

LAYING AMERICA: B.B.C.'s Winter Plans.

Popular Wireless

and Wireless Review

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EVERY FRIDAY.

No. 120. Vol. VI.

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

September 13th, 1924.



FEATURES IN THIS ISSUE.

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How to Understand Time Signals.

Broadcasting in Manchester.

Valve Notes.

Waves and Strays.

How to Make a Variometer.

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POPULAR WIRELESS

AND WIRELESS REVIEW.

September 13th, 1924] THE RADIO WEEKLY WITH THE LARGEST CIRCULATION. [Every Friday, Price 3d.

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

RADIO NOTES AND NEWS OF THE WEEK.

Listening for Germany.

THE German stations are coming in well now, and several readers report excellent results on 3-valve sets. Using only two valves they are not so easy to locate, but it can occasionally be done with the detector valve alone under good conditions. These, and the similar stations lately erected upon the Continent, will give a fine new zest to the winter evenings, which are so fast approaching.

More "Request" Nights.

I WONDER why the B.B.C. do not give us more "request" programmes? They are always popular, and I fancy they will become increasingly so, especially if the intervals between such evenings are not too long for us to make comparisons with the previous occasion on which we had a "request" night.

The Radio Association.

THE Radio Association have recently published their official handbook, and if you would care for a copy for your bookshelf you should apply to the Hon. Secretary, Mr. S. Landman, M.A., Sentinel House, Southampton Row, London, W.C.1.

"Chelmsford" Coils.

WHAT is a Chelmsford coil? Naturally one would expect it to be a coil capable of efficiently tuning in to 5XX, but I have lately seen coils sold for that purpose which needed a very large capacity in parallel to tune up to 1,600 metres.

When a reputable manufacturer recommends a coil specially for Chelmsford, you will notice that not much parallel capacity is required with it, and this, of course, is as it should be for best results. On the other hand, signals of a kind can be obtained with a coil of only about 100 turns when a .001 or so condenser is in parallel with it, but I should certainly not call this a Chelmsford coil.

A U.S.A. Record.

WHEN President Coolidge recently accepted the Republican nomination for the Presidency of the U.S.A. it was arranged to broadcast his speech for the benefit of listeners. He spoke in the Memorial Continental Hall, Washington, but it is estimated that at least twenty million people heard his voice by wireless.

Australia and the "Beam."

M R. BRUCE, the Australian Prime Minister, has announced that, instead of a high-power station, Australia will erect a "beam" station, to work on

100 metres and cost £120,000. It is hoped by this means to reduce telegraph charges by half, and if a saving of 1s. 6d. per word can be effected there will be plenty of support for the new service.

For Farmers.

COMMENCING on October 3rd, the Ministry of Agriculture will broadcast notes on marketing, hints on horticulture, dairying, livestock, and seed-

WHAT THEY SAY.

"Hello, Butter-fly! When you re-turn to the aero-drome we will test-a-gain, but it is no good speak-ing to you now, as you can-not hear me!"

Overheard during the recent Army air manoeuvres:

"The function of the broadcast talk as I see it is to stimulate trains of thought and awaken intellectual interest, rather than to satisfy it."—Mr. J. C. Stobart, Director of Education to the B.B.C., in a letter to "The Spectator."

"It is difficult to think of a more unsociable offence than that of the jammer. For his private convenience or pleasure he is willing to give annoyance to hundreds or even thousands of other people who wish to listen to an entertainment for which they have paid. If such conduct were common it would reduce the whole elaborate organisation of broadcasting to confusion."—London "Evening News."

"Sound travels at 1,100 feet per second, and you can work out for yourself how long before Friday night an inhabitant of Mars would have to broadcast a greeting to reach the earth when the American wireless men were listening in!"—News of the World (very) Special."

"It is advisable, if not absolutely necessary, when one wishes to listen-in, to buy a wireless set."

"One can, of course, listen-in on sets belonging to other people. But in so doing one misses the keenest pleasure to be found in broadcasting, and that is the right to take a penknife, a buttonhook, or a tin-opener and mess round with the set to make sparks come out of it."—Robert Magill, writing in the "Sunday Pictorial."

"Quite seriously, I hope that wireless drama has come to stay."—Mr. William Archer, the famous dramatic critic, writing in the "Radio Times."

"Broadcasting has started at the critical moment, and the B.B.C. cannot help creating a new national consciousness for better or worse."—Mr. E. R. Appleton, B.A. (Station Director, Cardiff.)

THE WEEK'S QUERY.

I see by the daily press that the Leeds aerial was "struck by lightning," which fortunately only destroyed one meter."

Does this mean that 2LS will now have to transmit upon 345 instead of 346 metres?

testing, and short talks on crops, plant diseases, etc.

To the farmer's boy who wants to listen in to the Savoy bands, this programme merely affords a splendid reason why his father should buy him a set.

Frankfort Calling.

A CLAPHAM reader who lives only about 2 miles from 2LO tells me that, after tuning-in Frankfort on H.F. and detector, he was able to bring that station up much louder than London, who was transmitting at the same time. He overheard the special tests made by Frankfort for the benefit of long-distance listeners, and says that announcements were made in English, and a wave-length of just over 450 metres was used.

Such is Fame!

A COPENHAGEN amateur who often succeeded in sending messages to England is now wishing that news of his DX exploits had never leaked out. Because of his violation of the Danish Government's monopoly of the sending of wireless telegrams, he has been fined 30 crowns (about 2ls.), and had all his transmitting apparatus confiscated by the authorities!

Worth Striving For.

I HEAR that Canada's premier station, CKAC, is using a wave-length of 524 metres, and I am afraid that from the British listener's point of view this is too high to be comfortable.

Keen as the average enthusiast is to pick up Canada, he is almost driven to lower wave-lengths by the barrage of spark-jamming from ships round about 500 metres. Nevertheless, CKAC is a goal worth striving for, and all the ships in the Channel won't stop the Montreal station being logged on this side, however deafening the din may be!

Broadcasting in South Africa.

DURBAN is going to have a broadcasting station of its own, and South Africans who are unable to comfortably receive the Johannesburg programmes are now eagerly awaiting developments in Natal. Results should be good, for the locality has an enviable wireless reputation, and I remember that, long before valves were used, the old spark station on the Bluff at Durban succeeded in transmitting to Australia on 1½ kilowatts.

"Ilo."

THE originators of Ilo claim it to be the perfect radio auxiliary language, because they say that it is "simple, neutral, euphonious, flexible, expressive, and logical."

If the one short word Ilo means all that, most people will agree that it is almost too expressive!

(Continued on page 78.)

NOTES AND NEWS.

(Continued from page 77).

Expansion all Round.

EXPANSION seems to be the order of the day in the B.B.C., and, not content with new stations, most of the old ones are acquiring extra rooms or more commodious premises. At Savoy Hill another part of the building has been taken, facing the Savoy Chapel, and I am hoping that before long we shall hear of extended programmes also. What was good for last year will be inadequate for this, and eventually it ought to be possible to tune-in British broadcasting at any hour of the day.

The 24-Valve Set.

READERS who have seen the "P.W." 24-valve set in Selfridge's Oxford Street window will be interested to know that the 12 or 15 amps. required to light the valves are supplied by Ever-Ready batteries. Cossor valves will readily be recognised, as also will the distinctive appearance of the Lissénagon coils. The resistance-capacity coupling units are by Peto-Scott, and fixed and variable condensers by Grafton Electric.

A Correction.

THIS Editor asks me to draw attention to the fact that in our issue for July 19th and the issue for August 30th certain pictorial valve circuits, contributed by Mr. O. J. Rankin, are the copyright of Mr. J. Scott-Taggart, and our contributor had no right to make use of these circuits. The Editor regrets that, by an oversight, they were accepted for publication in this journal, and wishes readers to know that these circuits should be exclusively credited to Mr. J. Scott-Taggart.

Plymouth's Exhibition.

PLYMOUTH is going to have a week's Wireless and Electrical Exhibition, to be opened by the Mayor on September 17th. It will be held in the Guildhall, where local amateurs are competing for a cup and other prizes.

A Great Conductor.

NEXT Monday Sir Landon Ronald will conduct a symphony concert from 2 L.O. Readers who remember his success with the Royal Albert Hall orchestra (at the Central Hall) are expecting great things from this first visit to the London studio.

Bias in Paris.

I HEAR that the transmissions from 5 XX were sharply criticised in "Le Petit Parisien" the other morning, and reference was made to bad modulation and variations in signal strength.

This newspaper, of course, has a station of its own, and considering the fact that Chelmsford hasn't settled down yet, I am afraid they are using too much bias in Paris.

Reception from Germany.

BRESLAU appears to be one of the most successful of the German stations, and the first reports of reception from readers in Essex (Chadwell

Heath) and Yorkshire (Knaresborough) have now been followed by a number of others from all parts of the country. So far, two valves (H.F. and detector) is the minimum number used by my correspondents.

* * *

The Right Man!

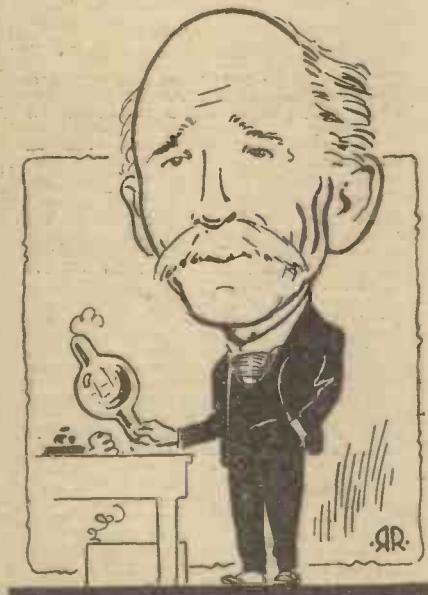
ONE of our contemporaries, referring to the owner of 8 A B (the first station to "cross the Atlantic" on less than 200 metres), styles him "Leon Deloy, the famous French radio ace." Just the man for the Pack of Cards Concert Party!

* * *

Cardiff's Party.

CARDIFF ought to enjoy the garden-party to-morrow, for, in addition to "visible broadcasting," there is an all-star cast featuring Besses-o'-th'-Barn band, Blossom, and John Henry. The entire profits will go to help to provide ultra-violet ray treatment for suffering

A Wireless Pioneer.



Professor J. A. Fleming, F.R.S., D.Sc.

children at the Cardiff Royal Infirmary, and I hear that John Henry is hoping his wheelbarrow will be necessary to carry the profits up to the infirmary.

* * *

Relaying the Provinces.

MY suggestion a few weeks ago that 5 XX should relay some of the provincial programmes occasionally has quickly materialised. Possibly before these lines are in print some of the other stations will be "on the air" via Chelmsford, and we ought to have some interesting comparisons as a result.

* * *

Wireless and Racing.

ALLEGED Turf swindles on a huge scale are supposed to have been made possible in Ireland by wireless. It is thought that, after being advised of the winner by radio, the "backers" handed in betting telegrams, which were then back-timed to a few minutes before the horses ran.

* * *

Another Continental Broadcaster.

ACOPENHAGEN correspondent tells me that the new broadcasting station in that city will commence transmitting shortly. He also states that the Lyngby transmissions on 2,400 metres commence at 7.20, 8.0, and 9.0 p.m. on weekdays and 4 and 9 p.m. on Sundays.

A Good Lead.

LIVERPOOL listeners paid about £2,150 for licences in the month following the opening of the relay station, and I hear that if everybody paid up like Liverpool, it might be possible to reduce the cost of a licence still further.

B.B.C.'s New Hours.

ON September 28th the B.B.C. will revert to "winter-time" hours, and transmissions will then be as follows: 7 p.m., First News Bulletin. 7.10 p.m., First Talk. 7.30 to 9.30 p.m., Programme. 9.30 p.m., Second News Bulletin. 9.40 p.m., Second Talk. 10 p.m. onwards, Programme. The Sunday times remain unchanged.

The Veterans Again.

ENCOURAGED by the success of the Veterans of Variety programme recently broadcast from London, the B.B.C. are arranging another old-time entertainment of a similar nature on September 16th. Mr. Willie Rouse, whose chairmanship was such an enjoyable feature of the last occasion, will again preside, and the choice of programme is in the capable hands of Mr. Robert Chignell.

Wireless Control.

CONSIDERABLE wireless interest attaches to the experiments between Manchester and the British Empire Exhibition at Wembley, during which the machinery in London was operated by radio over a distance of about 170 miles. I hear that a 500 kw. Rotary Converter (of the type used for town electric-light supply) was started and stopped without difficulty by means of the distant radio control.

Badly Wanted.

AT last the B.B.C. have managed to put a new floor down in 2 L.O.'s S.B. room, and certainly it was high time! Other little alterations are always going forward at Savoy Hill, some of which can hardly be classed as "improvements."

The Green Room.

FOR instance, the large waiting-room—known as the Green Room—has been closed, and in place of the handsome cabinet-set and loud speakers formerly available for visitors, the B.B.C. now provide one loud speaker, and one pair of phones. The room is comparatively cramped, so I hope that this change is only a temporary one.

No More Big Bangs.

THERE is now considerably less danger of a sudden bang deafening London listeners; because some genius has replaced the black microphone-cord with a bright yellow one. Formerly it was very easy to fail to notice the connection between the floor-plug and the "Mike," but now it is one of the most conspicuous things in the studio.

ARIEL.

RELAYING AMERICAN BROADCASTING.

AN INTERVIEW WITH CAPTAIN WEST.

By "ARIEL."

Will the B.B.C. carry out relay experiments again, and will the retransmission of American broadcasting prove a success this winter? In this article Captain West, Assistant Chief Engineer of the B.B.C., gives his views on a question which is exciting interest among thousands of wireless amateurs.

FEW of the experiments inaugurated by the B.B.C. last year excited more widespread interest than the relaying of American broadcasting from K D K A. Before the experiment took place it was made the subject of much humorous comment, and doubts as to the outcome were expressed right and left.

One wireless "expert" actually suggested that those who conducted the test—Captain West, Mr. B. Honri, and myself, as a looker-on—would probably join his friends in Colney Hatch, so sure was he that any attempt at relaying America would prove utterly futile. Needless to say, no such distinction has as yet been conferred upon us. But, joking apart, those whose interest was aroused when the idea was first mooted will remember the very severe odds with which we were faced in this enterprise.

Carrying On.

But Captain A. D. G. West, Assistant Chief Engineer of the B.B.C., is well known for his persistence—I might almost say his obstinacy—in the teeth of opposition. And few engineers can boast of greater skill and experience in wireless matters than he. Nothing daunted, he continued with his experiments, and the results were fame in a year, and the relaying of America from the North Downs. Those listeners-in who have held their licences for more than a year will probably have heard the concerts broadcast from K D K A, an American station lying east of Pittsburg, even on the cheapest of crystal sets.

And so it was but natural that, while dining with Captain West, the other evening, I should ask him whether he had any intentions of conducting further tests on the North Downs during the coming winter. Captain West's face brightened, and I saw that I had hit the mark. "If winter comes, can West be far behind?" he misquoted aptly, "and there seems every probability that winter will. In any case, I am quite prepared to continue with the experiments, and in fact, I have spent a good deal of my time this summer getting ready."

The Critics.

"Do you think," I inquired, "that you will be faced by as great difficulties this year as last, or did your last year's effort break the ice?" "I am very confident," he replied, "that the worst lies behind us. There is no reason why reception of America should not be considerably easier this year than last. For one thing I have made good use of the experience we gained last year in modifying my receiving apparatus, and I flatter myself that it is now very nearly perfect. I, personally, am of the opinion that, at the point we have reached, it only remains for America to overcome the difficulties on that side, and we of the

B.B.C. shall be able to provide American concerts for English listeners-in."

"It must, at any rate, be gratifying," I remarked, "to feel that, by the results you have already achieved, you have proved your critics in the wrong." "One would think so," Captain West replied, "but I assure you that this is by no means the case. In spite of the problems I have tackled, and the good results I have already achieved, I am still receiving adverse criticism from every side. Some people are never satisfied," he added laughing. "But I will prove them wrong yet. And I shall do more,

You will notice that for its construction we have not employed the usual bus-bar wiring, but twisted wire. We have recently made a good many experiments with this, and have found it, on the whole, to be much more effective."

Captain West then lead me to his office, where we smoked a peaceful pipe and chatted for a few minutes longer. Conversation turned on broadcasting in its more popular aspect, and I asked him what plans he had for the development of broadcasting in the near future. He smiled enigmatically. "I have no intention of giving away my secrets so rashly," he laughed, "but I will tell you this much. Before much time has elapsed you will hear some very interesting news from the world of broadcasting. Quite apart from my designs on America, I have every hope that the anticipated boom in wireless will prove as great as it did last year."

Still Pioneers.

"Then you are not like those of us who believe that wireless has very nearly reached its turning point?" I inquired. And I immediately saw from Captain West's expression that I had what is colloquially known as "dropped a brick."

"Utterly ridiculous!" exclaimed Captain West emphatically. "You must remember that broadcasting is yet in its infancy, and cannot hope to reach its zenith for many years to come. Look at the progress we are making, and the manner in which we are developing from day to day. Why, in my opinion, we of the Broadcasting Company are as yet but pioneers, and nobody but a fool would say that the entertaining possibilities of wireless had reached their limits! Present company, of course, excepted," he added hastily, seeing the astonishment reflected in my face that I should be included in such a category. I hastened to apologise for my rash utterances, and directed the conversation into safer channels.

I left Captain West, full of hope for the future of broadcasting, and feeling convinced that its progress was assured in the hands of a personality so enthusiastic, so energetic and competent.

Like most members of the B.B.C., Captain West, is seldom seen, and, what is rarer, he is very seldom heard. Hence it may be of interest to listeners-in if I draw something like a pen-picture of the man. I am not a phrenologist, psychologist, physiologist, nor any other kind of ologist, but still, I will do my best.

His actual portrait is, perhaps, not unknown to the readers of POPULAR WIRELESS, and it conveys the impression of an intellectual and enterprising personality. His face is serious—almost moody, particularly so when he is hard at work on a task



Captain A. D. G. West.

for really I see no reason why we should not relay stations even farther off than K D K A."

After dinner I accompanied Captain West back to the B.B.C., where he escorted me round the new workshops. Here I saw, in the process of construction, wave-meters, wireless receiving sets, and other radio instruments of every kind and at every stage of completion. The workmanship of these articles manufactured by the B.B.C. leaves nothing to be desired, and would be the despair and envy of many a "radio-fan." Thence we passed out of the general workshops into another and yet larger room, where I noticed several enormous steel frames, some of which were very nearly ready.

"This apparatus is for the new relay station at Nottingham," Captain West told me, pointing to one of them. "There is no doubt that this set is as nearly perfect as present-day workmanship could make it.

(Continued on page 117.)

EXPERIMENTS I HAVE MADE.

By "RADIO."

In this article the amateur will find some very useful suggestions which should form the basis of a score of instructive experiments.

As a pastime or hobby there seems to be a great gulf between cricket and wireless, but there is a similarity in one respect. One of cricket's greatest attractions is the glorious uncertainty of the game, and the same applies to wireless. How frequently does it happen, for instance, that we carefully design, and very neatly arrange a new set, and then find the results disappointing? On the other hand, we might have the roughest of "hook-ups" and get exceptional results.

At the best there does not seem to be much consistency, and it would help to advance wireless generally if experimenters would take nothing for granted. If they have an idea, however improbable it may seem to others, they should try out the idea. They will certainly learn something, and might drop across something new.

Something Worth Investigating.

Take, as an example, aerials, the results from which are most inconsistent. If we refer back to wireless journals, say in the early days of broadcasting, we will find numerous questions about indoor aerials, and the reply was always to the effect that such an aerial would be of little use. We know now that very good results can be got from an indoor aerial.

Again, we follow blindly the practice of most carefully insulating the aerial from earth, and it is most amusing to see the chain of insulators in some aerials.

Actually better results can be obtained by earthing one end of the aerial, but I will refer to this again later. How is it that a frame aerial is *comparatively* more efficient than the ordinary aerial? I will explain it in this way:

Dealing with alternating currents at ordinary frequencies, currents will only be induced in a *closed circuit*. No current would be induced in a straight wire, for instance, but join its two ends and a current will flow. With very high frequencies, however, a weaker current would flow in a straight wire, but in this case the current would actually be completed from one end of the wire to the other through the "ether," as this medium is called.

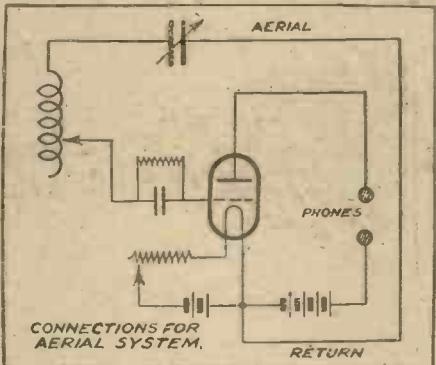
Disproving Accepted Ideas.

In the case of the frame aerial, we have a closed circuit, hence its comparatively high efficiency. Now, with the ordinary aerial we have one side of the frame missing. The circuit is from earth, through the receiving set, and up the lead-in. This forms one of the vertical sides of a frame, then along the horizontal aerial wire, which forms another side. The circuit is then completed from the extreme end of the horizontal wire, through the ether to earth, and then back to the set. It follows, therefore, that if this missing side of the frame were completed by a metallic connection, better results should be obtained.

This can be done by bringing the extreme end of the aerial down to an earth plate, say. The circuit is thus completed from the far end of the aerial down to earth and

then back to the set through the earth, but this method is apt to be noisy, due to earth currents. A better way would be to run a wire from the extreme end of the aerial, down the pole, and then bury same a few inches in the ground and run it directly back to the earth terminal of the set. The connections to the set should, of course, be the same as with an ordinary frame aerial, the A.T.I. being in series with the aerial system.

This system can also be used very effectively and efficiently for transmitting. This aerial arrangement disproves the accepted idea that it is necessary to carefully insulate the aerial at both ends. I have previously referred to the "ether," but have done so only to comply with conventional ideas. Now what is this



mysterious medium which we call the "ether"? All sorts of fanciful ideas have been put forward, which, to my mind, is remarkable, seeing that the explanation is under our very nose.

An Interesting Theory.

I advance the following theory, and if it is carefully considered, it will be found that everything fits in with the idea.

In the first place let the following rule sink deeply, *as it is the basis of everything*:

Every manifestation of energy is due to the disturbance of an equilibrium.

Energy is expended in disturbing an equilibrium, and energy in some form is manifested in the return to a state of equilibrium. This is a very roundabout process sometimes, but the theory always holds good, and it is interesting to try to trace the process through its various stages. Everything that happens, every movement, in fact *everything*, comes under this theory.

Suppose, now, you put your finger in the Atlantic Ocean on one side, then if it was possible to have sufficiently sensitive instruments, the effect would be felt on the other side. In this case energy is expended in pushing your finger in the water, which disturbs the equilibrium of this medium, and this energy would manifest itself somehow, only, of course, we could not detect anything with our present instruments.

Imagine, now, a large condenser consisting of two metallic plates separated by an air space. If this condenser is

charged, an electrostatic strain exists between the plates. This space between the plates, called the di-electric, corresponds in our analogy with the Atlantic Ocean. When current is applied to the condenser the electrostatic strain increases until it equals the applied voltage, and a state of equilibrium exists. Now, if this equilibrium is disturbed at any part of the condenser, either by draining away or increasing the charge, the effect will be felt at every point of the condenser.

Probable Cause of "Night Effects."

Now we know that the earth is at negative potential. An inch above the earth is slightly positive, two inches, more positive, and so on. This fact cannot be doubted, and it follows, therefore, that the earth must be one plate of a huge condenser, the space above the earth is the dielectric, and the other plate we must imagine as the sun.

This electrostatic strain between the earth and the sun is the medium whereby all wireless signals are transmitted. It is a huge reservoir, and if its equilibrium is disturbed by altering its potential at any point, which is what takes place at an aerial when a signal is transmitted, its effect could be felt all over the globe, given sufficiently sensitive detecting instruments.

The equilibrium of this electrostatic strain is always being disturbed by many means, and it is that which is the cause of the statics.

Thunder and lightning is produced by this disturbance. Floating clouds carry charges from one point to another, altering the electrostatic strain at different points until a flash over occurs, either between the clouds and earth.

In an effort to regain a state of equilibrium which has been disturbed by various causes, clouds in particular, all high projections, such as chimneys, trees, etc., drain away increased potential. This is why statics are so prevalent in mountainous countries and least on the sea. What we call the "ether," then, is simply the electrostatic strain between the earth and the sun.

