of preventing the currents from flowing in opposite directions. *The grouping effect takes place at the transmitting station.* Each sound wave that strikes the transmitting microphone gives rise to a *group* of vibrations (or currents) in the transmitting aerial, and, hence, in the receiving aerial. The frequency at which these *groups* occur is therefore the same as the frequency of the sound waves addressed to the transmitting microphone, which, of course, corresponds to the pitch of the speaker's, or singer's, voice.

The Crystal's Action.

If each *group* of currents set up in the receiving aerial could be made to produce *one* vibration of the telephone diaphragms, the latter would, of course, vibrate at a rate corresponding to the pitch of the voice at the transmitting station. The problem of rectifying these currents still remains to be solved, however. How is it actually solved in practice?

One way of solving it is by means of a piece of crystal. Some American scientists discovered that certain kinds of crystal allowed electricity to flow through them *in one direction only*. When such a crystal is placed between the aerial and the telephones, therefore, it acts as a buffer to one set of currents from the aerial, whilst allowing the others to flow through the telephones.

That is to say, it prevents the aerial currents from surging *backwards and forwards* in the telephones. All the currents that flow in one direction will pass through it, and all those that flow in the opposite direction will be stopped. For each group

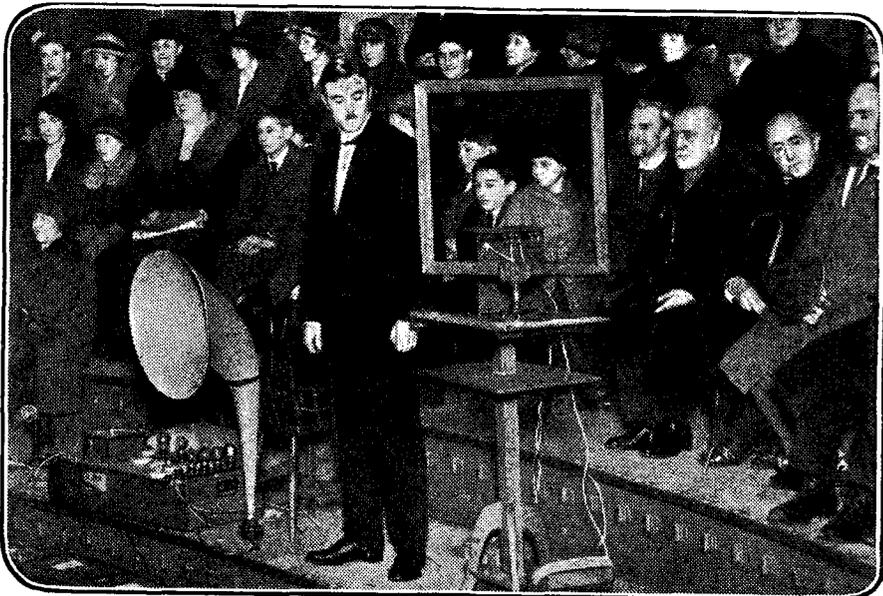
of electrical vibrations (or currents) that occurs in the aerial, therefore, what is virtually one large current flows through the telephones. This single large current is composed of a number of small currents, *all of which flow in one direction.*

What a Valve Can Do.

This is the only function performed by a crystal. It is a rectifier "pure and simple." A valve can only rectify, though its action is not so simple as that of a crystal. If the currents set up in a receiving aerial are weak, a crystal will be powerless to strengthen them. A valve, however, can only perform the important job of *strengthening* received signals. That is, it can increase, or amplify, their strength. There are ways of amplifying signals other than by means of a valve, but the valve is at once the most popular and the most efficient of all amplifiers.

A valve can be made to amplify signals either before or after they have been rectified. That is, it can amplify the "high-frequency" currents the moment they arrive from the aerial, as it were, or it can amplify the uni-directional currents that flow from the crystal before they enter the telephones. The wonder of the valve is that it acts either as a rectifier, as an amplifier of "high-frequency" currents, or as an amplifier of "rectified" currents.

Beginners in Wireless are strongly advised to visit the Wireless Section of the Ideal Home Exhibition at Olympia. "Popular Wireless" has a stall there, and free copies of a 24-page "Outline of Wireless" may be obtained on application.



The frame aerial receiving set used at the big public wireless concert given at Birmingham recently

EXTENDING THE WAVE-LENGTH RANGE OF YOUR SET.

By G. V. DOWDING, Grad.I.E.E.

THERE are doubtless many people who, having purchased a broadcasting receiver with a limited range of wave-length adjustments, are desirous of extending it in order to enable them to listen-in to aircraft and amateur telephony, Paris time signals, or even Continental broadcasting where the set is considered sufficiently sensitive to do so.

In the first place, it may be mentioned that there is no official objection to the extending of the wave-length range of a B.B.C. set, although additional apparatus such as variable condensers, etc., should bear the B.B.C. stamp. The adjustments of the majority of B.B.C. sets are limited to a range between 300 and 500 metres, and as it is essential that both those figures should be covered on any aerial between 30 and 100 ft. long before the P.M.G. will license them, it can safely be depended upon that 100 metres margin at least either way is allowed in most cases.

Down to Amateur Wave-lengths.

The only transmissions taking place below 300 metres are those of the amateur stations whose wave-lengths may vary from 150 to 200 metres. To get down to there, it will be necessary to introduce a variable condenser in series with the aerial. You will know by now that wave-length directly depends upon capacity and inductance; increase either and the resultant wave-length is increased, or reduce either and the wave-length is reduced.

Now we must have a certain amount of inductance in the set across which to connect our detector, otherwise it would not be possible to "tap" off energy from the aerial circuit for the purpose of diverting it through the telephones, and we do not want to shorten the length of the aerial every time we desire to go down to the lower wave-lengths, so, therefore, we must attack the capacity factor and endeavour to reduce that.

When condensers are placed in parallel, the resultant total capacity will be merely the sum of the individual capacities; thus, if we placed a .0005 mfd. variable condenser in parallel with one of .001 mfd. capacity, the total capacity will be .0015 mfd. On the other hand, when condensers are placed in series, the resultant capacity will be smaller than the smallest individual capacity. There is no need to detail the mathematics involved in this latter case, however, as it is rather tricky and apt more to confuse than assist the beginner.

An Adjustable Coil.

However, if we place a variable condenser in series with the earth lead and the earth terminal of the set, we shall be able to control the capacity value of the whole circuit, but only from somewhere near normal downwards. We cannot increase the capacity, because however much we place in series, the resultant total will always be less than the smaller capacity, which would in that case be that of the aerial and the set.

By decreasing the value of the variable condenser placed in series, we can bring the total capacity down, and, therefore, reduce the wave-length tuning of the set. A .001 or .0005 mfd. variable condenser would be the most suitable value to employ for the purpose.

Now we come to the more difficult question—that of increasing the wave-length range. For this we must rely solely upon the other wave-length factor—inductance—because the capacity must always be kept at its minimum value if efficient reception is desired. Quite a number of the sets being sold for broadcast purposes have two small terminals or plugs on the panel marked "extra induct" or "long wave." To these two points can be connected extra inductance coils in order to increase the wave-length range. Should such terminals not be in evidence upon your particular set, then the extra coil or coils must be placed in series with the aerial lead and the aerial terminal of the set.

An adjustable coil is an advantage, otherwise it is obvious that to cover very dissimilar ranges several different coils will be required. For instance, Paris transmits on a 2,600-metre wave-length, and to get up to that on a set normally tuning but to 500 metres would require an inductance coil of some considerable value, which would obviously be far too large for the aerodrome telephony 900-metre adjustment.

How to Get Paris.

As a matter of fact, the most suitable form of loading coil for ranges from, say, 900 to 2,600 metres will be an ordinary single layer single-slide coil of about nine inches in length by five in diameter, wound with some 350 turns of what is known as gauge

24 wire. In the case of the plug or two-terminal connections provided on a panel, one lead would go from the slider bar to one of these terminals, and one end of the winding itself to the other. Or it can be placed in series with the aerial lead by taking the aerial lead straight to the slider bar of the coil, and a lead from the end of the winding to the aerial terminals on the set.

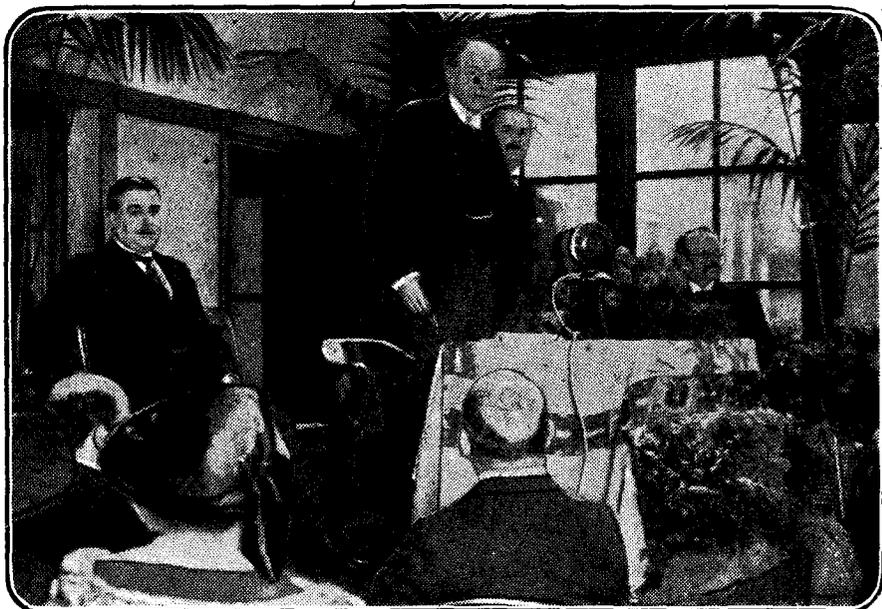
Where the increased wave-length range desired is from, say, a maximum of 550 metres or so to only 1,100 metres to cover shipping, the aerodromes, planes, and the Hague, etc., a small single-slide coil of some seven inches in length and three in diameter wound with 150 turns of 22-gauge wire would suffice. Although these single layer coils are the more efficient for the purpose, it stands to reason that a fixed coil of the well-known honeycomb type or even basket type could be used for useful extensions of wave-length ranges.

A More Efficient Method.

For instance, if your set has a minimum adjustment of 300 metres, and will range up to 550 or so, it is very easy to see that a fixed coil placed in series to bring the minimum adjustment up to 550 metres would allow the set to be adjusted to seven or eight hundred metres. For efficient reception on long wave-lengths, however, it is advisable to have the set at its maximum adjustment, and do the tuning with the loading coil, unless this latter is inserted right into the circuit of the set in the way that they are in the case of those sets that have terminals provided for extra coils.

To insert a coil into the circuit in this way, it is necessary to slightly modify the wiring, in order that the additional coil can be placed in series with the original coil of the set, so that to all intents and purposes the arrangement results in one continuous coil, with the detector circuit tapped across the whole lot.

As a matter of fact, this last arrangement is so much more efficient than directly loading the coil on to the aerial, that I would advise you to have a shot at doing it in that way when you have acquired a little more knowledge on the subject of a set's "innards."



Lord Robert Cecil speaking into the microphone at the opening of the new G.E.C. Laboratories.

GETTING THE MOST OUT OF A VALVE SET.

WE will put aside the question of tuning because by this time you will be able to realise the necessity of bringing this to the sharpest point possible, and that whilst it is advantageous to employ a variable condenser to enable you to do so, this, the capacity value, should be kept as low as possible, and the more considerable variations of wave-length obtained by varying or changing the inductance coil. Also, it might be added, that if you are employing one of these very popular coil-holders, or a "loose coupler," always work with the loosest possible coupling consistent with good signals. This is obtained by keeping the coils as far apart as possible.

Until you have "experimented" a little with your set, you should not take it for granted that you are receiving the best possible signals. At the same time, limit the extent of your "experimenting" to those things that you know you can do with safety—burnt-out valves or short-circuited accumulators are expensive items to replace.

Efficiency and Economy.

With a one-valve set there is little that you can do towards this "experimenting," except in the way of careful high and low tension current regulation. The high tension—that large dry battery—should be variable, and the type that is fitted with a small plug and tapping sockets is highly to be recommended. With the filament resistance regulated so that the dulllest light is emitted from the filament while signals are still audible, vary the high tension until the loudest signals result, and then gradually increase the filament brightness until, with the lowest possible variation of both, you are satisfied that the best possible signals are coming in.

Having accomplished this, you will have effected both efficiency and economy. Lighting the valve filament at its lowest temperature increases the life of the valve and saves accumulator "juice," while obviously there will be a saving of H.T. pressure, thus allowing plenty of "margin" against the time when the H.T. battery begins to drop in voltage. Regarding this latter, when to all intents and purposes, judging by results, its active days are over, by all means purchase a new battery and use it, but don't throw the old one away. A rest of one or two weeks will prove that it is still capable of recuperation, and it will provide a very useful "standby."

A Wise Precaution.

Should you be the possessor of a two or three or more valve set, there are several little "tips" worth noting. In the first place some valves will function better when used on the amplifying side than on the detecting side although they are of the same type and make. No two valves are alike in individual characteristics. Therefore, it is always a good plan to change the valves about until the best positions have been discovered. Should you have a separate L.F. amplifying unit connected to your detector panel, changing over the "line" or "input" leads on the amplifying panel sometimes results in an extra-

ordinary increase in efficiency. On some "hook-ups" these terminals will be the "phone" terminals on the receiver or detector panel. Owing to the fact that in some cases the L.T. positive is taken to earth, and in others the L.T. minus, it is a good plan to observe the effect of changing over the accumulator leads. Very little alteration in the circuit results, and there is no danger in doing it, but sometimes it causes signals to be very much improved.

Finally, although if you leave the H.T. terminals alone, and the H.T. battery

isolated and carefully connected to those terminals, it is hardly likely that a blown-out valve will result; it is always as well, apart from this, to take other precautions. The investment of a shilling or so for one of those small "pea" lamps and holder to place in direct circuit (series) with one of the H.T. leads, to act as a fuse, is a wise one. In the event of the H.T. battery becoming by some means connected to the filament of the valve or valves, the small "pea" lamp will burn out, break the circuit, and save the more expensive "lamps."

DULL-EMITTING VALVES.

By an Expert of the General Electric Co.'s Research Laboratory.

THE electron-emitting properties of thoriated tungsten filaments were studied by Dr. Langmuir in America as long ago as 1914, and American patents covering the use of these filaments were taken out by him shortly afterwards.

When a thoriated tungsten filament has received no special treatment, the electron emission obtained from it is approximately the same as that obtained from a filament of pure tungsten. At a very high temperature (about 2,600° C.) in thoriated tungsten a chemical reaction occurs between the tungsten and thorium oxide, resulting in the formation of a small amount of the element *thorium*, some of which remains in solution in the tungsten. Then, when the filament temperature is lowered to about 2,000° C., thorium atoms diffuse outwards from the interior of the filament and gradually form a film or coating on the surface of the filament.

What Actually Happens.

Now, when an electron escapes through the surface of a hot filament it has to do work against the electric field at that surface, and the amount of work which it has to do is different for different substances. This amount of work happens to be less for thorium than for tungsten, so that with the same filament temperature many more electrons are able to escape from a filament covered with thorium than from one having a tungsten surface. The actual ratio of the number escaping from these two surfaces at the same temperature is about 100,000 to 1.

