

MORE ABOUT THE OSCILLATING CRYSTAL

Amateur Wireless And Electrics

Vol. V. No. 130.

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Price 3d

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TRIPLEX AMPLIFICA-
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RECEIVER

VALVE "BACK-LASH"

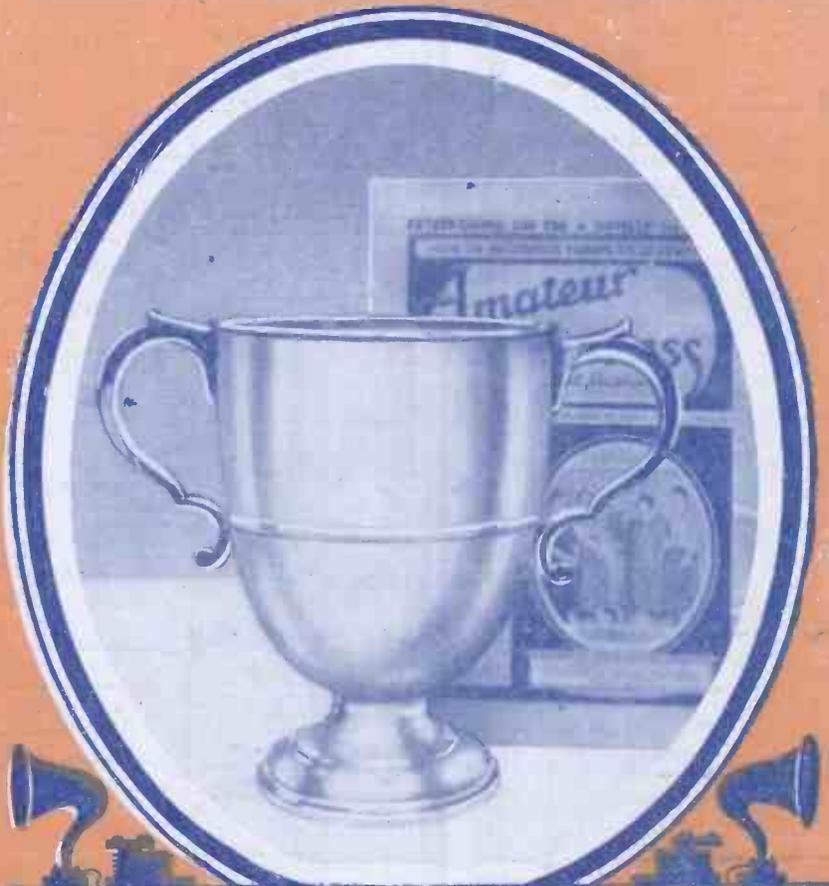
TOPICAL ASPECTS OF
WIRELESS

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LING RECEIVER

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QUESTIONS

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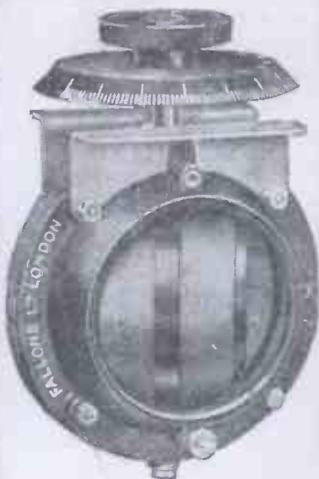
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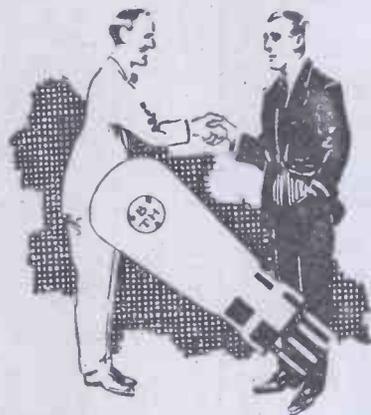
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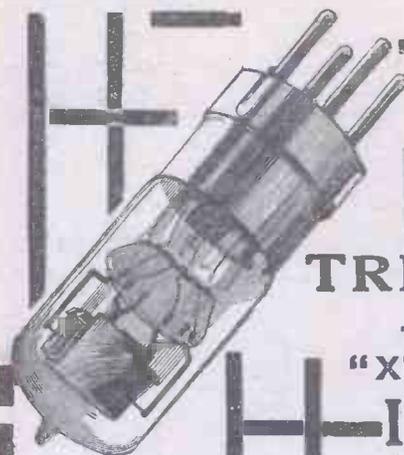


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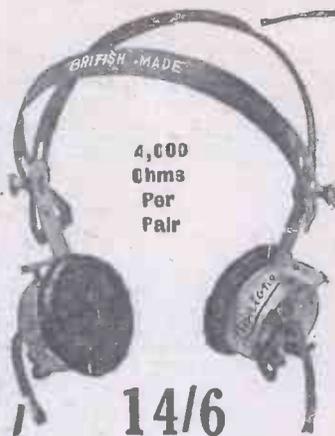
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Amateur Wireless

and Electrics

Vol. V. No. 130

November 29, 1924

RESULTS WITH THE OSCILLATING CRYSTAL

THE experimenter, on hearing of a new discovery, often hesitates to take it up because he thinks that apparatus will be required which is quite beyond his means. The object of this article is to show that results can be obtained with a simple oscillating crystal circuit using apparatus which is to be found on almost any work-bench.

Though the apparatus is simple, good results are not easy to obtain, the success of the experiment depending largely on obtaining a suitable crystal. Once a crystal has been found which will oscillate smoothly, however, results are assured. The writers, using the apparatus mentioned below, have obtained results equivalent to those obtainable from a valve used as detector. It must be understood that the circuit is not intended to replace the usual broadcast set, as the action is rather critical, and some crystals are liable to oscillate violently. When the circuit is oscillating, it will be found that C.W. stations can be received as with a valve set.

The Circuit

The circuit, which is not new, is shown in Fig. 1. As will be seen, two crystals are made use of. The first (X) is the special crystal which oscillates and acts

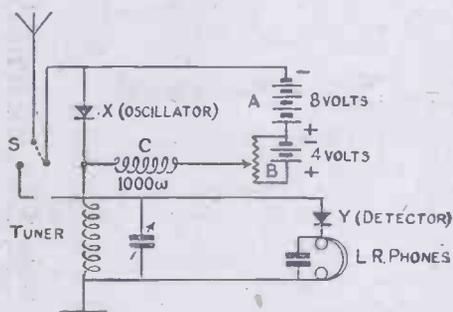
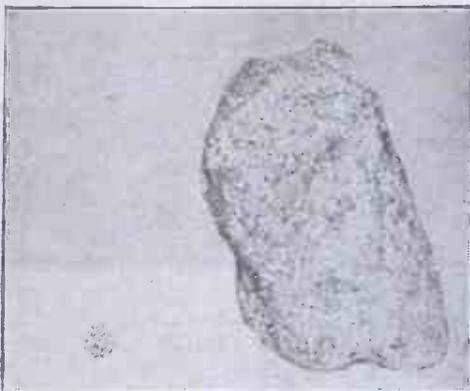


Fig. 1.—Oscillating Crystal Circuit.

as an amplifier to the incoming signals. The crystal Y is the detector, and is of the usual type (hertzite with copper wire contact). The circuit is really an ordinary crystal receiving circuit with the addition of the crystal X inserted in the aerial lead, and with provision made for the application of a suitable difference of potential between the oscillating crystal and its contact. A is a dry battery of about 8 volts

and B is one of 4 volts. It is possible to use two 4½-volt pocket-lamp batteries in series for A and one for B. Note that the negative end of A is connected to the contact wire of the crystal X. B is shunted



The largest natural crystal yet extracted from the earth. It weighs over 14 lb., and was shown by Harding, Holland and Fry at the White City Exhibition.

with a potentiometer of 360 ohms resistance, but one of higher total resistance would probably be better, since it would pass along current from B. This potentiometer serves for a fine adjustment of the potential applied to X, which is, in most cases, rather critical. The moving contact of the potentiometer is connected through the coil C to the oscillating crystal. C should have a resistance of about 1,000 ohms to 1,500 ohms. It is also desirable that it should have a high inductance to discourage the oscillations in the aerial circuit from traversing the battery circuit. Hence for C we used a small iron-cored choke coil of 1,000 ohms resistance, such as may be obtained for a few pence from dealers in disposals apparatus. S is a two-way switch, by means of which the aerial can be connected directly to the detecting circuit for the adjustment of the detector and tuner in the usual way; it can then be switched over to the amplifying circuit as it is shown in Fig. 1. It is found that best results are obtained with phones of a comparatively low resistance (say 60 to 150 ohms).

There is still time to send in your effort for the Christmas Competition. Details are on page 848.

Crystal and Contact

We now come to the most important point, namely, the oscillating crystal and its contact. The crystal the writers have used exclusively is zincite, with a very fine and springy steel wire contact. Several specimens of crystal may have to be tried before a really good one is found. It is advisable to fit a long arm to the wire contact used for the oscillating crystal, so that a given movement of the end of the arm produces only a minute movement of the actual contact. It is also desirable to insulate the crystal and contact from vibration by means of a felt or rubber pad.

Operation

To get the set working, wire it up as shown, and tune in some transmission on the detecting portion of the set. Now switch over to the amplifier, and set the slider of the potentiometer about half-way between its maximum and minimum positions. Then proceed to adjust the oscillating crystal; here patience and a delicate touch will be required.

You will hear when the crystal is oscillating by the usual rushing noise in the phones. When this has been obtained, adjust the potentiometer until the smoothest and most stable point is reached. It is quite probable that the original transmis-

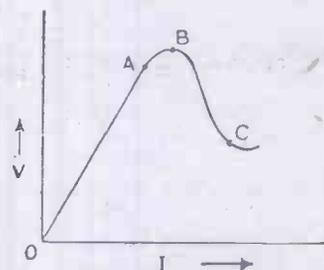


Fig. 2.—Curve showing the Characteristics of the Crystal.

sion will be inaudible; if so, readjust the tuning of the set, when it will be found that the station will come in with greatly increased power. A final adjustment of the potentiometer may be necessary if the transmission is found to be distorted. It will be found that tuning is much sharper than with the detector alone, and a vernier condenser, with an extension handle to

(Concluded in third column of next page)

MUSINGS BY MAGNET :: STANDARDISATION

IN common with the early experiences of most new movements, wireless has not quite settled down to accepted standards or accepted nomenclature.

Wireless Nomenclature

Some of the terms used are obviously crude, almost ridiculous in fact, but they will probably remain in spite of their obvious absurdity.

Take the term "high-tension" as applied to the anode battery as a typical example. Here we have a battery which averages 100 to 150 volts in the generality of cases. According to the Board of Trade regulations a pressure of 650 volts is only a medium pressure supply, and when we further consider the enormously high pressures of the oscillating currents employed in transmission we are forced to the admission that the term "high-tension" as applied to a battery of sixty to one hundred dry cells is pretty far-fetched.

Little if any more satisfactory is the rather empiric title of "B" battery, as used in the United States, for the particular group of cells we are dealing with at the moment. The proper term is undoubtedly "anode battery," as this implies exactly what the cells stand for and nothing else.

A difficulty arises, however, when we reduce these terms to symbols, as at present we have no doubt in our minds when we deal with the term "H.T." If we were to write "A" battery we should be up against another Americanism—the filament battery.

So there we are, and I am afraid we must leave these terms to be either corrected or glossed over by wiser people than ourselves.

Sizes

Coming to standardisation, it really is time that a distinct movement was made to reduce chaos to some semblance of order, not only in sizes, clearances and dimensions, but also in the layout of certain components. Take H.F. plug-in transformers. Some of these have the secondary windings at "twelve o'clock" and "six o'clock," with the primary connections at right angles to the former windings. In my own case I prefer this method, as I have made my plugs for tuned-anode conversion to suit this layout and I can change over quickly from one to the other.

When transformer coupling only is used and the two windings are equal—that is,

1 to 1 ratio—the disposition of the pins is immaterial, but where the rather debatable point of a "step up" between the primary and secondary arises we are faced with the possibility of a "step-down" effect if the windings are reversed.