The causes of communication being better during the dark hours is due, along with other possible causes, to the absence of the sunlight which causes constantly varying temperatures over the earth, and the presence of moisture in the atmosphere. In other words, there is a more definite and constant difference of potential.

An "Electrified" Wheatfield.

Has it ever struck you why trees, etc., grow in the form they do? Surely the spiked formation of every branch and twig, and even the serrated edges of leaves, is for a purpose. Every spike or point is a miniature lightning conductor. It is provided to draw off the atmospheric electricity.

In this connection it might be of use to describe an interesting experiment which the writer once carried out. The idea was to see the effect of an electrified network of wires over a field of wheat. The network was completed before the source of supply was available. It was found that this network collected a strong charge of atmospheric electricity, and large sparks could be got from it.

It was also interesting to note that there was a marked improvement in the growth of the wheat, although the network was left unconnected to the source of supply for some considerable time.

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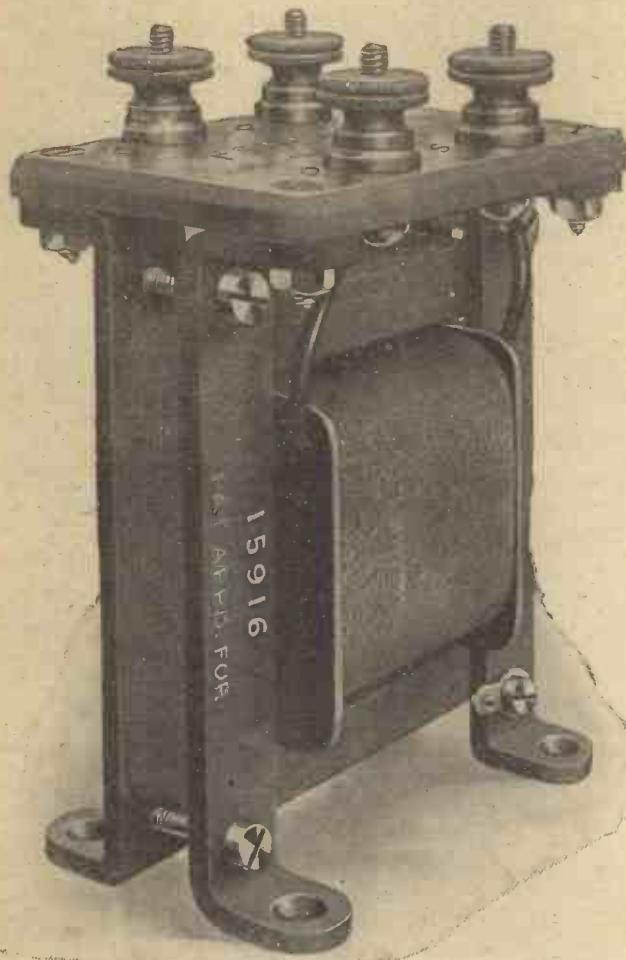
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THE TWO-VALVE REFLEX UNIDYNE CIRCUIT.

By S. W. DAVIES.

This circuit was described in some detail in the first article which appeared in POPULAR WIRELESS on August 23rd, 1924, to enable the more experienced readers to immediately construct their sets. With the following full constructional notes it is now a comparatively simple matter for the inexperienced reader, as well as the more advanced, to successfully build up the two-valve Unidyne reflex receiver.

THE first essential to the efficiency of a wireless receiver is to obtain good ebonite. Procure of this one panel 12 in. by 6 in., and if it has a glossy or dirty surface it should be sprinkled with powdered pumice and then rubbed well all over with a cloth dipped lightly in turpentine, a moderate amount of pressure being applied. The pumice should not be too thickly applied, and when finishing off care should be taken to move the cloth only lengthways so as to leave a nice surface. I have not before noticed this method recommended, but it gives a very fine finish.

Having prepared the panel, the cabinet should next be made so as to be a support to the panel when drilling and mounting. I have always found it best to build the cabinet round the ebonite panel.

Making the Case.

First plane up the wood, which should be $4\frac{1}{2}$ in. deep and $\frac{3}{8}$ in. thick, and finish off by giving it good glass-papering, using very fine glass-paper. Then cut off two pieces a good $12\frac{3}{4}$ in. long for the side-pieces. The end-pieces should then be cut just long enough to allow for trimming to the exact measurement of the corresponding end of the ebonite panel, and one end of each piece trimmed square.

Laying one of the sides flat, rest the panel edgeways on this. Now put the end-piece upright against the panel, trimmed edge down, then carefully chisel the top of your end-piece to come flush with the top edge of the panel. Having got this fitting

and screwed in. It is then a small matter to fix the last side of the cabinet to the two ends.

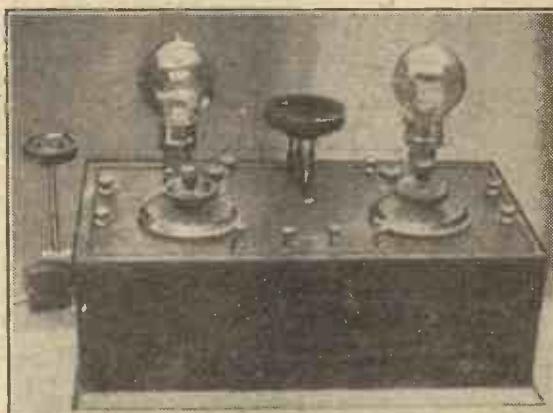
The four sides of the cabinet are now built up, and if instructions have been followed the panel should fit exactly into them.

The next step is the base-board. This should be cut $13\frac{1}{2}$ in. by $7\frac{1}{2}$ in., and, before trimming the ends, the built-up sides of the cabinet should be placed on it so as to leave an equal margin all round, and mark it with

and prevents the woodwork from getting dirty while in use during the mounting of components and wiring-up. It can easily be stained to any desired colour later.

A complete list of component parts for the set is given below, and it will bear comparison for economy with most sets:

	s. d.
1 ebonite panel 12 in. by 6 in. by $\frac{1}{2}$ in. (say)	3 6
1 0.005 var. condenser with vernier	8 6
1 0.003 " "	7 6
1 Lissen T.3. L.F. transformer	16 6
2 microstats	5 6
1 two-way coil-holder	4 6
1 var. grid leak $\frac{1}{2}$ to 5 meg. (Lissen)	2 6
1 H.F. transformer (B.C. range)	4 6
1 0.006 fixed condenser (Edison Bell)	2 0
1 0.001 ditto	2 0
1 0.002 ditto	1 3
12 valve legs	8
8 terminals	1 0
Sundry wire, etc.	1 7
Total £3 1 6	



A photograph of the two-valve reflex Unidyne receiver described in the accompanying article.

a sharp instrument—just a thin line. The sides should then be lifted off and the edges bevelled from the marked lines on the one side to the full size on the other. This bevel will give a better finish to the completed set.

Complete List of Components.

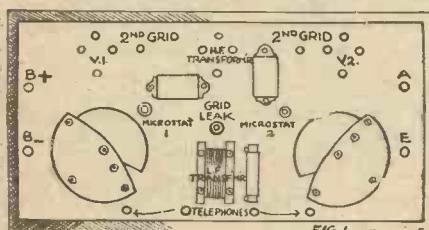
When the base-board is screwed on, a good, firm cabinet will be the result. All that now remains is to trim the rough edges of the sides where they overlap the ends—this can easily be done with a sharp chisel—and then to screw in small supporting lugs to support the panel. For these a strip of wood about 12 in. by 1 in. by $\frac{1}{16}$ in. cut into suitable pieces is required.

These strips should, of course, be fixed the exact thickness of the panel below the top of the cabinet.

Having trimmed all edges and rough points, clean up the outside again with very fine glass-paper, and immediately give a couple of coats of shellac varnish—very thin. This dries instantly,

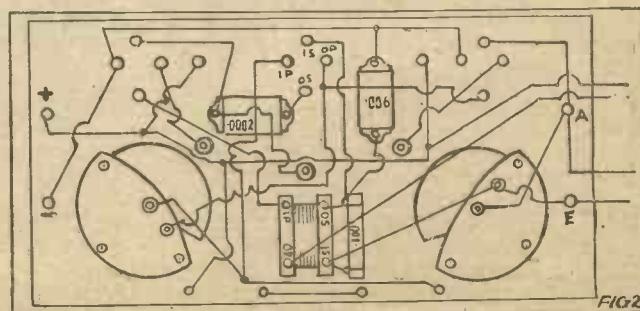
Drilling can now be commenced and an exact lay-out is given of the underside of the panel in Fig. 1. Having mounted all components, the panel should be removed and the coil-holder fixed on the aerial side of the cabinet, centrally, and holes drilled through which the flex is passed to the coil plug screws.

A good many readers might object to the coil-holder being on the cabinet on account of the difficulty of opening up at any time for inspection, but this difficulty is easily overcome by having long rubber flex leads so that the panel will lift up door fashion, opening up from the battery side of the



correctly, temporarily mark the end with the corresponding end of the panel, so as not to get them reversed. Emphasis is laid on the necessity for getting these ends absolutely square, otherwise a badly fitting cabinet will result.

After fitting both ends as described above, proceed to bore one end only of the two sides for purposes of screwing. Three screw-holes in each will be sufficient. Now screw one end to one of the sides and lay the panel tightly against the fastened end and side, and mark off the other end of the side for screw holes. When these ends have been bored, the next end-piece should be held tight up to the panel, which is again in position against the fastened end and side,



receiver. The advantage of this arrangement is a great one in the saving of space.

The wiring diagram is shown in Fig. 2, (Continued on page 84.)

THE TWO-VALVE REFLEX UNIDYNE CIRCUIT.

(Continued from page 83.)

and in conjunction with the first part of this article will readily explain itself to the experienced reader.

If soldering your wiring, first file well every place to be soldered and apply a spot of solder. This will mean much more rapid working when actually commencing to solder the wires in position. I would recommend that the leads to or from the variable condensers and L.F. transformer should be attached by means of the terminals supplied for this purpose, and not by soldering; it is then an easy matter to extract them at any time for examination with a minimum of trouble. All other leads can be soldered.

Wiring Details.

The battery positive should first be fixed quite close to the panel, and it will be seen that one wire goes unbroken from the positive terminal to the second valve microstat, thence to the grid leak, and on to the first valve microstat. Leads from this wire should next be soldered to one side of the 'phones and also to both extra grid terminals. All these leads leave the main wire at right angles. Then wire the other side of the microstats to the filament valve legs.

Next wire from the battery negative direct to the second valve filament leg, and from there to the first valve filament leg, and a short lead down from this wire goes to one side of the .006 fixed condenser.

From the grid of the second valve a lead can now be fixed to one side of the .0002 fixed condenser and thence to the top of the grid leak. The other side of the .0002 condenser will then be joined by a short lead to the O.S. of the H.F. transformer pins. The I.S. of the same transformer should now be joined to the O.S. of the L.F. transformer and thence to the unjoined side of the .006 fixed condenser.

Now join the plate of the first valve to the I.P. of the H.F. transformer pins and thence to the moving vanes of the transformer primary tuning condenser. The .001 fixed condenser can now be soldered to the tags on both sides of the secondary of the L.F. transformer.

Useful Tuning Addition.

The rest of the wiring does not need much comment, as it presents little difficulty to the amateur. It will be noticed that four terminals are given for the 'phones. This is simply a series arrangement, the two middle terminals being joined by a wire. Consequently, for one pair of 'phones the two outside terminals are connected, and for two pairs they will be connected side by side, as in Fig. 3.

Lastly, do not forget when soldering the coil leads to have a good length of flex to enable you to raise the panel for inspection at any time. Wire can always be taken off, but cannot easily be rejoined.

A useful addition for tuning purposes,

as well as saving in coils, is a series-parallel switch. But beware of approaching this little proposition without due thought and caution. It is simplicity itself to look at, but it has been the pitfall of hundreds of experienced amateurs. A diagram is given for ready reference to help those readers who would care to include this switch. See Fig. 4.

Operating the Receiver.

With the D.P.D.T. switch in the left-hand position you have parallel and in the right-hand position series tuning.

Nothing now remains but the polishing of the cabinet, which must be left to individual taste, and the question of the coils.

Efficient home-made coils, either honeycomb or basket, appear to be most satisfactory. The sizes of these coils were given in the previous article.

The coils being ready, we come to the operation of the set.

The grid-leak will be found to be critical, and in commencing should be turned practically right down until signals are heard, after which it can be adjusted. If the position suggested induces howling which

HOW TO MEASURE INDUCTANCE AND CAPACITY.

To Measure Capacity.

CONNECT up the condenser of unknown value, C_x in Fig. 1, with the detector 'phones, and inductance, L_k (Fig. 1). Now set a wave-meter going, and adjust it to the wave-length at which most noise is heard in the 'phones. Now the circuit is "in tune" with the wave-meter. As we know the value of the inductance in the circuit, by applying the formula :

$$\text{Wave-length in metres} = \frac{1885}{\sqrt{L_{\text{mphys.}} \times C_{\text{mfd.}}}}$$

we can find the capacity. In this case we must alter the above formula to :

$$C_{\text{mfd.}} = \frac{\lambda^2 \text{ metres}}{1885^2 \times L_{\text{mphys.}}}$$

In which C_x = Capacity of condenser in mfd.s.

λ = Wave-length in metres.

L = Inductance of coil in mphys.

To Measure Inductance.

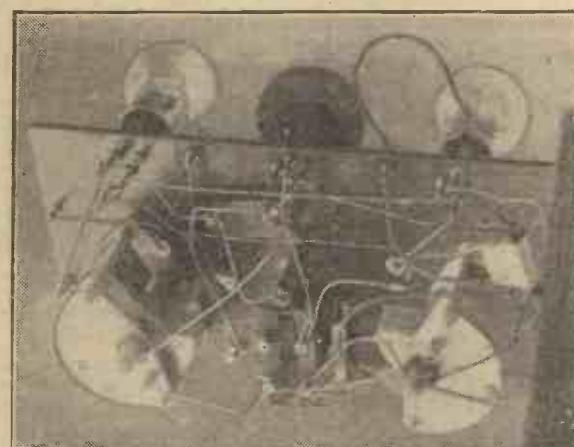
In a similar way we can find the inductance of coil by connecting it up as in Fig. 2. Here L_x is the coil, C_k is the standard condenser, and T the 'phones. Again start wave-meter buzzer and adjust the wave-length till most sound is heard in the 'phones. Again we apply a formula, but this time we use :

$$L_x \text{ mphys.} = \frac{\lambda^2 \text{ metres.}}{1885^2 \times C_k}$$

Where L_x mphys. is the required inductance,

λ the wave-length in metres,

C_k mfd.s. the capacity of condenser.



Showing the wiring, etc., of the two-valve reflex Unidyne.

cannot be tuned out, it should be unscrewed until the howling is stopped.

Tuning Stations In.

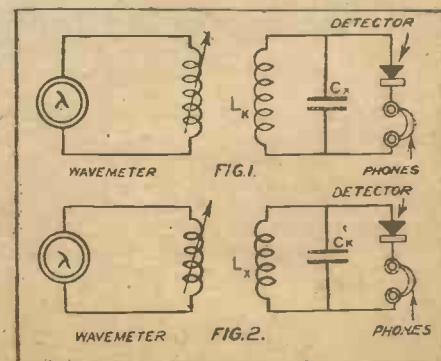
The coils should be fairly close together, in which position the set manifests a certain "liveliness." They can afterwards be adjusted.

If the receiver gives no signals, reverse the leads of one of your coils, and, provided you have wired up correctly, there should be no further difficulty. When a carrier is heard, resort to the verniers, and carefully tune in with them and the adjustment of the coils.

Suggestions regarding changing over transformer leads were made in the first article on this circuit, and it is suggested that readers should again refer to that.

A little practice will soon render tuning-in a simple matter, and it will be found that the set works up to all the efficiency claimed for it in the previous article.

Four-pin four-electrode valves were used in the original model, but the five-pin can be employed if desired.



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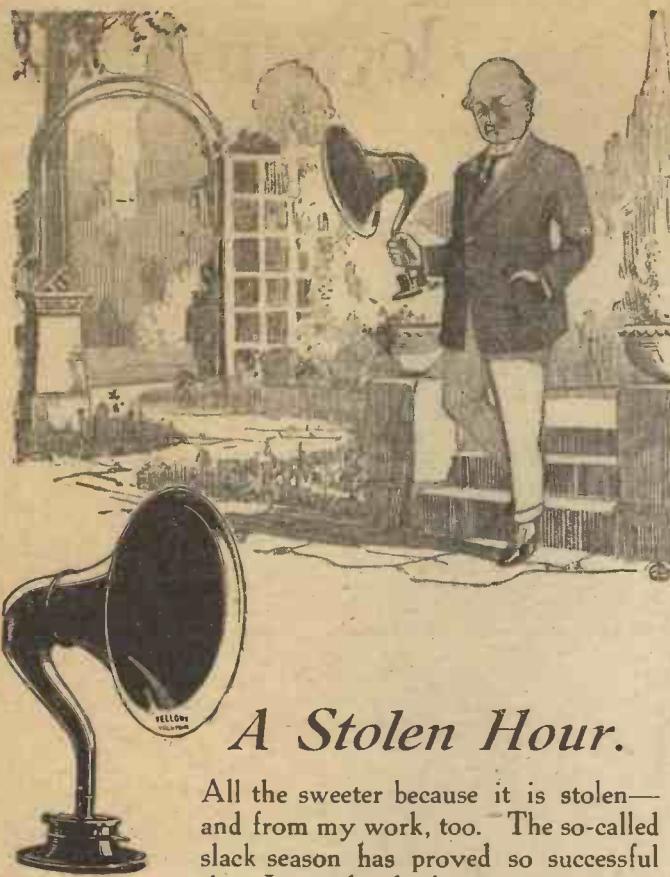
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A Stolen Hour.

All the sweeter because it is stolen—and from my work, too. The so-called slack season has proved so successful that I simply don't get a minute to myself; it doesn't look as if I'll even get a holiday. I don't really mind, though; perhaps it's because of my record wireless Summer, but somehow a quiet hour or two in the garden after dinner—with my Volutone—seems to me easily enough recompense for just a holiday.

I'm really glad, however, we did produce the Volutone; the Junior is a fine little instrument, even better now we're fitting it with an adjustable diaphragm, but you do need something a little more powerful in the open air. You want to listen to a Volutone to appreciate how perfectly a modern Loud Speaker can give a large volume of sound without distortion. But more than anything I'm pleased about its price. It really is

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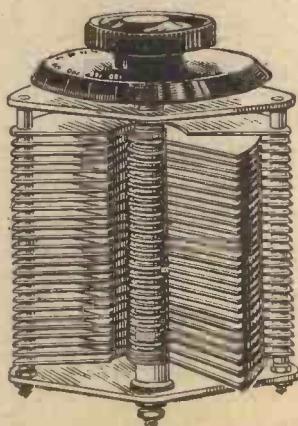
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Mainly About Broadcasting

by
The Editor

OFFICIALLY, summer-time is very nearly at an end; actually, of course, it died at birth this year. But now that September is upon us, thousands of people who have left their wireless sets alone during the last few months will be overhauling them again in preparation for the winter season.

Humorists Wanted.

And very shortly now the B.B.C. will be reverting to their winter-time hours of transmission, and it is to be hoped they will be making special efforts to broadcast some extra specially fine programmes during the winter months. Judging from the letters I receive from correspondents and from inquiries I have made, the majority of listeners-in would appreciate more radio humour. Broadcasting has produced very few good wireless comedians, yet there must be a good many humorists in this country whose talents would be appreciated by listeners-in.

But so far the B.B.C.'s humorists can be counted on one hand. I have often wondered why Norman Long and R. I. Stevenson have not been heard for so many months. They were two excellent humorists, and it is a great pity they were not booked up by the B.B.C. for a series of performances. At the moment of writing I think it is safe to say that Londoners are only really familiar with two broadcasting comedians—namely, Willie Rouse and John Henry.

These two names are very well known, and nobody wants to see them disappear from the programmes. But, on the other hand, nobody wants to hear them regularly as the *only* two wireless comedians during the coming winter. It may be that radio humorists are difficult to find. Probably they are. But the humorous side of wireless is such an important one that no effort should be spared to find as many funny people as possible whose services can be engaged for broadcasting purposes. There should be one humorous item in every broadcasting programme, and I hope the B.B.C. will be announcing the names of some new humorists for their winter season.

A Good Idea.

As many novelties as possible will be needed this winter if broadcasting is to remain a really popular factor in the lives of hundreds and thousands of people in this country.

The "Daily News" made a suggestion recently which might result in an interesting scheme for the B.B.C. It is that a number of well-known people should be invited to compile an evening's programme for the B.B.C. For instance, the public would be very interested if some well-known actor or actress, musician or politician, be invited to draw up an evening's programme to be broadcast from 2 L O; and a voting competition might be inaugurated whereby listeners-in were invited to criticise and vote for the best programme made up in this way.

The programmes will undoubtedly want a lot of "pep" this winter. Excellent as they are at the time of writing, they are tending to become stereotyped. Novelty, above all things, is wanted, and novelty, above all things, is going to be the most difficult thing to secure; but I feel confident the B.B.C. can tackle this problem and that they will do their best this winter to make their programmes more fresh and varied than hitherto.

* * *

The announcement made by the B.B.C. that the Earl of Balfour and Viscount Grey of Fallodon are to broadcast from 2 L O in October is welcome news. "Talks" by such eminent men are bound to interest vast numbers of listeners-in, and it is a good omen that so many well-known people are beginning to realise the value of broadcasting. A few names like these on 2 L O's programmes would enormously increase the popularity of broadcasting. Such "talks" are out of the ordinary rut; there is a distinct difference between a "talk" by the Earl of Balfour and a "talk" by some gentleman who looks after one of our museums. When the talks from 2 L O are good, they are very good; but when they are bad, they are very bad indeed—chiefly because the subject matter interests so very few people.

Winter Progress.

This winter is likely to see a very rapid expansion of the B.B.C. It has been found that the premises at 2, Savoy Hill are becoming very inadequate, and fresh accommodation is required for the rapidly increasing staff. I understand that a new wing is being added to the building at 2, Savoy Hill, and that it is more than likely that 2 L O will have its own transmitting plant before next year. At present, of course, the B.B.C. have the temporary loan of the Marconi Company's plant at Marconi House, which means that London is the only B.B.C. centre which does not have its own transmitting gear.

* * *

Some alarm has been shown by listeners as to the probable site of 5 X X when that station is erected as a permanency. At present Londoners are rather disgruntled because they find it almost impossible to tune in Radiola and other Continental stations while 5 X X is working; and as the practice of tuning in Continental stations is becoming more and more popular, it is to be hoped that the B.B.C. will choose a site for 5 X X as far out of London as possible, and thus enable listeners-in to tune out this station, should they feel inclined to listen-in to Continental programmes instead.

If 5 X X is erected too close to London, and amateurs find that the station cannot be tuned out, there is not much doubt that the station will be vastly unpopular. Thousands of people who were mere listeners-in last year have now developed into keen amateurs, with a desire to listen to other stations besides those of the B.B.C.

But as far as I can gather the uneasiness in amateur circles about 5 X X is more or less unnecessary, as the B.B.C. fully realise the necessity for keeping 5 X X as far away from London as possible.

At the time of writing I have not heard that any particular site has been chosen definitely for 5 X X's new home, but it is more than probable that a site will be selected which will enable London amateurs to tune out 5 X X when that station is working.

The John Henry "Stunt."

John Henry's aeroplane trip appears to have been quite a success. It was, of course, what is technically known as a publicity "stunt," and as such it has brought the B.B.C. considerable Press notice. But I think the time has come when readers of POPULAR WIRELESS should be told a few plain facts concerning this and other "stunts" which have been undertaken by the B.B.C.

About three months ago "Ariel," of POPULAR WIRELESS, who has always done his very best to assist the B.B.C. either directly or indirectly in such publicity efforts, suggested this identical experiment to certain responsible members of the B.B.C. His suggestion contained also the idea of sending up a small band in the aeroplane, under the leadership of Mr. Stanton Jeffreys, which would broadcast in mid-air, the signals to be picked up by a B.B.C. station and relayed to listeners-in. This suggestion was received with a certain amount of scepticism by the B.B.C., but they said they would probably consider it later on when the technical difficulties had been worked out.

The Press and the B.B.C.