When employing these filaments in valves, what we do is to reduce the filament temperature until we get the same electron emission as we normally use from a tungsten filament. We therefore save very much in the current used for heating the filament.

Much Longer Life.

For example, the tungsten filament in an ordinary receiving valve requires a voltage of 4 and a current of 0.7 amp., the power being 2.8 watts; while a dull-emitting filament of the same dimensions requires a voltage of 1.6 and a current of 0.36 amp., the power being only 0.58 watt, or less than a quarter of that for tungsten.

Owing to its electro-positive character and consequent great affinity for electro-negative gases, the thorium film is very soon oxidised in a poor vacuum, so that special precautions have to be taken in manufacture in order to obtain a very high degree of vacuum in these valves. However, it has proved to be possible to obtain the necessary degree of vacuum under manufacturing conditions, so that numerous types of receiving valves are being turned out which give very long working lives—sometimes as much as 5,000 hours.

BOOK REVIEW.

Radio Telephony for Amateurs. By STUART BALLANTYNE. (London: Chapman & Hall, Ltd., 7s. 6d.)

From the point of view of the real wireless amateur who wants to know the values and constructional details of receiving and transmitting apparatus, this book will prove invaluable.

In the introduction the writer comments on the fact that in his earlier experiences of amateur experimental wireless he had searched in vain for a book that would provide more practical data and less formulae than the average wireless handbook, and determined to write one himself when his knowledge and experience warranted him taking that step. The result we have before us as we write, and it proves that Mr. Ballantyne has completed his task in an exceedingly commendable manner. Being an American his wire gauges are B and S, and some of the apparatus is little known on this side, but, on the whole, those minor points detract little from the value of his book.

Beginners are reminded that P.W. will answer all questions free by post. Address your queries to Room 138, "Popular Wireless," The Fleetway House, Farringdon St., London, E.C.

QUESTIONS & ANSWERS FOR BEGINNERS.

NOTE.—On this page the beginner will find a selection of questions and answers which will concisely deal with many little problems met with in the erection of a wireless receiver. Readers are invited to send their queries to the Technical Dept., Room 138, The Fleetway House, Farringdon Street, London, E.C.4, where they will be carefully and promptly dealt with. Replies are sent by post free of any charge.

Q. Is there any limit to the distance that you can tune downwards towards the lower wave-lengths?

A. Yes; you will find that to tune below 200 metres is a difficult undertaking even with condensers in series with the aerial. If you shorten your aerial, you can tune still further down; but for effective reception of telephony, it is not usually possible to get below 150 metres. Below this a smaller aerial has to be employed, and a system of condensers, all of which tend to reduce the signal strength. For amateur work 180 metres is a good minimum, as the natural wave-length of most aerials is about 130–150 metres, and to get below this natural wave-length will result in a great loss of efficiency.

Q. What is meant by heterodyning?

A. When one station's continuous wave gets mixed up with that of another station, and these waves keep on getting in and out of step, or phase, with one another. This produces a series of notes in the telephones of receiving stations within range. It usually occurs when near-by stations have nearly the same wave-length, or wave-lengths that have common harmonics. One method of receiving C.W. depends upon heterodyne reception. The receiving aerial is made to oscillate at a given rate or frequency, and the incoming C.W. signals get mixed up with these oscillations, and the result is a beat giving audible signals in the phones.

Q. What is the cause of crackling in the phones when using a valve set?

A. This may be the result of several causes. It may be due to atmospheric; disconnect the aerial and see if it ceases. It may be due to a faulty high-tension battery, in which case it will probably be continuous. See if it ceases when you change the battery. If you have a loose connection anywhere, it will cause noises in the phones. A loose filament resistance, loose valve, or an insecure lead from the L.T. battery will also cause a great deal of disturbance, and possibly the valve will flicker. Lastly, you may have a broken wire, probably in the phone leads, or even a burnt out, or breakdown of insulation somewhere in the telephone windings.

Q. Do all crystals have sensitive points?

A. Presuming that crystals such as are used in wireless reception are being considered, you will find quite a number that do not have sensitive points. The mineral may be quite right, but the structure may not be suited for the rectification of high-frequency currents. For instance, carborundum is a very uncertain mineral. It is quite a frequent occurrence to have to try several crystals before you find one that will operate at all efficiently. Different crystals, even of the same type, vary considerably in sensitivity, and often such sensitive

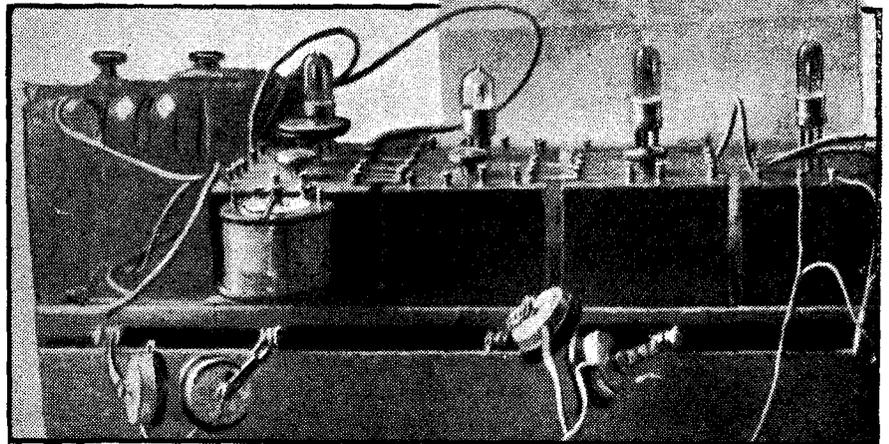
crystals as galena and hertzite appear to have no sensitive spot on them anywhere. If you cannot find a spot, and scraping the surface with a penknife does not uncover one, you should try a new crystal.

Q. What is the cause of a valve filling with a blue light?

A. Too much H.T. potential. If you have a fairly soft valve, such as the Dutch valves sometimes used, the remaining gas in the bulb becomes ionised and collisions of electrons take place, causing the gas to become incandescent, and the "blue glow" will result. Decrease the H.T. voltage until the glow disappears.

Q. What resistance should be used for the filament control? What voltage should be employed?

A. About 9 ohms is quite suitable with a 6-volt low-tension battery. You then have



Mr. Edwards' set 84, Warboro Rd., Babbacombe. Note P.W. map.

a wide range of control over the filament current. This means of varying the current should not be neglected as, to get the best out of a valve, the filament current should constantly be adjusted, as the amount of current has a great effect upon the results achieved. Similarly the high-tension voltage should be adjustable by means of switches or wander plugs, as a matter of a few volts more or less will often make all the difference between good and poor reception. Especially is this the case with soft detector valves.

Q. Is a variable grid leak an advantage?

A. Yes, we would advise the experimenter to fit a variable grid leak to his set. For those who are using broadcast sets, and always the same make of valve, this is not so important, but those who wish to experiment with various valves and various circuits will find a variable grid leak of great assistance, as practically every valve, even of the same make, will need a slight adjustment of the leak value if best results are to be obtained.

Q. Can slate be used as a panel instead of ebonite?

A. Yes; but you may find it is not quite so efficient. The surface of the slate should be thinly coated with shellac to break up any film of moisture that is likely to form on the panel.

Q. What is ebonite?

A. A specially prepared black substance that has very good insulating properties.

MAP OF RADIO STATIONS

It is a preparation of sulphur and rubber. It is one of the best-known insulators that can be successfully worked for the making of instruments.

Q. Can valves be repaired?

A. Yes, we believe that one or two firms are now in existence which undertake the repair of valves. The price is usually about 7s. 6d. or 8s. 6d. The G.W.I., Ltd., Imperial Works, Shanklin Road, Crouch End, carry out these repairs at about the above charges.

Q. How long should a valve last?

A. This, of course, depends upon the way in which it is handled. Properly treated, it should give about 1,000 hours of light, though this is sometimes exceeded. A "soft" valve will not last quite so long as a "hard" one, owing to the bombardment of the filament by gas ions which have been liberated by the collision of the gas atoms with the electrons emitted from the filament.

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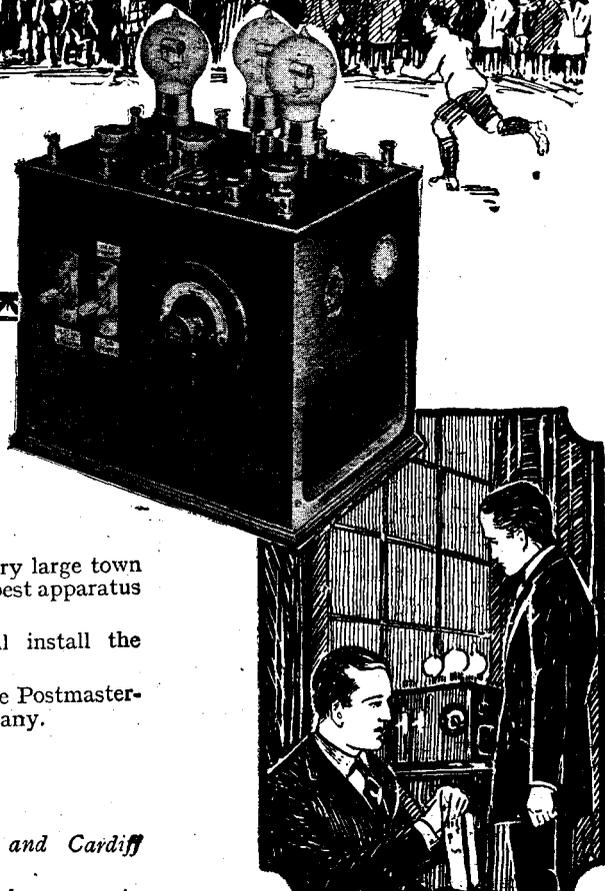
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CORRESPONDENCE.

To the Editor, POPULAR WIRELESS.
THE LICENCE DODGER.

Dear Sir,—I have read your somewhat severe strictures on the "licence dodger," and, whilst agreeing with you that this practice is not playing the game and is dishonest, I would ask you what one is to do. What would you yourself do were you in the position of thousands like myself?

To illustrate. If you will turn to page 967 of POPULAR WIRELESS, you will find these words, "The first diagram A . . . could be aptly named the beginner's circuit, being a hot favourite amongst those amateur mechanics who believe there is nothing like the home-made set." Now this—and dozens of other instances can be found in back numbers—is a direct incentive to one and all to make their own sets. Acting on your advice the set is made, then the poor devil prepares to purchase a Broadcaster's Licence, but learns that if he does so he will not be permitted to use the set. Now, sir, what is he to do? What would you do? Evade the case by declining to take out a licence, or take out a licence and straightway break your contract with the P.O.? It is a simple issue. What would you do? Tell us frankly.

That was my plight, for I knew nothing of that clause nor of the B.B.C. stamp until my set was completed—a two-valve set.

I had to do something, so took out a licence and broke my word. Nay, further, I have since purchased a set of 52s. 6d. headphones from the Sterling Company which does not bear the B.B.C. stamp, so again I break the contract.

I ask you, sir, who should be in the dock—who should be pilloried? I, who acted in all good faith—up to that point—or the Press proprietors who advise us and the members of the B.B.C. who sell their stuff without the requisite stamp? Anyhow, the B.B.C. stamp is but a transfer, and wears off in the course of a few weeks.

Having a conscience, however, and also a sense of decency, I sent to the B.B.C. a £1 postal-order made out to them and crossed "A/C payee."

Now, where do I come in in your strictures, and when I am before the magistrate? The P.O. officials have been round to see my set on three successive days, so what is going to happen I don't know. You can, however, appreciate what my defence will be—copies of POPULAR WIRELESS and other technical papers and the Sterling Company's phones.

It seems to me that the P.O. is missing its mark when it hits us, and I think that in common decency the Wireless Press should take up the case for us if we are prosecuted. Personally, I am very doubtful as to whether it is *law*, but I cannot afford to fight on those lines, I should have simply to state my case and accept the magistrate's verdict.—Yours faithfully,

A B.B.C., NOT A P.O., LICENCE DODGER.

NOTE.—The above letter is printed exactly as received. The case presented by the writer is a common one, and

he has my sympathy. But sympathy is not much good, of course. That the writer has acted in good faith few can doubt, and I have no doubt there are many more in the same position as himself. The writer, however, is hardly fair when he blames POPULAR WIRELESS for publishing constructional articles. There are some thousands who hold experimental licences; they must be catered for. The writer asks where he comes in for my strictures; he does not come in at all, because he has acted in good faith. The point is—thousands are *not* acting in good faith. How many readers who have made their own sets have forwarded compensation to the B.B.C.? It is the deliberate "dodger," the man who avoids paying *any form of tax*, that is to be pilloried—if at all. When "home-made sets" licences are issued, even this concession will still leave the deliberate dodger, and I cannot imagine any reader of POPULAR WIRELESS disagreeing when I say such behaviour is grossly unfair.

THE EDITOR.

To the Editor, POPULAR WIRELESS.

Dear Sir,—I wish to notify you that I received the American station WG Y on a home-made *single-valve set* between the times of 3.21 a.m. and 3.51 a.m. this morning, February 20th, 1923. I am enclosing programme of items received. The words given are the exact words used by the announcer. I think that this constitutes a record, taking into consideration the material at my disposal. I think a short description of the components of my set will upset a few standard ideas.

My aerial is, approximately, 65 ft. long (single wire, 223 gauge, copper). The lead-in, after passing through the window-frame, runs along the wall of a bedroom, through the bedroom floor, down a wall downstairs, and through same to instruments in the kitchen, the length of lead being, approximately, 34 ft., a most inefficient arrangement. The phones I am using are a pair of watch type receivers taken from 2-in. "Sterling" intercommunication commercial desk telephone sets, the combined resistance being only 300 ohms. The only alteration I have made to same is the fitting of thinner diaphragms. I do *not* use a telephone transformer, the phones being placed directly in the plate circuit.

WG Y was tuned in with two basket coils made from descriptions given in POPULAR WIRELESS, the primary coil having 64 turns of 36 wire, the reactance having 102 turns of 36 wire coupling between the two coils 2 in.

A 39 plate standard variable condenser in series with the aerial. The earth connection was connected to gas-pipe near meter. This is the second time I have received the American stations, the previous occasion being last Friday, when I received WJZ.

I am making a few adjustments to my set, after which I will forward you a full night's programme from either WJZ or WG Y.

I should be pleased if you would publish this letter and programme, as I should like to know if any other amateur has received American broadcast using a ragtime set like mine.

Yours faithfully,

J. H. BRITAIN.
5, Leighs Fold, Green Lane, Patricroft,
Manchester.

(NOTE.—As the programme given by Mr. Britain is very long, it is not reproduced. It has been checked, however, and found correct.—EDITOR.)

To the Editor, POPULAR WIRELESS.

Sir,—I have read with much interest your article on "Licence Dodgers." Will you allow me to state a few facts? I have applied *eight weeks ago* for an experimental licence, so far with no reply. (I called for the form.) Since then I have built a crystal set. It being home-made, I cannot obtain a B.B.C. licence; and, presumably, as I am not a true experimenter, I cannot obtain an experimental licence.