In many cases the bobbin type of H.F. transformer is not marked at all, and the way of the novice in the admittedly difficult process of H.F. amplification is hard indeed.

The valve holders, too, vary far too much in centres and socket diameter, as also do the valve pins. I have two valve holders of high-class make and neither of these will admit any valve on the market without much shaping and filing.

Then, again, the valve pins on all standard four-pin valves are far too long and introduce quite unnecessary capacity when H.F. work is concerned.

Unwanted Capacity

It is obviously useless for the designer of low-capacity valve holders to cut down the metal to the irreducible limit when the valve maker imposes upon him a mass of metal which in itself represents a certain fixed capacity, partly in the valve pins—which is reducible—and partly in the "pinch" of the valve, introducing a glass dielectric, which is not reducible.

To my mind these things have gone on too long, and I am sure that an effort to reduce capacity in the standard valve, at a popular price, would meet with a gratifying reception at the hands of the experimenter who is out for short-wave reception with the minimum of trouble in unstable functioning in H.F. amplification.

Very few workers can afford special valves which cannot be interchanged with the standard type, and any attempt to make adaptors generally nullifies the advantages of the special valves by rein-

roducing capacity in the shape of pins and grouped sockets.

Winter Work

A friend has asked me to recommend a class of work for special study this coming winter which will not impose too great a strain on quite moderate means or experience.

Where the worker is fortunate enough to be a good twenty miles from the nearest station I should certainly recommend his taking up the single valve with well designed tuning gear and very carefully applied reaction.

The experience thus gained in tuning in and logging as many stations as possible will stand the worker in good stead, and he will find a peculiar thrill and fascination in the handling of a really good one-valve receiver when attached to a decent aerial and, what is equally important, an efficient earth. MAGNET.

"SOME RESULTS WITH THE OSCILLATING CRYSTAL" (continued from preceding pag.)

minimise hand capacity effects, will be found almost indispensable.

Finally a few words as to the action of the crystal as an amplifier may be added. It is found that if we apply a gradually increasing potential difference between the crystal and its contact, the current across the contact at first increases in accordance with Ohm's law. Fig. 2 shows this. Here V is the applied voltage and I the current. In the first part of the curve (OA) the crystal acts as an ordinary conductor with a constant resistance. Soon, however, a point is reached (A) where the resistance begins to diminish, and finally becomes zero (at B). Still further on the resistance becomes negative.

The term "negative resistance" has no real meaning physically—it merely signifies that energy is not absorbed, as in the case of ordinary conductors, but is actually emitted. In this way the crystal acts as a generator, and when an alternating potential difference is applied across it (for example, in the aerial circuit of the above set), it adds energy to the incoming signals and so amplifies them. In order that this may be possible the crystal must be in the condition represented by the steep "negative resistance" slope of the curve (BC), and this is brought about by adjusting the applied potential with the potentiometer.

W. R. D. and W. E. M.

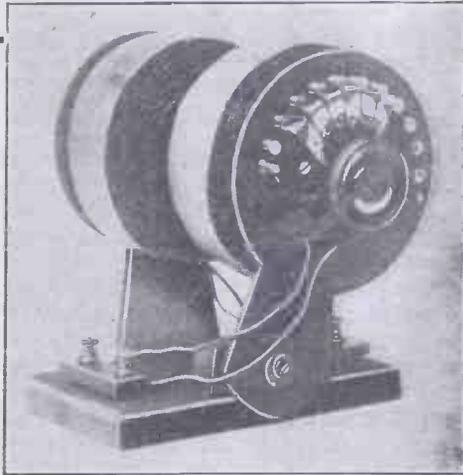


The Largest Crystal Holder Yet! A Model of the "Perfection" Cup.

AN "ALL-WAVE" TUNER UNIT

A VERY useful tuner unit that covers all wavelengths from 200 to 2,000 metres is shown in the accompanying photograph and drawings. It will be found very handy for trying out experimental circuits. It can also be used for anode and reaction coils, aerial (primary and secondary) coils or aerial and reaction coils. The tuner unit consists of two main coils (Figs. 1 and 2), one fixed and the other pivoted on a screw A so that the relative positions of the coils are adjustable.

It will be seen that each main coil consists of six basket coils, each containing 50 turns of No. 22 d.c.c. wire, connected in series to the studs S as shown in Fig. 3. In assembling the coils it must be remembered to have the windings all in the same direction and the inside of one connected to the outside of the next. The coils are made on the usual type of former, consisting of a 1½-in. diameter rod with nine radial spokes (french nails) which are withdrawn after the coil is coated with just



The "All-wave" Tuner Unit.

and the other is pivoted on a screw A, as before mentioned. A circular panel 4 in. in diameter (the diameter of the coil) carrying the studs and dead-end switch is screwed on to the outside of each boss.

The construction of the dead-end switch (see Fig. 4) is perhaps a little unusual.

A cardboard covering is placed around the coils in order to exclude dust and foreign matter, and an ebonite disc is fixed to the inner face of each boss to retain the coils and to improve slightly the general appearance. H. J. T.

VALVE "BACK-LASH"

"BACK-LASH" exists in a valve when the coupling required to start self-oscillation is tighter than the coupling at which the oscillations cease. In other words, as the reaction coupling is gradually increased there comes a point when oscillation suddenly starts. If the reaction coil is now drawn back so as to lessen the coupling, the oscillation persists for some distance beyond the reaction setting at which it first started.

When the "threshold" point "drifts" in this fashion it is impossible to adjust the valve for maximum sensitivity. Back-lash can be eliminated by using a smaller-

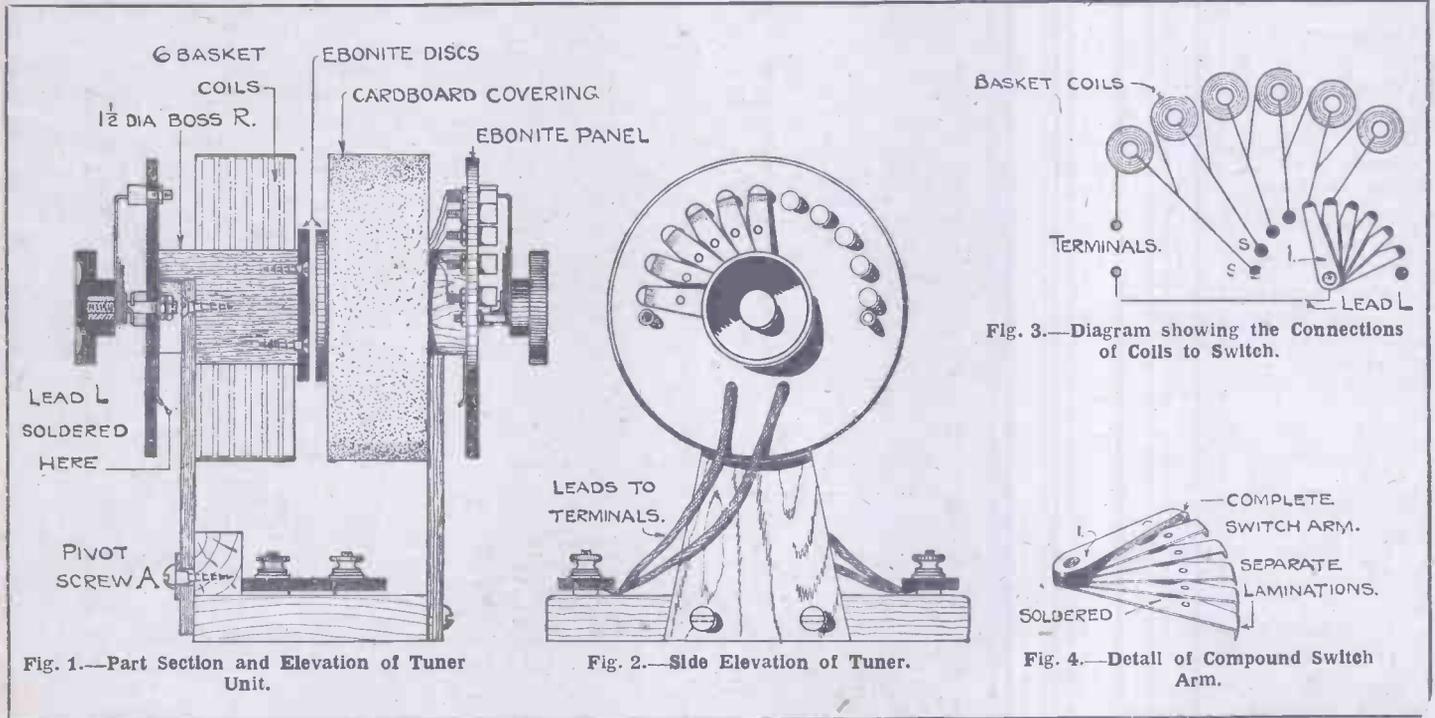


Fig. 1.—Part Section and Elevation of Tuner Unit.

Fig. 2.—Side Elevation of Tuner.

Fig. 3.—Diagram showing the Connections of Coils to Switch.

Fig. 4.—Detail of Compound Switch Arm.

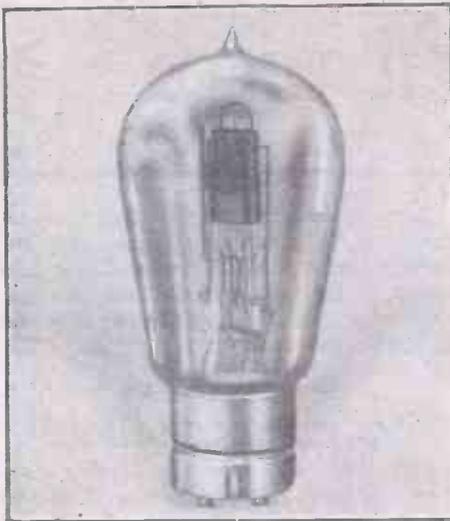
sufficient shellac to hold the wire in place. The six coils are packed together on a boss R, Fig. 1, made from a piece of 1½-in. diameter rod, all the leads pass along a groove in the boss and are then soldered to the ends of the respective contact studs. A recess ½ in. in depth is cut in the boss to receive its support, which is made from ⅜-in. three ply wood, the two being screwed together. One support is screwed directly to the base, as shown in Fig. 2,

The first and principal arm 1 is of ordinary pattern, consisting of four laminations riveted near the outer end. The other five arms consist merely of single laminations, obtained by knocking out the rivet from a complete arm. The drawing shows the construction of the switch. It will be noticed that when the arms are arranged on the spindle and correctly spaced a drop of solder is placed between each adjacent pair.

sized reaction coil, or by increasing the resistance of the grid leak. This in fact is the great advantage of using a variable grid leak. Too high a voltage on the plate and excessive filament current are also factors which tend to create back-lash.

M. A. L.

Ask "A.W." for
List of Technical Books



Mullard D.E. Power Valve.

NO aspect of wireless is receiving more attention from investigators at the present moment than the problem of low-frequency amplification. When the reception of telephony first began on a large scale, those who used loud-speakers were quite a small body, since it was found that they did not give such pleasant reception as the headphones. To-day the position of affairs is very much changed: telephones are everywhere giving way to the loud-speaker.

An Important Advance

The reasons for this change are many. Telephones even of the best types are distinctly uncomfortable to wear for a long time on end. Loud-speakers have been improved out of all recognition, transformers are on the whole much better than they were, and various methods have been devised for minimising distortion when speech and music are amplified up to loud-speaker strength.

One of the most important advances in this direction is to be found in the develop-

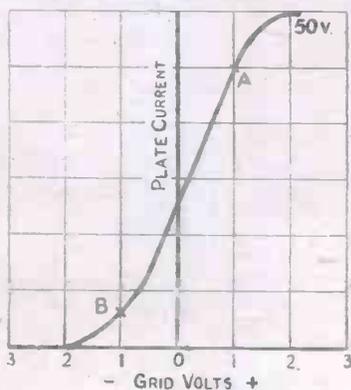


Fig. 1.—Grid-volts Plate-current Curve.

ment of the small-power valve intended primarily for the production of a large volume of sound. I used some of the earliest of these, some time ago now, and all had one fatal defect—they simply "ate" current. When one lives in the country and cannot easily get accumulators charged a valve whose filament requires

COMPONENTS YOU CAN RELY UPON

SMALL POWER VALVES.—I.