I want readers to be quite clear that "Ariel," in making this suggestion to the B.B.C., did so in the natural belief that the B.B.C. would co-operate with him in the experiment. "Ariel" was quite willing to devote considerable time to making the necessary arrangements. It should be further noted that there was no suggestion, and never has been any suggestion, that "Ariel" should receive any payment from the B.B.C., or that he even asked or expected any payment. But now that the B.B.C. have adopted his original suggestion and put it into practice, and that absolutely no credit has been given to "Ariel" of this journal for a suggestion which the B.B.C. obviously thought of value, it is only fair that listeners-in should be informed that this much-talked-of "stunt" was planned, in the first place, by "Ariel" of POPULAR WIRELESS.

Therefore I think readers will agree that it would be only fair on the part of the B.B.C. to acknowledge the origin of this John Henry experiment. The Press can assist the B.B.C. considerably, but such a procedure as they have adopted over the John Henry experiment is one which is alien to mutual co-operation and the progress of broadcasting in this country.

Constructional Notes

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

A Crystal Contact.

MOST crystals have sensitive spots only here and there on their surface, and it is often difficult to find a sensitive spot, or to keep the cat's-whisker on it when found. The little arrangement shown in the accompanying sketch is interesting to try, however. It consists, as will readily be seen, of a small mercury cup, into which the crystal, which is inverted from its usual position, is partly immersed. The mercury acts as a large number of cat's-whiskers, and as it makes contact all over a certain area of the surface, it finds the sensitive spots and keeps to them. It is thus equivalent to a large number of cat's-whiskers in parallel. It is sometimes found that several cat's-whiskers in parallel do not give quite so good a result as one whisker in contact with a particularly sensitive spot. But, on the other hand, the advantage of having a constant adjustment is important and is worth a slight sacrifice in sensitiveness. The drawing will be explanatory. The lower cup may consist of a crystal-cup of the usual kind, to which a leading wire is secured (preferably not by solder, as the mercury may get to the solder and dissolve it off). The lower cup should, if possible, be a little

conveniently be used. The brass contact-plates may be secured to the barrel by means of small screws or by rivets, afterwards filed off smooth. They should preferably be cut from a piece of thin-walled brass tubing of about the same diameter as the barrel, and may even be secured to the latter by means of Chatterton's compound, if the screwing or riveting cannot be done. A central shaft of brass rod is passed through the barrel, and a strip of ebonite carries the four brushes, the ebonite being fastened to the shaft by means of two small brass plates as shown.

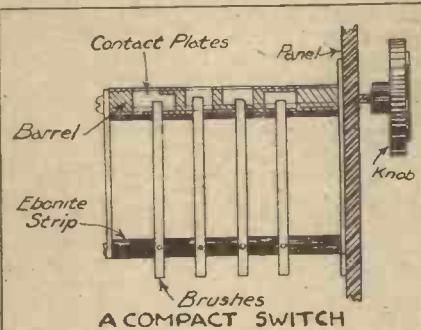


Fig. 1.

It will be seen from Fig. 2 that in the three positions of the barrel the condenser and inductance are first in series, secondly in parallel, and, thirdly, the inductance only, the condenser being shorted.

The construction of the barrel is simplified by reason of the fact that there are no leading wires to the contact, the leading wires being merely to the stationary brushes.

Useful Tuning Coil.

The illustration herewith shows two coils so arranged that they may be adjusted separately, and may be used separately, or in series, or as a vario-coupler. A piece of smooth board serves as the "former," and this may conveniently be about half an inch in thickness, by 4 in. wide, by 8 in. long. No. 24 enamelled wire may be used, each coil being wound for a length of about 2½ in. a space of ½ in. being left at the beginning,

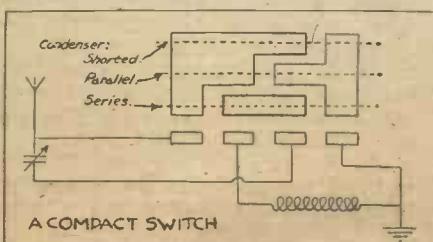
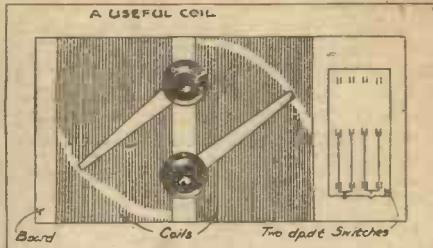


Fig. 2.

and another space of ½ in. between the two coils. This leaves a length of 2 in. at the right-hand end of the board, and this may

be used for two double-pole double-throw switches, by means of which the two coils may be put into series, or may be used one as the primary and the other as the secondary of the coupler.

Two switch arms are shown mounted in the ½ in. space between the two coils. One arm works over the left-hand coil and the other over the right-hand coil, the path of

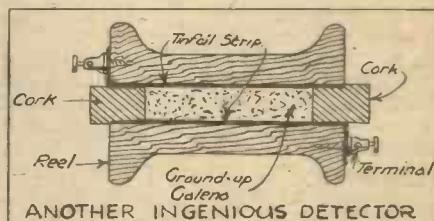


the contact-tip of the arm being scraped clean so as to ensure good contact.

The switch at the end of the board need not be included, but it is more convenient. If it should not be adopted, the length of the board may be reduced by 1½ in. The coils will then need to be connected direct in the manner in which they are intended to be used.

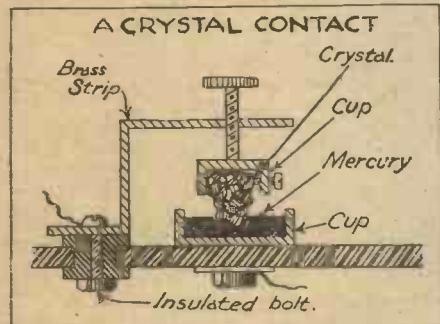
Another Ingenious Detector.

Here is another ingenious detector, which is based upon the idea of using a large number of contacts. The device, which is illustrated herewith, has the advantage that it is very easily made, and the parts required for its construction cost next to nothing. An ordinary cotton reel serves as the container. The central tunnel through the reel should preferably be enlarged in diameter, by means of a drill passed through. Two strips of tinfoil are then taken, equal in width to the diameter of the hole, and a little longer than the reel. The inside of the hole is moistened with gum, and one of the strips is pasted against the inside so that one end of it comes flush with one end of the reel, the other end projecting. The reel is now turned round, end for end, and the other strip of tinfoil pasted in in the



ANOTHER INGENIOUS DETECTOR

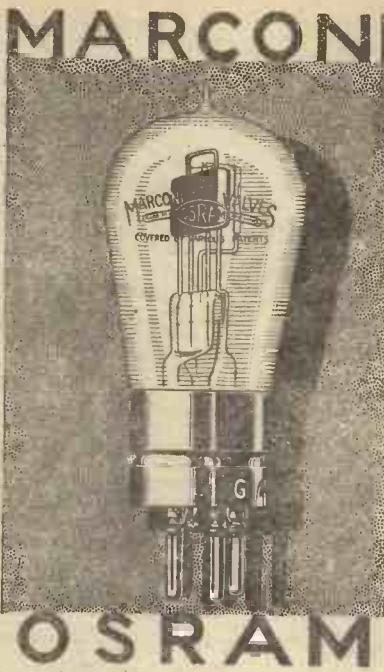
same manner, but with its loose end projecting from the reel at the opposite end to the loose end of the first strip. The strips may be rolled well into contact with the inside of the hole by means of a piece of brass rod passing loosely into the hole. We now have the reel with two conducting "plates" inside, these plates not being in electrical connection with one another. The inside is now filled up with ground galena, and two small corks, specially cut to size, are inserted. Two small screws may be used to secure the free ends of the two strips, and these then form the terminals of the detector. It will be found that this detector gives great constancy and is not upset by shaking or knocking.



larger than the upper one, the latter being simply an ordinary crystal-cup inverted. A piece of springy-brass strip, bent twice at right angles, serves as a support for the upper cup, which is adjusted by the screw in the manner shown. The crystal should only dip just below the surface of the mercury. The crystal and mercury should, of course, be perfectly clean.

A Compact Switch.

A series-parallel switch always comes in handy, and of designs for such switch there are many; but the one shown herewith is very compact, and so takes up very little space before or behind the panel. The principle of the device is simply a barrel of insulating material, upon which are mounted a series of contacts, and against which press four sprung brushes. (See Fig. 1). This barrel may be a rod of ebonite or fibre, or a cartridge-case may



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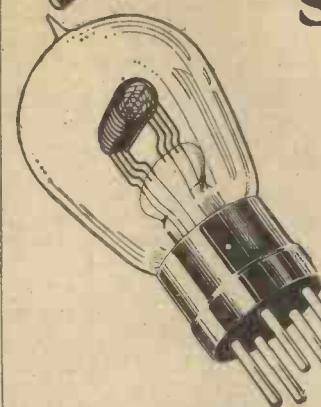
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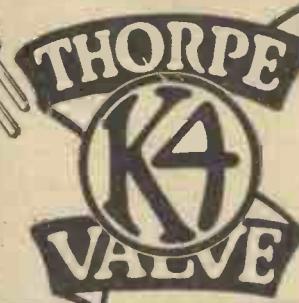
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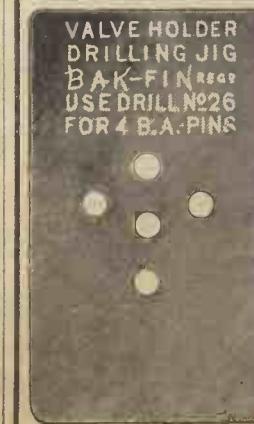
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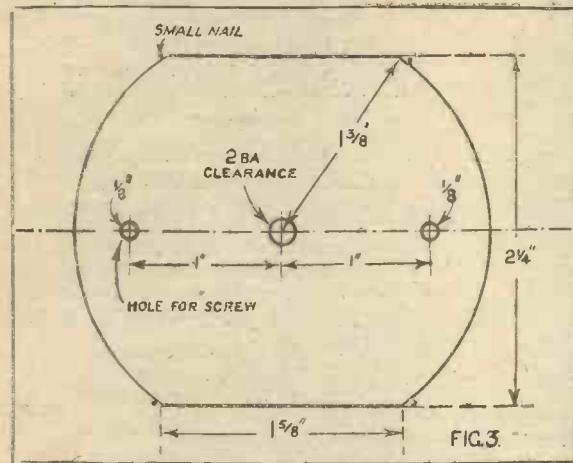
HOW TO MAKE A USEFUL VARIOMETER.

From a CORRESPONDENT.

Four shillings will cover the cost of this very efficient little variometer, which can be made with minimum trouble to give maximum results.

ONE of the most useful components that the radio enthusiast can possess is, without doubt, an efficient and reliable variometer, for which an ever-growing number of uses are daily to be found. Moreover, the experimenter who is lucky enough to possess a number of variometers has at his command the ideal form of tuning for all circuits.

Unfortunately, however, a really good variometer is an expensive component to buy, but the instrument described herein will be found cheap to construct and well worth the small trouble entailed.



Materials Required, and Cost.

	s. d.
Two-pieces ebonite, 3 1/2 in. x 2 1/2 in.	7
Two "one-hole fixing" bushes	4
Four inches 2 B.A. screwed rod	2
Four 2 B.A. nuts	1
1 lb. 22 D.C.C. wire	1 0
Dial and knob	1 6
Two terminals	3
Wood and screws	1
	4 0

An idea of the general design of the variometer can be gathered from Fig. 1, which shows the completed instrument, while Fig. 2 shows in detail the various component parts.

Making the Rotor.

Two plates are cut from $\frac{1}{8}$ in. thick teak or well-seasoned wood to the dimensions of Fig. 3, and the centre hole drilled to pass a 2 B.A. rod. Preferably these plates are turned on a lathe to ensure accuracy of working when assembled, but those shown in Fig. 2 were cut with a hand saw and finished off with a file.



Fig. 1. The complete variometer.

Four points are marked off on the edge of each plate, and a small pin or nail driven in nearly flush, as in Fig. 3. These will form a bearing for the rotor windings.

Two lengths of $\frac{1}{8}$ in. square wood, 1 1/2 in. long, are now cut and both plates screwed to them. Care should be taken that the resultant former runs truly on a rod passed through the two holes.

Two pieces of 2 B.A. screwed rod, 2 in. and 1 1/2 in. long, are obtained and one piece passed through each hole in the rotor and locked back and front by nuts. The length of each rod projecting, measured from the outside nut, is 1 1/2 in. and $\frac{3}{4}$ in. respectively, as in Fig. 4.

Winding of the rotor may now be commenced. One end of the wire is soldered to the inside end of one of the spindles and winding started from the outside, round four of the pins in a direction parallel to the axis, as shown in Fig. 2, winding towards the centre.

When 22 turns have been put on, carry the wire over to the outside of the second half and repeat as before, taking care that the two windings are in the same direction. The finishing end is then made fast and soldered to the inside end of the second spindle.

The rotor is now finished and may be coated thinly with shellac varnish.

Winding the Stator.

Two end plates are cut from $\frac{1}{8}$ in. ebonite to the dimensions of Fig. 5, and the centre hole marked out at the intersection of the diagonals. With this point as centre and radius 1 1/2 in., two arcs are scratched with a pair of dividers or compasses, as in Fig. 5, and the shaded portion shown there cut away with a hack saw and finished off with a file.

The centre point of each plate is now drilled out to $\frac{1}{8}$ in. to take a one-hole fixing bush, to the inside flange of each a length of 16 S.W.G. wire has previously been soldered. These wires will, with the bushes, form contacts to the two spindles of the rotor. Four holes for screws are drilled and countersunk in each plate, and two holes in the bottom plate for the terminals, as in Fig. 5. Next, four pillars, 2 1/2 in. long, are cut from $\frac{1}{8}$ in. square wood and screwed to the top plate, into the bush of which the longer spindle of the rotor is slipped. A spring washer, made from springy brass or copper, as in Fig. 5a is slipped on the

other spindle and the bottom plate, with the two terminals, put on and screwed down.

All is now ready for winding the stator. Having passed one end of the wire underneath the back plate and secured it to one of the terminals, winding is commenced

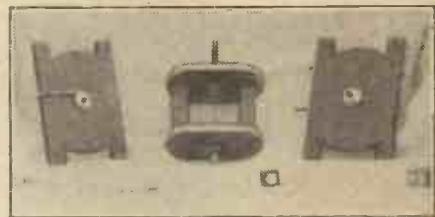


Fig. 2. The component parts used.

parallel to the axis, starting from the outside. Sixteen turns are wound on the first half, and the wire carried over to the outside of the second half and the same number of turns wound on again.

For Various Wave-lengths.

The finishing end is then made fast and soldered to the wire projecting under the top plate, while the wire projecting from the bottom plate is connected to the remaining terminal.

It now remains to shellac thinly the stator windings, and attach a spindle and knob to complete the variometer, which, on an average aerial, should cover a wave-length band of 200 to 500 metres. If wound with 26 D.C.C., putting 30 turns on each half of the rotor and 23 turns on each half of the stator, the wave-length band will be about 300 to 700 metres.

It may be that, when winding is finished, the stator windings need easing a little away from the rotor to give a nice clearance, which, if the construction has been accurate, may be made as fine as $\frac{1}{16}$ in. Also, it will be noticed that the variometer may be fixed underneath a panel by means of the one-hole fixing bush in the top plate.

(Continued on page 92.)

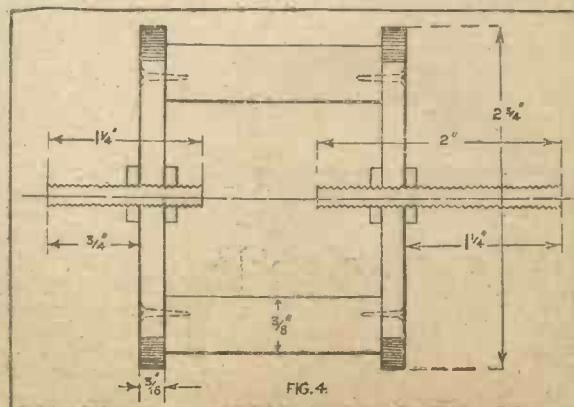


FIG. 4.

AN EASILY MADE MICROPHONE.

By B. J. KYNASTON.

THE transmitting microphone described in this article can be easily constructed by any amateur, and although the necessary parts cost next to nothing, the results obtained, if the instrument is carefully made, will be equal to the ordinary type of purchased microphone.

The advantage, however, will not be so much in the saving of money, but in the knowledge that the instrument is home-made.

The first portion to construct is the outside case, and this is easily made by cutting down an ordinary tin (such

as a cocoa tin) so that the portion left is about 1 in. deep. A hole is now cut in the centre of the lid and a trumpet soldered on, as shown in Fig. 1. The trumpet or mouth-piece can be conveniently constructed from the top portion which was cut away from the tin.

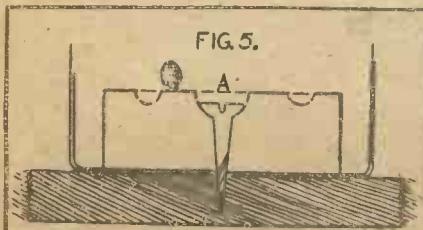
This piece should be straightened out and then cut as shown by the dotted lines in Fig. 2.

Fitting the Diaphragm.

The next portion to make is a simple wooden stand, which consists of a 3 in. square base and the two upright pieces—see Fig. 3. These should be made from wood $\frac{1}{2}$ in. thick and 1 in. wide, and 3 and 6 in. long respectively. The whole stand can then be arranged as shown.

The carbon block, shown in Fig. 4, can be cut from an old arc lamp carbon with the aid of a hacksaw. A hole must be drilled through the centre of this block, as shown in the diagram.

This hole is made larger on one side in order that it can take the head of an ordinary brass wood screw. Five small holes about $\frac{1}{4}$ in. deep are now drilled round the large centre hole, as shown.



The metal case and carbon block can now be fitted to the wooden stand, as in Fig. 5. A large felt washer must now be fitted round the outside of the carbon, and this should be a trifle thicker than the block, so that when the diaphragm is fitted, as shown in Fig. 6, there will be a small space between it and the block.

Useful for "Line" work.

This diaphragm is made by painting a thin circular sheet of mica with a paste made of powdered carbon and water, so that when dry a thin layer of carbon is formed over one side of the mica. The five small holes and centre hole of the carbon

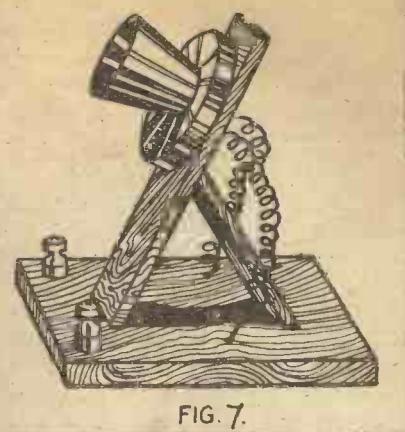


FIG. 7.

couple of dry batteries and a few switches, very satisfactory telephonic communication can be established between, for instance, an upstairs wireless "den" and somewhere downstairs.

A Microphone Transformer.

Generally speaking a microphone transformer is required, the primary of which is connected in series with the battery and the microphone, the secondary going to "line" or valve transmitting circuit, five layers of 20 S.W.G. on a $3\frac{1}{2}$ ins. $\times \frac{1}{2}$ in. iron core for primary and $\frac{1}{4}$ lb. of 42 D.S.C. for secondary being suitable dimensions for this.

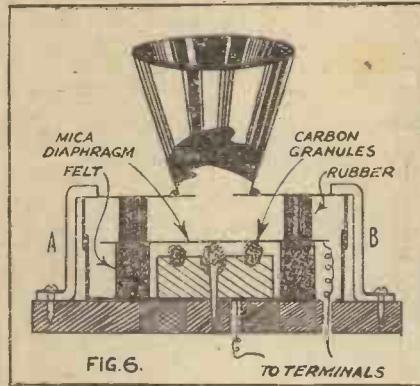


FIG. 6.

block should now be filled with small carbon granules, and the diaphragm then placed in position so that its coated side is next to the granules.

A small metal contact piece should, however, be placed on the felt washer to give an electrical contact with the carbon coating of the mica. An insulated wire is taken from this contact through a hole in the case and upright to the terminal mounted on the base. The metal case itself is connected in a similar manner to the other terminal of the instrument.

A large rubber washer can be used to hold the diaphragm in position, and the lid and trumpet can be clamped down by means of the brass pieces A and B in Fig. 6.

The remaining diagram shows what the finished instrument should look like.

It can be used in a number of interesting ways. If the reader does not possess a transmitting licence he can use it for short line telephony work. This necessitates a couple of these microphones and two single earpieces of low resistance. With the assistance of a

HOW TO MAKE A USEFUL VARIOMETER.

(Continued from page 91.)

Whilst retaining the general outlines, it is possible to construct a variometer tuning over any required wave-length band by increasing or decreasing the length of the pillars in rotor and stator, thus increasing or decreasing the inductance.

Losses in a variometer of this design are quite small, and hence tuning is both sharp and clean, while the general efficiency and neatness will amply repay one for the time spent upon its construction.

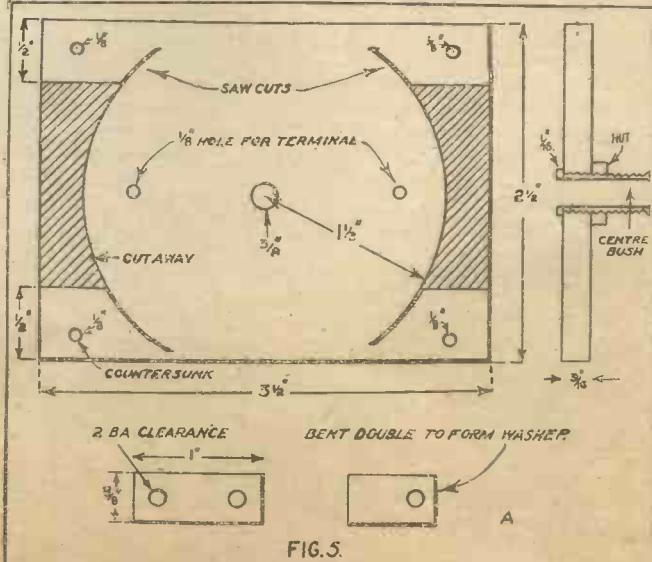
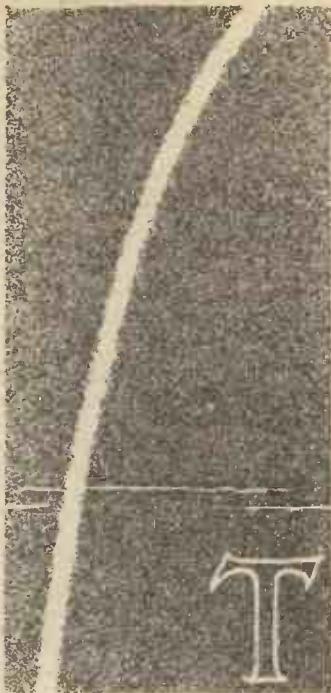


FIG. 5.

Reference to this diagram is made on the previous page.



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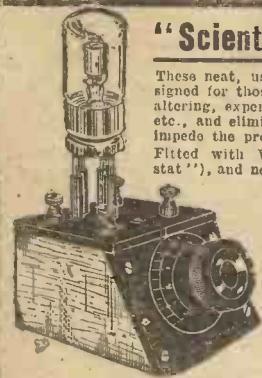
The Watmel Wireless Company wish to notify the trade and public that their Variable Grid Leak Patent Application No. 206,098 was contested in the Comptroller's Court, and on Appeal; in both instances the Patent Grant was upheld and costs awarded.

It is only fair to bring these facts to the notice of persons and firms dealing in Variable Grid Leaks, otherwise the successful issue achieved might not be known, and the public might be persuaded that no Patent is involved in the Watmel Variable Grid Leak.

It is the aim of this Company to protect its own interests, and those of its customers, by securing Patent protection for the novelties in its specialities, as it is these novelties, invented by experts and exhaustively tested, which are the Hall Mark of the Watmel Products, distinguishing them from inferior imitations.