Here am I, ready and willing (as are many others whom I know) to pay the B.B.C. royalty and licence fee if they will only let me.

I do not want to dodge the licence, but it seems a pity to place the B.B.C. in peril for want of a satisfactory system of issuing licences.

Yours faithfully,

R. E. THOMAS.
318, Milkwood Road, S.E. 24.

To the Editor, POPULAR WIRELESS.

Dear Sir,—Having read your article on the "Licence Dodger," I would wish to say that I am one of your thousands of readers who have made their own sets, and am unable to use it owing to restrictions. Several of my school-mates are in the same position. I am quite willing to pay 10s. 6d., or even more, for a licence for my crystal set. I agree that to dodge the licence is rather mean.

Also, that there will soon be a licence to the advantage of the home-worker I do not doubt. Meanwhile, I would like to ask what I am to do, as I am unable to answer the necessary questions for an experimenter's licence?

Yours truly,

WALTER J. GIBBS.
296, Lymington Avenue, Wood Green, N. 22.

To the Editor, POPULAR WIRELESS.

Sir,—Your article in POPULAR WIRELESS, February 24th issue, "The Licence Dodger," is decidedly interesting. I do not think there are *so many* who are desirous of dodging the licence fee as you may imagine. I have made a set (without any previous technical knowledge), but cannot really be called an experimenter; at the same time I am only too willing to pay a reasonable licence fee, over and above the 10s. 6d., for a "home-made set licence." There is far too much red tape in connection with "experimental licences." Why not issue straight away a "home-made" licence, and let our boys then get on with experimenting, with the aid of information gleaned from your valuable weekly publication?

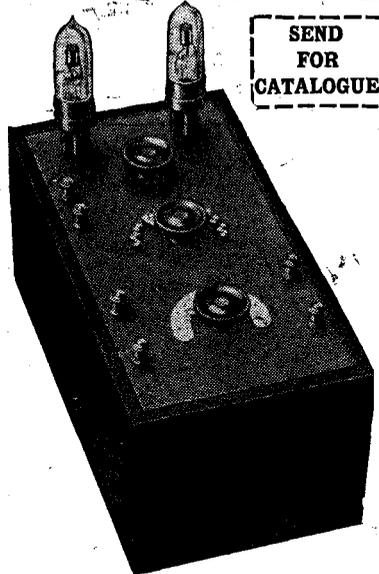
Yours faithfully,

G. H. H.
148, Queen's Avenue, Watford.

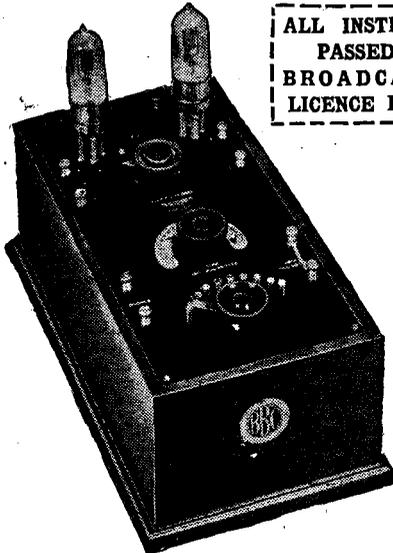
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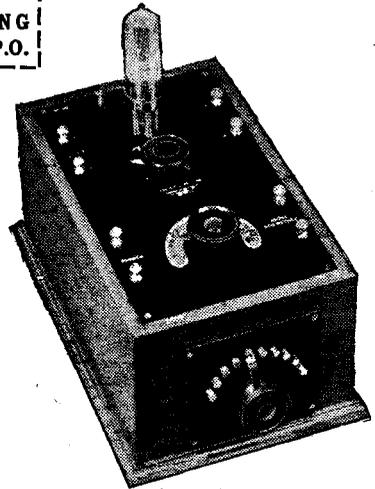
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We claim that this Set is the easiest 2-Valve Set to manipulate on the market.

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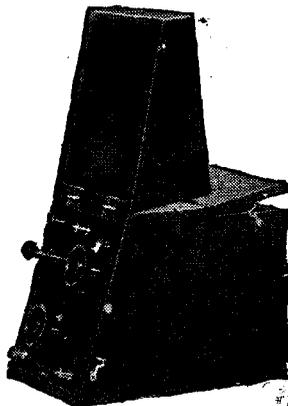
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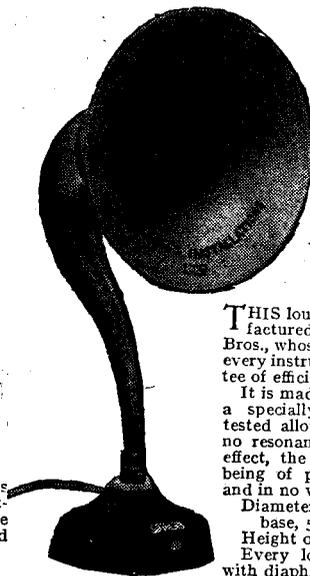
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In a self-enclosed hinged cabinet, thus keeping it free from dust. A compartment is provided at the back for the Phones. Tuning is done with a tapped coil and a Vernier Condenser.

Complete with Aerial and Insulators.

Set - **£2 0 0** | Insulators **7 6**
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Aerial **4 6** | Total - **£3 13 6**



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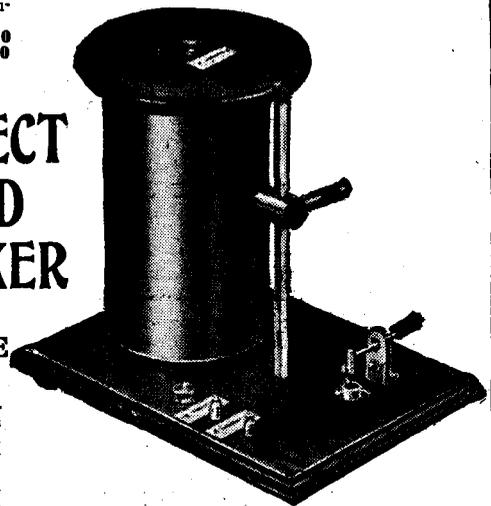
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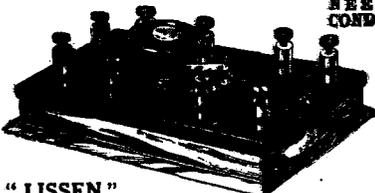
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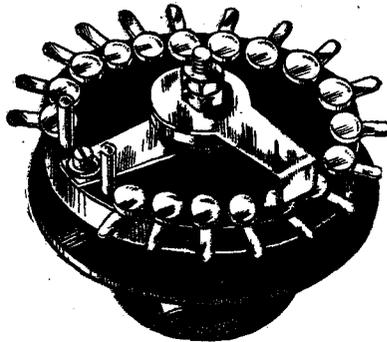
Use this Radio Frequency Amplifying component to increase the range of your set. Largely eliminates static and other disturbances. Strengthens weak signals, brings in distant stations. Allows use of indoor aerial where otherwise not possible. Has a "Lissen" Rotary Switch all complete. Can be fixed in two minutes. Only one hole to be drilled in panel, and two soldered connections made to tinned tags provided. In two ranges. One gives maximum efficiency on Broadcasting band of wave-lengths, 150 to 600 metres, 6 tappings, complete with multiple switch **27/6**

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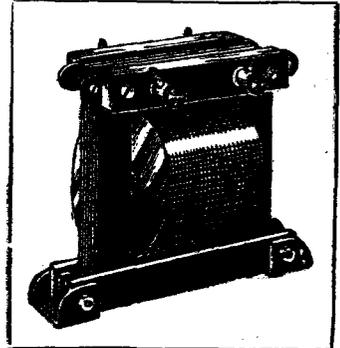
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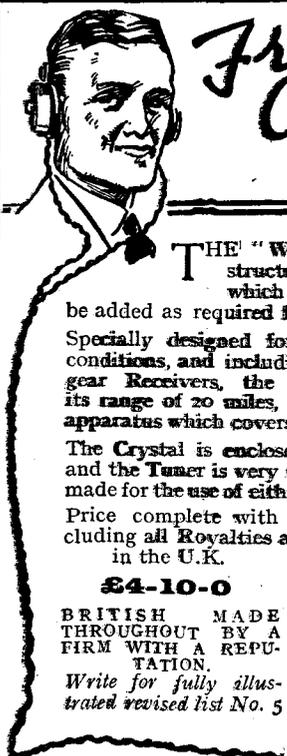
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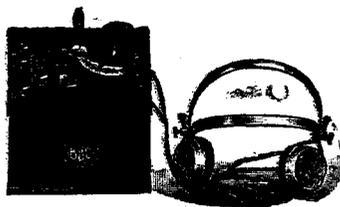
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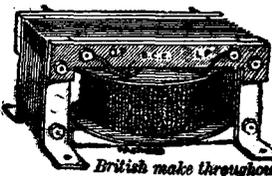
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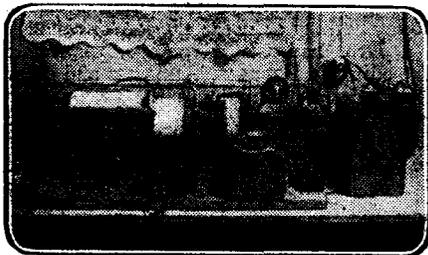
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A RADIO DINNER.

By P. E. HELYAR.

THE first annual dinner of the International Amalgamation of Wireless Societies was held on December 14th, 1932, at the principal hotel in every city of the world wherein the I.A.W.S. has a branch. The menu, which we reproduce, was broadcasted three days before the dinner from the society's head office in New York, thus ensuring that every member, be he in Paris or Patagonia, should partake of the same repast, and minute precautions were taken that the dinner should commence everywhere at the same time. It is whispered, however, in culinary circles that the interpretation of that menu by the cook of the Pig's Ear Hotel, Burnem-up-Creek, differed slightly from that of the Paris chefs.



Mr. F. G. Allen's Home Made Set, 58, King's Road, Wimbledon, S.W.19.

"The dinner-table of the New York branch of the I.A.W.S.," writes our special correspondent, "laid in the wireless room of the 'Wastorf-Aldoria,' was one of the wonders of the age."

Torturing America.

In reality a monster multi-valve panel, the sole illumination emanated from the valves, which ran down the centre, the table being laid in the usual manner, except that at every place, in lieu of the usual array of glasses, was placed a loud speaker, which, though in miniature, was none the less effective, and before each plate was a menu and a programme of speeches, each tastefully framed in ebonite.

Monsieur Duffle-Deucivre, the president of the Paris branch, who holds the honoured title of "Senior Radio Fan," opened the proceedings with an able speech in which he said that Esperanto had been adopted by the I.A.W.S. as the official language.

He had to congratulate the British Broadcasting Company on their enterprise in engaging the Spellmon Institute to teach Esperanto by wireless. At the conclusion of this speech dinner was served, and no event of importance was marked until during the second course the Abernethy branch reported interference from Berlin. Upon investigation this was found to be merely a member eating his soup. Apologies were tendered and accepted.

After the fish course a break was made for the speech of the "Assistant Senior Radio Fan," Mr. Cyrus Gurgleheimer, the president of the New York branch.

Mr. Gurgleheimer in his remarks asked that at future dinners of the I.A.W.S. his European confrères should fit silencers to their wine bottles, as the pop of drawing corks and the gurgle of poured wine was distinctly audible in New York. He was

told that the American Press were suffering the torments of Tantalus.

During the rest of the evening speeches were made at intervals by the "Junior Radio Fan," president of the Melbourne branch, the "Senior Tuner In," secretary of the London (England) branch, "The High Transformer," president of the Cape Town branch, and the "Chief Micro-farad," the Begum of Dungarree, president of the Calcutta branch and the only woman official in the society.

Britain to the Fore.

During the whole of the meal, music was discoursed by the foremost orchestras of the world in turn. One item, the Black Rhubarb Jazz Band of San Francisco, was specially appreciated.

While the coffee was being taken, Mme. Screecher gave an exquisite rendering of that soul-stirring solo "The Lost Volt," from the Queen's Hall, London.

The evening was brought to a close by the whole of the diners singing in unison the anthem of the I.A.W.S., "A Life on the Hertzian Wave."

We gather from our London correspondent that the only fly in the ointment was that while New York sat down at 8 p.m., the corresponding time in Great Britain was about 2 a.m. But as a famous wireless expert remarked, "Britain has always been foremost in making sacrifices in the interests of Science."

MENU.

Sparks Variés.

Consommé Marconi.

Supremes de Soles à la Micro Henri.

Escalopes de Riz de Veau à la Morse.

Tourmados de Bœuf Cathode.

Selle d'agneau Tonello.

Pommes en Grid. Artichauts en High Frequency.

Spaghetti à la Hertzian Wave.

Poularde Farcié Potential.

Ohmlette à la Resistance.

Oscillations en Parmesan.

WIRELESS RECEPTION BY TASTE.

By A. H. DALY.

SOME time ago a paper was read before the American Institute of Radio Engineers dealing with the reception of wireless signals by means of taste. It was suggested at the meeting that taste reception might be used on aircraft where the noise of the engine makes wireless reception by sound difficult for signals of low audibility. At the time very little attention was paid to the idea—taste being a very inferior sense for receiving

intelligence as compared with hearing. Now, however, the idea is again being revived with the object of enabling people whose senses of sight and hearing are impaired to receive by wireless.

The apparatus for tasting wireless consists of the usual type of wireless receiver minus the receiving telephones. In place of these are two flexible electrodes separated by a piece of ebonite. These electrodes, which are merely two short strips of silver three inches long, are constructed in the form of a clip which fits lightly over the tongue.

In the experiments with this apparatus the receiver was first excited by a buzzer, and it was found that by using two or three stages of amplification signals could be received by taste quite well, provided they were fairly strong. The apparatus was then connected to an aerial for actual reception of wireless signals, and provided at least four stages of amplification were used, all incoming signals from about medium strength upwards could be tasted distinctly.

A Good Effect.

The speed of reception was limited to a maximum of about ten or twelve words per minute by operators able to receive from twenty-five to thirty words per minute by sound. But although ten words a minute is comparatively slow, it is very useful to a person unable by an accident or otherwise to receive by sound or sight, and it is quite possible that with a certain amount of practice much higher speeds for taste reception might be attained.

The sensation of receiving wireless signals by taste is, of course, rather peculiar, and it is open to question whether it is good for the health of a person to receive by taste. The physiological effects of this method of receiving have been investigated already, and the general opinion appears to be that the electro-chemical action which takes place in taste reception will have a beneficial rather than bad effect upon the taste organs, as the electric current tends to stimulate the organs concerned.

It has been found that the intensity of the sensation of taste depends largely upon the area of the tongue stimulated, therefore the greater the surface of the tongue which comes in contact with the electrodes the more efficient and better is reception.

Try It.

Anyone who has the necessary valve amplification available can carry out tests with taste reception. It will be understood that a dash of the Morse code is a long taste and a dot is a short taste. Silver electrodes are preferable for the tongue clip, as copper and other metals tend to leave the taste in an unpleasant form in the mouth.