2 amperes or even a little more is out of the question for regular use.

In recent months quite a number of good small power valves have been placed upon the market with current requirements ranging from about .85 ampere down to as little as .2 ampere. It may, in fact, be said that whatever valves you are using for high-frequency amplification and rectification you can obtain a power amplifier whose filament has no greater consumption of current. The only exceptions to this statement are the "06" and the 1-volt dull-emitters.

General Purposes

Before we go on to say something about individual power valves the reader will no doubt wish to have a general idea of what these valves are and why their use is recommended for note magnification. It must be realised in the first place that the task of the note magnifier is entirely different from that which is performed by other valves in the set. Radio-frequency amplifiers deal with oscillations of very small amplitude but of high frequency. The rectifier converts high-frequency oscillations into audio-frequency impulses of considerable amplitude. To obtain good audio-frequency results it is desirable that the impedance of the intervalve transformer primary should be at least equal to that of the plate-filament path within the valve. The average general-purpose valve has an internal impedance of about 40,000 ohms. This in the case of the power amplifier is reduced to about 6,000 ohms on the average, but it may be as low in some cases as 2,000.

Impedance, by the way, must not be confused with direct-current resistance. You cannot measure the impedance of a transformer, as I have seen it suggested, by connecting a battery and a milliammeter across its primary. This measurement will give you merely the direct-current resistance of the primary windings.

The measurement of impedance is a very much more difficult matter, for it depends upon inductance, capacity, high-frequency resistance and the frequency of the oscillations which are being dealt with. The direct-current resistance of a power-amplifying valve is also low, which means that it will pass a bigger stream of electrons from the high-tension battery and thus supply more power to the loud-speaker.

Distortion, in so far as valves are responsible for it, is caused chiefly by a flow of grid current—that is, an electron

stream from the filament to the grid of the valve. The more positive the grid is made the greater, up to a point, will be the flow of grid current.

Now suppose that we are using a valve whose grid-volts plate-current curve is similar to that shown in Fig. 1, and that we are called upon to deal with waves whose crests have a value of 1 volt positive and whose troughs a value of 1 volt negative. Let us take it that the grid is connected simply to the negative low-tension lead, in which case it will be either at the same potential with respect to the most negative part of the filament or possibly at a slightly more negative potential. If we assume that the grid is at zero potential, the crest of a wave will take the working point of the valve up to A in the diagram. Here the flow of grid current will be very large and the upper half of the amplified oscillation delivered by the plate will be mutilated.

Another Cause of Distortion

In a valve with a curve like that in Fig. 1 a second cause of distortion will also arise. Here the trough of the wave will carry the working point down to B, at which grid current is very small indeed. But the point B is on the bent portion of the lower half of the curve, hence the lower half of the amplified oscillation delivered by the plate will also be distorted.

It is obvious that if we are to have perfect amplification the valve must have two qualities which do not appear in the curve to which we have been referring. In the first place there must be a long

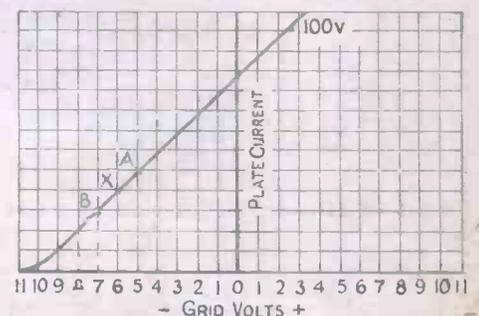


Fig. 2.—Curve of Power Amplifier.

straight portion, and in the second place we must have a very large part of this straight portion to the left of the vertical line.

Fig. 2 shows the kind of curve which the power amplifier will give with proper plate potential.

J. H. R.

(To be continued)

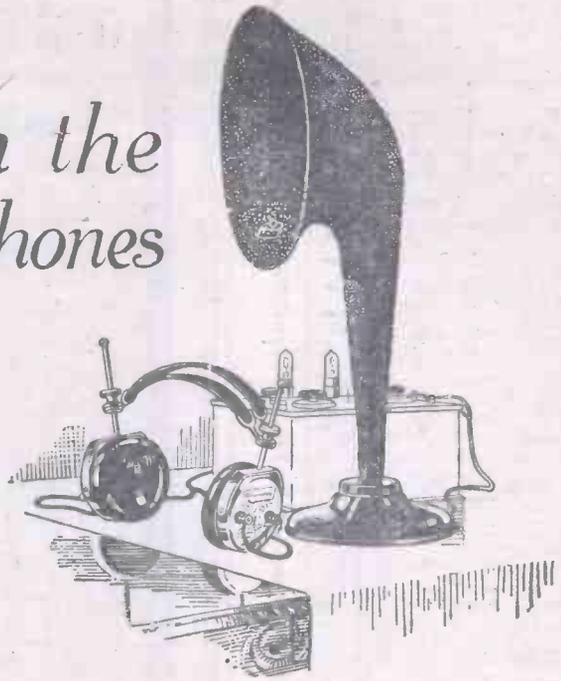
Tune the Table-Talker with the "Matched Tone" Headphones



The Brandes Family Series

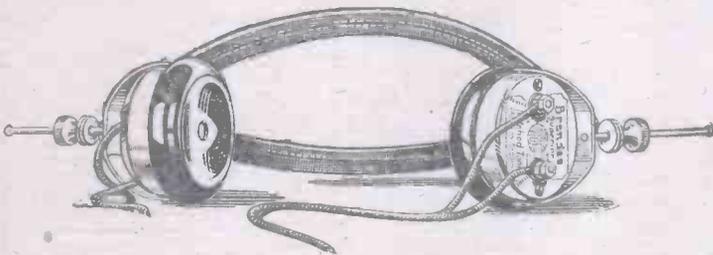
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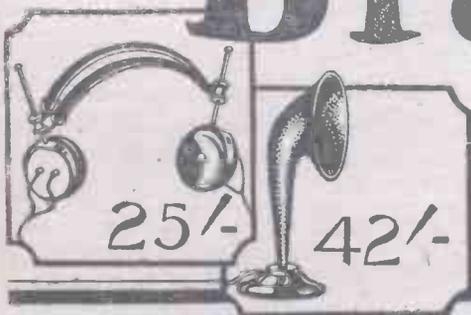
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On Your Wavelength!

Crackle, Fizz

I HAVE never known an autumn when atmospherics have been so persistent. They have in fact been with us on five evenings out of six ever since the end of September. Though not as a rule of a particularly violent kind, their presence has been sufficient to spoil to a certain extent one's long-distance reception and to make it difficult to get on terms on many nights with the broadcasting stations on the far side of the Atlantic. It is curious that these mild atmospherics should have been so prevalent. In most years November is the best month of all for reception, whilst October runs it very close.

Some readers may remember that I mentioned in these notes at the end of August that conditions were improving very rapidly and there seemed a likelihood that reception would be first-rate during the ensuing months. This has unfortunately not been quite the case. Some day I suppose we shall find a way of straining out atmospherics, but at the present time we must simply grin (or do the other thing) and bear them.

Further Afield

One night recently I tuned in Brussels and two French stations, all of which came in well. Then I turned to Madrid, to find that Radio Iberica was quite as powerful as any of our home stations with the exception of London. He was giving some particularly good violin solos on that night. I wonder, by the way, if Bournemouth or 2 L O can cross to Spain as well as Radio Iberica comes to us. Perhaps some reader who lives in that country will let us know how he receives the southern British stations. One would hardly expect that the strength would be so good, for the Spanish station uses 3 kilowatts, which is double the power of any of our own except 5 XX. This last station, of course, is well received in the south, and he has actually been tuned in with an unaided crystal as far away as the north of Africa. As things were so good I was all to make a night of it, and duly sat up until 3 a.m. I am glad to say that my efforts were rewarded, for I was able to pick up three of the American stations at very good strength and with remarkably little interference.

Two a Night

I am delighted to hear that we are to have in the near future two programmes broadcast simultaneously from the London station. The idea, I believe, is to make them entirely different in character, so that listeners may be able to select the kind of thing that is most to their tastes. The difficulties of pleasing everyone with

a single programme are, as I think I have said before, enormous. Quite apart from the fact that tastes differ tremendously, one must remember that the same person does not *always* like the same kind of entertainment. I imagine that even the high-brow with the loftiest forehead hankers occasionally after John Henry or the Savoy Orpheans. Similarly your low-brow has moments of exaltation in which only Beethoven or Brahms can fill the bill.

When there are two programmes going, each equally easy to tune in, we shall be able to take our choice, picking up whichever appeals to us most. And not only that; we shall be able to pick and choose our items. When, for instance, the announcer says that we are about to have ———. No, I will not say this lest I shall offend you. What I mean is that when one station announces an item of the kind that usually makes me fly to the switch, I shall in future simply give the condensers a little twiddle and bring in the second station.

Adjacent Stations

People have been wondering lately whether it will be possible to work two stations in London without their causing mutual interference even if their wavelengths are widely separated. To this I can only say: How about New York? New York boasts no less than thirteen fully-fledged broadcasting stations, and there are many American towns with pretty long lists. There are, for example, ten in Washington, seven in Denver, twelve in Los Angeles, nine in San Francisco, eight in Minneapolis and nine in St. Louis. Schenectady, the home of the powerful WGY working on 380 metres, has another station, WR L, whose wavelength is 360. Of course all these American stations do not as a rule transmit at the same time, though there are often two or three of them in the same town hard at it altogether. If Uncle Sam can solve these little problems, as apparently he does, we surely will have no difficulty with only a pair of stations.

And then you must not forget the fact that the American amateur transmitter is also a pretty hefty person. He is allowed by regulations to use greater power than the Britisher, and he often gets up to $\frac{1}{2}$ kilowatt or more by piling up his plate volts. Every self-respecting American city has, in addition to half a dozen broadcasting stations, hundreds of amateurs each striving to get the utmost watt into his aerial. I have seen a good many articles recently in American papers on how to build selective receiving sets. I do not wonder.

The Maple Leaf

I expect that a good many of you will have been sitting up during the week when these notes appear in print in endeavours to pick up CFAC, the broadcasting station at Calgary in Canada, run by the proprietors of the *Calgary Herald*. The tests are to be made on the 25th, 26th, 27th and 28th from 3 to 4 a.m., the wavelength being 430 metres. It will be most interesting to try for them, and if one succeeds it will be something of a feat, for I believe that the power of CFAC is only about a kilowatt.

Personally I think that the odds are against his being received in this country, except possibly by a stray enthusiast who is lucky enough to have erected his aerial in an especially good spot. However, the experiment is well worth trying, and I for one shall be amongst those who sit shivering into hours of the morning that almost cease to be small. There is one thing about it, anyhow, and that is that one will be able to while away the time until 3 a.m. by searching round for U.S.A. stations. If any reader does pick up the Canadian transmission he should write at once to the proprietors of the *Calgary Herald*, who are most anxious to have reports of long-distance reception. Calgary, by the way, is in Alberta, in the West of Canada, so that its transmissions have to cross something like 2,000 miles of land before they strike the Atlantic on their way to us.

The Zoo Again

The inmates of the Zoo were in better form this time than on the last occasion when the B.B.C.'s perambulator paid its visit to them. The parrots had apparently been taught to behave as perfect gentlemen and ladies—for this occasion, anyhow. I was quite expecting to have my loud-speaker burnt out by forcible remarks of some polly with seafaring experience, but nothing so unfortunate occurred, and no remark was uttered which would have been out of place even in the most Victorian drawing-room. The worst language was, I think, used by the monkey, which had been deprived for the occasion of the society of his pal. However, being no Tarzan, I do not understand the monkey language and no harm was done. You, I expect, were equally fortunately placed. Old Bill, the walrus, who suffered, if you remember, from microphone fright on the last occasion, appeared this time to have overcome his shyness and gave a remarkably good impression of what it feels like to be really hungry. The elephants were in great voice, so much so in fact that I felt it advisable to lop off a valve during their part of the programme.