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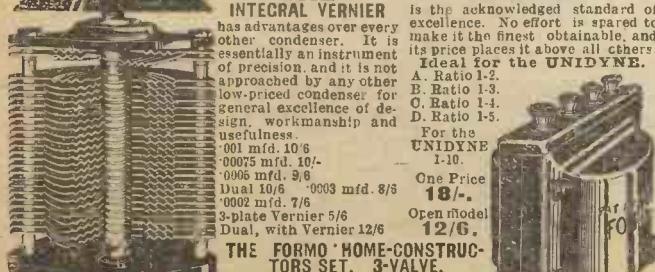
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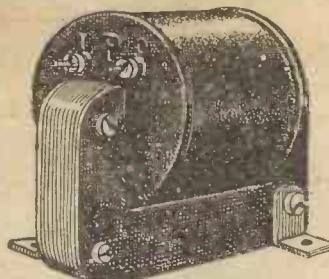


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HOW TO UNDERSTAND TIME SIGNALS.

From a CORRESPONDENT.

Every day a number of time signals are transmitted by various European wireless stations, and as most of them can be heard on crystal and single valve sets, readers should welcome the information contained in this article.

THERE must be a large number of amateurs in the country who, possessing a single-valve set, a two-coil holder, and an assortment of plug-in coils, and having mastered the tuning-in of the various broadcast stations, desire to extend their field of operations. To these, the following notes on some of the time-signal transmissions may be of interest.

The Eiffel Tower.

Presuming that the amateur is in possession of a complete set of coils up to Igranic No. 1,500, or their equivalent in coils of any other make, and a good coil holder so as to be able to employ reaction, there is a number of stations transmitting time signals well within his reach. Let us take first the Eiffel Tower station in Paris, possibly the best-known station in Europe.

Time signals are sent out from this station on a wave-length of 2,600 metres at 9.30 a.m., 10.0 a.m., 10.45 a.m., 10.0 p.m. and 10.45 p.m.

Of these the 10.0 a.m. and 10.0 p.m. signals are known as "beat signals," and necessitate some calculations to be made before one can get the true time, so they will not be further noticed, except to remark that the first time one hears these 300 beats coming through, one is apt to think that the "beats" have their origin in the set itself.

The 9.30 a.m. signal really commences at 9.23 a.m., when for the space of one minute the general call signal V (---) is given. After a minute's silence, Observatoire De Paris, etc., is sent out slowly in Morse.

At 9.26 a.m. a series of dashes, in groups of three, are sent out, and at 9.27 three slightly shorter dashes come through. Following this, a series of dots, in groups of four, are sent, winding up with three dashes at 9.28 a.m. During the next minute the letter N is sent, at uniform intervals, and at 9.29 a.m. the three dashes come through. Finally, during the last minute, the letter G (---) is sent, winding up with three dashes at 9.30 a.m. (The first of the three dashes denotes the exact minute.)

The 10.44 a.m. Signals.

This, probably the most popular transmission in Europe, starts at 10.36 a.m. The first part of the message relates to the "beat" signal which went through at 10.0 a.m., giving the exact time of the start and finish of that signal. At 10.44 a.m. a series of dashes are sent out (generally 19), followed by a dot; this occurs at

exactly 10.45 a.m. After a silence of one minute, the letter D (---) is sent out, generally 14, and the dot comes through at 10.47 a.m. After another minute's silence the figure 6 is sent out (---), the dot at the end of this minute coming at 10.49 a.m.

The above remarks on the 10.44 a.m. signal also apply to the 10.44 p.m. signal, as they are identical.

Lyons.

At 8.59 a.m., on a wave-length of approximately 15,000 metres, a time signal similar to the above 10.44 a.m. signal may be heard from Lyons. The dots in this case occurring at 9.0 a.m., 9.2 a.m., and 9.4 a.m.

Quite recently it was possible, with careful tuning, to hear Annapolis, U.S.A. (to be mentioned later), and Lyons, both giving the time signal for 9.0 a.m. simul-

Annapolis, Maryland, U.S.A.

On one valve, this station while not very loud, is quite distinct, the greatest trouble one has is the great number of other high-powered stations all working round about this wave-length; still, the note of Annapolis is so distinctive that once it has been identified, it can always be picked up again quite easily.

At 4.55 p.m. the station starts to send out a series of dots at intervals of a second. The 30th is missed, as are also the last 5 beats in each minute. At 4.56 p.m. the process is repeated, and so on through the 5 minutes (except that the last 10 dots are missed in the last minute). Then at 5.0 p.m. a short dash is sent.

In the above description the word dot has been used to denote the beat used, but this is hardly a correct name for it; it is

rather an increase or reduction of the wave-length, with the result that it sounds something like this—SOH DOH, SOH DOH, the SOH standing for the dot.

The only other station which might be mentioned is Moscow, which sends out a time signal at 10.0 p.m. on a wave-length of 5,000 metres, but owing to the proximity of several large powered C.W. stations, it is not of much use to the possessors of a single valve.

Further, the transmission is of a somewhat complicated character, so details are omitted.

All the above times are G.M.T., so that one hour has to be added to bring them to summer time.

The accompanying table of coils to use, and the amount of condenser to be used, may be of some use to beginners, for whom these notes are intended. Of course, the table can only be an approximate one, as length of aerial, etc., will make the values vary.

Eiffel Tower and sometimes Nauen can be heard on a simple crystal set, the former's signals being particularly clear and loud.

Station.	Wave-length.	Coils to Use.		Con-d'ns'r '0005	Sys-tem.
		A.T.I.	Rec.		
Eiffel Tower	metres			Dgs.	
	2,600	250	300	60	Spk.
Lyons	15,000	1,500	12	30	C.W.
Nauen	3,100	300	400	25	Spk.
Nauen	18,000	1,500	1,250	90	C.W.
Annapolis	17,000	1,500	1,250	90	C.W.



The control room at the Leeds relay station.

taneously; but Annapolis has ceased to send out at 9.0 a.m.

Nauen.

At 11.55 a.m., also at 11.55 p.m., Nauen, on a wave-length of 3,100 metres, will be heard. First the general call letter (---) for one minute, followed by P O Z M G Z. At 11.57 a.m. they send out a series of Xs (---) followed by three dashes at 11.58 a.m. Following this is a series of Ns (--) with three dashes at 11.59 a.m. During the last minute a series of Gs (---) are sent, the three dashes coming at 12.0 a.m. As before, the first of the three dashes denotes the minute.

This signal can also be heard on a wavelength of roughly 18,000 metres, the times and system being the same. In fact, it would seem as if the same operator sent out both simultaneously.

A "beat" signal may also be heard on both these wave-lengths, starting at 1 minute after 12.0 a.m. This consists of 300 beats similar to those sent out from Paris, and the remarks made in connection with them apply here also.

Technical Notes

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

Some Tuning Hints.

IT is useful to remember the general rule that damping (electrical damping, that is, dissipation of energy) broadens the tuning of a set, and so a sharply tuned set, or selective receiver as it is more usually called, is one in which the losses due to damping are comparatively small. Electrical damping is sometimes due to actual physical damp in the coils and on the insulation generally. If the tuning of your set seems to become gradually less sharp, it is well to keep the set for a few days in a warm room, and see whether this does not sharpen the tuning.

Wave-length Variation.

Variations in the wave-length of different stations are frequently recorded, and these apparent variations are usually due to variations in the adjustments of the receiving set. For example, if the shaft of the variable condenser is loose and permits lost motion or backlash, this will sometimes give the impression of variations in the settings. Variations in the distances between plates, often due to the same cause, will produce similar effects.

Another cause for gradual change in the dial settings for a given wave-length, although one which is not likely to arise so often, is gradual drying of the wood of the cabinet, particularly if this was new when the set was made up, and if the tuning coils or condensers come into very close proximity with the wood at some points.

If a local station is too loud on two stages and not loud enough on one stage, instead of turning down the filaments, try using the two stages and slightly de-tuning; this will usually give better reproduction.

When receiving out of doors, using an aerial slung to a tree, you will sometimes have trouble with the aerial sagging, owing to the tree swaying in the wind. A simple way to keep the aerial taut when the tree sways is to attach the aerial to the tree by means of a long "soft" spring, such as the spring from a roller-blind. Another simple way is to attach a metal ring to the tree, by means of a piece of twine, and to pass the aerial support through this, hanging a weight to the latter. As the tree moves, the weight keeps the aerial taut, the rope passing to and fro through the metal ring.

Increasing Capacity.

It is not generally known that the capacity of a variable air condenser may be considerably increased, when such increase is required—for example, for experimental purposes—by substituting another dielectric in place of the air, which ordinarily occupies the spaces between the plates. The capacity, of course, depends upon the dielectric constant, or specific inductive capacity, of the dielectric, and is in fact proportional to it, although certain considerations in actual practice interfere with the exact proportionality. However, roughly speaking, it may

be said that the capacity of the condenser will be proportional to the dielectric constant of the material between the plates, provided this material completely fills the spaces.

Fluid Dielectric.

This points the way to the simple method of increasing the capacity. The dielectric constant of air is approximately unity. The constant for certain insulating liquids is, however, very much higher. For example, for turpentine and for paraffin oil it is about 2, for acetone about 22, for glycerine about 56, and for petrol over 30. Acetone and petrol are quite convenient liquids to use, as their insulation resistance is high and they do not attack the plates of the condenser in any way.

All that need be done, therefore, to increase the capacity of the variable condenser, is to place the latter in a jar or

(Continued on page 120.)

BROADCASTING A REAL ORGAN.

By BASIL DAVIS.

THE organ at the Shepherd's Bush Pavilion is now being broadcast twice weekly from 2 L.O. The pipes are enclosed in two solid concrete chambers situated immediately beneath the stage and to the rear of the orchestra. The console, or operator's mechanism, which has four manuals and pedal keyboard, is in the orchestra, and takes up about as much space as a large-sized harmonium.

It is connected to the pipe chambers by nothing but thousands of separately insu-

lated wires, as the mechanical movement of opening stops, pipes, swell shutters, etc., is entirely electrical. Any effect can be obtained from this organ, from the singing of a nightingale to a thunder peal or bombardment. It is blown by a 20-h.p. motor and fan, and works partly at 6 in. water-gauge pressure and partly at 15 in., which pressure is more than twice as much as that of any other organ in England.

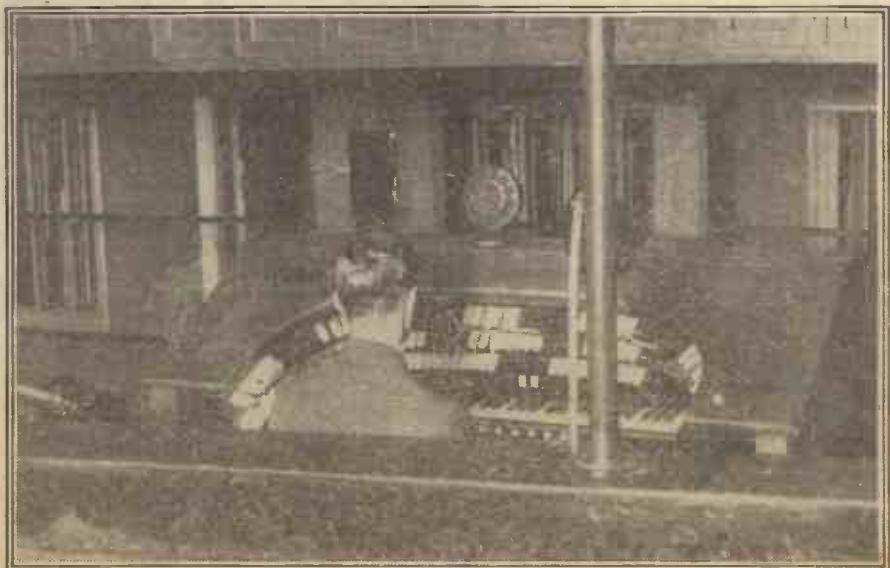
As an old experimenter in transmission of music by wireless, I have often tried to broadcast the organ at the Pavilion, Marble Arch, without very much success. The reason for this difficulty about broadcasting organ music is due to the sound having to get to the microphone as best it may from a long distance, as the instrument is usually so large and spread about that the microphone can only be brought close to the middle of it. As little tiny pipes may be situated high up in the right-hand corner of the hall and far away in the depths, it is easy to understand that difficulty of balancing, which often and usually results in only heavy sounds being heard in organ transmissions.

As before stated, the organ at Shepherd's Bush is entirely enclosed in a pair of sound-proof concrete chambers, with the only openings, which are controlled by swell shutters, directed through the orchestra space towards the audience of the theatre. These chambers, which measure about 40 ft. by 20 ft. by 16 ft. each, allow ample space for all tones to be thoroughly mixed before reaching the open, which is quite the contrary of most other organs, and for that reason I was able to get the officials of the B.B.C. to come down and make some microphone tests.

The microphone, which will be seen in the photograph, was easily able to catch all tones which issue from the comparatively small shuttered openings, and very successful results were obtained.

I would like to add that the directors of Shepherd's Bush Pavilion have instructed me to extend a standing invitation to any of your readers who may care to inspect the organ at any time by appointment.

Capt. Basil Davis is the chief engineer of the Shepherd's bush Pavilion, and operates the well known amateur station ^ B 2. Ed.



The manuals of the Shepherd's Bush Pavilion organ showing the microphone in position.

Artistes of the Aether

By "Ariel"

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

DESPITE the cry that too much classical music is being selected by the B.B.C., it is evident that the company desire to make their policy one of educational rather than entertainment principles. Symphony concerts continue to be held at all stations, and though for the most part the works selected have been ideally suited to concert hall audiences, there is still a marked tendency to cater for the few, already well cared for really by the classical halls, rather than the great masses of the people.

Symphony Music.

A noteworthy instance of this was found in a recent symphony concert at 2 L.O. Conducted by Mr. Percy Pitt, it commenced with Goldmark's so-called overture, "Sakuntala." This is really a symphonic poem, for it is complete in itself, and is woven round a Sanskrit story.

Goldmark was born in Hungary, but spent much time in Vienna, and evidently gained by his environment, but the music as broadcast is not strikingly distinctive when considered in juxtaposition with the story of the king and the nymph, a mythological King Cophetua. This was followed by Rachmaninoff's Pianoforte Concerto No. 2. One of the best known of the modern Russians, though he has written an opera and numerous concertos and symphonies, it must be confessed that his two preludes for piano are most popular.

Fortunately for all concerned, an equally famous soloist was found in Miss Irene Scharrer.

She is a noted exponent of the Matthay method of pianoforte playing, and made her musical debut in 1901 at the old St. James Hall. Since then she has been heard under the ægis of Sir Landon Ronald at his symphony concerts at Albert Hall, Sir Henry Wood at Queen's Hall, the

great philharmonic concerts at Birmingham, Liverpool, and Norwich, as well as the Manchester Halle-Richter concerts. Her playing was eminently suited

to the needs of the microphone—crisp, lucid, and free from affectation.

Works of Chopin, Elgar, and Wagner made up the rest of an excellent, if "highbrow," programme.

The General Public.

Music of a less exacting nature, however, has had its fair chance round the stations, and there is no doubt the military bands of H.M. Grenadier Guards, the old 3rd Cheshire Regiment, and the Kneller Hall bands, as well as the local bodies—"The Besses o' the Barn," the Black Dyke Mills, the Clydesbank Burgh, the St. Hilda Colliery, and the City of Birmingham Police Bands—all contributed largely to the pleasure of the general public.

The Children's Hour.

Here is another section that requires improvement. Bach's fugues and the reading of books on every shelf in the libraries means simply a waste of battery current. It is the personal element that really counts, and a once a week treat would, we venture to believe, be of greater value.

Manchester.

Pre-eminently one of the most musical towns in the provinces, Manchester demands the best in every branch of art.

One of the most popular singers at 2 Z Y is Mr. Stephen Williams. Specialising in operatic and classical music, Mr. Williams possesses a bass-baritone voice of wide range and power. He has sung not only from this station, but from London and Birmingham. He was one of the first of the Manchester singers to play his own accompaniments, thereby securing admirable effects.

Apart from his musical career, Mr. Williams is a well-known critic on one of the big London dailies, and he confesses that he believes in broadcasting as a means of implanting the love of good music in the hearts of the people. His translations, also, of foreign songs have added considerably to their value and success.

Melodious Music.

Music with a lilt, phrases that "stay by you," as the old woman expressed it, tunes that are whistled up one street and down another, may rouse the scorn of the "highbrow," but it is the music that makes the widest appeal, and is especially needed for broadcasting purposes. Among

the composers who have realised this, though retaining their ideals in giving the very best of musical art, mention must be made of Frederick Nicholls and Albert Ketelby, both of whom have had special programmes of their music.

Mr. Ketelby's works have long been broadcast from every station, music of sentiment, action, and humour, for his "Musical Switches" is one of the best yet constructed. It has formed an integral item on countless programmes, and there is hardly need to refer to the success of his tone-pictures: "In a Monastery Garden," and "In a Persian Market."

But few listeners remember possibly that Mr. Ketelby is also a composer of "highbrow" music. His string quartet, quintet for wood, wind, and piano, and his many orchestral works place him among the front rank of serious composers. He started his career practically as a boy prodigy composer at the age of 13, gaining important scholarships at Trinity College.

A Versatile Artist.

For four years organist, during which time he composed much church music, and a prize anthem, the winner of the £50 prize for Van Biene's "The Phantom Melody," winner of the "Evening News" £100 prize song, and of the Etude International first prize for pianoforte composition, there is no doubt of his versatility and ability to give the public what it wants.

We must also refer to one of the most popular singers, Mr. Tom Sherlock, best known perhaps as Tom Case, for under that name he has sung for the last twelve months at 2 Z Y and other stations. His voice is rich and of wide range and power, and his songs are well chosen.

Glasgow.

Another favourite singer up here is Amy Samuel, a mezzo-soprano with a surprisingly wide range and expressive quality of tone that lends itself well to operatic rôles.



Mr. Tom Case.



Mr. Stephen Williams.



Mr. Albert W. Ketelby.



Miss Irene Scharrer.



Miss Amy Samuel.

LORD ROTHSCHILD'S VIEWS ON BROADCASTING.

By "ARIEL."

LORD ROTHSCHILD probably addressed a larger audience than ever before when he delivered his speech over the microphone the other night.

When I arrived at the studio Lord Rothschild had nearly finished his speech. I was introduced to him by Mr. Joseph Salmon, whose name is well known in connection with Messrs. Salmon & Gluckstein and Messrs. J. Lyons & Co.

His Investment.

I asked Lord Rothschild how he had enjoyed his experience before the microphone, and whether he had previously taken any special interest in wireless matters. He told me that he had, like everybody else, invested "a small sum of money in a wireless set." "But," he added, smiling, "the younger members of my family are so much more interested in broadcasting than I am that the set is in constant demand. Thus I get very little opportunity of listening-in myself. But, then, my spare time is mostly occupied by my museum, which, I flatter myself, is one of the largest and most complete private museums in the world."

"But," I said, "you cannot have failed to be interested by the recent wonderful discoveries and developments in the world of wireless?"

"Yes, indeed," replied Lord Rothschild, "the progress has been immense, and the benefit to the world at large of this marvellous medium is quite incalculable. And I think that broadcasting, even in its more popular aspects, is an interesting and valuable means of gaining the public ear. Thus, when I was invited to broadcast on behalf of the Jewish Hospital, I was very glad of the opportunity to put its case before such a large audience."

Dr. Leopold Mandel, the famous surgeon attached to this hospital, who was standing close at hand, added that this institution was organised by charity, and was the only hospital he knew of at the moment which was not in any way endowed. It is entirely dependent on voluntary contributions. "Lord Rothschild," he said, "has always shown a very keen interest in our work, and this is not the first time that he has exerted himself on our behalf."

Broadcasting's Moral Value.

"I wonder if you have ever heard of the paper that I am representing to-night?" I asked with a smile.

"Assuredly," replied Lord Rothschild. "I am told that POPULAR WIRELESS has always been a supporter of the British Broadcasting Company. Indeed, I very much admire the attitude of the Press generally towards broadcasting in this country, and consider that it is in great measure due to the publicity it has thus received that the B.B.C. stands where it does to-day."

"It is extraordinary," he added, "how the popularity of this form of entertainment

has spread during recent years. Wherever I go I see aerials, and I know that there is hardly a cottage on my own estate which cannot boast a receiving set. And I do believe that every one of my tenants, from the richest to the poorest, has by this time either a crystal or a valve set. They listen-in regularly, and I am told that they particularly enjoy the musical programmes."

"Do you think," I inquired, "that the advent of broadcasting has been in any way beneficial to the people of the countryside?"



Lord Rothschild.

"I do indeed," Lord Rothschild replied emphatically, "and, personally, I think that we owe much to this new entertaining medium. It provides a constant means by which the younger members of the family can amuse themselves at home, and in my opinion this keeps many of them out of mischief. People have written and talked a good deal lately about the disintegration of the home, particularly in country districts, where the young men and women want more distraction than the country provides. But I should not be surprised if wireless were to help in bringing about a change."

"Do you not think," I inquired again, "that besides its moral value, there is a great opening for broadcasting as an educational medium?"

Lord Rothschild laughed. "In that direction I have noticed its effect already," he said. "It seems to me that the younger generation of my tenants are becoming daily less ignorant and less illiterate. On several occasions I have heard them correcting each other for slight inaccuracies of speech which had not been affected by their school education. Perhaps the gaps left by the elementary schools will gradually be filled by broadcasting."

As the next item on the programme was now due, Lord Rothschild and I left the

studio, and, as we descended the steps, I asked him whether he had experienced any nervousness before the microphone.

Wireless Stage Fright.

"Well," he said, "I have heard a good deal about wireless stage fright, but I cannot say that I consider broadcasting an unpleasant ordeal. Of course, I had my speech all ready to read, and once I was shown where to stand, I simply forgot all about the microphone."

When Lord Rothschild had left us, Mr. Salmon, who had accompanied us downstairs, told me that he, too, was deeply interested in broadcasting, and that he had started wireless clubs in many of his enormous concerns. He invited me to give a lecture in the near future to one of these societies, and it was my pleasure and privilege to accept.

THE UNIDYNE RECEIVER.

THE following report appeared in the wireless column of the *Glasgow Evening Citizen* for August 27th, 1924:—

The Unidyne receiver, so called by its inventors, and described by them in POPULAR WIRELESS some time ago, was favourably commented upon by the writer when the diagrams and particulars were first published.

Careful tests carried out with a single-valve Unidyne receiver have served but to strengthen the original good impression created in the mind of the writer, in spite of the controversy which the whole subject of "high-tensionless" receivers has raised in the technical press.

The Unidyne, it will be remembered, is a "high-tensionless" receiver of unorthodox design, and in the hands of the writer has put up an excellent performance, so that he is impelled to relate his experiences for the benefit of others. Needless to say, the writer has no connection whatsoever with POPULAR WIRELESS!

Results.

Using one of the new Thorpe K.4 four-electrode valves, results were in every way equal to an ordinary single-valve receiver employing reaction with 60 volts high tension in the anode circuit of the valve.

Reaction control on all wave-lengths between 300 and 15,000 metres was delightfully smooth, although—with the particular aerial on which the tests were made—it was found necessary to insert a fixed value (.0002 mfd.) condenser in series with the tuning coil, to obtain reaction effects below 400 metres.

In every instance a reaction coil one size larger than the aerial tuning coil provided the most critical reaction control. No other arrangement proved wholly satisfactory, and, in addition, a .0003 variable condenser across the reaction coil was found to be essential for the proper functioning of the instrument. A Lissen variable grid leak was used throughout the tests and is recommended to all readers, as—unlike several other makes of variable grid leaks—it really does vary when adjusted!

The entire absence of those faint rustling and crackling sounds which invariably accompany the use of high-tension batteries in valve circuits was a noticeable feature in the operation of the Unidyne receiver.

THE PROGRESS OF BROADCASTING IN MANCHESTER.

By B. E. NICOLLS

(Director of the Manchester Broadcasting Station).

The following article from the pen of [the popular director of Manchester broadcasting station gives an excellent idea of the progressive spirit which animates the staff of one of the best known provincial stations which is rapidly expanding and gaining hosts of new admirers.

PROGRESS is a dangerous word, and in talking of broadcasting, as in philosophy and history, it may very well prove a signpost to hidden pitfalls. Let us ignore these, however, for our present purpose, and assume that progress in the ordinary run of things means something that is quite easy to understand, but rather more difficult to assess with any degree of certainty.

The remarks that follow are intended to have reference merely to the Manchester Broadcasting Station, and, even in saying that, I must utter the warning that they are based on a short experience.

A Step Forward.