Apart from the actual experiment a fairly good idea of what wireless signals taste like can be gathered by placing the tongue between the positive and negative terminals of the dry battery of a small electric pocket torch. If the battery has any energy in it, a salty, rather acid taste is experienced, and this will give some impression of what wireless taste reception is like.

THE FUTURE OF WIRELESS

By SIR PHILIP GIBBS.

Sir Philip Gibbs is one of the most brilliant of living journalists, and readers of "Popular Wireless" who remember his vivid war articles, and the wide imaginative thought they displayed, will read the following article with more than usual interest.

THE first time I had a revelation of the new miracle of "wireless," and some idea of its future possibilities, was in the city of Detroit, in the United States. The editor of the "Detroit News," which gives a programme of music, lectures, stories, and news every night to something like two million people, listening-in from many towns, villages, and lonely homesteads, asked me to speak for ten minutes or so on any subject I liked to this invisible audience.

I had lately come back from the famine area in Russia, and in that ten minutes I gave a concentrated description of the tragic pictures I had seen. It was a strange experience, speaking down a cardboard funnel in a big room littered with musical instruments belonging to an orchestra which had just been giving a selection from light operas, and with a few members of the newspaper staff standing about. But, somehow or other, I was conscious that great numbers of people in the outside world were listening to what I was saying, could hear the tones of my voice, and were receiving this message of mine.

A Strange Power.

It gave me a strange power. I might have written an article on the same subject for the "Detroit News," but it would not have had the same effect. People would have read the headlines and skipped it, or they would have read it without that sense of personal contact with a man who speaks as an eye-witness of the thing he tells. The human voice has an authority not belonging to the written word. It is also self-revealing, for a liar gives himself away and a truth-teller establishes his character by the tone in which he talks.

Anyhow, here was a new instrument by which the human brain could get closer into touch with the minds of his fellow men; and, in my opinion, that is the supreme value of this new discovery, and the secret of prodigious possibilities which lie in the future of wireless. It is a miraculous triumph over the material limitations of life which have hitherto hampered human society and confined the individual intelligence in a very small prison-house.

All the progress of civilisation has been in the breaking down of that prison-house dividing one brain from another. Language came first as a means of thought transmission after signs and gestures and inarticulate noises. Then came the hiero-

glyph, or written symbol, by which primitive man could inscribe some thought on a bit of clay or stone or leaf. Then writing was developed and manuscripts were circulated among the chosen few.

Then printing was invented, and books became more numerous and passed from one country to another. Then the telegraph and telephone enabled a thought from one brain to be transmitted rapidly to another brain, and news from one part of the world to be published in all other countries within a few hours. All this was the breaking down of the prison-house, until it seemed that man's mind was liberated utterly, and that human thought had no limitations, and that no further conquest were possible. We now see that we are only at the beginning of thought transmission.

Looking Ahead.

It will surely be possible in the future to talk with one's friends almost regardless of distance and without any complicated arrangements now required by long-distance telephones. It is even now possible for one man to make a speech in New York and to deliver his message direct to human brains in London, Paris, and many other cities on this side of the Atlantic. The present limitations of wireless, the first experimental adventures, will be followed by such improvements and facilities in common use that every little home will be a storehouse of vibrations linking up the individual mind with the great world intelligenc.

That, anyhow, is how I see this thing, and I am inclined to believe, without scientific authority, that this is the beginning of an era when we shall not only be able to listen to people at great distances from our whereabouts, but shall be able to see them by vibrations of light as well as sound. In that case there will be no barriers in space, and distance will be annihilated.

But that is looking too far ahead! What of this wireless now? So far, it seems to me merely a scientific curiosity with very little practical use, and giving very little addition to the means of knowledge and enjoyment as at present developed in this country. That is partly due to the limitations imposed upon it by the Government and the wireless authorities.

Until there are great numbers of transmitting stations, and until the most important news, music, knowledge, and intellectual activity of the nation, and ultimately of the world, pass freely through the ether to the receiving sets of the listeners, there will not be much value in the invention. The weakness of the present state of wireless is in the poverty of the programme presented to the public.

It is interesting to listen to a bit of ragtime, a popular song, a violin solo, a bedtime story, an item of news that was in the evening papers—only as the first

uncanny experience of picking up these things from a distance and realising its scientific marvel. But that is not satisfying after one evening at the game. It is not going to appeal to large numbers of people after the novelty has worn off. A rather third-class programme of musical selections and comic tales, with a dreary speech by some second-class celebrity or a mock debate put up for the purpose, is, to my mind, hopelessly unattractive, and bound to result in a general "slump" of interest. Far better to read a decent book, or listen to a gramophone, or pedal at a pianola, to say nothing of intelligent conversation.

I have had the advantage, thanks to the editor of POPULAR WIRELESS and other friends, of listening-in to the programmes of the British Broadcasting Company, and I have heard all I want to hear of that class of entertainment. I would not pay sixpence for it. Indeed, I should charge for my waste of time. But I quite realise that we are only at the beginning of things, and that public opinion is bound to exert sufficient pressure to obtain a very much better and wider service when the initial difficulties have been overcome. It is certain that before long this means of influencing national thought will be used by public men who have important things to say, and that it will be used largely for the transmission of news.

Newspapers Replaced?

It is said that the newspapers are nervous of its development, but in my judgment they have nothing whatever to fear, and will make use of wireless for their own prestige, just as in election times they flash the results to the public on the cinematograph screen.

For wireless will never replace the written word. It will only aid it by the spoken word. An important item of news told one night to millions of listeners at their receiving sets, will send them all to the papers next day to read the detailed story. The only way in which newspapers might suffer would be in losing the first publication of racing and football results, and the verdicts of great trials—which, I admit, would hit them hard. But they must make up their minds to that, for it is going to happen anyhow, as it is already happening in the United States. They must supplement their ordinary newspaper service by their own wireless news, as the "Detroit News" does, and compete in that way with their rivals, so increasing their popularity in millions of households.

Looking ahead, it is impossible to avoid the conviction that wireless is going to create a revolution in the means of transmitting news and views, and will be a powerful aid to the education of humanity. This country is going to be left behind if it allows official obstruction and narrow-minded policy to limit its opportunities in receiving and transmitting.



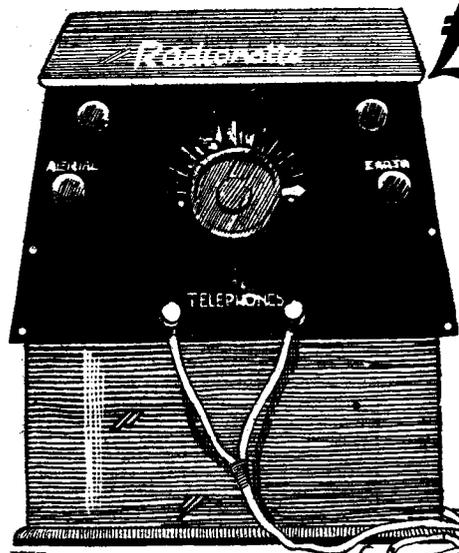
Sir Philip Gibbs.

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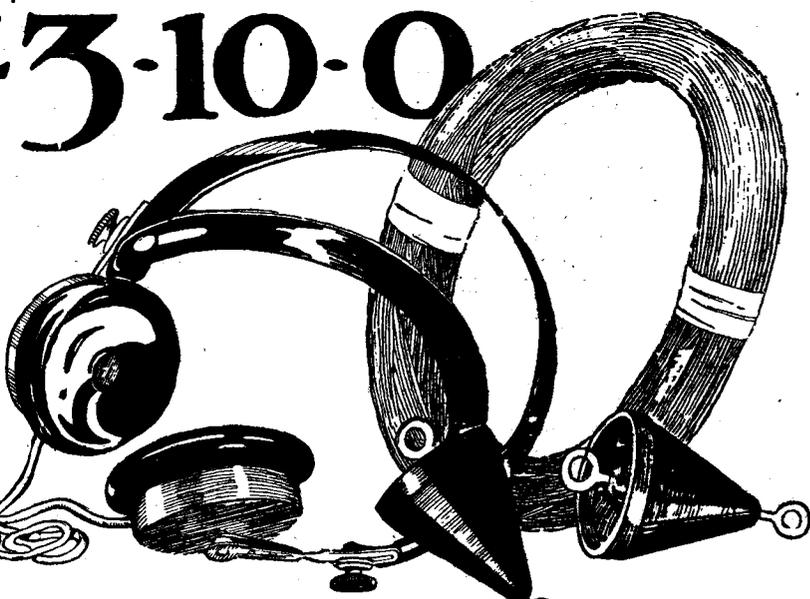
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WIRELESS CLUB REPORTS.

The Editor will be pleased to publish concise reports of meetings of Wireless clubs and associations, reserving the right to curtail the report if necessary. Hon. secretaries are reminded that reports should be sent in as soon after a meeting as possible. Reports sent in cannot appear in this paper in less than ten days after receipt of same. An Asterisk denotes affiliation with the Radio Society of Great Britain.

Hackney and District Radio Society.*

The above society held its usual weekly meeting on Thursday, February 15th, at its premises at the Y.M.C.A., Mare Street, Hackney, the chairman, Mr. A. E. Epton, presiding.

After the formal business had been dealt with, when several new members were elected, three "waistcoat pocket" talks were given by members of the society on their experiences with radio. Mr. Kiernan gave details of interesting experiments he had carried out by the extension of telephone leads to distant rooms in his house, and their utilisation for both transmitting and receiving of telephony in the house. He demonstrated with a couple of ordinary watch earpieces connected together. One was taken out of a room, and a conversation was carried on by two members of the society by means of these earpieces.

Mr. Francis then gave a short talk on a simple plan for utilising D.C. mains for charging accumulators. His plan consisted in breaking one of the two main switches, and attaching thereto an ordinary d.p.d.t. knife switch, one end of same being shorted and the other connected by the two accumulator terminals. He was bombarded with quite a number of questions, and gave the usual warning of standing on a piece of wood or other non-conducting material when playing about with the electric mains.

Mr. Bell put a problem before the members. He stated that he had fixed a crystal set at home, using a short piece of insulated wire hung up in the room as an aerial, and an earth wire attached to the nearest gas pipe. Signals came in quite nicely. When the earth wire was detached, signals faded away, the same occurring when the aerial wire was detached, but when the aerial was detached and the gas-pipe-connected earth wire was detached from the earth terminal and attached to the aerial terminal, and the earth terminal left unconnected, the signals were quite as strong as with both aerial and earth. Several theories were expounded, but no satisfactory solution was given. Perhaps the readers of this report may be able to throw light on this apparent mystery?

Hon. sec., Chas. Phillips, 247, Evering Road, Upper Clapton, E.5. (Letters only.)

The Radio Society of Highgate.*

A very attractive programme of lectures has been drawn up for the next three months, and includes a special series of lectures on the

elementary theory of wireless reception, and the construction of apparatus suitable for the reception of broadcasting. These lectures are being given on Fridays, at 7.45 p.m., at the 1919 Club, South Grove, Highgate, and should prove of great interest and assistance to all those who are taking up, or thinking of taking up, wireless for the first time. Lectures of a more advanced nature are also being given.

A complete programme of lectures, and full particulars of the society, may be obtained from the hon. secretary.

Hon. sec., J. F. Stanley, B.Sc., A.C.G.I., 49, Cholmeley Park, Highgate, N.6.

Exeter and District Wireless Society.

At the meeting of the above society at 31, Longbrook Street, Exeter, on February 12th, a lecture was given by Mr. W. Smitham on "The Principles of Wireless." After a brief account of the transmission of wireless waves through the ether, and a description of the various detectors which have been used up to the present, Mr. Smitham went on to describe the various means of amplification, illustrating them with diagrams. A discussion followed. Any person wishing to join the above society is invited to communicate with the secretary.

Hon. sec., F. S. Valentine, 10, Colege Avenue, Exeter.

Swansea and District Radio and Experimental Society.

The Swansea and District Radio Experimental Society recently organised and held Swansea's first wireless exhibition, which was a huge success and was attended by many people.

The exhibition was held for one day only, but really should have been for three or more days.

The opening ceremony was conducted by Mr. John Lewis, the deputy mayor, who took the place of the mayor, who was at a St. David's Day function.

A very encouraging opening speech was given by the president, Capt. Hugh Vivian, and a hearty vote of thanks was accorded to the deputy mayor, proposed by a vice-president of the society, Mr. Kirkman, B.Sc., A.Inst.P., Fellow of Phy. Soc., Lond.

Beckenham and District Radio Society.

A most interesting lecture took place at the above society's headquarters on Thursday, March 1st, by Lieut. Walker (2 O M).

Great appreciation of the evening's programme was shown by all present.

It is hoped to have a number of well-known amateurs lecturing in the near future.

Sec., Mr. J. F. Butterfield, 10, The Close, Elmers End, Beckenham.

Isle of Man Radio Society.

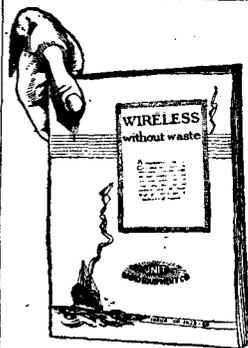
A meeting was held on Monday, February 12th, at the secondary school. There were eighteen members and two visitors present. In the absence of Mr. T. H. Colbourn, Mr. A. L. Downward presided. At the conclusion of the preliminary business, the chairman called upon Mr. Gillmore to address the meeting. Mr. Gillmore dealt with the subject of primary and secondary cells. He explained that when two dissimilar metals were moistened by acidulated water and brought into contact with each other, they would generate an electric current. Continuing, he explained the action of the Fuller, Bunsen, Daniel, and Leclanché cells. He emphasised the importance of a depolarising agent in the construction of a cell if it were to be of any practical utility. Mr. Gillmore then passed on to the secondary cell or accumulator. Before concluding, the speaker gave some hints for the successful operation of accumulators in the hands of amateurs. Next week Mr. J. P. Johnson will speak on "The Use of a Single-Valve Set."

Joint hon. sec., Mr. J. S. Craine, 6, Belmont Terrace; Mr. J. P. Johnson, 16, Hildesley Road, Douglas.

The Liverpool Wireless Society.*

The annual general meeting of the Liverpool Wireless Society was held at the Royal Institution, Liverpool, on Thursday, January 25th, Mr. E. B. Grindrod in the chair. There was a very good attendance.

The secretary read a report of a special impromptu meeting of the society, which met to discuss the question of a new and up-to-date receiver, and it was unanimously decided that the society's present apparatus now being somewhat prehistoric (the society having been established pre-war), it was urgently necessary to have a special "whip round" the members for the necessary funds. One of the members present very kindly offered to provide the greater portion of the necessary funds and guaranteed a cheque for £50, which was handed over the following day. Promises were also made by the members present at this impromptu meeting to the extent of £23, and the secretary was then instructed to write to the members not present inviting them to join in the subscription list. As an expression of appreciation of the generosity of the principal donor, Mr. C. R. Honiball, this gentleman was elected the first honorary life member of the society.



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RADIO T O R I A L

All Editorial Communications to be addressed The Editor, POPULAR WIRELESS, The Fleetway House, Farringdon Street, London, E.C.4.

THE LICENCE QUESTION.

In this issue of POPULAR WIRELESS will be found several letters from readers on the vexed question of home-made sets and the rights and wrongs of "deducting" the licence fee.