:: :: *On Your Wavelength! (continued)* :: ::

I hope that the B.B.C. will extend this idea to what one might call "micro broadcasting." Personally I should revel in hearing the love song of the cheese mite or the oyster's pæan of joy when May ushers in the R-less months. Or, of course, as the animals have entertained us they might arrange for us to entertain them. I am sure that my lord the elephant would much enjoy hearing the morning lament of an elderly business man who has lost his collar stud and has only five minutes left in which to breakfast and catch the 8.50.

Birthday Honours

With both 2 LO and Birmingham indulging in birthday parties, I don't wonder if there were not enough "bouquets" to go round. I think, on the whole, both made a good job of it, though between ourselves I don't think 2 LO was as festive a gathering as last year. Do you? There was a Sunday-school sort of flavour about it, a kind of "one eye on the programmes and another on the licences." Perhaps the old stagers haven't renewed theirs. However, P. P. and his merry engineers worked nobly, and to quote them one and all, "That's the stuff to give 'em."

Which Way?

The results of the recent transoceanic tests on short waves makes one think rather deeply. It has been remarked that American east coast amateurs have reported that our amateur signals are very weak, and yet shortly afterwards a New Zealand station reports that the selfsame signals are too loud for the headphones! It has been suggested that owing to the phenomenon of the Heaviside layer the signals travel in the direction in which it is darkest, but the above-mentioned fact does not confirm this. Another theory is that the signals travel *through* the earth, and there seems no reason why they should not go this way; in fact I for one feel almost inclined to accept this latter theory.

Why?

Another question which rather exercises one's mind is why do these very weak signals travel so well? The high-brow reasons—less absorption by intervening hills owing to sharp tuning, the high frequency used and therefore the selectivity, less interference, etc., etc.—But then I don't think that these can all be accepted without question. Take, for instance, the first point. The working of these short waves requires considerable skill and knowledge, and a short-wave transmitter must be carefully designed in order to prevent absorption *in the set itself*. If this is the case, one would naturally expect greater absorption in outlying areas. As regards the

third point, the Americans will tell us that, as far as they themselves are concerned, the interference is pretty bad on these wavelengths.

The Hidden Hand

There are some who say that the commercial people have long been aware of the carrying propensities of short waves, but that in order to avoid scrapping expensive gear they have kept these matters in the background, and are now viewing with not a little concern the raking out of these skeletons of the past by the amateur. I can hardly credit that such a "dog in a manger" policy would have been adopted by vigorous go-ahead concerns, and can only think that this is yet another attempt to rob the amateur of the honour of making a valuable discovery.

The Amateurs

2 SH has been received in Johannesburg on short waves, and is thus the first British amateur to be heard in that part of the world. Congratulations, 2 SH! 6 PD has now changed over from a D.C. source of power to A.C. The first time that I heard him on this new power his speech was wonderfully smooth and good—in fact I should not have known that he was using A.C. if he had not said so. He had a bad shaking a few days back when he accidentally got across a pair of 2,000-volt wires. I believe that he was unconscious for five minutes. 6 VX seems to be gaining lung power as time goes on. He is now apparently using an outdoor aerial, and he begins to shake the ether pretty vigorously!

German Wireless

I have been very interested lately in going through copies of the German wireless periodicals. Wireless over there seems to be making great strides, though I cannot say that one is vastly impressed with the apparatus advertised or with much of the information given. One paper, for example, gives the power used by both 5 XX and 2 LO as 10 kilowatts, and states that both Plymouth and Nottingham are rated at 1.5 kilowatts. Some of their words are rather beautiful. Telephones they call doubleheadhearers, whilst a duolateral coil is known as a honeyweb-spool. Why they should call plug-and-socket mountings bananastickers I really do not know. And do not you think that roundwirelesspartaker is a glorious title for the humble broadcaster.

Wireless Societies

Probably those people who are not members of a wireless society often wonder what is done by these bodies, and picture to themselves a number of enthusiasts gathered together to listen to a lecture by

some "high-brow." Having recently had the privilege of visiting upwards of half a dozen of these local societies, I am able to assure readers that this is not the only thing that happens at these meetings.

A typical programme is as follows: Inspection of members' handiwork, and criticism; short talk by member of neighbouring society on "short-wave working"; Morse class; and, finally, a consultation and discussion on choke-coupled amplification—a very interesting evening. These societies are doing excellent work, and the fact that the meetings are well attended during the summer months shows that their members' enthusiasm is great.

Early English

There is a special run just now on things "early English," and I should think we have had a surfeit of Jacobean, Elizabethan and the Stuart songs. A seventeenth-century opera was perhaps a novelty, if one may be allowed to express it thus, heard from Newcastle on Friday. Written by Purcell (who contrived to live in three reigns—Charles II, James II, and William and Mary), it was intended for the private school of "Mr. Josias Priest at Chelsea," so I suppose he had to be careful. *Dido and Aeneas*, its title, was written round the story of Aeneas, driven on to the coast of Carthage and welcomed by its queen, Dido. Like most of those heroes, he was called away just before the wedding-day, and Dido dies. The libretto was written by Tate—not Harry, of course, but the famous Tate, of Tate and Brady, the metrical psalm-makers.

I like John Coates, too, but I do wish he'd sing us a real song occasionally just to encourage some of our modern composers to find a tune.

Pianos in Excelsis

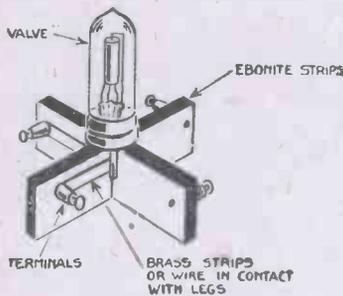
There is one instrument that has been shown to best advantage recently, and that is the piano, sometimes called England's national instrument. We have had William Murdoch, the Australian pianist, Irene Scharrer, Alice Couchman, and on Friday the great Continental artiste, Walter Gieseking. It is interesting to note that when he made his first appearance over here last autumn, though a name to conjure with on the Continent, he was an "unknown quantity," but after his first recital at Æolian Hall (for at the next it was reckoned that the hall contained more famous pianists than had ever been seen under one roof) they had come to see as well as to hear "how he did it." This year I suppose they all listened-in and tried to follow the extra difficult bits on their own instruments. Truly a wonderful sight!

THERMION.

PRACTICAL ODDS AND ENDS

Simple Valve Holder

A SIMPLE valve holder, very suitable for experimental work on the bench, is shown by the illustration. Two ebonite strips each about 3 in. by 1 in. by $\frac{1}{8}$ in.



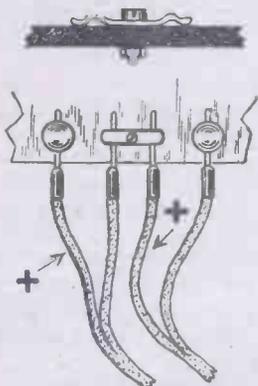
Simple Valve Holder.

or $\frac{1}{16}$ in. thick are joined together by cutting a slot halfway through each with a fretsaw, the two strips then being pressed together to form a cross.

Four terminals may be fitted and wires or metal strips carried to the legs of the valve, or the wiring of the set may simply be attached straight on to the legs, the ebonite cross strips effectively preventing any chance of the wire from any one leg coming into contact with the wires leading to any of the others. R. N. W.

Phone Connector

A SIMPLE device fitted between the phone terminals of a receiver to provide a convenient means of joining the tags of phones to be used in series con-



Phone Connector.

sists of a strip of spring brass about $\frac{1}{4}$ in. wide by 1 in. long, which is bent as shown and bolted to the panel. Care should be taken to see that both tags make good contact with the strip. O. J. R.

Emergency Detector

IN trying to alter the position of a crystal in a cup it may happen that you are unfortunate enough to break-up your last specimen. But do not despair.

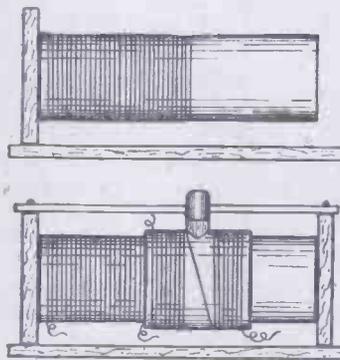
Connect a rusty knitting needle in place of the crystal cup. Lay a clean piece of copper wire on the needle (at right angles) and connect this up instead of the cat-whisker. Under favourable conditions this detector will give quite good results. J.

Burnt-out Filaments

IF, in a valve set, a phone cord with faulty insulation happens to touch an L.T. terminal there is likelihood of the filament being burnt out. This possibility can be prevented, in most one-valve sets, by placing the phones in the negative lead of the H.T. battery instead of between anode and + H.T., as is usual. D. P.

Slider-type Variometer

A N old slider inductance coil may be easily converted into a very useful variometer or variocoupler in the manner outlined in the accompanying sketch. Remove the slider bar and one of the coil ends, and strip off about half of the winding. Obtain a cardboard former about

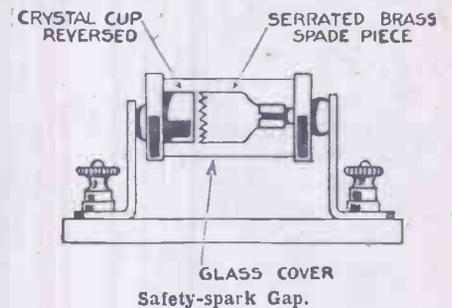


4 in. long and large enough in internal diameter to slide freely over the remaining winding.

Wind this with the wire taken from the original coil, leaving a space in the centre of the former to take a piece of round wood, which is secured firmly with Seccotine and attached at the opposite end to the under side of the ebonite slider. It is sometimes an advantage to replace the small spring in the slider before finally attaching the latter to the wooden distance piece. A. R.

Safety Spark Gap

A DISCARDED glass-enclosed crystal detector can be made into a useful static discharger in the simple manner shown. The crystal, catwhisker and catwhisker arm are removed and a serrated



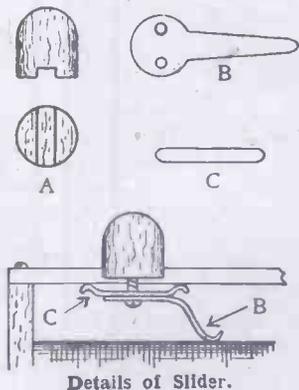
spade fitting clipped over the ball swivel of the detector.

Finally, the cup is reversed so as to present a flat surface to the discharging points, which should be placed approximately $\frac{1}{16}$ in. from the cup. W. R.

Efficient Slider

THE word "efficiency" is seldom coupled with an inductance slider of the spring plunger type, but a really efficient and still more simple device can be made up from a few pieces of scrap material in the manner to be described. A 1-in. length of wooden broom-handle A is slotted as shown so that when it is placed on the square brass rod the base is not quite flush with its lower edge.

Two pieces of spring brass are then cut as shown at B and C, these being soldered



together and finally assembled as shown in the lower diagram. The result is a perfectly smooth-rubbing contact along the whole length of the coil winding. R. J.

USING THE THOUSAND-CIRCUIT BOARD

The concluding article, detailing the uses of the experimental receiver described in preceding issues.

THE constructor, after making experiments with various types of coupling, will very soon discover what suits his particular needs best. There is, for example, no reason why both H.F. valves should be coupled in the same way. Very good results can be obtained by coupling the first to the second with tuned-anode circuit and the second to the rectifier with the aperiodic transformer. Other possible combinations are as under:

First Coupling.

- Tuned transformer.
- Tuned anode.
- Aperiodic transformer.
- Tuned transformer.
- Loose-coupled transformer.

Second Coupling.

- Tuned anode.
- Loose-coupled transformer.
- Tuned anode.
- Resistance capacity.
- Tuned transformer.

Thousands of Combinations

These are just a few suggestions; as a matter of fact the number of combinations even on the high-frequency side which can be made up with variations in the use of a loose-coupled tuner or not, and in employment or non-employment of reaction (which may be coupled, of course, to the A.T.I., to the secondary or to anode inductances or transformers), runs into thousands. If you care to amuse yourself by making up ten new circuits a day on this experimental board you can continue happily for five years without once repeating yourself!