Broadly speaking, I think that the main indication of progress in our corner of the broadcasting world is the fact that our listening public is showing every sign of settling down into a steady acceptance of broadcasting as an ordinary, and undoubtedly valuable, adjunct to the routine of living. Time was, only a few months ago, when broadcasting was still an almost incredible novelty, and achievements in every field of the work, which now are the merest commonplaces of the studio and transmitting rooms, were hailed by a large section of the public in a most uncritical spirit as successive miracles, although some people went to the other extreme in losing their sense of perspective and treated it all as a mere joke.

I think we can say with some certainty that the public in general has now grown into a maturer and more balanced view of broadcasting, to the great advantage of everyone concerned. This maturer outlook is, of course, more critical; but the criticism is now, on the whole, born of a better knowledge and a clearer understanding of the ways and means, the value and limitations, of broadcasting, and this is all to our advantage as broadcasters. This, when you come to look into it, is a substantial step forward.

Miracle Seekers.

There are still a few miracle seekers who think that we ought to be able to please all our audience all the time, and there are still, possibly, some who do not realise the tremendous future which lies before broadcasting; but, on the whole, our public has settled down to an attitude of tolerance towards fellow listeners' tastes and towards our lesser eccentricities, while well informed and reasonable criticism is always ready for any definite departure from a programme standard, which, under fire from this more discerning audience, is becoming, and must continue to become, higher and higher every day.

Now, as to the broadcasting itself from the Manchester station, there is little to say.

We still suffer from certain disabilities such as cramped quarters and lack of studio room, and also, for that reason, we are unable to instal the latest equipment until we move into our new premises. Strikes permitting, this move should take place towards the end of October or in November, the transmitter and aerial remaining at the present place.



Mr. B. E. Nicolls, Manchester's B.B.C. Station Director.

The new office and studio quarters in Orme Buildings, the Parsonage, Deansgate, are palatial, and should provide us with a most favourable background for our broadcasting work; and with the new microphone equipment we should be on a technical equality with London and the newer provincial stations.

Too Many Talks?

In the matter of programme developments, we have recently been doing something in a modest way towards co-operation with the different educational bodies in school work, and we are trying to choose our "talk" subjects and our speakers so that their talks may be instructive to those who wish to consider them so, as well as entertaining to our general public. I have recently had a feeling that we might be "spoiling our market" slightly by putting on too many talks, and steps are being taken to reduce the number of local talks in our main evening programme, and substitute entertainers and humorists, humour being a necessary antidote to dull skies and smoke and rain.

The Dramatic Side,

As to music, we have lightened our local programmes a good deal lately, and in the coming winter we hope to improve them without necessarily making them heavier. Mr. T. H. Morrison, the musical director of the station, has had a life-long experience of orchestral concerts, and the fact that he is conducting the band at Colwyn Bay this season should be an indication to our listeners that he is well in touch with popular taste in music. This is a great asset in a musician of Mr. Morrison's standing and qualifications, and an absolutely necessary qualification for the post that he holds.

We also hope, during the coming winter, to strengthen the dramatic side of our programme. A station dramatic company is to be organised on a permanent basis, under the leadership of Mr. Victor Smythe, who is perhaps best known to Manchester listeners as, for a long time, our one and only announcer. Mr. Smythe has already scored many successes with dramatic performances in the studio, and, with other members of the staff at the station, he will now be able to devote more of his time and attention to this most important branch of programme work.

For Every Home.

In conclusion, may I say, with regard to the future generally, that it seems to me axiomatic that our efforts should be directed, to the exclusion of all other considerations, towards reaching every home in Great Britain at the earliest possible date. The power of broadcasting for the well-being of the people is so great that it seems to me imperative that we should keep this goal constantly before our eyes, and if we compare the million or so sets, licensed and unlicensed, which may be in use at this moment in the whole of the country, to the ten million or so of population concentrated within fifty miles of Manchester, we can get an idea of the ground which remains to be covered.

READERS' QUERIES.

Readers would render great assistance to the Editor and Technical Staff if they would refrain from sending in queries of a minor character such as have been answered again and again in the columns of POPULAR WIRELESS. At the present time our Queries Department is simply inundated with questions concerning the Unidyne and other circuits, and, as wireless experts are entitled to holidays as well as other people, it will be understood that delay may take place in answering the thousands of letters that pour in on us from week to week. Will readers kindly forbear from asking "stock" questions for a few weeks, and also pardon any little delay in the answering of highly technical problems involving much checking and calculation? Thank you!

PRACTICAL ADVICE FOR THE RADIO AMATEUR

By "VARIOTRON."

Sound advice concerning the elimination of unwanted signals, the improvement of reception, and on the acquirement of general efficiency is contained in this article.

IT is proposed to give a few hints which will enable the amateur to improve his existing set or to incorporate various refinements in the next set he builds.

Firstly, with regard to single-circuit tuners. These represent the simplest form of tuner, but are not selective, because of the damping caused by the valve or crystal which is shunted across the tuner. As a result, a lot of interference or jamming is experienced. This may be eliminated by the use of two tuned circuits, but also by lessening the damping in the aerial circuit.

Reducing Interference.

The rectifier is generally connected across the whole of the tuning inductance, which gives the maximum voltage changes to the rectifier. As the rectifier possesses resistance, damping takes place, and to obviate this the damping may be decreased by connecting the rectifier across a portion of the inductance, as in Fig. 1 (A). In the case of a variometer, the rectifier may be connected across either the rotor or stator, across that portion which is on the earth side, Fig. 1 (B).

This expedient results in a certain loss of signal strength, as the voltage variations across a portion of the inductance are not as great as the voltage variations across the whole of the inductance. This sacrifice in signal strength is well worth the increased freedom from interference which is obtained by this method.

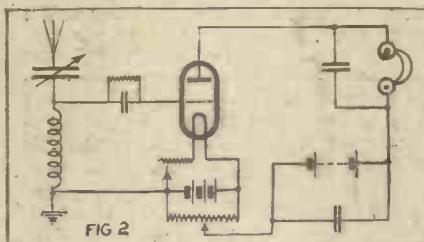
There are on the market nowadays some Dutch valves (which are "soft") at quite low prices, and no doubt many experimenters may have purchased one or more of them. They make quite good rectifiers, but for best results the filament current and H.T. voltage must be critically adjusted. In this connection a "vernier" filament resistance is useful. A useful method for critically adjusting the H.T. voltage is shown in Fig. 2. The negative end of the H.T. battery, instead of being connected directly to the L.T. battery, is connected to the arm of a potentiometer, whose winding is connected directly across the L.T. battery, as shown.

Stabilizing H.F. Stages.

The voltage of H.T. battery—which should be of the "tapped" type—is first approximately adjusted by means of the wander plugs, the final critical adjustment being obtained on the potentiometer. The

range of voltage variation obtained by the use of a potentiometer is equal to the voltage of the L.T. battery.

When valves are used as radio-frequency amplifiers, there is a tendency to oscillate, and a small positive potential is sometimes placed on the grids of the radio-



frequency valves to counteract this tendency. A study of Fig. 3 will show that the radio-frequency oscillations in the grid-filament circuit of the amplifying valve have to pass through a portion of the resistance of the potentiometer which offers a certain impedance to them.

To obviate this, it is a good plan to offer a path of relatively low impedance to these oscillations, and this is done by connecting a .005 mfd. fixed condenser between the earth end of the tuning coil and the negative pole of the L.T. battery, as shown in Fig. 3.

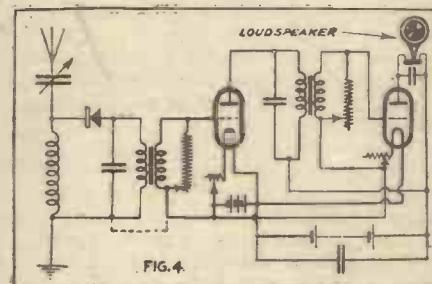
Improving Loudspeaker Signals.

If the sound issued by a loud speaker is harsh, the trouble is generally due to resonance in the L.F. transformer windings. Any make of transformer possesses resonance at some particular frequency, due to the inductance and capacity of the winding, but in a good make of

the band of frequencies which the transformer will normally have to handle. This resonance may be damped out by connecting a high resistance directly across the secondary winding. Different values of resistance should be tried, and it is a good plan to use one of the compression type of variable high resistances which have lately been marketed for use as grid leaks. The resistance is connected directly across the transformer secondary winding, as shown in Fig. 4,

Obviating "Howling" Troubles.

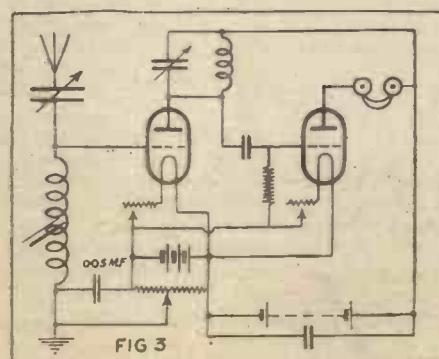
In order to produce a large volume of sound from a loud speaker, the ordinary valves in the L.F. amplifier are generally worked on a high plate voltage, or power valves are used. The addition of a third stage of note magnification is not often attempted, on account of the instability of such an arrangement. However, if proper precautions are taken to prevent howling, a three-stage note magnifier may



be used. The transformers should be placed well apart, and should be at right angles to each other.

The cores should be earthed, and it is advisable to employ earthed iron shields between each stage of the note magnifier. The primary windings of the transformer should be shunted by .002 mfd. fixed condensers. Iron-core choke coils connected between the primary and H.T. positive in each transformer, with between the secondary and grid of the valves small radio-frequency air-core chokes in series, increases the stability of the note magnifier and also increases the amplification somewhat.

Fixed condensers of the order of 1 mfd. are connected between the filament and the outer primary winding. The iron-core choke coils may consist of spark coil secondary windings, or the secondary windings of burnt-out L.F. transformers. They may be made by winding about 15,000 turns of 40 D.D.C. on a hollow former, 3 in. long and $\frac{1}{2}$ in. diameter, the core consisting of a bundle of iron wires. The air-core chokes may consist of 25 turns of 30 D.C.C. copper wire on a 1 in. diameter tube.



transformer the winding is designed to have its resonance point well away from the mean speech frequency.

However, there are several makes of cheap transformers on the market, in which the resonance effect takes place in

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WAVES AND STRAYS.

By HIGHAM BURLAC.

V.—THE MODERN BOY.

If we could take a trip on Mr. H. G. Wells' Time Machine, stepping out about 10,000 B.C.—say at Peckham—and examine the contents of the pockets of a small boy—Didn't have pockets then, you say? Right again,

Alfred. Your turn to listen in. No. Maybe any tampering with the apparel of a Stone Ager would have left him *au naturel*. He probably carried his stores inside his skin, a little to the left of his middle waistcoat button. But he must have had a little stone axe, surely, and a bit of string made of chewed mammoth sinew. I refuse to believe that a Stone Age boy had no string. It isn't human. Well, let's try again.

Mysteries of the Pocket

Stepping out again nearer Anno Domini 1924, say 1066—but don't forget that young Urg, the Stone Age boy, listened in, too. Oh, yes he did! When he put his ear—it was a large flappy one—to the ground, he could hear the bull bison debating with the buck bears on Peckham Rye, and so he scooted for the home cave with his little axe-handle all sticky to his hand and his little fur jacket all disarranged. But the lad of 1066! He would have string in his pouch, a scout's knife, half a manchet of oatcake, two round stones, several assorted vertebrae of a rabbit (*Lepus caniculus*)—though those words had not been adopted by the biologists of the period—and two or three (I incline to three) horseshoe nails.

All this desultory talk of pockets may seem like extracts from "Covert and Criminal Prestidigitation," the well-known primer for

pickpockets. But patience! All will be clear anon, as the man said when he tried to clean the windows with brick-dust and oil

A Great Theory.

Let us alight—patient Mr. Wells—at 1573, seize a human boy, invert same and examine the articles which jerk from his jerkin. Ha, string! What, more round stones, rounder than the 1066 fellow had? A better knife—two blades and the useless thing for extracting stones from a horse's hoof, which we have to pay extra for in knives to this very day. What, a bit of glass? Dangerous, my lad! Half a manchet of wheaten bread, a bit of wire, an inch of tinder, a candle's end (stolen from Fat Alice, the verderer's wife), and a bullet.

Nineteen twenty-four. Rainy, Ramsay and Wembley 1924. Hastily grabbing Boy Jones we invert him and mark the result. String, of course. Wire a good second. Brass terminals, bits of quartz (bless him, he is always thinking of crystal reception), a valve leg, an inch of ebonite, a telephone diaphragm, a flash lamp battery, and a small lens from a camera.

Now we have the basis of a great theory, which will confound us as utterly as any theory can. Arguing from pockets, from Urg with zero pockets to Boy Jones with seven pockets, we readily deduce that we are nowadays mighty fine fellows—advances of science, civilisation, knowledge, and all those un-eatable things. Urg heard the bull bison debating with the buck bear. We hear the nightingale singing electromagnetically and slightly distorted.

Young 1573.

To hear the bull bison debating with anything nowadays would cost you a dry trip to the National Park, U.S.A., and would not be really thrilling. Urg was thrilled because his juices ran; little glands in him sang, "Bear chops and bison steaks." Even young 1573 might have been ecstatic about the nightingale because it reminded him of the morrow's roast pie.

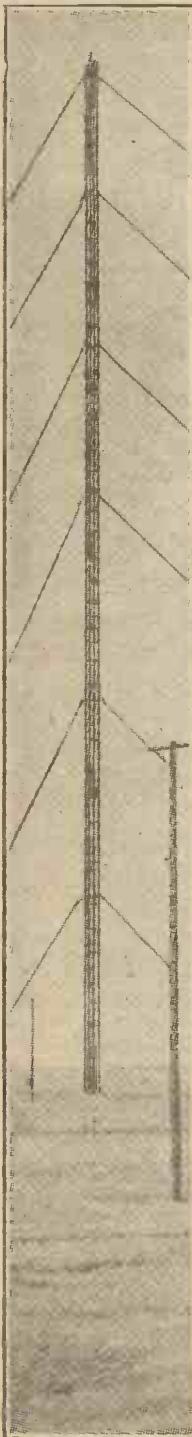
But we? This nightingale bother is the queerest artificiality—when one thinks about it—since Luigi Lippo Giovanni, lord of Verona, brought up fifty foundlings to coo

like wood pigeons. Ingenuous Lippo! He would eat of wood-pigeons and hear their love cries as well. Untold centuries have witnessed man's curious nosing into Nature's business and his fiddling experiments, his terrific powers of superstition and credulity, his blindness and his intermittent vision.

The Mighty Harp.

The nightingale has made his peculiar noise for—well, I suppose Noah had a pair; and yet Faraday laboured, Maxwell wrung his equations out of his grey matter, Hertz lived, and Lodge came amongst us, so that, *inter alia*, a certain bird, annoyed by a 'cello, might pipe out a few indignant notes and thus cause thousands of telephone diaphragms to vibrate. But this is a triumph of science, to fling the cry of a bird from Surrey to the Pyrenees.

We are funny folk. Here is the mighty harp of the aether, and we play the nightin-



One of the masts at the Giant Monte Grande Station, Argentina.

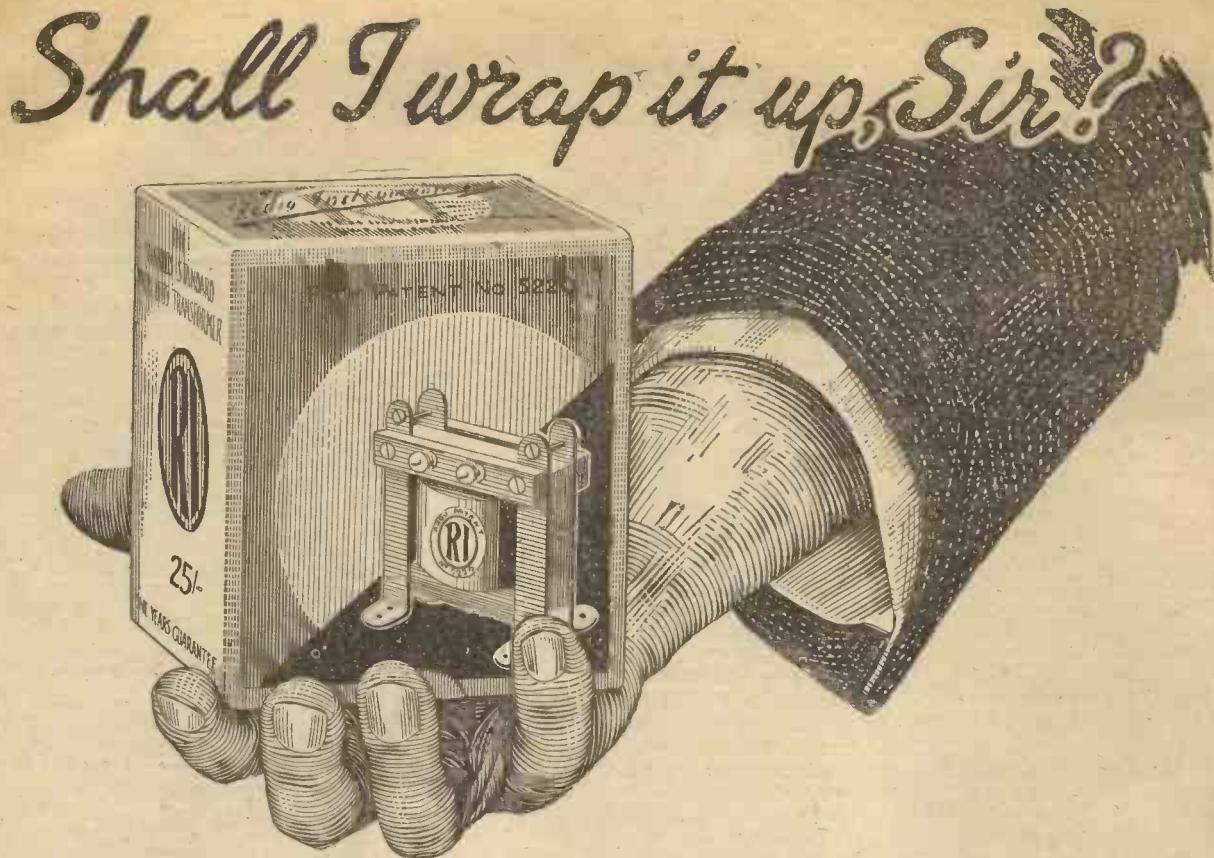


These two chimneys will support the aerial for the Belfast Broadcasting Station, which is now being built.

gale's song upon it—and the "Death Ray." A little acceleration, please, Mr. Wells.

The World's all Right.

The Time Machine leaps into 2024. There is a boy, looking like a wise old man. He was born with a working knowledge of valves, and his mamma, on the Riviera, looked at him in the cradle each evening by television. He is aged ten, has no hair, no teeth of his own growing, has eyeglasses like microscope lenses, and speaks in Universalese. Let us invert this person. No string! Bad, bad! What? A pocket spectroscope? A stainless steel, magnetic, super keen knife? A lump of radium in a leaden capsule? A pocket "death ray" and a folding "private flyer"? Not even a brandy ball or a bit of liquorice. Is there, then, no hope? Yes! Here is a cork, a nail, and a fourpenny magnet. Oh, eternal boy! Let him go. The world's all right, after all. What's that? Yes, Alfred, John Henry's talking to-night. Switch her on.



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VALVE NOTES.

EXTRA RESISTANCE FOR DULL EMITTERS.

By R. H. WATSON.

When dull-emitter valves are to be used with ordinary bright-emitter accumulators and filament resistances, certain modifications are necessary to ensure their safety; this article tells you how to make the necessary extra resistances.

MOST people nowadays either have tried dull-emitter valves or intend to try them. There is a certain amount of difficulty attached in fitting them to an ordinary set owing to their very small current requirements, standard rheostats not having sufficient resistance to enable them to cut down the supply to the necessary small amount.

It is desirable, therefore, to add an extra resistance in series with the rheostat, as shown in Fig. 1.

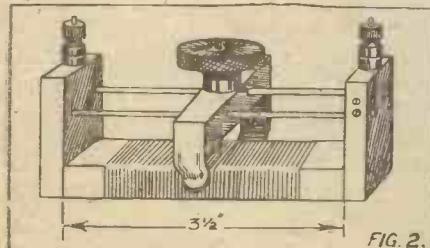
If we are going to use only one type of valve, and to employ always the same kind of accumulator or dry battery for heating its filament, the resistance may be fixed. But it is really better to make up a variable resistance, so that valves of all kinds may be used satisfactorily

with batteries of various makes. This resistance should be capable of cutting down the output of a 6-volt accumulator to suit the requirements of the valve with the lowest consumption.

Fig. 2 shows a type of resistance that is quite easy to construct and very satisfactory to use. The former consists of a piece of $\frac{1}{4}$ -inch ebonite, $3\frac{1}{2}$ inches long, upon which are wound 20 yards (roughly two-thirds of an ounce) of No. 28 enamelled Eureka resistance wire. The windings will occupy rather less than 3 inches if the turns are tightly put on, so that there will be a vacant space of about $\frac{1}{2}$ inch at each end of the ebonite.

Constructional Details.

The ends of the wires should be anchored by small screws. One may be cut off short, but two or three inches of the other should be left for making the connection that will be required for one of the terminals. Fig. 3 shows the details of the end pieces.



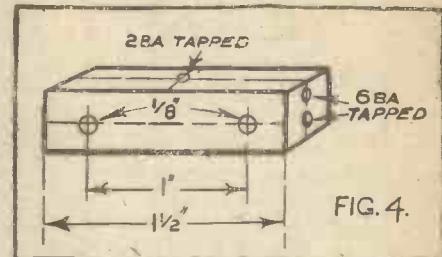
These are best made of $\frac{1}{2}$ -inch ebonite, though $\frac{3}{8}$ -inch or even $\frac{1}{4}$ -inch material will do quite well. They are $1\frac{3}{4}$ inches in height and $1\frac{1}{2}$ inches in width. The drawing shows how they are drilled.

The hole at the top is for the shank of a terminal; the two $\frac{1}{2}$ -inch holes situated $1\frac{1}{8}$ inches from the bottom are to take the parallel brass rods upon which the slider will travel. These rods are held in place by short 4 B.A. screws driven into the tapped holes seen in the sides of the end-pieces. A quarter of an inch from the bottom are two 4 B.A. clearance holes, through which pass screws which secure the end-pieces to the former (Fig. 3).

The Necessary Connections.

In Fig. 4 is seen the drilling lay-out of the slider, which is made from a $1\frac{1}{2}$ -inch length of $\frac{3}{8}$ -inch or $\frac{1}{2}$ -inch square brass rod. There are two $\frac{1}{2}$ -inch holes 1 inch apart for the guide rods, and in the top edge there is a 2 B.A. tapped hole for the screw which will fix in position a standard ebonite knob, such as is used for variable condensers. At either end are made two 6 B.A. tapped holes for the screws which will secure the contact arms. If, however, a drill and tap of this size are not available, the arms may be soldered on. The arms themselves are made

With its help we can tell approximately the amount of resistance that is being thrown into circuit with the slider in any position. We can thus use the device to regulate any dull-emitter valve worked from any source of supply with a potential up to $6\frac{1}{2}$ volts. All that we have to do is to calculate the filament resistance of the



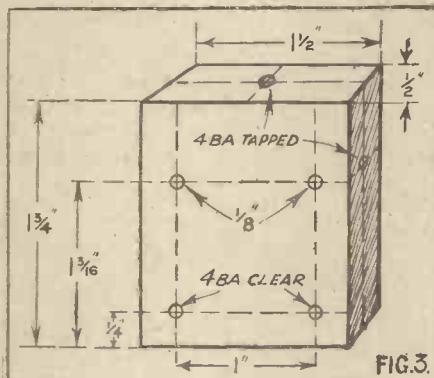
valve and to adjust its current requirements. We will then set the resistance before switching on to approximately the correct position.

Calculating Required Resistances.

Suppose, for example, that we wished to work a Weco valve from a 4-volt accumulator, we should proceed as follows: The maker's figures for his valve's consumption are .25 ampere at 1 volt; the resistance of the filament is therefore $\frac{1}{25}$ or 4 ohms. To obtain a current of .25 ampere from a 4-volt battery we require a total resistance of $\frac{4}{.25}$ or 16 ohms. As the filament provides 4 of these, 12 more are needed. If we set the extra resistance at 10 ohms, the standard rheostat in series with it should enable us to control the filament to a nicety.