The letters published represent only a fraction of the correspondence I have received on this question during the last week or so. In touching on the subject in a recent number, I seem to have stirred up a veritable hornet's nest of outraged amateurs—and, quite frankly, I am delighted.

This delight is hardly unseemly, because it proves quite clearly that a large percentage of my readers are really keen on wireless as a serious hobby. They are not merely "playing about." They evince a keen desire to advance in their study of wireless, and quite rightly, they cannot do this to any degree of satisfaction without getting the necessary experience by building their own gear.

Probably many applicants for experimental licences have noticed that their applications have recently been ignored. I regard this as a good sign, for it shows that the whole question of granting licences—other than the B.E.C. variety—is under serious consideration. In fact, I am unofficially informed, from a very reliable official source, that the question of issuing a new class of licence is practically a foregone conclusion.

Some correspondents ask what I would do if I was in their position. As the Editor of this paper I can hardly publish what I would do. I cannot say: "Go ahead, and build your set, and risk the consequences." I feel sure every reader will appreciate that. Because Editors have to be very careful indeed when it comes to advising their readers to break the law. All I can say with safety is that every potential maker of a set has my sympathy and best wishes for the rapid issue of home-made set licences. I believe this class of licence is not only essential if wireless is to stay as a permanent hobby, but that its general effect would be to the ultimate benefit of manufacturers and to the B.E.C. Manufacturers should specialise in the production of useful component parts as well as complete sets. And if the fee for the "home-made set" licence is increased in fair proportion, the B.E.C. will not lose.

I may say that I have sent a letter to the Postmaster-General informing him of the widespread desire of readers of POPULAR WIRELESS to build their own sets, and urging him to facilitate the granting of the "home-made set" licence. In fact, I am doing everything in my power to assist in drafting out some plan whereby the amateur is allowed to make his own gear without detriment to the revenue of the B.E.C. Let us hope something will come of it, and quickly at that.

THE EDITOR.

Questions Answered

Owing to the enormous number of queries received daily from readers of POPULAR WIRELESS, I have temporarily decided to limit the number of questions sent in by one reader to three. Readers are asked to keep their questions as short and as concise as possible in order that the minimum of delay can be exercised in answering queries. Until further notice three questions from one reader will be the limit for one letter. All questions should be addressed to POPULAR WIRELESS Queries Department, Room 138, The Fleetway House, Farringdon Street, London, E.C.4. Readers are requested to send the necessary postage for reply.

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

A. M. L. (Norwich).—I have plenty of room for an aerial of the full height and length allowed by the P.M.G., but do not quite know what type to erect. Would a "sausage" or cage aerial be suitable?

You do not state the nature of the transmissions you most wish to receive. If you are merely interested in broadcast telephony we would advise the use of a single aerial about 30 feet high. If you intend to devote your time more to the reception of longer wave-lengths a twin aerial or even a sausage aerial will be most suitable. The sausage type is not as a general rule to be recommended for reception of low wave-lengths if you can have anywhere near the total measurements allowed for an aerial. The high natural wave-length of this cage aerial renders it difficult to tune down below about 300 metres if the aerial is of any size. For experimental work the low wave-lengths will provide ample scope for investigation, as the transmissions of amateurs on 180-200 metres are very useful for when testing out circuits. We would advise you to stick to the single type of aerial if you wish to get the best results in telephony reception.

A. B. (Argentine).—From what distance can a single valve receive telephony?

This question needs a great deal of qualifying before it can be answered. If the valve is used without reaction, about 40-50 miles is a good range. With reaction it will often exceed this, and has been known to give results on telephony over thousands of miles. American broadcasting has been heard in England on a one valve set. These results are, of course, not usual and depend largely upon the conditions prevalent at the time. The power of the transmitting station will also have a great effect on the range of reception of the set. Roughly speaking 50-70 miles for good reception of telephony on low wave lengths should be a fair result using one valve and reaction, the transmitting station using about one to one and a half kilowatts. The height of aerial, etc., of the receiving station will, of course also effect matters, but the above should be possible on all single valve reaction sets, using moderate aerials and during average conditions. Without reaction 35-45 miles is a fairly good result.

F. T. H. (Palmer's Green).—If I use a basket coil for a tuned anode coil, what value should it be for 2 L O, assuming that the reaction will be acting upon it?

For broadcasting wave-lengths you will find that basket coils of about 40 turns for both the reaction and the anode will be somewhat near the mark. Wind the coil with fairly stout wire—about 26 D.S.C.—using nine spokes and a one inch centre hole.

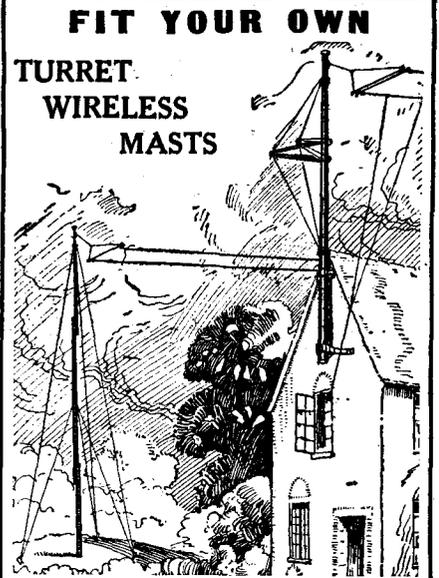
M. P. D. (Cornwall).—I have a 3-valve set, and have just burnt out a valve by letting the H.T. voltage get across the filament. Is there no safeguard that can be used?

There is a fuse on the market, we believe, but you will find that a small 2.5 volt pocket-lamp placed in series with the high tension battery will form quite a good fuse.

J. J. T. (Manchester).—Asks for a criticism of a one-valve and crystal set.

As you are employing the valve as an H.F. amplifier you will find that the crystal circuit will need to be tuned if efficient results are to be obtained. For broadcasting, a basket coil of about 38 turns on a one inch former will be somewhere near the mark if used as the anode coil. A variable condenser of about 0002 mfd. maximum should be shunted across the coil; the tuning will be found to be very sharp. Yes, you can use silicon for the crystal, but we think you will obtain better results if you employ some form of treated galena, such as Hertzite or permanent. You are wrong in inserting a grid leak and condenser. The leak is only used for rectifying valves, or as an earth leak in front of an H.F. valve coupled to the tuned anode coil of a previous H.F. valve. You will not need a battery and potentiometer for the crystal if you use one of those named above. The choice of valve is not very important, as long as you do not use a very soft one. An "Ora" will do quite well, or any valve that can be used for amplifying. No, those Dutch valves are only useful for detectors, as they are very soft. A plate voltage of 60 should be ample, probably you will not need as much as that. Yes, it is better to have filament rheostat, as a very little difference in filament current may mean all the difference between good and bad results. A 6 volt 40 amp. accumulator is ample.

(Continued on next page.)



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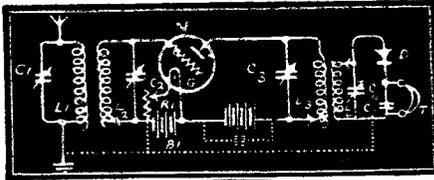
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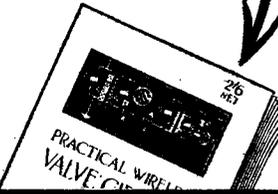
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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

A. P. L. (St. Albans).—I have recently burnt a valve and have replaced it by one of a different make. I find the results are not nearly so good, have I got a poor valve? The make is Mullard Ora.

The valve is probably quite a good one, but as you have changed the type of valve you will most likely find that a different value of grid leak will be necessary. Different valves need an alteration in the value of the leak if you are to get the best out of the valves.

"EDONA" (Shrewsbury).—I have a 3-valve set, and wish to use different H.T. potentials on the various valve plates. Can this be done, using the one H.T. battery?

Yes; this is quite easily accomplished. Instead of taking the transformer primaries to a common H.T. lead, take each one to a movable plug. These plugs are inserted into the H.T. battery at the various points most suited to the separate valves. Of course, separate H.T. batteries can be used, though this is not necessary.

"AMATEUR" (Co. Down, Ireland).—I have a loose coupler type crystal set. Can I add to it so that I could hear 2 L O ?

Yes, you can add to the set fairly easily. You would need at least two H.F. amplifying panels and probably an L.F. amplifier as well. On the whole, as the set is not of a particularly efficient description as you now have it, you would do better to dismantle it and either make up a 2 H.F. crystal and 1 L.F. set, or a four-valve set. You will find the articles by Mr. Hersey, which appeared in our issues Nos. 26, 34 and 35, of great assistance. These articles describe a unit set which is very useful, as any number of valve panels may be added at will.

"SECOND YEAR" (Nr. Burnley).—I am thinking of building a dual-amplification set, using one valve and crystal. What size coils do I need? Can I use honeycomb coils?

Yes, for the A.T.I. and the secondary you can use coils of about 35 and 50 turns, according to the wavelengths you require.

What H.F. transformer do I need?

A plug-in transformer will be quite O.K. Use one to cover the necessary wave-lengths, and tune it by means of a variable '0002 condenser across the primary. See our issue of No. 36 for the construction of H.F. transformers.

What voltage do I require on the anode?

About 45 to 70 volts. This depends upon the type of amplifier used. Remember that you need a valve that will amplify. It is no use obtaining a soft valve, which will be only useful as a detector.

What size aerial do I need, and do I need two variable condensers?

Use the ordinary standard P.M.G. aerial. You need three variable condensers altogether, one for the primary A.T.I., one for the secondary, and one for the H.F. transformer. You will find that the circuit needs some experimenting with before good results are obtained.

R. B. W. (Glasgow).—What size coil do I need for 360 to 440 metres? What capacity should the condenser be? Need the earth wire be insulated?

A coil of about 60 turns of 22 d.c.c. on a 3 inch diameter former should prove satisfactory. The condenser should be about '0005 to '001 and is best connected in series between the coil and the aerial. The earth lead need not be insulated. This is because all that the lead is likely to touch is already earthed, and would thus only help the oscillations on their path. In the case of the aerial we want the oscillations to go through the set, and thus no path to earth must be provided. Hence the need for highly insulating the aerial.

A. B. C. (Hampstead).—I am thinking of building a small portable crystal or one valve set. Can I use variometer tuning, using basket coils? If so, how large should they be for 350-450 metres?

The use of basket coils for variometer tuning will give quite good results. We presume you intend to

(Continued on next page)

HALL'S

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- Stop Pins 9d. doz., each 1d
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- Brass Nuts, 2, 3, 4, B.A., doz. 4d. 5 and 6 B.A. doz. 3d
- Ebonite Sheet, 3/8, 1/2, 3/4 (cut to any size) .. lb. 4/6
- Fixed Condensers, any capacity each 1/3
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- Slider Plunger, complete each 4d
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- Hertzite, 1/6. Borneite, Carborundum, Galena Screwed Brass Lengths, 12-in. 2 or 4 B.A. each Inductances, wound 22/24 enamelled wire, each 3/2
- Leading-in Tubes (Ebonite) 6-in. 1/4-, 9-in. 1/2-, 12-in. each 1/4

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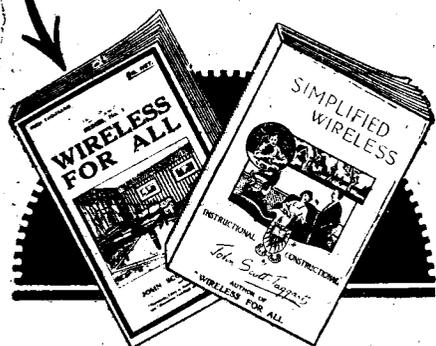
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RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from previous page.)

let them slide, one over the other, in a flat position. You can use a thin cardboard former for each, having about 9 slots and a centre diameter of 1 in. to 1½ in. Winding with 26 d.c.c., about 42 turns on each coil will be sufficient. The coils are, of course, connected in series with one another, and in series between aerial and earth. No, you do not need a variable condenser.

S. C. S. (Haywards Heath).—Is it possible to burn out a valve on four volts? The one I use is an "Ora," and no filament resistance is provided on the panel.

With the type of valve you mention and others of fairly similar characteristics there is no danger of doing so, but you will find that using just the one valve the full four volts will not be required, and by not including a filament resistance you will be wasting a certain amount of current, quite apart from the question of efficient results. With regard to this latter you will discover with a filament resistance that there is a more or less critical adjustment for the filament temperature of a valve where either a decrease or an increase will result in a falling off of signals. It is only possible to discover this point by means of a filament resistance.

"PUZZLED" (Northampton).—Why is it that a crystal will only allow current to pass through in one direction?

The action is thermo-electric—in other words, an electrical effect produced by the generation of heat at the point of contact between the crystal and the other element of the detector.

F. M. (London, E.).—Could not wireless messages be sent by means of a machine that would send them in the form of a code only decipherable by some specially set receiving apparatus quite apart from the question of wave-length? Something like, for instance, a Yale lock and its key.

Such a scheme for transmitting messages by code only decipherable by the receiving instruments at the one particular station has already been introduced in Sweden, and it is intended to operate by this method between the new high-powered station at Grimetown, near Gottenburg and the other Scandinavian countries and America. This system, styled the Cryptographic wireless telegraph, automatically turns the telegrams into secret code at the sending station and transfers them into straight text at the receiving station.

R. T. R. (Bampstead).—What is the "peanut" valve?

An American valve of small dimensions that will function quite well on a 1½-volt dry battery filament supply.

W. S. P. (Hanley).—I am 30 miles from Manchester. Could I hear it on an aerial 35 ft. high and 60 ft. long with a crystal set?

We are afraid that, although with fine adjustments it would be possible, it is very doubtful.

(Continued on next page.)

OMNIPHONE VARIOMETERS

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This instrument is a complete tuner for the broadcast wave-lengths, tuning the standard 100-ft. aerial between 800 and 525 metres, and is infinitely more efficient than slider coil or tapped inductance. Can be used in series with fixed coils for longer wave-lengths. Special precautions have been taken to reduce self-capacity to a minimum. As for results, London telephony has been heard in South Wales with a crystal detector, and in North Lancs with a single-valve non-reacting set.

Price, complete with engraved dial, ready for panel mounting, sent post free,

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RADIOTORIAL QUESTIONS AND ANSWERS

(Continued from previous page.)

L. F. (Birmingham).—Which makes the best earth—copper gauze, copper plate, or copper piping?

We should use the copper gauze in preference to either of the two others. Bury the gauze as deep in the earth as is practicable, in a horizontal position, though this is not very important.

"DUMMY" (Blackburn).—I have a coil wound for 12½ in. with 26 enamelled wire. What is the wave-length if the coil is 4½ in. in diameter?

About 300 metres to 3,400 metres, using an average-sized aerial.

Do I need a condenser for tuning this coil?

You would not be able to tune the coil solely by means of a condenser. The coil should either have a slider or be divided up into a number of tappings taken to studs and a switch arm. The condenser could then be employed to give you fine tuning. A variable condenser of about .0005 mfd. would be quite large enough.

"AMPLIFIER" (Burnley).—What would be the ranges in miles for telephony reception on a crystal set using (a) H.F. amplification, (b) L.F. amplification?