If Purity is Required

One of its most handy uses is that which enables those who specialise in purity rather than in mere noise to discover the best combination of valves for any particular broadcast station. It is, for example, a mistake to use more high-frequency amplification than is absolutely necessary for reception of telephony, for high-frequency amplification always means the bringing in of a certain amount of mush.

On a very near station, one that is within twenty-five miles, it will usually suffice even for loud-speaker work to use the rectifier with or without reaction and the two note magnifiers. Are better results obtained by using reaction and no H.F. amplification or by employing one H.F. amplifying stage and no reaction upon a near-by transmission? Try and see. If signals are very loud and a little

distortion is noticed when two H.F. stages are in use you are probably rather over-loading the rectifier. In such cases try the effect of substituting aperiodic for tuned coupling and see whether this is better or worse than cutting out one H.F. stage altogether.

If you are not fond of low-frequency amplification you will probably prefer to work, as a rule, with two H.F. stages and one L.F. Then should you pick up a distant station which is too faint to be comfortably audible you can throw in the second L.F. stage in a moment. When atmospherics are bad you may find a distinct improvement in results by cutting down the H.F. amplification and making up for its loss by adding a second stage of low frequency.

Choice of Valves

Then again you can accommodate your set to suit exactly any valves that are in use. Some rectifiers work best with the grid leak in parallel with the grid condenser, others if it is taken straight across to plus, and others again when it goes direct to L.T. negative. When used as note magnifiers most valves do best with a fairly high anode voltage; but there are some which will not stand it. By using an extra high-tension battery with wander plugs you can adjust the anode potential exactly to their requirements and with the help of the grid battery you can make them work at their very best.

Most sets are considerably stabilised by earthing the secondary circuit if one is in use. You can try the effect of this in a moment. The usual connections of L.F. transformers are plate to IP, OP to H.T. plus, grid to OS, IS to L.T. minus. Some transformers do better with both grid and plate attached to the "in" terminals. Again, it may be found that there is less interaction between the transformers if the connections of one are made in the ordinary way, whilst those of the secondary in the other are reversed. In most sets it is a matter of some difficulty to make these changes, but on the Thousand-circuit Board they can be done so quickly that they entail no trouble at all.

Oscillation

Is it better when using the two tuned-anodes to connect the inductances so that current is passing through both in the same direction, or will there be less tendency to oscillation caused by interaction if connections to one of them are reversed? It depends very much upon circumstances, and you can try it for yourself in a matter of a few seconds.

Readers may wonder what is the best way of making the wiring connections upon the surface of the panel. I divide these into two classes—semi-permanent and temporary. The semi-permanent connections are such as those which connect the aerial terminal to the top of the A.T.I. (this will be changed only if the A.T.C. is placed in series) and the wires from OP and IS of the low-frequency transformers to H.T. plus and grid battery. These I made with No. 16 bare copper wire. For the shorter temporary connections I use a thinner and more pliable bare copper wire.

A Dual Purpose

Both the experimenter and the man who wants a set purely for listening in will find in the Thousand-circuit Board exactly what he needs. The first can change his circuits as frequently as he wishes, trying out every new one that comes along with minimum of trouble; the second can find the arrangement of valves that best suits his purpose, and once he has found it can let it remain upon the board. There is very little fear that an outfit of this kind will become out of date, since it allows one to keep pace with all the new developments in wireless without making any new constructional alterations.

J. H. R.

"TRIPLEX" AMPLIFICATION

FOLLOWING the ordinary reflex principle, in which one valve is used to amplify both high and low frequencies simultaneously, comes the application of the same idea in a more elaborate form to the so-called supersonic method of reception. In the supersonic system the incoming energy is first converted to a lower beat frequency, which is then amplified and rectified. For example, received short-wave signals (say 100 metres) are first heterodyned to a frequency corresponding to a wavelength of 3,000 metres, and this "supersonic" frequency is then amplified, thus eliminating the capacity losses that render direct H.F. amplification so inefficient. In the supersonic receiver there are therefore three frequencies present, namely, the signal frequency, the supersonic frequency, and the ordinary rectified or audible frequencies. By passing all three in succession through the same valve the latter can be made to function as a triplex or threefold amplifier. We now await the evolution of a quadruplex circuit!

M. A. L.

B.T.H. Headphones

WE couldn't improve the technical qualities of B.T.H. Headphones. They were and are perfect in tone, clarity and volume. We have, however, embodied a great many constructional improvements in the latest pattern, which make it the most comfortable and convenient instrument of its kind. Here are some of the more important features of the new B.T.H. Headphones:—

Weight, with cord, only 9½ ozs.

No hair-catching projections.

No "scissors" movement of headbands.

Adjustable to any head by a single movement, without the manipulation of screws or nuts.

No screws or nuts employed in construction, and therefore nothing to work loose.

Minimum number of separate parts.

Body of ear-piece made of non-resonating material.

Diaphragm rigidly clamped around periphery between surfaces of non-resonating material.

Permanent magnets are really permanent and are not affected by lapse of time or external changes of polarity.

B.T.H. Headphones are unequalled for sensitiveness, volume, comfort and appearance.

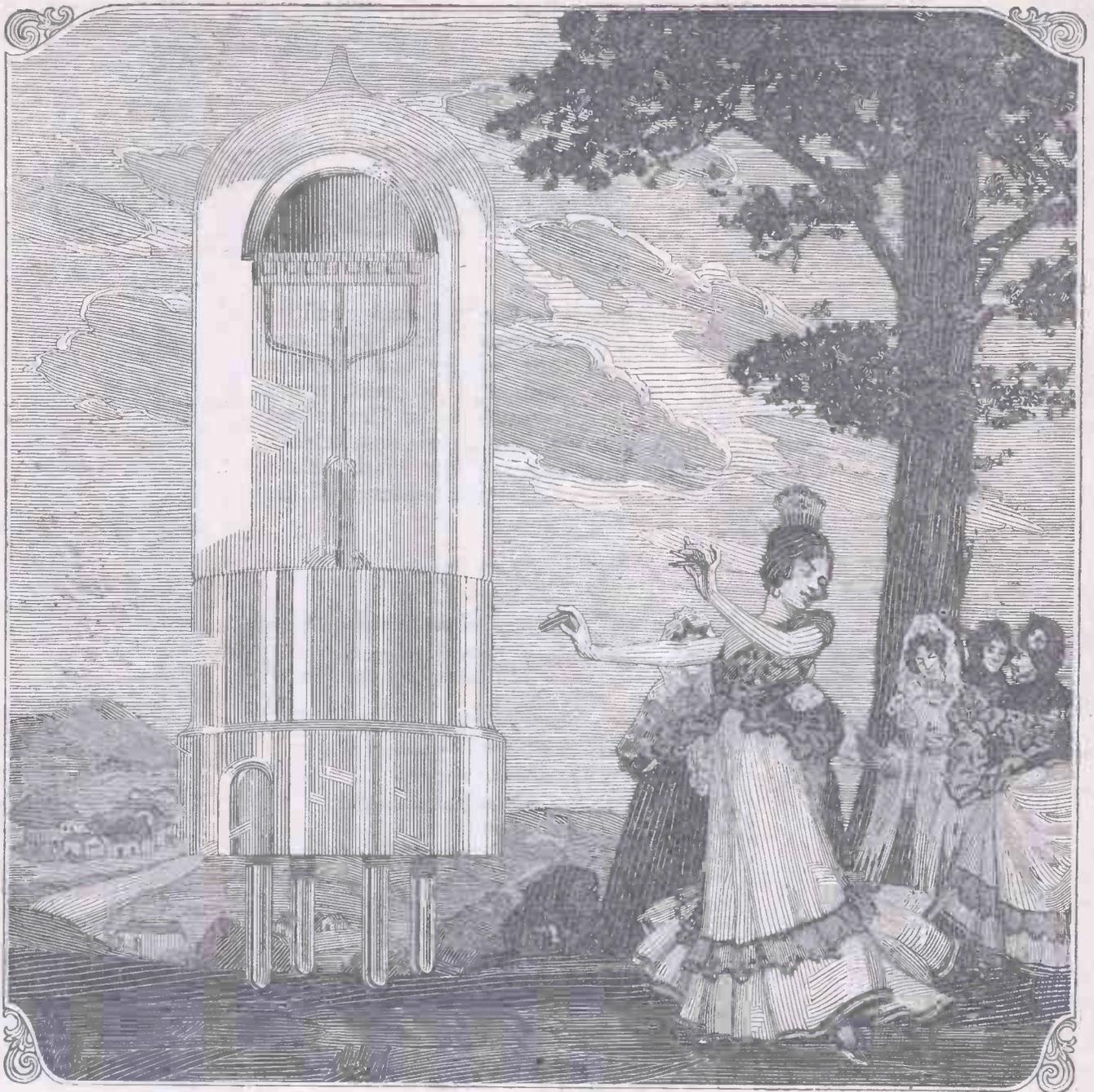
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*Obtainable from all
Electricians & Radio Dealers*

Advertisement of The British Thomson-Houston Co. Ltd.
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Continental Series No. 1.

Spanish Broadcasting

Station "Radio Iberica" situated in Madrid transmits every evening on 392 metres (nearly the same wavelength as Newcastle). Its programme begins at 9.30 p.m. and concludes at midnight—there is ample time for anyone to enjoy it without interference from our own B.B.C. stations.

"Radio Iberica" uses a power of nearly 5 k.w., therefore it can easily be received on a 2-valve Set fitted with Cossor Valves in any part of Great Britain. An additional P1 fitted as a Note Magnifier would probably bring it in at loudspeaker strength.

Cossor

An international education for users of Cossor Valves

A YEAR AGO Continental Broadcasting, as received in this country, was more a matter for the experimenter. But to-day a great change has been wrought. New Stations in every European country are springing up almost overnight! Splendid programmes are now available for all who will take the trouble to equip themselves for it. From Scandinavia to Spain the ether is alive—take advantage of it.

Any good Receiving Set using at least one stage of high frequency—two stages would be better—and a good aerial will be all the equipment necessary provided you are using the correct type of Valves.

For long-distance work use a Cossor P2 (the valve with the red top) in the high-frequency socket, and a Cossor P1 as a Detector. These two valves have been definitely worked out as a combination where the greatest efficiency is required.

Any experimenter knows that high-frequency amplification must be treated quite differently to rectification or low-frequency amplification—therefore the Cossor P2 possess very different characteristics to the P1. But both of them use the same master principle of

design—the arched filament and the hood-shaped Grid and Anode.

When dealing with the minute oscillations generated by a Broadcasting Station hundreds of miles away you cannot afford to take risks with inefficient valves—and the ordinary valve with a straight filament and tubular anode is inefficient when compared with a Cossor.

You know, of course, that the effective working of a valve depends on the electron stream given off by its heated filament. To prove this, turn the rheostat knob and lower the filament temperature of any valve—immediately the output of electrons is diminished and signal strength falls off.

In the Cossor Valve the filament is arched and follows closely the contour of the hood-shaped Grid and Anode, therefore few—if any—electrons can escape.

But in any ordinary Valve a large proportion of the electron stream leaks away at each end of the Anode and causes a serious falling off in efficiency.

If you are keen on getting good results from Continental Broadcasting, therefore, be sure to use Cossor Valves. *They cost no more—but what a difference in results!!*

BRIGHT EMITTERS.

P1. For Detector and L.F.
use 12/3
P2. (With red top) for H.F.
use 12/3

WUNCELL DULL EMITTERS.

Model A. (With resistance in base for use with 2-, 4-, or 6-volt accumulator.)

WR1. For Detector and L.F.
use 23/6
WR2. (With Red top) for
H.F. use 23/6

Model B. (Without resistance working direct from 2-volt accumulator.)