Though it is possible to use a resistance of this kind by itself for filament control, it is always desirable to wire a standard 5 or 6 ohm rheostat in series with it. The reason is that owing to the small gauge of the wire used for the windings and to the length needed to go once round the former, each turn has a resistance of almost $\frac{1}{2}$ ohm, which means that very fine adjustments are not possible.

The ordinary rheostat, however, each of whose turns represents only a very small fraction of an ohm, will provide a sufficiently fine adjustment for all ordinary purposes.

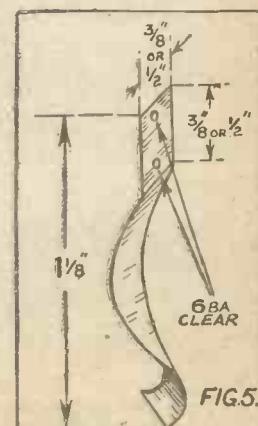


from springy sheet metal and are bent to the shape shown in Fig. 5.

Two perfectly straight $4\frac{1}{2}$ -inch lengths of $\frac{1}{8}$ -inch round brass rod having been cut, the apparatus may now be put together as shown in Fig. 2. To one terminal is connected the end of the wire left over from the windings; the other is connected to one of the brass guide rods by means of a wire fixed to it and to one of the setscrews.

Easily Calibrated.

We can calibrate the rheostat approximately in the following way: Three inches of windings have a total resistance of 80 ohms. Hence the resistance of each inch is approximately 27 ohms, and each $\frac{1}{10}$ inch is equivalent to a little more than $2\frac{1}{2}$ ohms. A scale of white celluloid can be marked off in ink in divisions equal to $2\frac{1}{2}$, 5, and 10 ohms from zero to 80 ohms. This may be fixed between the endpieces so that it rests upon the upper side of the slider.



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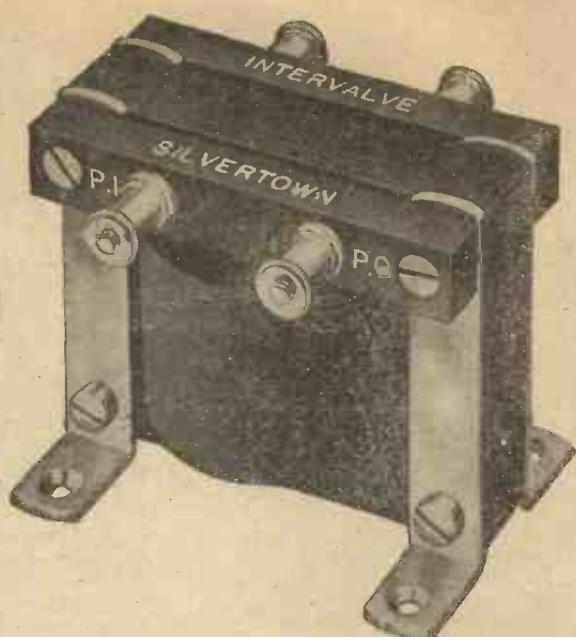
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WIRELESS IN FRANCE.

THE CRAZE FOR SELECTIVITY.

By OUR PARIS CORRESPONDENT.

Our correspondent gives details in this article of some interesting experiments made by a well-known French radio experimenter whose work has created a deep impression in French wireless circles.

THE radio sets in general use in France had until recently one principal fault as compared to those of the fans across the Channel—very few of the European ones could by any stretch of the imagination be termed acutely selective. This was due in part to a tardy development of the multi-valve set, and in part to

tuning for all wave-lengths from 25,000 metres down to 250.

Circuit Connections.

Each coil corresponds to a variable condenser of vernier adjustment. The first circuit controlled by the first coil and condenser is the primary circuit, the second is the secondary circuit, and the third is the feedback or regenerative. The feedback circuit is tuned by a variable condenser which allows for regeneration, as desired up to a maximum efficiency.

The first circuit is mounted in such fashion that the variable condenser can be put in series or in parallel in the antenna. Special terminals allow also for the use of a loop antenna if desired or found practicable.

The amplification

with a seven-valve set is obtained as follows: The first valve is mounted resonance-coupled; the second is a radio-frequency amplifier coupled with the third, which works as a detector by means of a special patented coil, which gives it excellent operating effects from 100 metres upwards. In the eight-valve apparatus two similar inductances are mounted in special fashion with one control contact switch which couples the third and fourth valves, which is in this case mounted as the detector.

In the seven-valve set the two valves which follow the detector are audio-frequency, with transformers of especially high efficiency. The two last valves are mounted in a circuit entirely separated from plate and filament, and are amplifiers of great strength. In the eight-valve set the four last valves are mounted in the same way. On the latter, for example, the amateur can receive on four, five, or seven valves; or on four, five, six, or eight valves. This set will pick up American stations

under ordinary conditions without the use of the reaction; and England and other European stations can be often heard on the loud speaker in the same way.

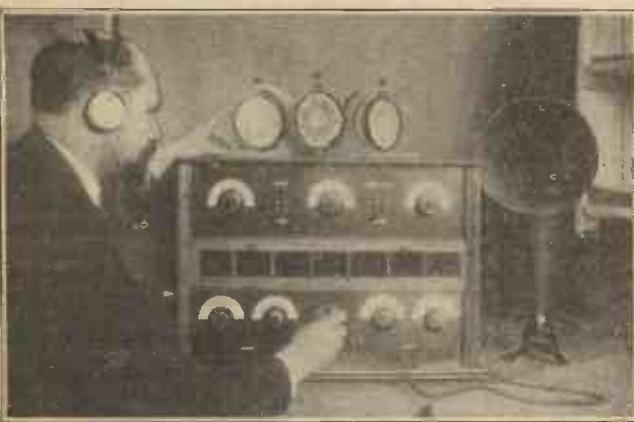
The heating of the valves is regulated by a separate vernier adjustment rheostat for coupling, audio-frequency, detectors, and radio-frequency. The valves of the set are in the centre of the panel, and hidden from view by opaque glass windows—one square for each valve. This shades the operator's eyes from the sharp glare of the old-style valve, and at the same time enables him to watch them carefully.

M. Liebert is enthusiastic about the interest which his set is creating, and looks forward to many important developments in the radio field in France this year, as he feels confident that the public is becoming more interested, and that greater care is being taken by the manufacturers to build more satisfactory and well-constructed sets.

NOTES FROM PARIS.

From Our Own Correspondent.

A NOTHER mystery post has put in an appearance in France, this time talking in Italian instead of English, according to "Paris-Radio," weekly wireless journal. He is heard on about 392 metres, especially in the north of France.



M. Liebert tuning his seven-valve super-phal receiver.

the high cost of such sets and delicacy of adjustment.

With the advent of the low consumption valve, however, the French manufacturers have begun to work out designs for the larger sets, although even yet they have not brought these apparatus down to the meagre pocket of the average radio fan. One interesting experiment that was brought to the fore recently, and which has since been more highly developed, is the seven and eight-valve (old style 6-volt) super-phal, built by an electrical engineer of some note, M. Georges Liebert. (M. Liebert is the brother of the French Minister Plenipotentiary in New York, Gaston Liebert.)

The Tuning Coils.

This set has several interesting and novel features, being primarily one of the largest receiving sets built commercially in France. One original system is the mounting of the tuning inductance, of very low capacity, shown in the photographs on top of the apparatus. These tuning coils are of the spider-web variety without mounting, but contained in wooden boxes covered with glass.

They can be coupled or uncoupled by means of the brackets in which they are supported, as these brackets swing backwards and forwards in a circle on pivots, and can be separated or closed together according to the tuning desired. The coils are also on axes, so they can be turned in any direction desired. This permits of a very close



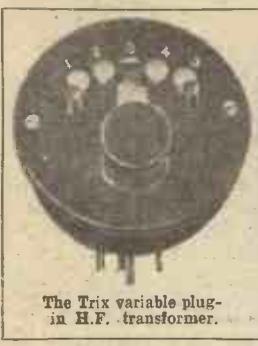
Putting the finishing touches on a seven-valve super-phal receiver.

A new broadcasting station near Copenhagen (Denmark) will soon be opened, it is reported from that country. This station, under the Radio Club of Copenhagen, will start tests on wave-lengths between 300 and 500 metres, and also on 900 metres.



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

MESSRS. ERIC J. LEVER of 33, Clerkenwell Green, London, E.C.1, have sent us a range of the well known "Trix" products for test, some of which are photographically illustrated on this page. That which impresses us most in connection with these instruments is the evidence of a high standard of workmanship, both electrically and mechanically, which is maintained. One has "no time" for the instrument of



The Trix variable plug-in H.F. transformer.

something worth consideration. There is far too much shoddy wireless apparatus on the market, but it is in the hands of the wireless amateur to create a demand for better stuff, even if he has to pay a few shillings more; it is always worth it.

Perhaps the most interesting of the above mentioned items is the Trix anode inductance, with variable magnetic reaction. Now although we have always advocated plug-in coils as being preferable to tapped coils for anode tuning over wide ranges of wave-length, we must admit that the Trix anode inductance is a very efficient little instrument, and functions admirably between its stipulated 200 to 4,000 metres, employing a .0002 mfd. variable condenser and a fixed .0003 mfd. condenser which was used, in addition, on the higher waveband. Soundly constructed and with a well finished appearance, we consider the Trix anode inductance with reaction quite a good investment at 31s. 6d.

Another type of Trix anode inductance, in this case without reaction, is before us as we write. This one is designed to tune between 300 and 3,500 metres with a .0003 mfd. variable condenser. It is provided with eight tappings, contact being made with velvety smoothness by a revolving arm on the base. Judging by its appearance, it could be dropped on to a concrete floor and even trodden on without impairing its working efficiency, whilst, as with the other Trix products, its finish can be described as "Al." On test, in conjunction with the Trix anode inductance with reaction, in an experimental five-valve circuit, results little short of perfection were obtained, and at 18s. 6d., this, too, is an item we can well recommend to the attention of our readers.

Another point in favour of these Trix inductances is that they are fitted with screw terminals of a most sensible size.

We now come to the Trix tapped high-frequency transformers, with ranges of 300 to 3,500 metres when a .0003 mfd. variable condenser across the primary is used. Two types are supplied, the one for plugging-in, at 17s. 6d., and the other for panel mounting, at 19s. 6d., the latter being supplied with four clearly marked terminals. The first mentioned, we understand, can be supplied wound in either direction to suit any type of set made to use plug-in H.F. transformers. Running through the specification supplied we cannot find, after carefully examining and testing both these instruments, anything in the nature of exaggeration, and the fact that the makers guarantee these instruments is worthy of commendation. Undoubtedly such firms whose confidence in their productions enables them to do this are adopting the only course to ensure continued prosperity in these days of keen competition. Messrs. Lever have also sent us a sample of the Trix plug-in H.F.

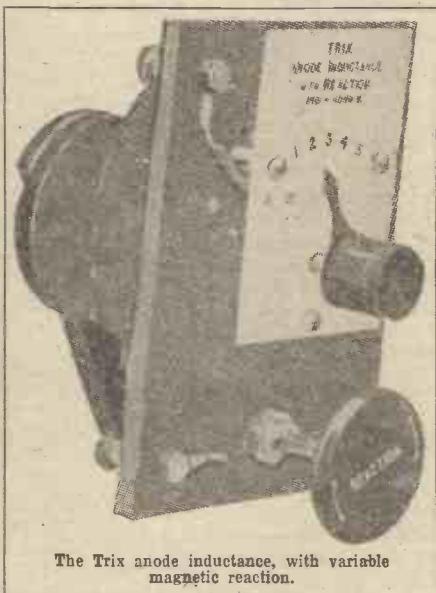
own particular classes as high as any of the other first-class components reviewed on this page.

"Britezite," a synthetic crystal produced by the British Central Electrical Co., Ltd., of 6 and 8, Rosebery Avenue, London, E.C.1, is well deserving of our recommendation. The samples sent us proved to be both sensitive and stable, two essential factors for a crystal if it is to command a successful sale in the almost overloaded market of to-day. Certainly Britezite is one of the most efficient we have yet had brought to our notice, although we believe we have seen it before supplied as standard in a certain well-known crystal set.

Wireless Apparatus, Ltd., proprietors of the well-known "Vertex" aerial, have transferred their offices to more commodious premises at 35, Panton St., Haymarket, London, S.W.

Undoubtedly one of

the most interesting and useful devices is the "Easifix" four-way multiple connecting cable. It is an item that should be brought to wide notice. The battery connecting wires leading to most valve receivers are an eyesore, and, apart from the untidy appearance they generally present, it is seldom that they possess really clean ends capable of making efficient contact. Failure to do this produces mild atmospherics. The multiple cable mentioned above, and which is manufactured by Messrs. Ward & Goldstone, of Frederick Road, Manchester, consists of four coloured, heavily insulated, flexible leads, arranged in most useful lengths. The ends of the H.T. leads are provided with wander plugs, spade terminals being fitted to all the other ends. The sample submitted to us for test proved both electrically and mechanically efficient.



The Trix anode inductance, with variable magnetic reaction.

transformer. A nice solid little job it is, too, and where it scores over any other type we have had brought to our notice is that it is provided with a large milled knob. An almost obvious refinement this, but one that has seemingly escaped the notice of other manufacturers.

Our general impression of Trix products after a careful series of practical tests is that they can be fully recommended to our readers as moderately priced first-class instruments, which set a standard in their



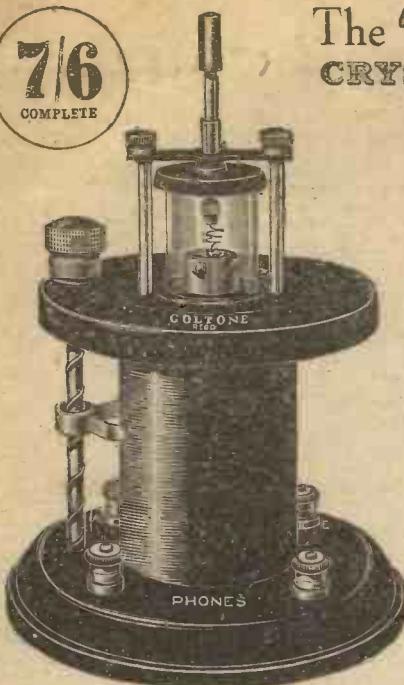
The Trix variable anode inductance.

A new type of wander plug manufactured by Messrs. A. H. Hunt, Ltd., of Tunstall Road, Croydon, a sample of which is just to hand, is certainly well worthy of attention, inasmuch as it is so constructed that the lead passes through the top of the small ebonite barrel, and is gripped by screwing this latter down. Although it is an improved model, the price remains the same at 6s. per dozen.

We have received for test two of the new transformers (H.F.) which are being placed on the market by the Peto-Scott Co., Ltd. Externally the transformers look very well, and upon test the results are certainly in keeping with the appearance.

We are given to understand that for two or more stages of H.F. amplification these transformers are obtainable ready "matched," so that single control condenser tuning can be utilised if desired.

7/6
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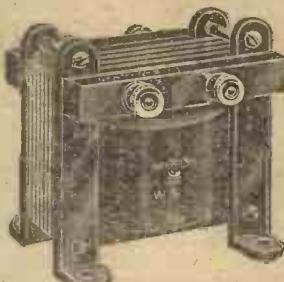
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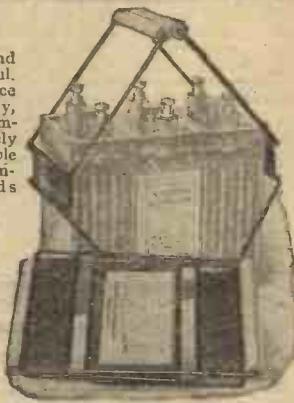


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The Editor will be pleased to consider articles and photographs dealing with all subjects appertaining to wireless work. The Editor cannot accept responsibility for manuscripts and photos. Every care will be taken to return MSS. not accepted for publication. A stamped and addressed envelope must be sent with

every article. All contributions to be addressed to The Editor, POPULAR WIRELESS AND WIRELESS REVIEW, The Fleetway House, Farringdon Street, London, E.C.4. All inquiries concerning advertising rates, etc., to be addressed to the Sole Agents, Messrs. John H. Lile, Ltd., 4, Ludgate Circus, London, E.C.4.

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 specialties described may be the subject of Letters Patent, and the amateur and trader would be well advised to obtain permission of the patentees to use the patents before doing so.

PATENT ADVICE FOR READERS.

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

wish to construct this type of set, and should very much like to know if a circuit is likely to appear in "P.W." soon.

The inventors are still experimenting with the Unidyne and crystal detectors, and whilst some very encouraging results have been obtained with this class of circuit, there are still certain difficulties to be overcome, mainly owing to the high resistance of the crystal.

This is particularly noticeable when amplifying direct from a crystal receiver, but in dual circuits this has been largely overcome and a circuit giving excellent results on these lines will be published in "P.W." very shortly.

B. B. (Bermondsey).—I have the following components on hand: Two .0005 variable

condensers, two fixed condensers (.001 and .002), L.F. transformer (ratio 4-1), and plug-in coils (50, 75, and 100 turns). I wish to make a one-valve reflex set, employing all or most of these components. Can you supply a pictorial diagram of circuit?

Pictorial diagrams and descriptions of several circuits of this kind appeared in "P.W." No. 106, under the heading "One Valve and a Crystal." Back numbers of "P.W." are obtainable from the Amalgamated Press (1922) Ltd., Back Number Dept., Farringdon Street, E.C.4, price 4d. each, post free.

W. H. M. (Golders Green).—In the "P.W." ultra crystal set, does it make any difference to signal strength if the aerial is taken to the "tens" switch and the earth leads to the "units," instead of reversing their respective positions?

Generally it is absolutely immaterial in which direction the connections are made, but occasionally one way seems to give rather better results than the other, so reversal may be tried if desired.

A. W. (Coleford), R. Brown (no address given), and many others.

In sending your inquiries without stamped addressed envelope you are disregarding the rules of the Query Department. Your inquiries are not suitable for answer in these columns, and must, therefore, be repeated with due regard to the rules if an answer by post is desired.

R. R. C. (Ilfracombe).—I have lately been learning Morse and listening-in to shipping on 600 metres, but although I can now read most of what is said, some of it appears to be in a three-letter code, which I do not understand. Certain of the code-groups (such as QRM) are often used, and others infrequently, but they all appear to begin with the letter Q. What code is this, and what do the various groups mean?

The code is that laid down by the International Radiotelegraphic Convention for the use of ships' operators and shore stations. It covers most of the

(Continued on page 112.)

Questions and Answers!

E. W. B. (Willesden, N.W.10).—When will "P.W." publish a one-valve (H.F.) and crystal set on the Unidyne principle? I

Ask to see the TrueMusIc JUNIOR Loud Speaker.

Before you decide on the Loud-speaker for your Set, see, and listen to a TrueMusIc Junior.

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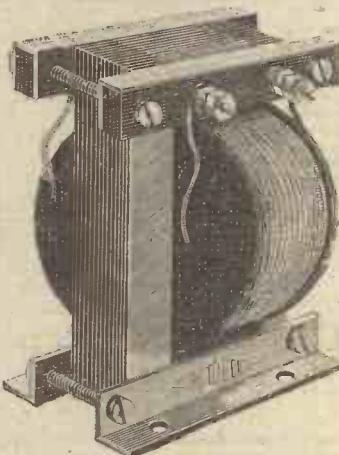
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IN deference to the wishes of the Marconi Co. we are discontinuing the use of the name "MARKONITE." This well-known crystal will in future be labelled

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"The sample we had was very satisfactory, Newcastle, over 50 miles, Bournemouth, 300 miles, and Poldhu, test transmissions to Sydney, have been received on a single crystal set with "MARKONITE."

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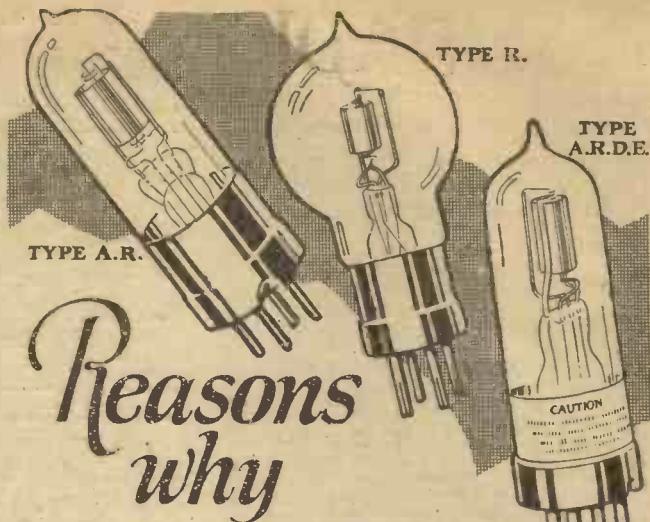
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TYPE R.

TYPE A.R.D.E.

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THIS Valve has been specially designed for operating on low plate voltages, and is especially suitable for amateur use. It is compact, silent in working, and gives high amplification.

Plate Voltage	..	..	..	30-80	PRICE
Filament Voltage	..	..	..	4	
Normal Filament Current	..	..	0.75 ampere		
Overall Diameter (approximate)	..	..	35 m/m		
Overall Length (approximate)	..	..	108 m/m		
Cap	..	..	4 prong		EACH

TYPE R.

THIS Valve, which has a vertical filament, grid and plate, is mounted in a spherical bulb. It has essentially the same electric properties as the A.R. Valve, but the grid has a greater number of turns, and is also of smaller diameter, which results in a somewhat greater amplification, with the same plate and grid voltages, than is obtained with the A.R. Type Valve.

Plate Voltage	..	..	..	50-100	PRICE
Filament Voltage	..	..	..	4	
Normal Filament Current	..	..	0.75 ampere		
Overall Diameter (approximate)	..	..	55 m/m		
Overall Length (approximate)	..	..	110 m/m		
Cap	..	..	4 prong		EACH

TYPE A.R.D.E.

THE Ediswan Amateur Receiving, Dull Emission (Low Temperature) Valve, Type A.R.D.E., has been specially designed to meet the demand for a valve that will function at very low filament volts, and at the same time have an extremely long life. It is far superior to any valve at present on the market.

Filament Volts	..	..	..	1.8-2.0	PRICE
Filament Current	..	..	..	0.30 ampere	
Anode Volts	..	..	..	20-50	
Overall Length, including Pins	110 m/m	
Overall Diameter	29 m/m	
Cap, standard	4 pin	

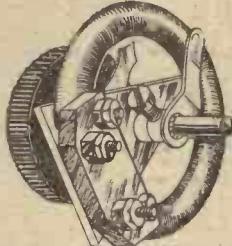
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These points place them beyond all others in the eyes of wireless experimenters and constructors. But their uniform operation and all-round superiority of design, coupled with their low price, gives them absolute supremacy. Make sure of the soundness of your wireless components, and your set will make sure of sweet sound.

"CLIMAX POINTS."

One hole fixing.

Solid rigid coil.

Perfect cooling.

Insulation stands high temperatures and voltages.

Unbreakable bakelite terminal bar.

Large and well spaced terminals.

Steel grub screw fitting.

No lock nuts to work loose.

Riveted brush with perfect brush contact.

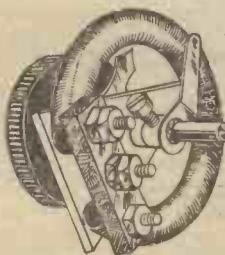
Takes any panel up to 3" thick.
Bakelite knob with blind brush will not work loose.

Price

Climax Universal pattern rheostat for bright or dull emitter valves, 30 ohms - - - - 4/6

For power valves, 6 ohms - - 3/6

Climax Potentiometer, 200 ohms 6/-



Leaflets on Application

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QUESTIONS & ANSWERS.

(Continued from page 110.)

stereotyped questions and answers between ship and shore stations by means of its three-letter groups. Most of the groups have two meanings—a question and its answer, and the inclusion or omission of the ? sign indicates in which way the letters are to be understood.

The following are the most commonly used code groups, with their meanings, but a full list is obtain-

list of broadcasting stations published in a recent issue has been compiled from information supplied by the authorities concerned, but even then some of the information has had to be corrected before publication owing to the frequent alterations.

* * *

R. A. O. (Stalybridge).—What are the connections for a one-valve crystal circuit, using .001 and .0003 variable condensers? As I am not very sure of ordinary diagrams, will you please show the pictorial kind? Can tapped coils be used for the inductance in aerial or anode circuits?

LIST OF ABBREVIATIONS TO BE USED IN RADIOTELEGRAPH TRANSMISSIONS.