Roughly speaking, if H.F. amplification were used without reaction, as would be necessary if only one valve were employed, the range would be approximately 50 miles maximum. With one L.F. amplifier, a crystal set will only receive telephony up to about 30 miles as a general rule. With good conditions and efficient sets, these ranges are, of course, sometimes exceeded, while in many cases the opposite occurs.

"IGNORAMUS" (Windermere).—I should like to be able to hear all the broadcasting stations on telephones and, say, one or two on a loud speaker. What set should I require?

You would need quite four valves, as you are a considerable distance away from even the nearest station. For reception of London on telephones, one H.F., one Det., and two L.F. valves should be O.K. You may find that for Manchester and Newcastle—your nearest centres—another L.F. valve is needed in order to operate a loud speaker successfully. Why not build the set up by units? You can then add valves at will, and need only use the number of valves you require for any one station. See our issues Nos. 26, 34, 35 for a useful unit set.

"PATENSE" (Drayton Park).—How long should the earth wire be? If I lengthen the phone leads, will it interfere with reception?

Keep the earth lead as short as possible. In any case, use thick wire for it; 7/22 copper wire, as used for the aerial, is about the best. No, the lengthening of the phone leads will not reduce the signal strength if they are not made too long. Use ordinary lighting flex for this purpose.

P. N. (Dulwich).—Which will be the most efficient for an eight-mile range for loud-speaker work—a two-valve set employing one L.F. or a crystal detector with 2 L.F. stages of amplification? Is there any reason why I should not use a crystal detector, thereby saving filament current and being able to use another stage of amplification with the same consumption?

For loud-speaker work, a crystal detector with two L.F. will be much more efficient than just two valves. Using a good stable crystal detector, carbonium and steel with a battery and potentiometer for preference, there is no objection at all to such a valve-crystal combination; in fact, we have always had a distinct inclination to the employment of a crystal detector in most valve circuits. Naturally, from time to time even the most stable of crystal detectors will require a slight readjustment, and for this reason those amateurs who can afford to bear the slightly increased initial and running expenses, and possess fairly comfortable available charging facilities, prefer the valve detector.

Will dull emitter valves function as amplifiers with valve or crystal detectors?

Yes.

(Continued on next page.)

HULLO! HULLO! HULLO!

Compare our prices with our competitors and remember our goods are

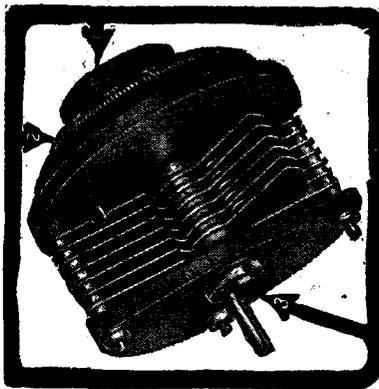
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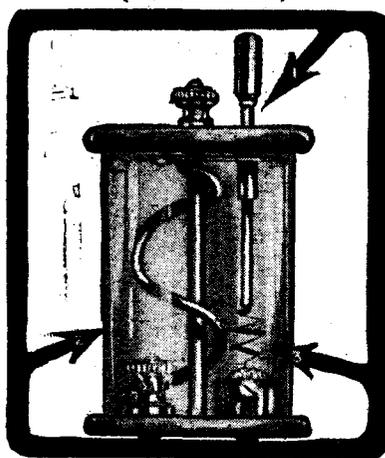
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VARIABLE CONDENSERS.

Photograph of one of our .0002 Type.



CRYSTAL DETECTORS (DUSTPROOF)



We consider that our Condenser is the very best on the market.

Note our Special Features:
1. EBONITE DIAL, 0-180, and Knob (much superior to Brass Pointer and Ivorine Scale).
2. EBONITE CIRCULAR Top and Bottom End Plates, accurately drilled for assembling and panel mounting, including centre bush and nut.
3. CONTINUOUS CONTACT COIL CONNECTION and nut.

Everything ready to assemble, together with Ebonite Knob, all the necessary aluminium vanes (fixed and moving), spacers, spindles, nuts, washers, etc.

Capacity	No. of Plates.	Unassembled end plates.	Complete mounting, incl. knob, without dial & dial, and plates.
.001	57	6/3	12/6
.00075	43	5/3	11/6
.0005	29	4/3	10/-
.0003	19	2/9	7/6
.0002	13	2/3	6/6
.0001	7	2/-	5/9
VERNIER	3	1/9	5/3

If Ivorine Scale and Pointer required instead of Ebonite Dial, deduct 9d. from each of the Assembled Condenser prices.

Packing and Postage, 1/- per set; 2 sets, 1/3;

5 sets, 1/6.

Full details how to erect enclosed with each unassembled Set.

Top and Bottom Ebonite Circular End Plates, 1/6 per pair. By post 1/9.

NOTE.—Actually the bottom plate is a circle, and not half-circle as shown in photo.

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The above-mentioned articles are manufactured solely by us, and are stamped with our trade-mark. We guarantee them to be of the highest grade workmanship, and made of the very best of material.

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Ebonite Dial, 0-180. Best quality. Bored in centre, 1/3 each. By post 1/6.

Ebonite Knob; Tapped 2 B.A., 4½ d. each. By post 7d.

Ebonite Valve Holders, (best quality), complete with 8 nuts, 1/3 each. By post 1/8.

Superior Fixed Condensers: .0005, .0005, .001, .002, 1/6 each. By post 1/6. Above .002-.006, 1/6 each. By post 1/8.

Laminated Switch Arms, with Knob (best quality), 2/- each. By post 2/8.

Filament Resistances, Inc. Knob, FIRST QUALITY, 3/- each. By post 3/6.

Aerial Wire, 7/22 bare copper, stranded. Price per 100 feet, 3/-. By post 4/-.

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Basket Coils, Range 300 to 3,000 metres. Per set of 7, 4/3. By post 4/9.

COLOURED Sleeving, 1½ m/m, 6d. a yard. By post 9d.

Leading-in Tubes, ebonite with terminals. 12-in., 1/6. By post, 1/6.

6-in., 1/2. By post, 1/8.

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Half sheets—half price plus 1s. Postage and Packing 1s. 3d. any weight.

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Ebonite, 20 tappings	12 6
Crystals—		
Ansizite Granula ("AGr")	1 9	
Hertzite	1 6
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Detectors double claw, glass		
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Dubitier	3 0	
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If possible send small sample order. SETS.

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Parts £1/12/-

B.B.C. 2-VALVE AND CRYSTAL £10/10/-

Parts £3/3/-

JAMES PORTLAND

(MAIL ORDERS)

6, CHEAPSIDE, LONDON, E.C.

RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from previous page.)

"Cosmos" (Dunedin).—Is a grid leak necessary in an amplifying circuit? Generally speaking, a grid leak is employed only on the grid of the detector valve.

* * *

H. F. R. (North Mount Vernon).—Do ether waves travel through or over mountains? To a greater extent they are presumed to travel over them, although they have been proved to penetrate to varying distances into the earth and through such projecting natural obstacles.

* * *

Do intervening mountains affect the strength of wireless messages?

Yes, in certain circumstances very considerably. For instance, a mountain can have a "shielding" effect to stations closely overhung by them, although it is not noticeable in every individual case.

* * *

What geographical conditions affect wireless messages most?

The proximity of rivers and the sea, more especially when such lay directly between the transmitting and receiving station, we should think; unless inversely the nature of the natural conformation of the intervening areas will more aptly and adequately answer that question. Wireless waves will more easily radiate, or radiate with less loss in energy, through absorption over water or moist ground. Naturally, large deposits of metal ores will tend to reflect ether waves and cause inefficiency in wireless communication with a point so affected.

* * *

"AMATEUR" (London).—I get strong signals on my super-crystal set, and am thinking of adding an L.F. amplifier for a loud speaker. Will this be O.K.? Would an old gramophone horn do?

If the signals are unbearably loud when you have the amplifier fitted, the set should be capable of working a small loud speaker. You will be able to adapt a gramophone horn fairly satisfactorily for use as a loud speaker. Of course you will still have the gramophone effect, and the apparatus will not give such pure tones as are obtained by the use of ordinary headphones.

* * *

B. J. F. (Tottenham).—I have constructed the crystal set described in POPULAR WIRELESS recently, and would like to increase the wavelength. Can I do this?

Yes, quite easily. Place basket coils (loading coils) in series between the aerial lead-in and the aerial terminal of the set.

* * *

"AERIAL" (Muswell Hill).—I have my aerial arranged on pulleys, so that I can let it down when required. Ought I to clean it at all?

If the aerial wire that you are using is the bare 7/22 copper, a periodic clean will do good. If the wire is insulated, or, rather, protected, by enamel, there is no need to clean the wire. In any case, the insulators should be examined periodically and the accumulated soot and dirt removed. A little vaseline smeared round the insulators will help to preserve good insulation during wet weather. If the aerial wire is of the bare variety, a little cleaning up of this will also help to improve your results. The oxide which coats the wires will resist the passage of the oscillations, and thus weaken your signals. Rub the wire from end to end with fine emery paper until the copper is once more bright. The same should be done to the down lead.

* * *

"INTERFERENCE" (Dorking).—Is there any really satisfactory method of telling when your set is oscillating?

Unless you have a milliammeter in the aerial you will not be able to tell if your set is oscillating slightly. If the signals are distorted you may be sure oscillation.

(Continued on page 140).

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Zincite, Copper Pyrites, Bornite, Silicon Galena, Etc., 6d. and 1s. Postage 2d.

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Explains, in plain everyday language, everything you wish to know about Wireless Telegraphy. HOW TO ERECT, CONNECT, AND MAKE the apparatus required, and full instructions for making coils, tuners, and complete valve and crystal sets. Instructions and diagrams for a two-valve receiver are alone worth four times cost of the book. 112 pages, price 1s., post free.—SAXON RADIO CO. (Dept. 14), South Shore, Blackpool.

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We guarantee every tube to be cut dead square, exactly the same in length, and not exceeding 1mm. variation in diameter. Send for price list to J. E. Poulten & Son, 31, Meredith St., Clerkenwell, London, E.C.1. Est. 1854.

The whole programme or snatches!

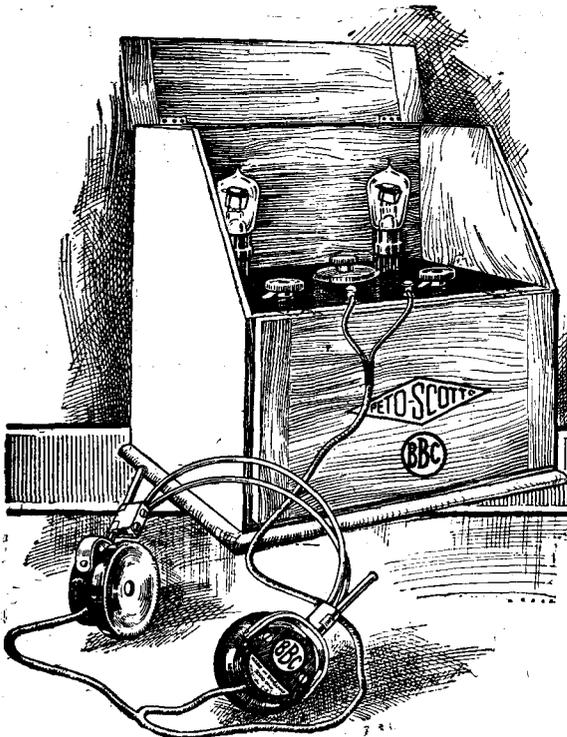
Read what Capt. Round says about receiving the long-distance Broadcast Concerts.

In an interesting article in POPULAR WIRELESS, Capt. Round—the well-known Radio Engineer—made pointed references to the mistaken desire possessed by some listeners—in for picking up every possible Broadcasting Station.

To design an instrument to do this is easy, but such a set would not be so easily controlled as the BROADCAST MAJOR, which is operated by *one dial only*. In addition, atmospheric, jamming by other stations, etc., would make listening-in anything but a pleasant occupation.

It is our experience that, while the enthusiastic experimenter finds it an absorbing pastime to obtain snatches of song from a station several hundreds of miles away—amid the interruptions of the ether—the average person is quite content to listen to the *whole of the programme* broadcast from the nearest centre.

This is exactly what the BROADCAST MAJOR is designed to do. It gives volume and purity of tone, which will be a pleasurable surprise to those who have had to strain their ears to catch the tinkle of a crystal set.



...can which is produced only just sufficiently at this end to include the whole length of the British Isles.

There is something very fascinating in the idea of switching off from a song in Manchester to a violin solo in London, for instance. If you are wise, however, you will control your early enthusiasm and concentrate on getting good results from the nearest broadcasting station. By doing so you will, on the average, afford far more pleasure to yourself and to your family than if you follow the more ambitious course of trying to receive from a number of distant stations. It is very nice, of course, to be able to listen to Paris, and even New York, but this is an achievement which may well be postponed until you have gained a little experience in the manipulation of instruments.

Without recommending or condemning any particular instruments, I would like to emphasise this point: Do not purchase any instrument until its efficiency has been satisfactorily demonstrated to you.

Don't be too ambitious; it will be far more satisfactory in the long run to get good signals from a neighbouring station than bad ones from the other side of the earth.

As to more expensive apparatus still, there are, of course, the cabinet and

factory outside casting

For two years a two that adv valve will g 50 or 6 out a l distan distan if a t pure

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GUARANTEE

We guarantee that every Instrument is actually tested on our own Aerial and that it must give you complete satisfaction after a seven days' test in your own home or money willingly returned in full.

Catalogue of Radio Components and full list of Amateur Transmitting station.

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The simplest Receiving Set you can buy. All wave-lengths from 300-500 metres—the **concert wave-lengths**—being obtained by the rotation of a single dial. Even a child can use it successfully. Has a range of 25-30 miles from any of the B.B.C. stations—London, Manchester, Birmingham, Cardiff, Newcastle and Glasgow. Solid Oak Cabinet, hand-polished throughout and fitted with nickel-plated piano-type hinges.

EQUIPMENT SUPPLIED.

The following equipment is supplied without extra charge with every instrument. **One Accumulator**—6 volts 40 amp. hours. **One H.T. Battery**—60 volts, both made specially for us. **One pair of Western Electric Headphones**, Two efficient Insulators and a coil of Aerial Wire.

Ready for immediate use—nothing more to buy.

When this Set is required for use with Broadcast Licence, a royalty to B.B.C. of 35s. must be paid at time of purchasing. The royalty of 25s. due to Marconi Co. is being paid by us.