W1. For Detector and L.F.
use 21/-
W2. (With Red top) for H.F.
use 21/-

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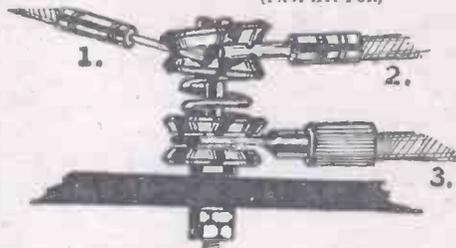
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VOLT METERS, 0 to 15 Volts, 5/-; double reading, 0-10, 0-100 volts, 12/-.
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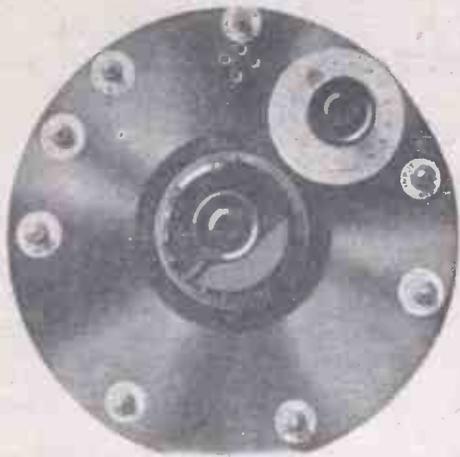


Fig. 1.—Front of H.F. Panel.

CLOCK CIRCUITS.—III

THE HIGH-FREQUENCY AMPLIFIER

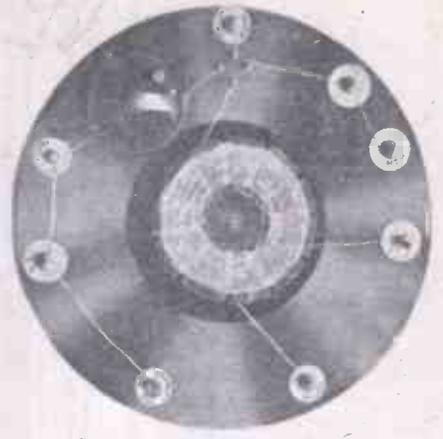


Fig. 2.—Back of H.F. Panel.

THE evils of stray capacity effects caused by an overcrowding arrangement of component parts or superfluous wire crossing and recrossing, are experienced in their worst form in badly-constructed high-frequency amplifiers.

Arranged on the clock system, which was described in Nos. 121 and 128, a high-frequency amplifier is simple to construct and, more important still, is easy to control.

A 10-in. damaged gramophone record was used to construct the tuned-anode high-frequency amplifier shown by the photographs Figs. 1 and 2. The eight terminals are arranged (see Fig. 2) in positions corresponding to the clock hours: Twelve, aerial input; 1.30, L.T. +; 2, H.T. -; 3, H.T. +; 5, aerial output; 7.30, earth output; 8.30, L.T. -; 9.30, earth input.

The rheostat is between the aerial input and earth input, whilst the valve is con-

veniently situated between the aerial input and L.T. +. The variable condenser is conveniently situated in the middle of the record. Instead of a coil holder, the writer mounts his coil on the base of the variable condenser, the idea being to cut out every capacity-causing component it is possible to dispense with. Only six pieces of bare wire are required for this unit.

After inserting the eight terminals, the rheostat, valve legs, variable condenser, and fixing in position the coil, the wiring up is simply done in the following manner: First wire, aerial input to grid; second wire, filament leg to L.T. +, finishing at H.T. -; third wire, one end of coil, on to variable condenser, finishing at H.T. +; fourth wire, plate to other side of coil, on to other side of variable condenser, finishing at grid output; fifth wire, filament output, to L.T. -, to earth input, finishing at rheostat; sixth wire, other side of rheostat to filament leg of

valve. There is no crossing and every wire is well spaced from its neighbours; avoidance of parallel wiring is the great feature of this amplifier.

For use the aerial input and earth input terminals are connected to the tuning system; the usual battery connections are made, preferably from separate batteries from those used for the detecting panel, and the aerial output goes to grid of next valve; the earth output, of course, goes to earth on next panel. F. W. E.

CORRECTION.—In the last instalment of this series (No. 128) an error was made in the connections. These should be as follows: 10.30 = L.T. -; 1P to input; 0P to other input; L.T. - to rheostat and IS of transformer; rheostat to valve-filament leg; other filament leg to + L.T. and - H.T.; OS of transformer to grid; plate of valve to one phone; other phone to + H.T.

ROUND *versus* SQUARE WIRE

IN wiring up a set the amateur has a choice of several varieties of wire for his "back-of-panel" connections. At the present moment, perhaps, the square bus-bar type enjoys the greatest vogue. It certainly makes a neat job, if properly done, and its stiffness enables insulating sleeving to be dispensed with and so lessens stray capacity. But there are two sides to the question of its efficiency as a conductor of H.F. currents.

Skin Effect

Most readers will probably have heard of "skin effect"—that is, the property of H.F. currents which causes them to pass along only a very thin surface layer of the conductor. According to Professor J. J. Thompson, the depth of this skin in the case of copper wire at ordinary radio frequencies is only one-fifteenth of a millimetre. It follows that the larger

the surface of a wire in proportion to its cross section the more efficient it is as a conductor, weight for weight. Now let us compare a round with a square conductor.

If d be the diameter of the circular wire, its cross section (which governs its weight) will be $.785d^2$ (approximately). The length of the side of a square of corresponding area is therefore $\sqrt{.785d^2}$, or $.886d$.

The circumference of the circular wire is, of course, $3.14159d$, and the perimeter of the square $4 \times .886d = 3.54d$.

The surfaces will, of course, be in proportion to these last two results, so that for equal weight, or quantity of material, we get a better conductor, other things being equal, by using the square wire.

Objections to Square Wire

But whether other things are equal is a

controversial point. The objection to square wire on theoretical grounds is not so readily shown as its advantage. It is alleged that there is a loss owing to the dissipation of energy at the angles of the wire.

The Ideal

Theoretically neither ordinary round wire nor the square bus-bar wire is by any means ideal. The best wire of all, from the purely theoretical point of view, would be one composed of a large number of very fine insulated strands. But this is very difficult to handle and to make joints with. The insulation also introduces a certain amount of stray capacity.

Offsetting the slightly better surface area against the rather vague "angle losses," it may probably be concluded that there is very little to choose, electrically, between round and square wire. H. W. S.

THINGS THAT CAUGHT MY EYE AT THE WHITE CITY

SOME NOTES ON THE BRITISH WIRELESS EXHIBITION BY A VISITOR

FROM a building that is usually both bleak and uninviting the White City has for the last fortnight been transformed into a home constructor's paradise, for the British Wireless Exhibition is primarily of interest to the fathers and mothers, sisters and brothers, who find as much pleasure in making their own sets as in listening to the broadcast programmes.

Components and "gadgets" form the bulk of the exhibits at the White City, elaborate cabinet sets being conspicuous only by their absence. This is rather beneficial to the average amateur than otherwise, for it leaves a larger field open for the display of parts for home construction. Many improvements have been made in component parts during the last year.

Crystal Detectors

As far as the ubiquitous crystal detector is concerned, few radical departures from ordinary practice have been made, improvements being marked rather by detail refinements than by new principles of operation. In view of the difficulty often experienced in adjusting the catwhisker contact for the best results, I was interested to note on a number of stands (notably Superlamp, Ltd., on Stand 60) glass-enclosed detectors of which one-half of the tube is provided with a white opaque coating to render the detector parts more easily distinguishable. This refinement will be appreciated by all crystal users.

Perhaps the most compact detector, at least amongst the adjustable variety, is that made by Abgar Electrics (Stand 57). This takes the form of an ebonite tube about $\frac{1}{2}$ in. in diameter and $2\frac{1}{2}$ in. in length, provided with a small adjusting knob at one end; in appearance it is somewhat similar to a variable grid leak. Quick interchangeability of crystal cups and catwhiskers is a feature of the Amplex detector made by the A. K. U. Co. (Stand 31), whilst detectors of the fool-proof variety are well represented by the Gravity, shown by the Portable Utilities Co., Ltd. (Stand 44), and the Everon, shown by Read and Morris (Stands 54 and 55).

Apparatus for Valve Sets

Of apparatus for use in valve sets two neat valve holders and a variable grid leak especially attracted my attention. The Abgar valve holder (Stand 57) is of special service for sets constructed with vertical panels, where the valves are mounted horizontally on the baseboard.

Small capacity between the sockets is a feature of the Bretwood holder (Stand 51A), which is adapted for under-panel mounting.

I was particularly impressed by the exhaustive tests which Bretwood variable grid leaks were given on Stand 51A. The megger is convincing enough (the leak I saw tested was continuously variable from a little below 300,000 ohms to just over 10 megohms), but the neon-lamp test is even more delicate. Nobody can now say that variable leaks are not variable, as has been true to some extent in the past.

Amongst the most handsome valve sets shown are a number made by Read and Morris (Stands 54 and 55) and Abgar Electrics (Stand 57). Sets that would make specially good presents for people who are not wireless "maniacs" are those with bright coloured panels, examples of which are shown by a number of firms. The City Accumulator Co. (Stands 25 and 26) are showing a two-valve set that sells for £5 without accessories.

Holder for Universal Coupling

From the amateur's point of view I suppose that the most interesting coil holder in the exhibition is that shown by the Penton Engineering Co. (Stand 27). The sockets are mounted on the ends of rods that have a ball-and-socket swivelling motion, thus permitting of any desired variation in coupling. On the same stand are shown some new coils, which have large air spaces. The adjustment of the new Lissen coil holder shown by Pettigrew and Merriman, Ltd. (Stands 10, 11, 12 and 13), is also neat.

Crinkled copper tape for aerials (by means of which a large amount of wire is contained in a comparatively short

length) is shown by Read and Morris (Stands 54 and 55). For use as an indoor aerial the Formo Co. (Stand 41) are showing a close-coiled spring of wire than can be stretched across any ordinary-size room. Non-tangling of the wires when folded is a feature of the Eureka collapsible frame aerial (Stand 44), while for obtaining reaction Seagull, Ltd. (Stand 23), use a small frame within a larger one.

"Organ-pipe" Loud-speaker

There are a number of interesting loud-speakers on show, the most notable being the Flair, made by the Penton Engineering Co. (Stand 27). This is constructed entirely of wood and can best be described as a collection of miniature organ pipes. The upright horn of this, which is of square section, is divided into channels by dozens of carefully planned intersections.

Another interesting loud-speaker is the soundboard type shown by Peronet, Ltd. (Stand 56). The back of this is a curved soundboard actuated by a receiver, the front being of cut-away pattern backed with silk to get an ornamental effect. On Stand 60 I noticed a little Songster loud-speaker for 12s. 6d.

Wire for Connecting Up

For those who use both bright- and dull-emitter valves I noticed a neat Abgar dual filament resistance on Stand 57. One half has a resistance of 7 ohms and the other a resistance of 30 ohms. Of special use in connecting up sets is some No. 16 gauge insulated wire shown by the City Accumulator Co. on Stands 25 and 26. In this case the Systoflex covering is actually built up round the wire while it is being made. A useful polishing outfit that gives excellent results even in inexperienced hands is also shown.

On Fuller's stand three things that caught my eye were a very compact valve amplifier, some new phones and Sparta dry batteries. Two new types of fixed condenser are the Igranic-Freshman on Stands 9 and 14, and the Penton on Stand 27. On Stand 46 I noticed a useful coil winder, on a baseboard, made by Morch Bros. Klutch terminals, shown by Henry Joseph and Co. (Stand 35) have no nuts that have to be screwed down.

Altogether the show is just what the amateur wants, and its success is sufficiently proved by the good business that exhibitors have and are doing. Under one roof the amateur can inspect at his leisure dozens of interesting and useful little "gadgets."