Abbreviation.	Question.	Answer or Advice.
----- (CQ)		Inquiry signal employed by a station which desires to correspond.
----- (TR)		Signal announcing the sending of indications concerning a ship station (Article XXVIII).
----- (I)		Signal indicating that a station is about to send with high power.
----- (T)		This station is
----- (N)		The distance between our station is nautical miles.
Q R A	What is the name of your station ? ..	My true bearings are degrees.
Q R B	How far are you from my station ? ..	I am bound for
Q R C	What are your true bearings ? ..	I am coming from
Q R D	Where are you bound ? ..	I belong to
Q R F	Where are you coming from ? ..	
Q R G	To what company or line of navigation do you belong ? ..	
Q R H	What is your wave-length ? ..	My wave-length is metres.
Q R J	How many words have you to transmit ? ..	I have words to transmit.
Q R K	How are you receiving ? ..	I am receiving well.
Q R L	Are you receiving badly ? Shall I transmit 20 times ----- so that you can adjust your apparatus. ..	I am receiving badly. Transmit 20 times ----- so that I can adjust apparatus.
Q R M	Are you disturbed ? ..	I am disturbed.
Q R N	Are the atmospheres very strong ? ..	The atmospheres are very strong.
Q R O	Shall I increase my power ? ..	Increase your power.
Q R P	Shall I decrease my power ? ..	Decrease your power.
Q R Q	Shall I transmit faster ? ..	Transmit faster.
Q R S	Shall I transmit more slowly ? ..	Transmit more slowly.
Q R T	Shall I stop transmitting ? ..	Stop transmitting.
Q R U	Are you ready ? ..	I have nothing to transmit.
Q R V	Are you busy ? ..	I have nothing for you.
Q R W		I am ready. All is in order.
Q R X	Shall I wait ? ..	I am busy with another station (or with please do not interrupt).
Q R Y	What is my turn ? ..	Wait. I will call you at o'clock (or when I want you).
Q R Z	Are my signals weak ? ..	Your turn is No.....
Q S A	Are my signals strong ? ..	Your signals are weak.
Q S B	Is my tone bad ? ..	Your signals are strong.
Q S C	Is my spark bad ? ..	The tone is bad.
Q S K	Is the spacing bad ? ..	The spark is bad.
Q S L	Is the last radiotelegram cancelled ? ..	The spacing is bad.
Q S M	Have you got the receipt ? ..	The last radiotelegram is cancelled.
Q S O	What is your true course ? ..	Please give a receipt.
Q S P	Are you in communication with another station (or with) ?	My true course is degrees.
Q S Q	Shall I signal to that you are calling him ?	I am in communication with (through the medium of).
Q S R	Am I being called by ?	Inform that I am calling him.
Q S T	Will you dispatch the radiotelegram ? ..	You are being called by
Q S U	Have you received a general call ? ..	I will forward the radiotelegram.
	Please call me when you have finished (or at o'clock). ..	General call to all stations.
		I will call you when I have finished.

EXAMPLES.

Station						
A	Q R A ?		What is the name of your station ?			
B	Q R A Campania		This is the Campania.			
A	Q R G ?		To what company or line of navigation do you belong ?			
B	Q R G Cunard. Q R Z		I belong to the Cunard Line. Your signals are weak.			
A	Station A then increases the power of its transmitter and sends :					
B	Q R K ?		How are you receiving ?			
A	Q R K 80		I am receiving well.			
B	Q R C 62		The distance between our stations is 80 nautical miles.			
			My true bearings are 02 degrees, etc.			

able in the Postmaster General's Handbook for Wireless Telegraph Operators, obtainable from H.M. Stationery Office, London.

* * *

R. D. P. (Bootle) gives particulars of a concert heard recently between 350 and 400 metres, and asks if we can give the name of the transmitting station ?

We regret that we are unable to identify the station from the particulars given. There are a number of new Continental stations starting up on these wave-lengths, particulars of which it is impossible to obtain yet. Many of the stations vary not only in time of transmission, but in wave-length also, and some of the tests are purely experimental, with the object of finding out best wave-lengths, etc. The

Pictorial diagrams of several good reflex circuits recently appeared in "P.W." No. 106, under the title "One Valve and a Crystal." Copies of this number may now be obtained from The Amalgamated Press, Back Number Department, Bear Alley, Farringdon Street, E.C. 4, price 4d. each, post free.

In the article in question the condenser values are both given as .0005, but it is explained that other values can often be used to advantage. This applies to the values that you wish to use, and it will be found that very good aerial tuning can be obtained with a .001 variable condenser, and that with a .0003 in the anode circuit results are rather superior to those obtained with .0005 mfd.

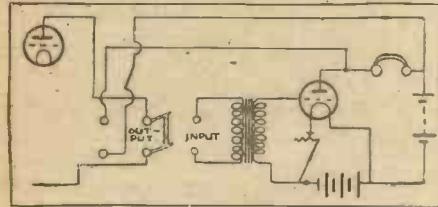
A diagram showing the connections for tapped coils is included amongst those given.

(Continued on page 113.)

RADIOTORIAL QUESTIONS & ANSWERS.

(Continued from page 112.)

R. A. G. (Winchester).—I have a 3-valve set (H.F., detector, and L.F.), from which I get excellent long-distance results on 'phones, but I frequently wish to disconnect the last valve when signals are loud, so as to receive on H.F. and detector only. What are the connections to employ a double-pole double-throw switch for this purpose, and how can grid biasing cells be connected to the last valves only?



The connections for a double-pole double-throw switch to cut out the final L.F. stage are as shown in the accompanying diagram. It will be noticed that when the switch is thrown over to the left-hand position the 'phones are placed in the plate circuit of the preceding valve. No grid bias is shown in the diagram, but one or more dry cells are generally connected in series for this purpose and joined to the lower end of the transformer secondary. The positive pole of the cells is connected to the L.T. negative side, so that the grid is permanently negative with respect to the filament.

K. D. R. (Ilfracombe).—I should like to make up my first set for myself, but I am not sure from the articles which Unidyne would be the best one for my purpose. It would have to be a one-valve set, and I am undecided whether to amplify X from a crystal, or to use the circuit shown in "P.W." 103 (detector with reaction), or that in 112 ("Simplified One-Valve Circuit"). Is a transformer necessary, and if so, should the ratio be 10 to 1 or about 5 to 1?

We recommend the simplified one-valve set described in "P.W." 112. This set does not need a transformer, and has very simple connections.

We hope very shortly to publish a pictorial diagram showing components and the connections between them, for the benefit of those who find difficulty in following out the theoretical diagrams.

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

In the early experiments a 10 to 1 ratio transformer was used, as described in "P.W." 103. Subsequently improvements were made, and the circuit was simplified, so that the necessity for this transformer completely disappeared.

(The simplified circuit is the one we recommend you to use, and it is described in "P.W." 112.)

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

T. S. P. (Portsmouth).—Will a good variometer do the same work at a plug-in coil and variable condenser in any part of a circuit?

In a general sense a variometer can be employed for tuning in exactly the same way as a coil in conjunction with condenser. Nevertheless, certain "freak" circuits use the tuning condenser as a blocking condenser to stop H.T. shorting, so care must be taken not to attempt to replace such an arrangement by a variometer.

For reflex circuits and ordinary straight circuits they are quite O.K., but they have certain slight disadvantages as regards flat tuning, the application of reaction, etc.

T. H. S. (Mortimer).—What are the connections for a two-valve Unidyne (H.F. and Det.), and also for a single tube Unidyne note—magnifier?

The H.F. and Det. connections are as described in "P.W." 107 and 108, and it is hoped to publish a wiring diagram of this circuit (and also of the Detector and L.F.) in an early issue.

Particulars of the L.F. amplifier appear in "P.W." 104 (see also "P.W." 109, when connections for 5-pin valves were described).



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It is no more consistent to use an arched filament with a straight anode than a hood shaped anode with a straight filament—either

permits an obvious leakage of the electron stream which is at once apparent to the eye. The whole point of curving the filament is to make it conform to the interior contour of the Grid and Anode.

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L.F. use)

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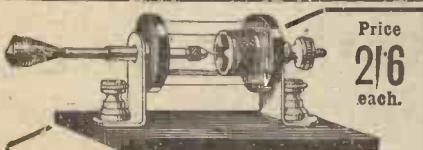
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B.B.C. ACTIVITIES.

The Editor, POPULAR WIRELESS.

Dear Sir,—what has become of the alternative programmes we were promised, either off the 2 L.O. aerial or from the high-power station? We now hear that the latter, if permanent, will be within 40 miles of London, and will continue to relay the latter.

At present all the relay stations give the London programmes, as does 5 X.X. also, and the seven other main stations now relay them for two evenings out of every week, which means that they have no artists to engage or programmes to arrange for those evenings.

We are told that 2, Savoy Hill is to be extended to make room for "the rapidly increasing staff," but one wonders why this rapid increase should be necessary, if the B.B.C. are curtailing their activities instead of extending them, as far as programmes are concerned. What, for instance, does an "Artistic Director" do, apart from giving readings of his own works, and occasionally forestalling the announcer in introducing a speaker? Then, too, why do we need a director of plays, whose performers are not even word perfect—a thing one would expect from any amateur dramatic society?

If we are being worked up to a policy of "one programme for all, and take it or leave it," let us hope that the P.O. will hand over some of the also "rapidly increasing" licence money to some other firm, so that we may have an alternative choice of what we shall hear. No one wants the confusion of American broadcasting, but it seems that a little competition would be a very good thing.

Yours truly,
W. JOHNSON.

26, Bolingbroke Road, W. 14.

A HINT TO MANUFACTURERS.

The Editor, POPULAR WIRELESS.

Dear Sir,—As a regular reader of your splendid publication, POPULAR WIRELESS, I was very pleased to see that you advocate making up panels in the American style, as demonstrated by the Unidyne Sets. Personally, I believe it is the only sensible way of making up a valve set.

Although English apparatus is by far the best in quality of workmanship, general design, and efficiency, our manufacturers seem singularly behind the times in certain respects, compared with most American firms.

It is only necessary to run through the advertising columns of any American wireless publication, such as "Radio Broadcast," to find many refinements and useful accessories that are impossible to obtain at present unless sent for direct. As, for instance:

Wave traps ready for attaching to any existing set;
Push-pull transformers for note magnifiers;
Complete H.F. units for adding to crystal sets, etc.;
Condenser dials with reduction gear self-contained;
Variable condensers with die cast rotors and vernier at a competitive price;

A valve socket mounted on sponge rubber, which in turn is mounted on a bracket at right angles for attaching to vertical panel, etc., etc.

How many English makers fit 'phone plugs and jacks, and yet it is by far the simplest method of connecting in 'phones.

Why are nearly all our rheostats and similar controls fitted with such uninteresting and stereotyped knobs and dials, compared with Yankee examples?

Incidentally, how is it that American valves are nearly all the same price for both bright and dull emitters, whereas ours differ by as much as 17/6?

Of course, American manufacturers have not got it all their own way. I think we can show them a thing or two in respect of fixed high resistances and fixed condensers.

These are, after all, only small details, but I think there is money in them for the person who puts them on the English market.

If you care to publish this letter you are quite at liberty to do so. With best wishes for the further success of your excellent paper.

Yours faithfully,
A. T. SINCLAIR,
21, Graham Road, Rugby.

A "NOVEL CIRCUIT."

The Editor, POPULAR WIRELESS.

Dear Sir,—Re the "novel circuit" in "Correspondence" column of POPULAR WIRELESS, August 16th. I think that this circuit is the best on the "market," or if it is not on the "market" it ought to be. I have made up several sets up to four valves, but I think for a straightforward single valve, it beats the lot, including the famous reflex circuits. I had the set made up and working last Saturday night, and with about 80 volts H.T. and four volts L.T. was giving splendid volume on an amplion (A.R. 110), and can be heard over 30 feet from the loud speaker, with perfect clearness and splendid tone. I find that the most critical part for tuning is the filament resistance, for which I have substituted a "microstat," which does it to a nicely. On Tuesday night I got Glasgow, but kept losing him trying to cut out the Morse; but, however, I shall do some experimenting with the circuit and may eventually come across a few other "stunts." I do not require it any louder in the living room, as it is the "natural voice," and comfortable for hearing at the other end of the room, and I may say that I am not good at hearing. The writer of the letter with this circuit is to be congratulated on its simplicity and effectiveness. The components I use are: Moorhead R valve; .001 variable condenser; .0003 variable condenser; Watmel variable grid leak; basket coils, and microstat filament control.

Hoping to hear further of this circuit.

I am, yours faithfully,
W. J. HUTCHINGS,
6, Kenbury Gardens, Camberwell, London, S.E.5.

THE B.B.C. PROGRAMMES.

The Editor, POPULAR WIRELESS.

Dear Sir,—I trust the B.B.C. will make no alteration in its London broadcasting programme, nor its announcer cease giving his very kind and courteous introductions to the pieces and movement announced, in consequence of the individual opinion expressed—none too courteously—by E. R. M., of Thornton Heath, in your issue of August 30th.

After all, it is only an *individual* opinion, and so rudely expressed, as to suggest grave doubts of its value. Before programmes are altered, it would be wise to ascertain what is the *collective* opinion of listeners in, and this can surely be obtained through the radio societies. Thornton Heath doubtless has its local radio society, and E. R. M. could surely have first obtained the opinion of its members, and if the majority thought with him, could through the secretary, have communicated with the B.B.C.

In "wireless" as in other matters, opinions differ, and what your correspondent contemptuously calls "highbrow programmes" may to many listeners be very ordinary programmes, and these people have as much right to be considered as E. R. M.

I would suggest that on the next occasion when the L.O. programme and the announcer gets on E. R. M.'s nerves, instead of putting down the 'phones in disgust, he should tune in one of the other stations. It might prove to be the "more excellent way"; it would certainly be the more charitable one.

Yours very sincerely,

W. WALTON.

Faversham, Kent.

THE SINGLE VALVE "P.W." UNIDYNE.

The Editor, POPULAR WIRELESS.

Dear Sir,—I feel compelled to write and thank you and the inventors for the Unidyne circuit. I have had a one-valve reaction set with H.T. for some time which received most B.B.C. stations, Hamburg and Paris. I determined, however, to try the Unidyne, and, despite discouraging remarks to the contrary, I constructed the one-valve set described in No. 112, altering the panel lay-out considerably and having coils and valve above-board. At first the results were poor, not much better than a crystal set.

Increasing the reaction coil to 120 turns made little difference. Then, by way of experiment I put the 75 in reaction and 120 in aerial. Leeds came in louder, but no other station was audible, and the set refused to oscillate. While turning the condenser knob I happened to place my fingers on the 'phone terminals and the set began to oscillate violently. Placing a condenser across the 'phones gave splendid results. Leeds (1½ miles) came in at loud-speaker strength, Manchester and Newcastle were comfortably loud, and several other stations which I did not wait

(Continued on page 115.)

CORRESPONDENCE.

(Continued from page 114.)

to identify were heard as well, so I am more than satisfied with it, but am at a loss to explain why it functioned best with the reaction coil (120) in the aerial and the aerial in reaction.

The parts used are : H. & B. 0005 variable condenser, with vernier; Thorpe K.4 valve (5 pin); microstat filament resistance; Dubilier fixed condenser; Watmel variable grid leak; 6 volt accumulator; home-made coil-holder and coils.

I remain, yours truly,

H. WOLUSON.

21, Talbot Terrace, St. Michael's Lane, Leeds.

CALIBRATING SIGNAL STRENGTH.

The Editor, POPULAR WIRELESS.

Dear Sir.—All the "R" tables which I have seen so far for conveniently comparing signal strength seem to have been compiled purely for amateur C.W. signals. Might I suggest that the code given herewith be adopted when reporting the reception of broadcasting stations? Experimenters' reports on results from different sets and circuits would be of much greater value if this simple standard were used when giving comparative signal strength :

- R 1—Carrier wave irresolvable.
- R 2—Music faint and unstable.
- R 3—Music faint but clear.
- R 4—Music quite clear but speech barely readable.
- R 5—Speech clear and readable.
- R 6—Music and speech fairly strong.
- R 7—Music and speech strong; faintly heard on loud speaker.
- R 8—Music and speech very strong; loud speaker clear.
- R 9—Loud speaker strong.

Intermediate strengths, if desired, would be denoted by decimal divisions.

Yours faithfully,

W. J. POTTER.

Egremont, Marguerite Drive, Leigh-on-Sea, Essex.

WIRELESS AND LIGHTNING.

The Editor, POPULAR WIRELESS.

Dear Sir.—My experience in the storm of August 18th, I think, should be interesting, and also a warning to other wireless enthusiasts. I was listening in, but when I thought the storm was almost overhead I decided to disconnect. I laid the lead-in, earth, and 'phone ends on the table, on which were a number of tools and wireless parts. I then took up a coil I had wound and examined it, holding it about a foot above the table. Suddenly there was a crash and a flash. The coil became alive, gave me a nasty shock, and flashed a fierce spark to my waist. Now, what could have happened? I can only explain it in this way.

My aerial was struck, and the lightning came in on the table, over the tools, and found the earth wire. But how about the coil I was holding above all this? It seems I was struck by lightning by induction—the current jumping one foot to an induction I was holding. On trying the 'phones in the evening I unfortunately found they had also accepted it, giving only the faintest sound. The moral to this is, if you are doing wireless work during a storm remove yourself as far as you can from the aerial lead-in, even though it is earthed, for lightning will jump, especially if it meets an induction in its path. I think this experience must be unique, and to those who say, "Well, you see the danger of aerials," I should like to reply, "Yes, that aerial probably saved my house, for it caught the flash and safely earthed it."

For myself, I shall be very cautious in future, and I hope you will give my experience to others as a warning. Lightning is very freakish, so it is just as well to earth properly, and leave things alone until the show is over.

Faithfully yours,

G. BALDWIN.

33, Deptford Bridge, Greenwich.

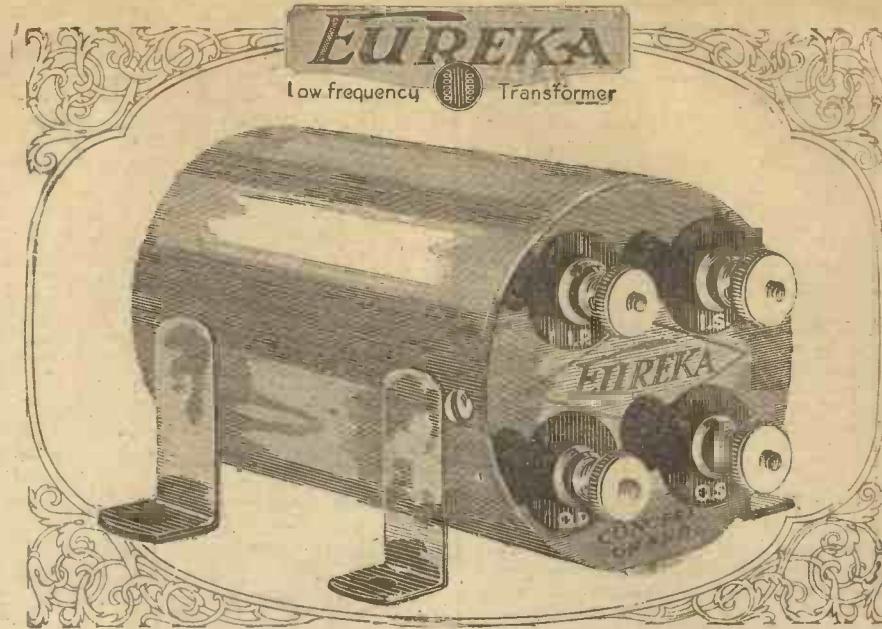
FRANKFORT-ON-MAINE STATION.

The Editor, POPULAR WIRELESS.

Dear Sir.—It may be of interest to your readers who are fond of searching the ether to know that the German station at Frankfort-on-Maine, 467 metres, is coming over fairly good. Two weeks ago (Aug. 29th), at 10.55 p.m. (Birmingham had finished a little before time), I picked up this station's dance music, which finished a little before 11 p.m. Then followed an announcement, and the orchestra played the tune of the hymn "Praise the Lord ye Heavens Adore Him." This station was again picked up about 11.20, giving announcements in which "Ach Toom" (or Doom), and "Frankfort-a-Maine" were repeated several times. No fading was noticed. I switched off at 11.40 p.m.

There was also another station on about 390 metres, but I was unable to be certain which it was; I believe it was Hamburg, as the announcements were like German. The station was very strong at times, but fading was very bad; the orchestra played dance music, and the announcements were rather long.

A straight circuit three-valve receiver was used



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(For second stage)



Gilbert Ad. 1365.

(Continued on page 116.)

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South Shore, BLACKPOOL.

1/3
post free.

CABINETS YOU WANT.
PICKETT'S CABINETS—they're good value, from 1/8 each, highly polished. Cabinet (P.W.) Works, Albion Road, Bexley Heath, S.E. Write for List.

-CARZITE CRYSTAL-

THE NEW WIRELESS WONDER.

If you want clarity, sensitivity and long range? If you are out for the best results this winter you must have the best crystal, the "CARZITE." Send P.O. 1/6 for sample box, post free. Money gladly refunded if not satisfied.

USE CARZITE & HEAR ALL THE PROGRAMME.
LEROY & CO., 144, Oakwood Rd., BIRMINGHAM.

NAVY PATTERN
Sectional Steel Wireless Masts.
The LIGHTEST, STRONGEST, and CHEAPEST in the World. Made of the highest grade cold drawn weldless steel tube. Complete with pulley, cleat, wire rope, strainers, insulators, ground anchors and base plate. Full instructions supplied with each Mast. A man and boy can erect a 40-foot mast in an hour. CATALOGUE ON REQUEST.
20-ft., 25-ft.; 30-ft., 40-ft.; 40-ft., 55-ft.; 52-ft., 90-ft.
HAMILTON MAY (Late Lieut. R.N.V.R.),
Doone Cottage, Weybridge, Surrey.

CORRESPONDENCE.

(Continued from page 115.)

(Dect. and 2 L.F.), and operated the loud speaker at good strength; slight Morse jamming was experienced at times.

Can anyone enlighten me as to why the hymn tune was played, as I have heard this before when Eberswalde finished their concerts? Is it the tune of the German National Anthem?

Yours faithfully,
EDWARD TARPES.
73, Seymour Road, Gloucester.

ONE-VALVE "P.W." UNIDYNE.

The Editor, POPULAR WIRELESS.

Sir.—I have had success with my Unidyne one-valve (less transformer) set, and have received all the B.B.C. stations but Cardiff. Most of the tests were carried out in broad daylight. I found that by using a 125-turn basket coil with 75-turn A.T.I. the set oscillated very fiercely, but with 100-turn reaction it failed to.

Yours truly,
J. H. DAVIES.
110, Liscard Road, Wallasey, Cheshire.

ORIGIN OF CIRCUITS.

The Editor, POPULAR WIRELESS.

Dear Sir,—Regarding the "Novel Circuit," by H. G. Chitos, published by you in "P.W." August 16th, and which I have tried out and found, all that the correspondent claims for it, I should like to add the following:—Does it matter at all what any circuit resembles, as long as it is of some use to someone? Anyone might stumble on a circuit that might resemble someone's, whether it be "Colpitt's" or any other. Mr. J. D. R. Hammett admits that there is a difference, Mr. Chitos found this difference by experiment. I consider that these results are very helpful to others when published, as was also the 2-valve L.S. circuit by Edgar E. Bridger, published P.W., August 2nd. The question is, "Why is there always someone ready to criticise?" Why not give credit where it is due?"

This criticism is the one thing that kills. The result passed on to others is the thing that helps. Which is better?

Yours faithfully,
R. C. WILSON.
8, Bloomfield Road, Kingston-on-Thames.

"P.W." TWO VALVE UNIDYNE.

The Editor, POPULAR WIRELESS.

Dear Sir,—I feel I must congratulate Messrs. Dowding and Rogers for the wonderful Unidyne circuits.

I have a 2-valve Unidyne detector with reaction and L.F., and the purity of tone of the receiver should induce many amateurs to try this circuit out.

I have searched far and wide to obtain a really good variable grid leak, and the best one, in my opinion, is the Bretwood.

When building a Unidyne receiver, only the best quality components should be used, and it is best to buy from reliable manufacturers so as to ensure getting these.

With regard to the variable leak, as this is practically the heart and soul of the Unidyne circuits, readers should give care to this, as I have found several of these of quite well-known makes totally unreliable.