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£9:9:0

VALVES 15s. each extra

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All guaranteed phones: double earpieces, and complete with cords.	
AERIAL WIRE, 7/22 copper in 100 ft. lengths. Postage 1/-	2/9
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INSULATING SLEEVING, 1 mm., 5d. yd.; 1/4 mm.	6d.
INSULATING TAPE, 1 lb. roll.	9d.
INDUCTANCES, wound 22/24 enamel wire, 12 by 4 (postage 1/-)	3/3
INTERVALVE LOW-FREQUENCY TRANSFORMERS, finest manufacture, ratio 5 to 1 (postage 9d.)	14/-
KNOBS, with Brass nut insert, 2 B.A.	4 1/2d.
LEADING-IN TUBES, ebonite, with terminals, 12 in., 1/4; 9 in., 1/2; 6 in.	1/-
SLIDER AND PLUNGER complete	4d.
SLIDER RODS, 1/4 in. sq., 12 in. or 13 in. drilled	4d.
SOLDER, ALUMINIUM, a stick	9d.
SPACER WASHERS: small, 2d.; large, doz.	3d.
SWITCH ARMS, laminated blades, complete	1/6 and 1/-
SCALES, ivory, engraved 0-180	4 1/2d.
TABLETS, earth, aerial, phones, etc., ca.	2d.
TERMINALS, special large, with nut and washer, 1 1/4; W.O. type, 2d.; telephone, 2d.; pillar	2d.
TIN FOIL	sheet 4d.
COPPER FOIL	sheet 4d.
VALVE HOLDERS, turned, ebonite, with nuts	1/3 and 1/-
VALVE PINS	each 1d.
VALVE SOCKETS	each 1d.
VALVE SOCKETS, with shoulder	each 1 1/2d.
WANDER, 1 1/4; 3d.; Wood's Metal, 4d.; Mica Strip	3d.

COMPLETE CONDENSER PARTS.

Capacity	Price	Assembled
.001	5/6	12/6
.00675	5/6	12/6
.0005	4/6	10/6
.0003	3/3	7/6
.0002	2/3	4/6
.0001	2/3	4/9
Vernier	1/3	3/-

Kindly forward ample Postage. Balance fully refunded. Drilled Circular Plates, not ends, 1/6 pair. Everything ready for assembling. Postage, 1/- set extra.

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We have no connection with the corner, No. 44, Cranbourn Street (jeweller's shop that sells Wireless parts). ENSURE that YOU FIND "STOCKS."

Read opposite Baly's Theatre, Cinema De Paris at Corner, Leicester Square Tube. Buses Nos. 1, 24, 24A, 28, 28A, 31, 33, etc., pass by Charing Cross one minute.

RADIOTORIAL QUESTIONS AND ANSWERS.

(Continued from page 138.)

is occurring, or if you hear a loud "pop" when you touch the grid connection of the first valve, and when you remove your finger. This is not an infallible test, but, combined with the distortion of signals when the set is oscillating, it forms a useful guide.

E. L. (Cirencester).—I cannot erect an outdoor aerial, so contemplate an indoor one of eight parallel wires across the room (12 ft.) about 3 inches below the ceiling. Will this be O.K.?

You should get fairly good results from this if you keep the wires as far apart as possible. We advise the use of about six wires, as eight is rather a large number. Keep the wires well insulated and about 6 inches below the ceiling. You will need one or two H.F. valves to enable you to hear any broadcasting. Use the usual earth connections and tuning coils, of course.

A. P. (Glasgow).—What experience and training do I need to become a wireless operator on a fairly?

You will need a fairly good theoretical knowledge of wireless, both telegraphy and telephony, and some practical knowledge of the use of the various sets now installed on ships. Your best plan would be to join some wireless school and work up for the P.M.G. first-class certificate, which is necessary if you wish to become a wireless operator.

Is the dull emitter valve provided with a gas-filled bulb instead of a vacuum?

No; it is provided with the usual "hard" vacuum, but has a special filament so constructed that it will emit electrons freely at a low temperature. An article dealing fully with the dull emitter valve appears in this issue of POPULAR WIRELESS.

E. B. (Wanstead).—Re the super crystal set described in No. 38 of POPULAR WIRELESS, what do the terminals A and G and sec for V T stand for?

A is for the aerial, G for the earth (Ground), and the two terminals V T for the insertion into the circuit of a valve if required (Vacuum Tube). If this latter development is not contemplated those two V T terminals can be wired in series with the phone terminals in order to provide accommodation for an additional pair of telephone receivers.

S. A. (Leytonstone).—At present I have a single slide coil, and receive quite good results from 2 L O. Will it improve matters if I add another slide?

As your results are, as you state, quite good, we would advise you not to attempt to modify your present set. We do not think that you will find any appreciable improvement by adding another slide, as you will not be experiencing any jamming from ships, etc., in which case the addition of another slide, providing as it does a closed circuit autocoil, proves slightly beneficial.

F. N. (Loughboro').—What make of valve is a C.V.C., and what current does it require? This is a Cossor product, and requires 35-45 volts for the filament and 20-30 volts on the plate.

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CASH.

Our wholesale factory cash prices to you are only a few shillings above cost. Ajax (ladies' and gent's) cycles embody the world's finest fittings. Workmanship, plating, enamelling and lining are super. HIGH GRADE. Fully warranted. Universally praised by riders for 35 years. Free packing. Carriage paid. Fortnight's trial willingly. Money back if cycle doesn't delight you. Credit terms arranged. Write for details to British Cycle Mfg. Co. (Dept. M277) Baisal Heath, Birmingham.



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1340	4	80	40	29/-	
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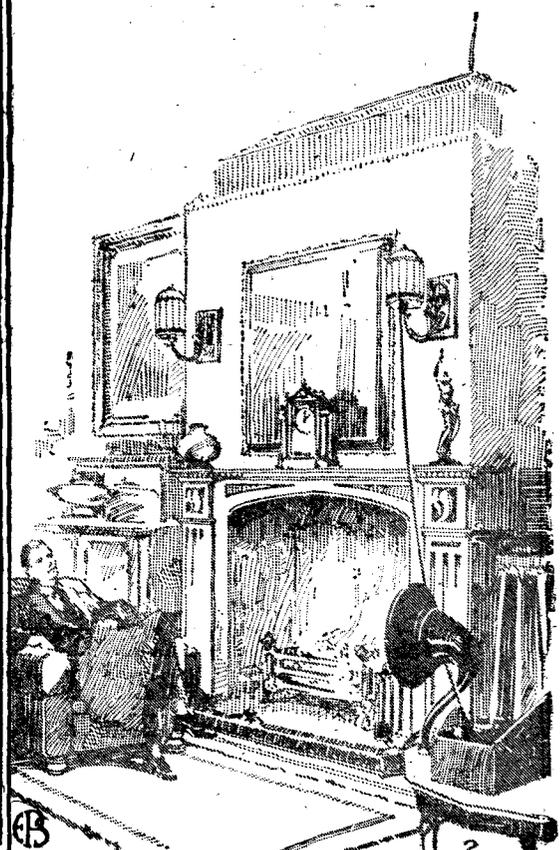
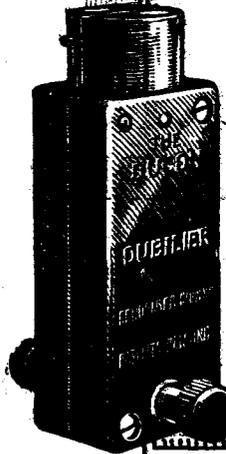
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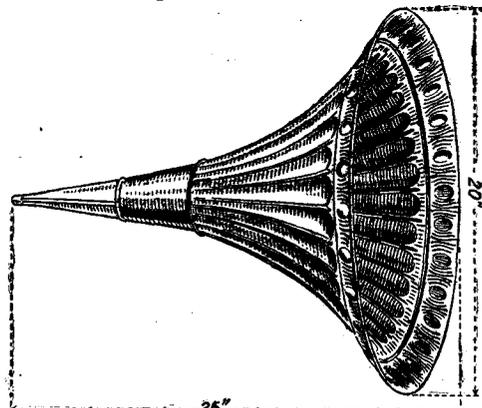
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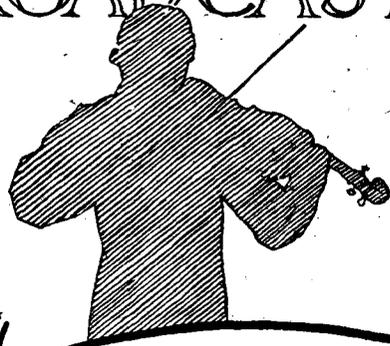
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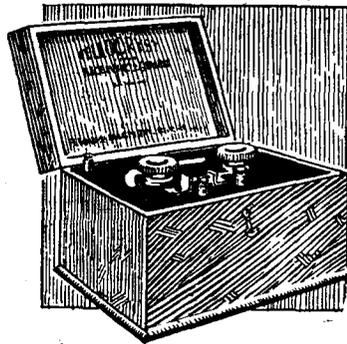
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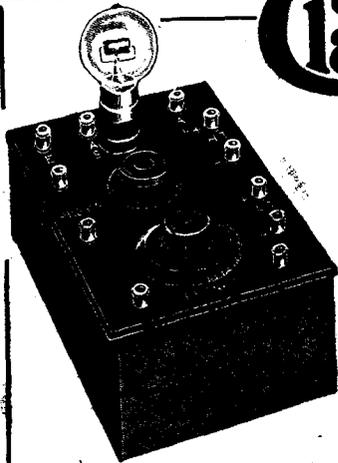
The "Clarophone" Single Valve Panel gives remarkably good results over a wide radius.

Panel only **£5 : 7 : 6**

Including Broadcasting Fees.
Complete Set including Panel, Marconi-Osram Valve, 6 Volt Accumulator, High Tension Battery, Insulators, Leading in Tube, Aerial Wire and 4,000 ohm Double Head Phones,

£9 : 12 : 6 Carriage Paid, Including Broadcasting Fees.

Represents the most remarkable value in Single Valve Sets. For full particulars of Crystal Sets and Two, Three and Four Valve Sets, see Catalogue R101, post free 2d.



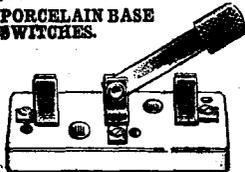
The
Universal Electric Supply Co. Ltd.
4 BROWN STREET
VICARAGE GARDEN MARKET ST.
MANCHESTER
G.P.O. BOX 519.

GENERAL HEADQUARTERS
for CRYSTAL and VALVE
WIRELESS RECEIVING SETS
and All RADIO SUPPLIES.
Fully Illustrated Catalogue Post Free 2d.

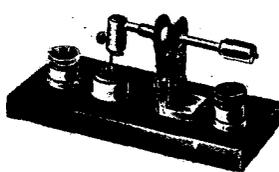
The "CLARITONE"
LOUD SPEAKER.
Highly efficient
TABLE TYPE, 14 inch
Bell Mouth.
120 ohms... **£6 : 5 : 0**
2,000 ohms **£6 : 7 : 6**
Including Broadcast-
ing Fee. Postage
extra. Large Stocks,
including "Browns"
and "Amplion".
High Note Sensitive
Buzzer, 2/9 post free.
Prompt Deliveries



PORCELAIN BASE SWITCHES.



Strong Copper Blades and Clips. Single Pole. Single Throw, 2/-; Double Throw, 2/9. Movements only for Panel Mounting. Single Throw, 1/9; Dbl. Throw, 2/3. All Post Free.

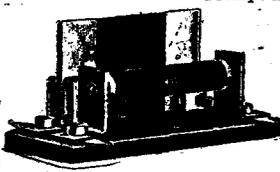


CRYSTAL DETECTORS.
Highly efficient. Mounted on Ebbonite Base, as illustrated, 3/3 post free. Fitted with our "Myronite" Super Crystal, 5/3, post free.



LAMINATED SWITCH ARMS.

Complete with Insulated Knob, Brass Bush, and Two Clamping Nuts. 1/3. Radius .. 2/6, post free.



FIXED CONDENSERS.

Various Capacities, .001 to .0005, with Clips, 2/9; Grid Leak, with Clips, 2, 3, 4, and 5 Meg, 2/9; Grid Leak and Condenser, Various Values, Mounted on Ebbonite Base, 6/3. All post free.



SELECTED CRYSTALS.

Packed in Airtight Tins.

Bornite .. 1/- per tin
Carborundum 1/-
Fused Silicon 1/-
Galena .. 1/-
Hertzite .. 1/6
Zincite .. 2/-
Myronite .. 1/6
Post 2d.



WOUND INDUCTANCE TUBES.

Insulated.
12 x 4' .. 4/-
12 x 3' .. 3/9
Post free.



AERIAL INSULATORS.

Reel Type, 2 in. 3d. each
Egg Type, 1 1/2 inch by 1 inch .. 3d. each
Post free in dozen lots.



MAKE YOUR OWN HIGH TENSION BATTERIES.

Terminals for Attaching to Pocket Lamp Batteries, 2d. each. Post free in dozen lots.

"Just as if I had switched in another Valve."

Read the testimony of a user of Crystor Cowl Insulators

"I was recommended by Mr. — (a well-known amateur)"
"to fit your Cowl Insulators to my aerial. The effect was extraordinary; it was just as if I had switched in another valve. I received signals I had never heard before."
S. D. (Baling)"

THE ONLY WAY TO OBTAIN 100% AERIAL EFFICIENCY USE

Crystor

COWL INSULATORS

(Patent Applied for)

- CRYSTOR AERIAL INSULATORS Price 1/9 each
- CRYSTOR VERTICAL LEAD-IN Price 6/- "
- CRYSTOR HORIZONTAL LEAD-IN .. Price 6/6 "
- LEAD-IN EXTENSION, 4-in: Price 1/6 "

SOLE DISTRIBUTING AGENTS:

WIRELESS AGENCIES Ltd.,
64, Mortimer St., London, W.1.

*Phone: Museum 2672.

*Grams: Adragonax, Wesdo, London.

Wire!

Are you satisfied with your long-range reception?

You will be surprised to find how much better results you get when you use **AUTOVEYORS'**

SUPER-INSULATED AERIAL WIRE

7/25 SWG. best tinned copper stoutly covered with rubber, jute and braiding.

1P PER FOOT

delivered post free in U.K. within 48 hours of order. Cash with order. Postal orders and cheques should be crossed "/ & Co. /" and made payable to:—

AUTOVEYORS, LTD.

Radio Engineers and Contractors,
84, Victoria Street, London, S.W. 1.
Special Terms to Trade. Write for Mail Order Catalogue.

HULLO

Come along and see us! We have just what you want!!

COMPLETE SETS of PARTS for Making VARIABLE CONDENSERS

(READY TO ASSEMBLE)

All Parts in the Sets are of the Finest Quality, and absolutely beat anything else offered by any other house. I guarantee that I have always got them in Stock.

CALLERS ONLY

**NOTE THE PRICES!
CALL AND TEST THE QUALITY!!**

Approv. Cap. in Microfarads	No. of Plates	Price	
.001	57	6s. 3d.	} DRILLED EBONITE ENDS 1s. pair. Sold with Condensers only.
.0005	29	4s. 3d.	
.0003	19	3s. 0d.	
.0002	13	2s. 3d.	
.0001	7	2s. 0d.	
Vernier	3	1s. 9d.	

These Sets consist of the following articles:

- EXTRA QUALITY VANES (Fixed and Moving)
- Large and Small Spacers (Ample Supplied)
- Scale 0—180
- 13 Nuts 2BA
- 13 Washers 2BA
- Centre Square Spindle
- 3 Side Rods
- Copper Foil
- Pointer
- Bronze Spring Washers
- Best Knob, Bushed 2BA Nut
- Top Bush
- Bottom Bush
- Flat Bush for Pointer

TESTIMONIAL
H. R. GOODALL, Radio Engineer, Experimental Station, 21 L, SOUTHAMPTON.