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SOME TOPICAL ASPECTS OF WIRELESS



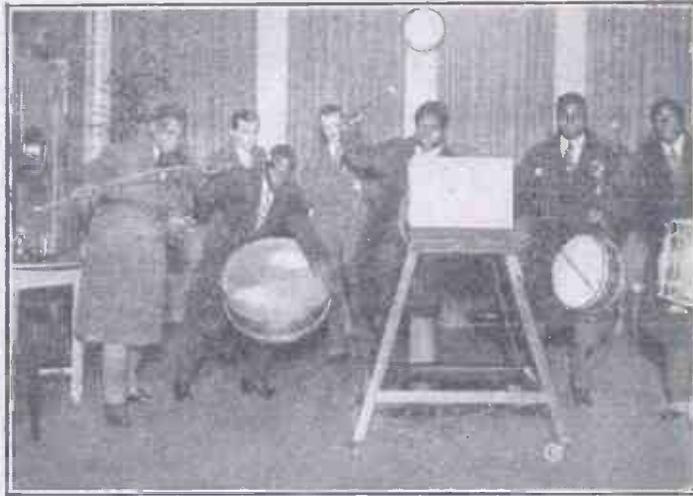
Mr. F. G. Kellaway, a former P.M.G., is to succeed Mr. Godfrey Isaacs as managing director of Marconi's Wireless Telegraph Co., Ltd.



Mr. Godfrey Isaacs, the managing director of Marconi's Wireless Telegraph Co., Ltd., is resigning on account of ill-health.



Capt. Ian Fraser, of St. Dunstan's, is now M.P. for St. Pancras, North. Capt. Fraser is a keen wireless amateur and holds a transmitting licence. The right-hand picture shows Capt. Fraser tuning in the Children's Hour for his daughter Jean.



"The Congo Bush at Night," a play broadcast from 2 L O, was written by Mr. Richard Hughes and produced by Mr. R. J. Jeffrey. The left-hand picture shows the author (sitting) and the producer (standing). The right-hand picture shows the natives from the Congo who supplied the musical effects.



RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, lay-outs, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 863).

Position of Crystal Detector.

Q.—Does it matter whether in an ordinary crystal circuit I connect the crystal to the aerial and the phones to earth or vice versa?—A. K. (Hammersmith).

A.—Theoretically the best results are obtained by connecting the crystal detector to the aerial and the phones to earth. The whole series of connections should be thus: aerial to catwhisker, crystal to one side of phones, other side of phones to earth.—D. C. R.

Finding Polarity of D.C. Mains

Q.—Please give me particulars of a test by which I can find out the polarity of my lighting mains, as I desire to use them for battery charging.—D. A. (Derby).

A.—If you insert two leads from the mains in a little vinegar, keeping the wires well apart, bubbles of gas will be given off at the negative lead. Another well-known test is to rest the leads on the freshly cut surface of a potato. The positive lead will leave a greenish-blue mark. Pole-finding paper may be obtained in the form of small books. This paper is impregnated with potassium iodide and starch. It is moistened and the wires held in contact with the paper, an inch or two apart. The positive lead will leave a brown spot.—D. C. R.

Making A Step-up Transformer

Q.—I want to make a small transformer capable of stepping up the 200-volt 50-cycle main supply on each side of a central tapping point, with an output capacity of about 50 watts.—N. M. (London, W. 14).

A.—Querist suggests the use of iron wire

for the core, bent back over the coil to form the return magnetic circuit, in other words the type known as the "hedgehog" transformer. The difficulty with this type of core is to calculate the sectional area and the reluctance of the magnetic circuit, since it depends so much on the disposition of the wires when they are bent back. It is not easy, moreover, to bring out the connections from the coil after it has been completely surrounded by the enclosing wires. A further disadvantage attending the use of round wires for the iron core is that space is not made use of to the fullest extent, owing to the interstices between the substance. The modern practice is to substitute laminated flat strips of thin sheet-iron, which pack closely in the form of a rectangular section. A good type of core will be found illustrated in "Auto-transformer Design" (Avery). High voltages on transformer windings necessitate a liberal space allowance for insulation and the smallest size of core that can be recommended for meeting the above specification is as follows: Core to consist of Stalloy strips 1½ in. wide by 0.018 in. thick. Quantity required 3 in. depth, 4½ in. long and 3 in. depth, 3 in. long. These can be obtained from J. Sankey and Sons, Ltd., Albert St. Works, Bilston, Staffs, and the weight of the assembled core without the windings will be 9½ lb. After building up and insulating after the manner recommended in the above book, the primary and the secondary coils can be wound on a circular former, the primary being electrically insulated from the secondary by three layers of 10 mil empire cloth. The

primary winding will consist of 700 turns of No. 28 s.w.g. d.c.c. copper wire, and the secondary will contain a total of 4,900 turns of No. 36 s.w.g. double-silk-covered copper. Halfway through this coil, namely at 2,450 turns, a tapping will be brought out for the mid terminal point desired. Special care must be paid to the insulation of the high-tension winding, a layer of 3-mil varnished paper being inserted at every fifth layer, cut wide enough to extend ¼ in. beyond the sides of the coil itself. The weights of copper required for the primary coil will be roughly 2 lb., and that for the secondary, 2 lb., or a little less. Suitable wire can be obtained from the London Electric Wire Co., Ltd., Playhouse Yard, Golden Lane, E.C., and all insulating material from The Micanite and Insulators Co., Empire Works, Walthamstow, E. For insulating varnish apply to Griffiths Bros. and Co., Ltd., Mack's Road, Bermondsey, S.E.—A. H. A.

Variometer and Variocoupler

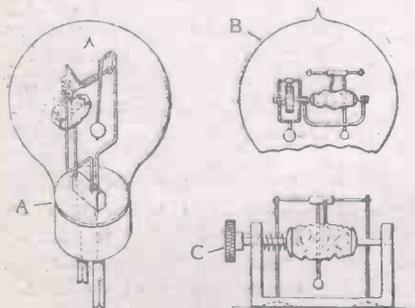
Q.—What is the difference between a variometer and a variocoupler?—S. C. (Chesterfield).

A.—A variometer is a tuning arrangement by means of which two coils, called the rotor and stator, are connected in series. The inner coil, or rotor, turns within the outer coil, and the wavelength of the system is thus varied. A variocoupler consists of two distinct coils not connected together. This instrument resembles the variometer outwardly, but is used for inductively coupling two circuits, whenever this is desired.—D. C. R.

PROGRESS AND INVENTION

Crystal Detector

SOME people are of the opinion that the waning of sensitiveness of crystal detectors is due to oxidation or atmospheric



Crystal Detector (222,522/24).

vacuum, Patent No. 222,522/24 (S. L. Price, of Clapham Park).

It will be seen at A in the diagram that the catwhisker is attached to a pendulum provided with a small bob, the point of contact being varied by tilting the bulb. Alternative methods of adjustment are shown at B and C.

[A crystal detector similar to that shown at A was entered for the AMATEUR WIRELESS Novelties and Inventions Competition.—ED.]

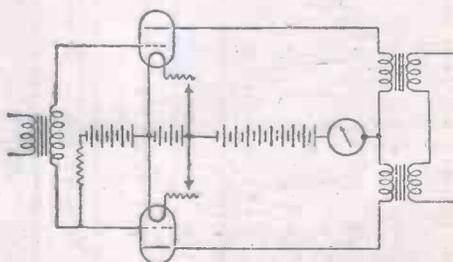
Push-pull Amplifier

IN push-pull amplifiers (where two valves are used differentially) it is usual to use a special input transformer with a tapped secondary winding. A method of using an ordinary L.F. transformer is explained in Patent No. 222,981/24 (P. G. A. H. Voigt, of London, S.E.).

The secondary terminals are connected to the two grids (see circuit diagram), and

a high impedance is connected between the secondary and filament, through biasing cells, to act as a path for the grid current.

In the specification a formula is given for finding the best value of grid bias, for if this is not of the right amount the valves will not function differentially. By



Push-pull Amplifier (222,981/24).

moisture dust. For this reason a detector has been produced in which both the crystal and its contact are sealed in a

altering the bias the valves can be made to amplify either both halves or one half of the wave.



The Complete Flewelling Receiver.

THE photographs illustrate a one-valve receiver based upon the well-known circuit of Mr. E. T. Flewelling. Apart from the question of the sensitivity of this circuit, it is most interesting and instructive and one which even after a period of twelve months or more is not properly understood. The results to be expected from it vary according to the ability of the operator and the experience which he has gained by using plain regenerative circuits.

Results

The receiver illustrated has been used with varying results; for instance, the circuit Fig. 1 has been used with a piece of wire about 8 ft. long as an aerial. Upon this many broadcast stations were received, including L'Ecole Supérieure and Radio-Paris, the speech and music being clear and distinct. The same arrangement was connected up to an ordinary earth lead with similar results, except that the tuning had to be altered to meet the additional inductance formed by the longer wire in this case. A piece of electric-light flexible wire 30 ft. long laid along

reaction coil two or three times as large as the A.T.I. in order to obtain the characteristic whistle of the circuit when used as a super-regenerator.

On the other hand, 2 L O, Birmingham, Newcastle and Cardiff were all clearly received using the circuit as a plain regenerator as well as a super-regenerator under these conditions and proves to be exceedingly efficient for the purpose. As, however, the arrangement

MAKING A FLEWELLING

Particular interest attaches to the Flewelling and the field it opens up.

the floor and connected to the terminal A produced louder and more easily managed signals than the short wire or the earth lead. With either of these arrangements it was found necessary to employ a

larger reaction coil up tight to the A.T.I. for super-regeneration or substituting a smaller reaction coil and loosening the coupling for simple regeneration. Probably the latter will be preferred by many for musical reception as there is no accompanying whistle; the set, though, is not functioning as a super unless this whistle is present to a greater or lesser degree.

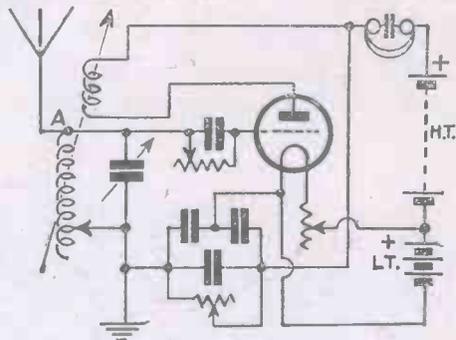


Fig. 1.—Circuit Diagram for Ordinary Aerial.

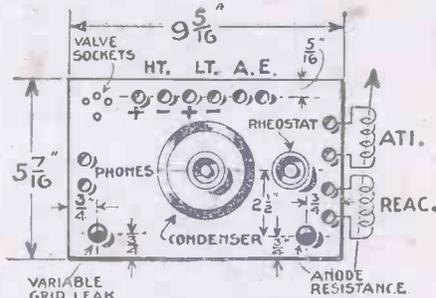


Fig. 4.—Layout of Panel.

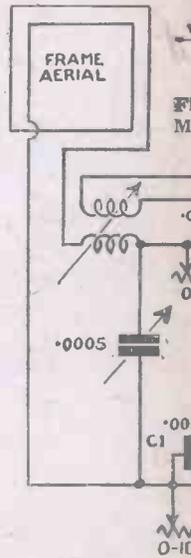
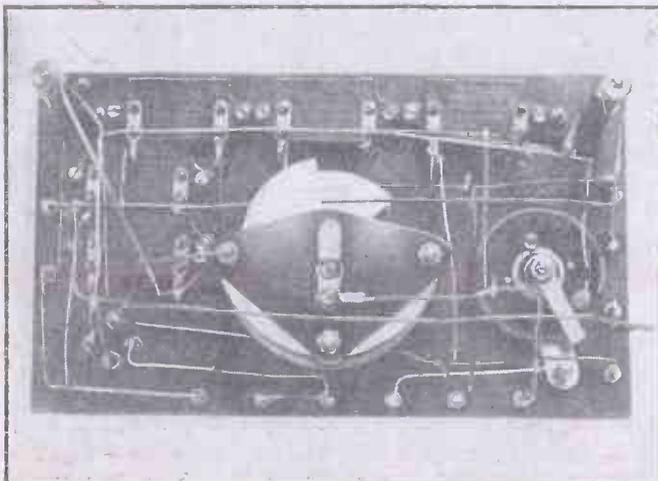


Fig. 2.—Circuit Diagram for Frame Aerial.