The components in my set are as follows:
Jackson Bros. variable condenser.
Two Lissenstads (Minor).
Bretwood variable grid.
Dubiller fixed condensers.
H.T.C. transformer (quite an excellent component).

Two Dutch 4-electrode valves.

I am very sorry to see that British valve manufacturers are so slow in putting a 4-electrode valve on the market.

I intend carrying out further experiments with various kinds of tuning coils, and I will let you know if I obtain better results.

However, no more H.T. batteries for me.
Wishing POPULAR WIRELESS and Messrs. Dowding and Rogers the best of luck.

I am, yours faithfully,
E. G. BARRATT.
112, Bedford Road, Clapham, S.W.4.

B.B.C. PROGRAMMES.

The Editor, POPULAR WIRELESS.

Dear Sir,—The remarks of "E. R. M." hereon, published in your issue of August 30th, are certainly not endorsed by the majority of "listeners-in." Apparently it has never occurred to this discontented gentleman that human tastes vary not slightly but largely on almost any subject. What is not appreciated by some is enjoyed by others, and I am sure it must be a most difficult task to cater for the pleasure of the British public, which is made up of so many types of varying intellect. So far as explanation of characteristics is concerned, this would interest many. It doesn't interest "E. R. M."

(Continued on page 117.)

AS SUPPLIED TO THE
BRITISH BROADCASTING
Company, Ltd.

PARAGON

Radio Quality. Post Office Specification.

EBONITE PANELS

"The Best
Made"
Uniform fine Grain. Dead Matt Finish,
Ground Edges,
Genuine ONLY when supplied in SEALED
CARTON—STAMPED "PARAGON."

Tested and Recommended by "Popular
Wireless" and other Wireless Journals,

STANDARD SIZES

4 x 4 x ½	7/9	14 x 12 x ½	10/-
6 ½ x 5 ½ x ½	1/9	16 x 12 x ½	11 ½
8 x 6 x ½	2/6	18 x 12 x ½	13/-
8 x 6 x ½	3/3	24 x 10 x ½	14 ½
10 ½ x 8 x ½	5/3	24 x 12 x ½	17 ½
12 x 10 x ½	7/3	12 x 6 x ½	4/6
12 x 12 x ½	8/6		

ALL ABOVE PANELS SUPPLIED FROM STOCK.

SPECIAL PANELS, similar quality and finish, CUT, SQUARED and despatched same day, 1d. per square inch x 1; 1d. per square inch x 1½—plus postage 6d.

Stocked by all reputable Stores.
But it must be in Paragon sealed Carton.

OVER 200 MILES!



THE CHELMSFORD
HIGH POWERED
STATION

on 3 pairs of headphones.

AT YORK

on the

RADIOPHONE

"POPULAR" MODEL

(With Plated Fittings)

No Extra Coils Required

For Local Broadcast

RADIOPHONE JUNIOR 15/-

ALL Ebonite tuning

THE

NU-GRAVING

PROCESS

FOR PANEL MARKING.

Neater, cleaner, cheaper than any other known method. INSIST on the name "NU-GRAVING" on every envelope and protect yourself from spurious imitations.

For Perfect Reception of All British, Continental and American Broadcasting. (Wavelength 50-25,000 metres.)

THE RADIO-STRUCTA
Latest Models fitted in Natural Walnut Finished Cabinet with Plated Fittings. Send for fully illustrated and descriptive lists.

PETER CURTIS, LTD.

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Telegrams: "Paracurtex." Phone: North 865
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In conjunction with

THE PARAGON RUBBER
MANUFACTURING Co., Ltd., HULL.

CORRESPONDENCE.

(Continued from page 116.)

because it doesn't coincide with his particular tastes. If this gentleman were a listener-in to America, where we are told one has difficulty in concentrating on one programme, as a result of opposition, would he then be satisfied?

In conclusion, I feel I am only voicing the sentiments of many when I assert that E. R. M. appears to be only an inconsistent grumbler who is not worth consideration or forththought.

Yours faithfully,

ERNEST S. JOHNSON.

19, Elm Road, Grays, Essex.

WIRELESS IN AUSTRALIA.

The Editor, POPULAR WIRELESS.
Dear Sir,—I have often read with interest the articles in POPULAR WIRELESS on long-range crystal reception, and to show you that Tasmania is not behindhand I am enclosing some of my own results. On 600 metres, among many other stations, I can read Brisbane and Townsville land stations (Queensland, approximately 1,500 and 1,700 miles away respectively) nightly, and often hear Broome (Western Australia, approximately 2,700 miles away) and also several New Zealand stations. On 1,100 metres I can receive 2 F C (Farmer's Broadcasting Station, Sydney) very clearly practically every night. This station, which is about 700 miles away, is not using full power (5 kw.) yet, I understand.

I am using a simple varometer circuit in conjunction with four detectors with a selector switch.

I prefer galena crystal for good signals, and I have one enclosed in a small box with a hinged lid which will remain adjusted for a week or so.

My aerial is a three-wire "T" type about 60 ft. long and 30 ft. high; the lead-in is about 60 ft. long. I use a water pipe for a ground connection. My phones are Murdock's 3,000 ohms, and have been in use over a year now. With the exception of the phones, my apparatus is entirely home-made.

Wishing POPULAR WIRELESS every success,

Yours truly,

L. R. JENSEN.

West Devonport, Tasmania, Australia.

"P.W." ULTRA SET.

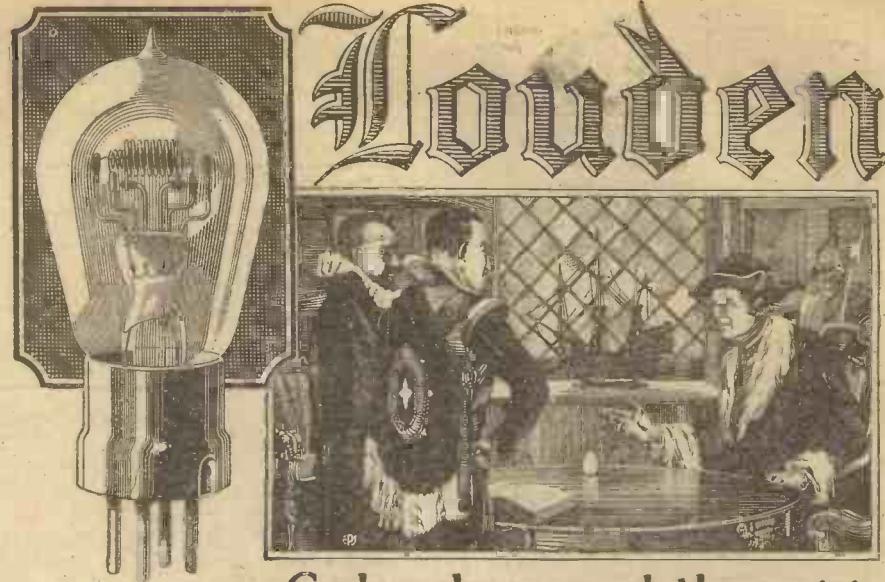
The Editor, POPULAR WIRELESS.

Dear Sir,—I have just completed the "P.W." Ultra Crystal Set. Results are very good indeed, and are far above the usual for a crystal set on an average aerial. I live about half a mile from 2 B D, so you can imagine the strength it comes in with. A small cardboard horn clamped on to the earphone enables the Savoy Bands to be heard clearly all over the room. Complimenting "P.W." for producing such a fine circuit,

I remain, yours sincerely,

A. M. HARDIE.

131, Hamilton Place, Aberdeen, N.B.



Columbus and the egg

Missing the obvious is a fault most of us are guilty of at some time or other, and valve designers have proved no exception.

One of their chief aims has been to eliminate "mush," that roaring or hissing sound which so often spoils what otherwise would be perfect reproduction.

It was found that "mush" was due to objectionable charges of electricity congregating near the anode and interfering with the electron stream.

All sorts of experiments were tried. Some increased the volume but at the expense of purity; others were free from distortion but still had "mush," and so on; and we seemed as far off as ever from our ideal valve, giving ample volume, no distortion and no "mush."

Then suddenly came the obvious solution. We simply made a way of escape for these objectionable charges—we made the anode like a spiral and immediately we got silver clear reproduction, with plenty of volume.

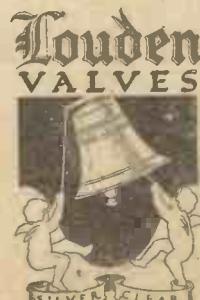
It has been decided to put the Silver Clear Louden on the market at the extraordinarily low figure of 10/- . This represents a certain faith on our part. To justify it the Louden must sell in enormous quantities.

But we cannot pretend to be taking much risk. Once you have tried the Silver Clear Louden you will be satisfied with no other.

The Plain Louden for
Detecting and Low-
Frequency Amplifying.
Filament Volts, 4·8-5.
Filament Amps., 0·4.
Anode Volts, 40-80.

10/-

The Blue Louden for
H.F. Amplification.
All Loudens are silver
clear and free from 'mush.'
The current consumption
is low and the life long.



Louden Valves - Silver Clear

HULLO, EVERYBODY!!

Goods are sent POST FREE except where marked. NO POST ORDERS from Callers' Columns.

DELIVERY.—Every endeavour is made to dispatch goods by return, but sometimes delays occur which are beyond our control, and in which cases customers may rest assured that their orders will be executed in the very shortest period. They will therefore realise that it is not possible to have orders cancelled through above causes.

FOREIGN ORDERS must have **EXTRA POSTAGE AND PACKING** enclosed.
ALL ORDERS IN STRICT ROTATION.

POST FREE COLUMN.

W.O. Pillar, large	doz.	1/3
'Phone 4 B.A.	doz.	1/1
'Phone 2 B.A.	doz.	6 for 1/-
Med. Pillar 4 B.A.	doz.	1/1
Valve Sockets, plain	doz.	10d.
Ditto with Shoulder	doz.	1/1
(Above with Nut and Washer.)		
Single Cyl Plug on stand	doz.	1/3
Ditto Swivel movement	doz.	1/3
Plug and Socket	6 pairs	10d.
Screw Spade Terminals	doz.	1/-
Pin Screw Terminals	doz.	10d.
Spade Taps	doz.	5d.
Empire Tape 1 in.	12 yds.	9d.
Insulating Sleeving	6 yds.	2/-
Ebonite Coil Plugs	2 for	1/6
Best quality ditto	2 for	1/10
Ebonite Knobs 1½ in. 2 B.A.	doz.	6d.
Moulded Knobs 1½ in.	2 for	8d.
Knobs 1 in. 4 B.A...	2 for	8d.
Ditto 1 in. 2 B.A...	2 for	8d.
H.F. Transformers, Plug-in type 250/700	doz.	3/11
Ebonite ex. handles 8 in.	9d.	
Ebonite Bushes 2 or 4 B.A.	doz.	1/-

D.C.C. L.R.C. Bell Wire	10 yds.	1/-
Ganze Valve Windows	7d.	
Double 'Phone Cords, 72 in.	1/11	
Porcelain S.P.D.T. Switch	1/11	
Ditto D.P.D.T. Switch	2/6	
Battery Clips	doz.	10d.
Ebonite Valve Holders	doz.	1/-
Variometer 250/650	2/6	
Lead-in Wire	10 yds.	1/6
Twin Flex	12 yds.	1/11
100 ft. 7/22 Aerial Wire	3/9	
with four insulators		
Nugraving Titles	8d.	
"R.L." Choke Coil	10/-	
Watmel Var. Grid Leak	2/6	
Watmel Anode Resistance	3/6	
Nickel Panel Switches, D.P.D.T.	1/5	
Ditto, S.P.D.T.	1/2	
Insulating sleeving 3 yds	1/4	
Tinelle copper sq. 16 gauge, 18 ft.	1/-	
Spearpoint whisker	4d.	
Gold whisker	4d.	
Set of 5 (one gold)	6d.	
100000 ohm fixed	1/6	
Real Ebonite Dials	1/3	
1 in. Knobs 2BA	6d.	
4 in. Knobs 4BA	6d.	

RHEOSTATS.

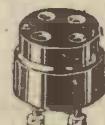
Ormond	doz.	2/-
Raymond	doz.	1/6
Do. with dial	doz.	2/-
Extra value do.	doz.	2/6
T.C.B. 6 ohms	doz.	4/-
Potentiometer T.C.B.	doz.	5/-
Microstat for D.E. & R.	doz.	2/9

POWQUIP TRANSFORMERS (L.F.)

Manchester	15/8	
(Similar appearance to "R.L.")		
Shrouded	18/-	
Open, 2-1, 4-1	14/11	
"Bucks" for Reflex	12/6	

OPEN EVERY DAY 9 a.m. to 7.45 p.m.

SUNDAYS 10 a.m. to 1 p.m.



This first-class Switch
Arm with 12 Studs, 12
Nuts, 12 Washers.
Hand-turned, 8 Nuts,
To Callers, 10d.
By Post, 1/6 Set.



CRYSTAL DETECTORS

Post 6d. each.

Enclosed glass. As sketch. Ebonite Base.
Brass 1/4 1/6 2/-
Nickel 1/8 1/6 2/-
Ebonite 1/8 1/6 2/-
Perikon 1/8 2/2 (With Zincite and Bornite)

OUR WONDERFUL MICROMETER ADJUSTMENT GLASS-ENCLOSED DETECTOR. WHY PAY MORE! POST 6d. each. 1/11

HERTZITE SHAW'S GENUINE

1/-

BEATS ALL OTHER "ITES."



Post 4d.

WEST END DEPOT FOR

POLAR; JACKSON BROS.; R. I.; BURNDEPT; GOSWELL ENG. CO.; GRAFTON ELECTRIC; SILVERTOWN; IGANIC; LISSEN; RADIO PRESS ENVELOPES; DUBILIER; EDISON BELL; WOODHALL GOODS, ETC.

ORMOND Condensers at list prices.

BRETWOOD

2-way Coil Holder for Critical Tuning or Reactance or Aerial Coils.

Specially adaptable for M.W. Sets 7/9

J.B. Condensers, list prices.

CAM VERNIER

2-way Coil Holder for Critical Tuning or Reactance or Aerial Coils.

Specially adaptable for M.W. Sets 7/9

Foreign Post Extra.

4 v. 40 .. 17/6

4 v. 60 .. 21/-

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HULLO EVERYBODY!!

RAYMOND'S VARIABLE CONDENSERS

NEW MODEL.



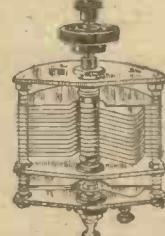
INCLUDING KNOB.

Nat.
Phys.
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Certificate
for
Guaranteed
Capacity.

	Cap.	Height without Price. connections.	ALL PARTS NICKELLED.
	.001	6/1 1...3½ in.	One hole fixing.
	.00075	5/1 1...2½ in.	Narrowest spacing.
	.0005	4/1 1...2 in.	Aluminium end plates.
	.0003	4/6 1...2 in.	Accurate Constant Capacity.
	.00025	4/4	Rigid Construction.
	.0002	4/...1½ in.	Low Loss.
	.0001	3/6 1 in.	Electrically and Mechanically Perfect.
	.00005 (vernier)	2/6	
			EBONITE DIAL 8d. extra.
			Many unsolicited Testimonials.
			POST 6d. SET.

NEW MODEL with 3 Plate Vernier at bottom. Specification as ordinary, but the Vernier allows absolutely the finest tuning possible. Very sharp and defined. They do not need varied long and technical words to recommend them. Satisfied users are the best recommendation. Assembled for panel mounting, and for a limited period. I will include FREE an EBONITE DIAL to retail customers only.

Height Cap. Price
4 in. .001 8/11
2½ in. .0005 6/11
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Complete with 2 Knobs & Dial.

POST 6d. PER SET PLEASE.

VALVES.

B.T.H.

R4 type

B5 .06

Power Valve

12/6

30/-

35/-

COSSOR.

P1, P2

12/6

MULLARD.

L.F. or H.F.

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D.F. Ora

30/-

1 volt

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EDISWAN.

A.R.

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A.R. .06

30/-

LISSEN COILS.

No. 25

4/10

30

4/10

35 and 40

4/10

50

5/-

60 and 75

5/4

100

6/9

All Sizes Stocked.

THORPE K4.

4 Electrode Valve (5 Pin)

17/6

RADION VALVE

(2 types).

Detecting or Amplifying

10/-

Post 6d.

KING RHEOSTATS.

With Vernier

5/3

Post 6d.

MANSBRIDGE

(NEW) T.C.C.

FIXED CONDENSERS.

.25, .05

4/6

1 MFD.

4/6

2 MFD.

5/-

Post 3d.

UTILITY

SWITCHES STOCKED.

ICRANIC, EDISON

BELL VARIOMETERS.

Post paid

10/6

VOLT METERS

0-6

4/11

0-16

5/6

High Class Goods. Post 4d.

HEADPHONES.

Sterling, 4,000 ohms

25/- Brown, "F" type

25/- Brown's "A" type

62/-

B.T.H.

25/-

Siemens

25/-

Geophone

25/-

Western Electric

25/-

Brunet, 4,000

17/6

Single Brunet, 4,000

8/6

3,000 Brunet (for Crystal
sets only)

19/11

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18/11

Lightweight "K"

10/9

Dr. Nesper, adjustable

13/6

Ericsson (EV)

12/6

Post 6d. pair.

BURNDIPT

Dual Rheostat 5 to 30 ohms,
for Panel Mounting

7/6 each

Post 3d.

FIBRE STRIP

FOR COILS.

Per dozen, post free

1/10

GAMAGE'S

"PERMANITE," 1/-

"EBONITE"

Cut to size.

1/16 at 1/2 d. square inch

1/4 at 1/2 d. square inch

Post 3d.

H. T. C.

Valve Holder

1/9

Under Panel

1/6

Post 3d.

TESTIMONIAL

that speaks for itself.

July 20, 1924.

From C. Walton Esq.,

Radio Engineer, Andover.

I have tested your
new variable condensers
on Megger and
get "INFINITY."

Yours sincerely,

C. Walton.

Raymond
SQUARE
LAW
Variable
Condenser
with
VERNIER
DIAL

NEW MODEL

Orders in rotation.

Other sizes shortly.

0005 Only
12/6

Post 6d. set.

BASKET
ADAPTER

10d.

Post 4d.

Two for 2/-

Extra
Quality
with
Plug

1/3

Two for 2/8. Post 4d.

BASKET COILS.

Chelmsford (Tandco) 2/-

Tandec 1,300/1,750

metres

1/8

Waxless set of 5.

200/2,000

Waxed set of 6.

200/3,600

Special Duplex Coil

fitted on adapter

for Chelmsford 2/11

(for variometer 650

metres).

Post 4d. each.

TESTIMONIAL

that speaks for itself.

July 20, 1924.

From C. Walton Esq.,

Radio Engineer, Andover.

I have tested your
new variable condensers
on Megger and
get "INFINITY."

Yours sincerely,

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1/2 in. 1/2 in. 1/2 in.	1d.	washer 2 for	1d.	
1/2 in. 1/2 in. 1/2 in.	1d.	Stop Pins and	1d.	
1/2 in. 1/2 in. 1/2 in.	1d.	nut .. . 2 for	1d.	
1/2 in. 1/2 in. 1/2 in.	1d.	Spade Screw ter-	1d.	
1/2 in. 1/2 in. 1/2 in.	1d.	minals each	1d.	
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TECHNICAL NOTES.

(Continued from page 96.)

other suitable vessel containing an insulating liquid, so that the plates, or some of them, are immersed in the liquid. Let us suppose that acetone is used. If the whole of the vanes are immersed in the liquid, the maximum capacity of the condenser will be about 20 times what it was with air. If only the lower half of the set of vanes is immersed, the capacity of that half of the condenser will be multiplied by about 20, and will therefore be about 10 times the whole capacity of the condenser in air, and so on. In this way the maximum capacity can be increased by any factor up to the maximum given by the liquid in question.

The only objection to the use of a liquid dielectric in this way is, of course, the necessity for keeping the condenser liquid-tight. But for experimental purposes, where the jar can be placed in a vertical position on the table, the method is often useful. It should be noted that most of the spirituous liquids are highly inflammable, and precautions are necessary in this direction.

The Use of Flux.

Every experimenter is familiar with the usual warnings against the use of acid flux for soldering electrical connections. This flux, which is variously known by the names of "killed spirits," "acid flux," and, more familiarly "soldering juice," is conveniently made by dropping some pieces of zinc into hydrochloric acid and leaving until all reaction has ceased.

Even then, however, although action may apparently be over, there is usually a good deal of acidity about the liquid, that is to say, potentiality for further reaction with metals with which it may come into contact for any length of time. In particular, it is liable to attack the connections in which it is used in soldering together. In practice, if you are making your own flux, it is always wise to put in an excess of zinc, so that there is some left lying at the bottom of the bottle after the action has practically ceased.

I may say that during the many years I have been engaged in scientific research work I have always used this type of flux for electrical connections, in spite of the prejudice which exists against it, as I find it so much more convenient and certain. The objections to its use are overcome if the acidity of the flux is neutralised, and if, after use, the excess is washed off the joint with a tiny wad of cotton wool on the end of a knitting-needle, or in some such way.

Taking these precautions, I have never had any trouble whatever with corroded electrical connections. Of course, in a wireless set, where the connections are usually bunched close together and in close proximity to insulating materials, the necessity for care is very great, as the flux sputters when it comes in contact with the hot soldering-iron, and for such cases it is, on the whole, safer to use a non-corrosive flux.

A Safe Flux.

The following recipe has been recommended for making a safe flux: zinc chloride, 40 parts; glycerine, 25 parts; methylated spirit, 35 parts, these ingredients being well mixed together, and the flux then stored in an air-tight tin or bottle.

Another good flux may be made by means of powdered resin and tallow, four parts of each, and powdered ammonium chloride two parts. The latter substance is generally known as sal-ammoniac, and is the same as used for electric bell batteries. The ingredients should be well mixed together and the mixture held over a gentle flame until it is thoroughly melted. It should then be stirred occasionally whilst it is cooling, until it has become too thick for any appreciable separation of the ingredients to take place.

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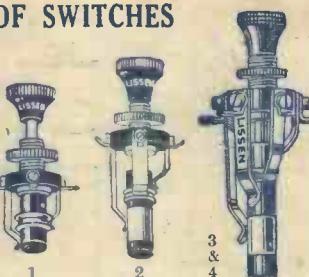
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1. LISSEN 2-way Switch (patent pending)	2/9
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This little switch does the following things:—

- a. Switches off one stage of L.F. without touching the filament control—a separate switch for each stage.
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- c. Cuts out a stage of H.F. in the same way as it does L.F. (we do not recommend any switching in H.F. circuits where it can be avoided, but where it is decided to use a switch, this is the switch to use).
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LISSENCEPTOR

Mark 1 Type 7/6



LISSENCEPTOR

Mark 2 Type (with switch for more selective tuning) 15/6

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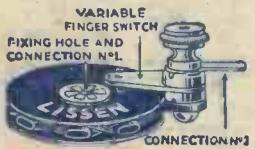
When a coupling condenser is leaky it makes the grid of the valve highly positive, due to the leaking of the H.T. battery through the condenser to the grid, so cluding the purpose of the condenser, which is to stop this voltage getting on to the grid.

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HOW TO FIT TO AN ORDINARY RHEOSTAT.

It should be used in series. Can be screwed direct on to some rheostats—with others it can be easily fixed on the panel.

Can be easily attached to the LISSENSTAT also.

Simply withdraw the screw from the bottom end of the LISSENSTAT and place the LISSEN Safety Resistance over the centre hole, and replace screw—this clamps the resistance in place. The connection which would previously have been taken off the bottom end of the LISSENSTAT is now taken off the terminal on the side of the Safety Resistance—the other connection on the side of the LISSENSTAT remains unaltered. Proceed in exactly the same way with the LISSENSTAT MINOR. Adds an extra 35 ohms. Price 1/3

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No connections to make. Interferes with nothing. Merely drill one hole in panel close enough to condenser dial so that depression of the adjuster knob engages its rubber friction washer on the bevelled edge of the condenser dial. Tuning on the condenser is quite independent of the adjuster. Can be fitted to any condenser in two minutes (not necessary with the LISSEN NICA VARIABLE CONDENSER, of course)



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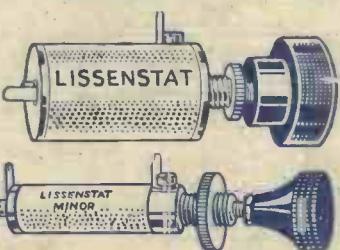
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