"W. O. R. Bamberger, Broadcast Station, Newark, New Jersey, U.S.A., received at my Station very well this morning, using one of your Vernier Condensers. . . ."

I regret having to suspend postal deliveries of goods until further notice.

ALL LETTERS IN HAND ARE RECEIVING ATTENTION

RIGHT OPPOSITE
DALY'S
GALLERY DOOR

M. RAYMOND

27, LISLE STREET, W.C. 2

Phone: GERRARD 4637

To avoid mistakes, this address is close to Charing X Road and Leicester Square Tube

OPEN: 9 a.m. CLOSE: 6.30 p.m.
Open: SATURDAYS, 9 a.m. Close: 4 p.m.

EVERYBODY

This is an honest advertisement and nothing is offered unless same is a regular stock line.

PLEASE NOTE

No further Post Orders executed at present owing to the impossibility of guaranteeing delivery.

Aerial Wire.

Genuine 7/22 bare copper stranded, 100 feet ... **2/6**

Condenser Vanes

Extra quality ... doz. **5d.**

Crystal Detector Parts

1/-

Lead-in Tubes

Ebonite with brass ends,
6 in., **10d.**, 9 in., **1/-**
12 in. **1/2**

Crystal Cups and Screws

each **1½d.**, doz. **1/2**

Condenser Bushes

each **1d.**

Reel Insulators

each **2d.**

Spacer Washers

Large **3d.** doz., small doz. **2d.**
Cheaper for quantities

Wound Formers

12 x 4 with 24 wire, each **3/3**

L.F. Intervalve Transformers

High quality 5-1 **14/-**

TRADE SUPPLIED

PLEASE NOTE

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Valve Holders

4 screwed legs, 8 nuts ... **1/-**

Filament Resistances

No cheap rubbish, but value for money **2/6** to **3/6**

Rheostat

Very special. Positive stops at Zero, full resistance **3/6**
(Guaranteed 7 ohms).

Switch Arms

Best bushed knob with 4-leaf laminated switch... **1/3**
(Also another pattern at **1/6**)

Oojah Basket Coils

7-in. set **5/-**

Contact Studs

Highly finished ... doz. **5d.**

Nuts

2 BA and 4 BA ... 3 doz. **8d.**

Telephone Leads, Extra long,

splendid quality ... pair **1/3**
Quantities Cheaper

CALLERS ONLY

PLEASE NOTE

No further Post Orders executed at present owing to the impossibility of guaranteeing delivery.

Slider Knob and Plunger **4d.**

Terminals

W.O., Telephone, P.O., and other designs, with nut and washer...2 for **3½d.**

Crystal Detectors

Glass covered, dust proof, extra quality **4/6**
Perikon Detector **3/9**
Detector on Ebonite **2/6**
Detector, extra design .. **2/8**
Detector and Crystal ... **3/-**

Fixed Condensers

Mica condensers in ebonite with terminals, all capacities **1/3**

Valve Pins ... per doz. **7d.**

Valve Sockets per doz. **1/-**

Scales 0-180 **4d.** and **5d.**

Lead-in Wire for

Indoor Aerials, etc., per yard **3d.**
Quantities Cheaper

NO POST ORDERS

HEADPHONES:

If you require a really Reliable Headphone **TRY**

"ERICSSON"

(CONTINENTAL)

per **23/6** pair

Stamped B.E.C.

SELLING HUNDREDS DAILY

Double Phones, complete with Headbands and Cords. Very Comfortable to Wear

I USE THEM MYSELF

"BRUNET"

(GENUINE)

Owing to the extreme difficulty in obtaining Genuine Brunet Phones at the moment, same are only offered subject to manufacturer's delivery.

25/- pair.

TESTIMONIAL

London Hospital, Whitechapel Road, E.1.
7th March, 1923.
Messrs. Raymond, 27, Lisle Street, W.
May I be allowed to express my great satisfaction in connection with the Wireless goods that I have purchased from you. The quality together with the most reasonable prices of all your Apparatus will do great things in making Wireless a most inexpensive and pleasing hobby. I enclose a small order from one of many friends whom I have recommended to you.—Yours faithfully,
FRANK CLIFFORD.

RIGHT OPPOSITE
DALY'S
GALLERY DOOR

M. RAYMOND

27, LISLE STREET, W.C.2

'Phone - - - - - **GERRARD 4637**

To avoid mistakes this address is close to **Charing X Road** and **Leicester Square Tube**

OPEN: 9 a.m. CLOSE: 6.30 p.m.
Open: SATURDAYS, 9 a.m. Close: 4 p.m.

We Specialise
in
Manufacturing The BURTON RADIO PARTS
in
BRASS AND ALUMINIUM

Send us your inquiries for

ALUMINIUM VANES
ALUMINIUM POINTERS
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BRASS TERMINALS
BRASS SPACERS
SQUARE 13" x 1/4" RODS
B.A. NUTS

AND NUMEROUS OTHER PARTS

Special Parts made to your requirements

Send sample and we will quote you

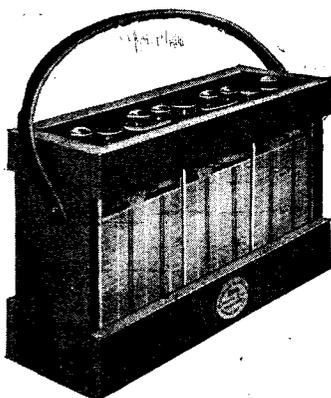
Messrs. C. F. & H. BURTON, Progress Works
Bernard Street, WALSALL

Exide

The Long Life Battery.

The Principal Wireless Manufacturers standardise Exide Batteries with their valve receiving sets. They know what disappointment can be experienced by users of inferior batteries.

Exide Batteries are used all over the World, in Submarines, on Motor Cars, Aeroplanes and for all wireless purposes. They retain their charge for long periods, do not froth, and give longest life.



6-V. 40-AMP. HOUR EXIDE BATTERY

They are used by the British Broadcasting Company for Transmission.

INSIST ON AN EXIDE FOR YOUR SET. Obtainable from Wireless Dealers and Exide Service Agents throughout the country. If in any difficulty write us.

Ask for Leaflets 4027 and 4030

THE Chloride ELECTRICAL STORAGE COMPANY LIMITED.

CLIFTON JUNCTION, 219 229, SHAFESBURY AVENUE, W.C.2. 58, DALE END BIRMINGHAM.

Stand No. 37
All British
Wireless Exhibi-
tion, Manchester,
March 17th to
24th, 1923.

The
"CLARITONE"
LOUD SPEAKER

*The best spoken
fellow in the world*

For volume, clarity and purity of tone, the "Claritone" Loud Speaker is unequalled. Used in conjunction with Valve Receiving Sets and Ashley Valve Sets in particular, it gives improved reception more than equivalent to an extra Valve without the distortion inseparable from excessive valve amplification. The "Claritone" is of pleasing design and high grade finish. A convenient lever in the base facilitates fine adjustment to suit any class of reception required.

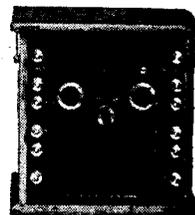


PRICE—2,000 ohms £6 : 2 : 6 each. 120 ohms £6 : 0 : 0 each.

THE ASHLEY 2-STAGE LOW FREQUENCY AMPLIFIER.—Embodies two

low frequency amplifying Valves, and is conveniently adapted for direct coupling to the Ashley 2-Valve and 3-Valve Receiving Sets, thereby converting them respectively into 4- and 5-Valve combinations and facilitating the use of the "Claritone" Loud Speaker, for both British and Continental reception. High grade finish and readily accessible interior.

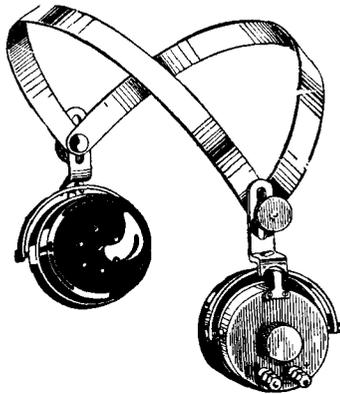
PRICE — £10 : 0 : 0 (Valves Extra).



**ASHLEY WIRELESS
TELEPHONE CO., LTD.**

69, RENSHAW STREET, LIVERPOOL.

**REMARKABLE OFFER OF HEADPHONES
AT EXCEPTIONALLY LOW PRICES.**

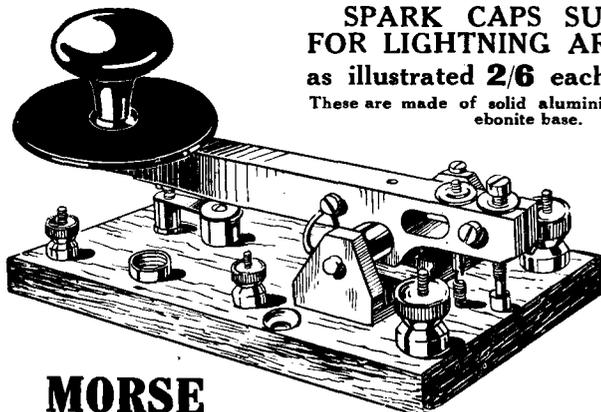


Why pay double the price and wait weeks for delivery when we can supply you direct from stock at half manufacturer's prices?

- BROWN "A" TYPE 120 ohms, Reed Pattern** - - 30/-
- SULLIVAN 120 ohms** - 12/6 **8,000 ohms** - 25/-
- Cords, 3s. 6d. extra. Reg. postage 1s. extra.
- THOMSON-HOUSTON (French) 4,000 ohms, complete**
- with cords - - - - - **20/-**

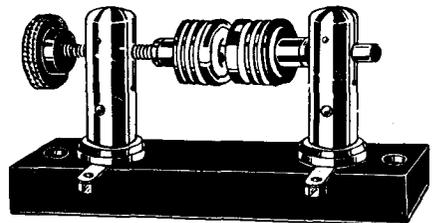
Any of the above phones will be sent on **SEVEN DAYS' APPROVAL** under our express guarantee that we will refund the full amount paid if not absolutely satisfied.

SPARK CAPS SUITABLE FOR LIGHTNING ARRESTERS.
as illustrated **2/6** each, postage 4d.
These are made of solid aluminium mounted on ebonite base.



MORSE TAPPING KEYS

Finest quality ex-Government Stock.
As illustrated - **4/6** each, postage 6d.
Better quality - **6/6** "
Complete with buzzer, etc. **10/6** each
postage 6d.

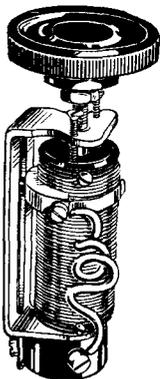


The "VIOLINA" Loud Speaker, £5 5 0

Packing and carr. 5/- extra.



THE MICROSWITCH RHEOSTAT



The finest resistance ever put upon the market. Enables a microscopic adjustment to be made. The "on" and "off" switch makes it unnecessary to alter the adjustment. Easily fixed. Complete **6/6** each. Postage 4d.

Read this Unsolicited Testimonial.

Phone 606 NEW CROSS.

To The City Accumulator Co.
79 Mark Lane, E.C. 3.

46, Lordship Lane,
East Dulwich, S.E.

Dear Sirs,

Having, as your books will testify, sold several of your Violinas, you may be interested in knowing the expression of opinion concerning them, that all my customers freely express. They are delighted with the sweetness and purity of tone; music is rendered with great clarity of tone, and speech free from distortion, even the letter "S," so often reproduced by loud speakers as "th," comes through as a clear sibilant sound.

Congratulations on having put on the market the perfect loud speaker. I will be pleased to give a demonstration of the qualities of your Violina to anyone to whom you care to give my address.

Please send two more Violinas H.R. and oblige,

Yours faithfully,
(Signed) R. Colwill.

**THE CITY ACCUMULATOR CO.,
79, Mark Lane, London, E.C. 3.**

Phone—Avenue 1316.

And at 33, Rue d'Hautville, Paris.

Agents for all BURNDEPT Apparatus.

Agents: Bristol Wireless Co., 52, Cotham Hill, Bristol. South Wales Wireless Installation Co., Ltd., 18 West Bute Street, Cardiff. Walter Rowe, Ltd., 96, Granby Street, Leicester. H. V. Albrow, 56, George Street, Portman Square, W.

Call at our Stand

No. 31,

RADIO SECTION,

Ideal Home Exhibition,

TO SEE THE NEW

STERLING RADIO

RECEIVING SETS,

also

THE STERLING LOUD SPEAKER



*A highly efficient
instrument at a
moderate price.*

No. R 1284. **Price** (120 ohms) £6 0 0
(2000 ") £6 2 6

Write for Publication No. 347.

"STERLING" RADIO RECEIVING SETS.

Publication No. 348.

"STERLING" LOUD SPEAKER & POWER AMPLIFIERS.

Sterling Telephone & Electric Co., Ltd.

TELEPHONE HOUSE,

210/212, Tottenham Court Road, London, W.1.

Telephone No.:
4144 Museum (7 lines).

Telegrams:
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Works: DAGENHAM, ESSEX.

BRANCHES:

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NEWCASTLE-ON-TYNE: 9, Clavering Place.

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*We guarantee that all Broadcast Radio Apparatus sold by us
conform with the conditions of the Broadcaster's Licence issued by
the Postmaster-General.*

IT IS THE CRAFTSMAN NOT HIS TOOLS!

Tools lie at the hand of every Craftsman. But it was Edison, not his tools, that produced the telephone, the forerunner of Wireless Telephony.

IT IS SO WITH

THE Crystophone

The fruition of our ambition has been to produce the most perfect wireless Receiving Set yet offered to the world.

Unceasing experiments, infinite patience and lifelong experience, have enabled us to give to the Crystophone the birthright of several all-important features not to be found in any other type of Receiver.

First among these is the now famous

LATTIKONE

which ensures an

INCREASE OF FIFTY PER CENT. IN RECEPTION STRENGTH.

It is no demonstration freak, but an everyday occurrence for owners of the cheapest Crystophone Crystal Sets to fit four pairs of headphones and to still hear with complete efficiency.

There's a "Crystophone" to suit every requirement and pocket . . . the following prices include all royalties, but are exclusive of Aerial Equipment, head-phones, valves, batteries, etc.

	£	s.	d.
"The Scout" Crystal Receiver	3	10	0
Royalty included—7s. 6d.			
21. Crystal Receiver	4	15	0
Royalty included—7s. 6d.			
20. Crystal Receiver	5	10	0
Royalty included—7s. 6d.			
30. Crystal and One Valve L.F.A.	12	10	0
Royalty included—£2 os. od.			
31. Crystal and One Valve (Detector)	10	10	0
Royalty included—£2 os. od.			
33. Crystal and 2 Valves (1 Detector)	15	0	0
Royalty included—£3 7s. 6d.			
34. Crystal and 3 Valves (1 Detector)	23	0	0
Royalty included—£4 10s. od.			

*We cordially invite you to visit our demonstration rooms
any evening during the Broadcast Concerts and test our
claims for yourself.*

THE CRYSTOPHONE MANUFACTURING Co., Ltd., 16, WELLS STREET, OXFORD STREET, LONDON, W.1.

TELEPHONE: MUSEUM 1664.