Plan View of Under Side of Panel.

is inclined to be tricky, it would be advisable not to put it on an outdoor aerial whilst broadcasting is in progress, otherwise considerable annoyance will be caused owing to the fact that in order to get maximum results one has to tune into the silent point of the carrier wave. Used on an indoor aerial, however, exceedingly fine results are to be obtained either as a plain regenerator or super by the simple expedient of coupling

Super Regeneration

It will be noted when using the set as a plain regenerator a point is reached when maximum signals are obtained, and pushing the reaction any further than this will merely result in a loud plop in the phones and utter silence after this. If, however, the reaction coil is of the correct value and is pushed right home and the variable resistances are correctly adjusted super-regeneration will become apparent by the whistle which may be varied in pitch until a point is reached where it becomes almost inaudible. It is then merely a matter of delicate tuning and adjustment of the correct position of the reaction coil before maximum clear and loud signals are obtained. Incidentally it might be said that it appears that if the variable resistances are once set to such

ELLING RECEIVER

g circuit, both on account of its sensitiveness
offers for experiment

a position that super-regeneration is obtainable, the same setting will serve for ordinary regenerative purposes.

The circuit so far referred to for use with a plain single wire aerial or earth wire on the aerial terminal will for ordinary regenerative purposes require an aerial tuning inductance consisting of about 30 turns of No. 26 d.s.c. on a 3-in.

Materials Required

Box, or wood to make ($\frac{3}{4}$ in. thick); three .006-microfarad condensers; one .002-microfarad condenser; one .0002-microfarad condenser; panel; two resistances (variable),

0-10 megohm; one variable condenser (good quality); one coil holder (vernier); one filament resistance (vernier); two coils; one dozen terminals; valve sockets; valve; and the usual H.T. and L.T. batteries.

The Case

The dimensions of the case are shown in Fig. 3. It is, of course, possible to incorporate a small frame aerial in the lid, but the size given would not provide an arrangement of maximum efficiency.

The Panel

A piece of best-quality ebonite is essential for the panel,

mounted on two separate strips of ebonite as shown in Fig. 6. All the condensers are screwed to the under side of the panel, as shown in the photographs by means of the ebonite strips. By this means a good and quick fixing is secured in a small space with a minimum amount of undesirable metal in the form of holding-in screws.

Variable Condenser

The value of this is shown as being .005 microfarad, and the one used in the illustration also possesses a vernier, a useful and almost indispensable arrangement. The value of the condenser, however, may be .0003 microfarad, providing it is not desired to cover a very broad band of wavelengths.

Filament Resistance

It is of advantage to use a resistance which has a vernier movement, since varying the brilliancy of the filament also affects the action of the valve, the adjustment being markedly critical with some valves. The diameter of the resistance (for reasons of space) should not exceed $2\frac{1}{2}$ in.



View of Under Side of Panel.

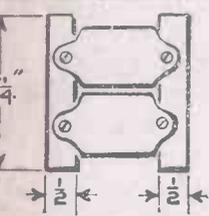


Fig. 6.—Method of Mounting Telephone and Grid Condensers.

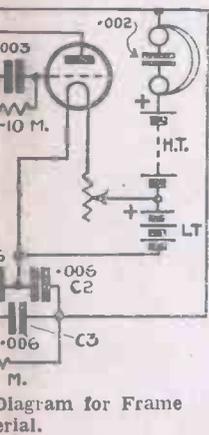


Diagram for Frame Aerial.

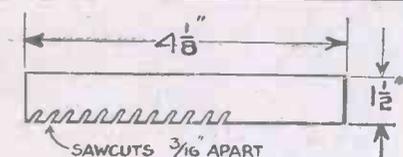


Fig. 7.—Wire Supports for Frame Aerial.

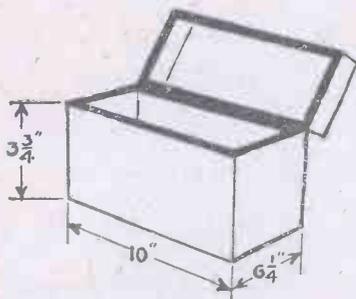


Fig. 3.—Details of Case.

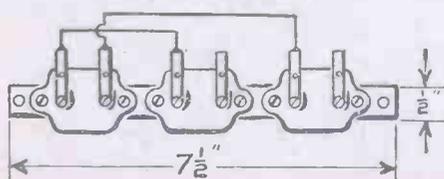


Fig. 5.—Arrangement of Fixed Condensers.

diameter former and a reaction coil of 40 turns on a similar sized former; Nos. 3 and 4 Burndept coils are suitable. For super-regenerative purposes the same size A. T. I. is suitable with a reaction coil of 150 turns of No. 30 d.s.c. on a similar former.

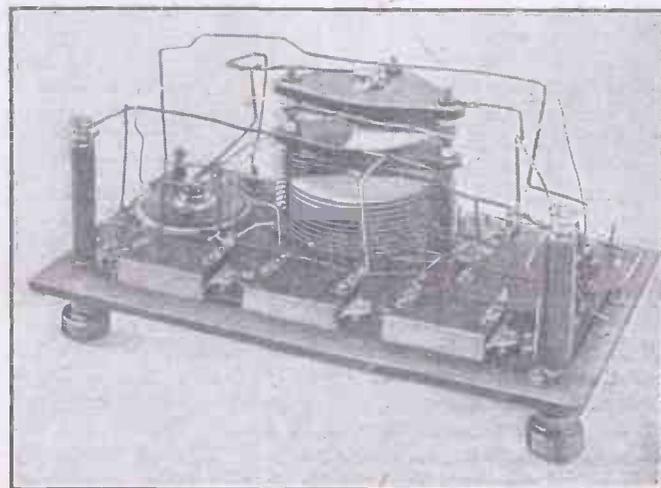
In passing it might be stated that upwards of thirty amateur stations on the 200-metre band of wavelengths have been received with this gear when using it as a super set, the telephony being clear and strong.

The circuit shown in Fig. 2 is for using the set with a loop or frame aerial, and this is perhaps one of its most useful adaptations, as it provides a directional portable set for those persons who are troubled by interference or have scanty accommodation for an aerial or wireless gear generally.

and only the matt-surface variety should be used. The dimensions are shown in Fig. 4.

Mounting the Fixed Condensers

The three .006-microfarad condensers are mounted on a separate strip of ebonite as shown in Fig. 5. The wiring shown therein is carried out with bare (not tinned) No. 16 copper wire. The .002 telephone condenser and the .0003 grid condenser are then



Another View of Under Side of Panel

Valve

A V₂₄ valve has been found to function as well as any, but a Cossor or an R

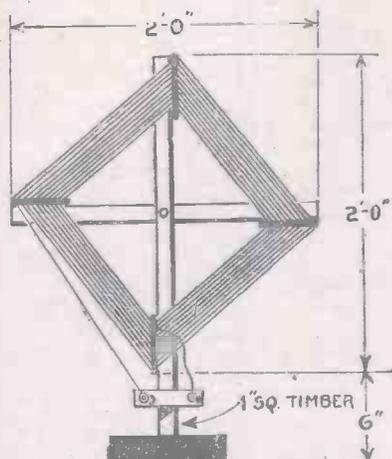


Fig. 8.—Constructional Details of Frame Aerial.

valve is very good. Whenever the valve is changed it will be found necessary to

vary the resistance value of the grid resistance and also the anode voltage.*

Coil Holder

The coil holder is screwed to the outside of the box and flexible leads are provided with spade terminals arranged so that they may be disconnected in order to close the lid. Although not essential, it is advisable to use a coil holder possessing a vernier arrangement, as here again the adjustments are critical.

Frame Aerial

The dimensions of the frame aerial are given in Fig. 8. The wire is spaced $\frac{1}{8}$ in. apart on ebonite projections screwed to the woodwork; the ebonite is $4\frac{1}{8}$ in. by $1\frac{1}{2}$ in., and is cut with a thick hack-saw blade as shown. The wire used is No. 20 enamelled, 12 turns being put on. The wooden frame is made up of two pieces each 2 ft. long.

A short concluding article in the next issue will describe the operation of the set. A. J. C.

MECHANICAL ANALOGIES

A Summary of a Lecture given before the Radio Society of Great Britain on November 12.

THE value of mechanical analogy in wireless instruction was demonstrated at the last informal meeting of the Radio Society of Great Britain, held on November 12, when Mr. R. C. Clinker exhibited a dynamical model of an oscillating valve circuit.

Opening his talk with some interesting historical notes, Mr. Clinker referred to Clerk Maxwell's early model designed to show the mutual inductance between two circuits. This model had evoked the admiration of Lord Kelvin, whose belief it was that if any electrical phenomenon was fully comprehended it should be possible to construct a mechanical model to illustrate it.

Mr. Clinker's model consisted of a simple circuit comprising a three-electrode valve placed across an aerial inductance tuned with a parallel condenser. The current flowing through the circuit was represented by a moving string, running on pulleys and actuated by a small electric motor.

The inductance of the coil was illustrated by the use of a pivoted rod weighted at each end. When this was mechanically oscillated the inertia of the coil was at once apparent. Equally ingenious was the representation of the condenser capacity by means of an elastic spring.

When the circuit was represented in a state of oscillation the grid was seen to change in polarity in accordance with the direction of the aerial current, and in other respects the action of the model was per-

fectly consistent with the electrical phenomena it portrayed. In concluding his demonstration, Mr. Clinker expressed the opinion that the best mechanical analogies for inductance and capacity were respectively mass and elasticity.

In the ensuing discussion Mr. R. E. Carpenter detailed an interesting mechanical model to show the internal action of the valve, but stated that so far he had been unable to evolve a satisfactory device to represent the space charge effect. Mr. J. H. Reeves urged the need of a mechanical model to instruct broadcast listeners in the proper use of reaction!

WORLD-WIDE BROADCASTING.

ORGANISED largely by the Wireless Retailers' Association in conjunction with the B.B.C., international radio week started on Tuesday with an opening programme transmitted from 2LO between 10.30 and 11.30 p.m. Listeners still have a chance of hearing a special programme from Brussels on Thursday. The Danish Radio Club will transmit on Friday and Radio-Paris will provide a programme on Saturday. KDKA is also to take part.

From 3 to 5 a.m. each morning from November 24 to 30 European broadcasting stations are to transmit special programmes. American stations will broad-

cast from 3 to 4 a.m., and European stations from 4 to 5 a.m. English and Continental stations are to transmit on alternate mornings. All the B.B.C. stations will transmit simultaneously.

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The extent of these responsibilities and the ideals to be sought in a public broadcasting service are clearly revealed by Mr. J. C. W. Reith, managing director of the B.B.C., in his book, "Broadcast Over Britain" (Hodder and Stoughton, Ltd.).

In this book Mr. Reith is concerned with the policies to be adopted in controlling a broadcasting service, the reasons for the existence of the service, and the heights to which it may attain. He indicates the problems that have been solved in the past, that are being solved now, and that will have to be solved in the future.

The hopes and aspirations of those responsible for providing entertainment (in its widest sense) by broadcast are explained, and nobody who reads what Mr. Reith has to say will wonder why Great Britain has the best broadcasting service in the world. The price of the book is 6s.

WHITE CITY WIRELESS EXHIBITION

Award of Silver Cup

The Novelties and Inventions Competition proved a great success, the entries being large in number and varied in character. Many of these will be described and illustrated in later issues. The following are the prize winners:

1st Prize.—Amateur Wireless Silver Cup; Mr. A. Page, B.Sc., 19, Blythwood Drive, Glasgow.

A Crystal Receiver, complete with detector, tuner and phone, all contained in a silver watch case.

2nd Prize.—Gold Medal; Mr. H. J. Lowe, 158, Lewisham Road, London, S.E.

A Loud-speaker with adjustable resonator.

3rd Prize.—Silver Medal; Mr. M. Masel, 20, High Street, Romford.

A Method of Using Crystals in Granular Form, applicable to any crystal set.

EXPERIMENTAL TRANSMISSION.—V

DIRECTIONAL AERIALS

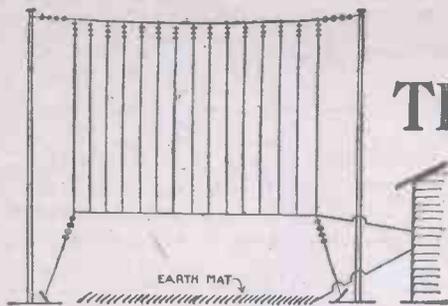


Fig. 15.—Directional Aerial with Tuned Screen.

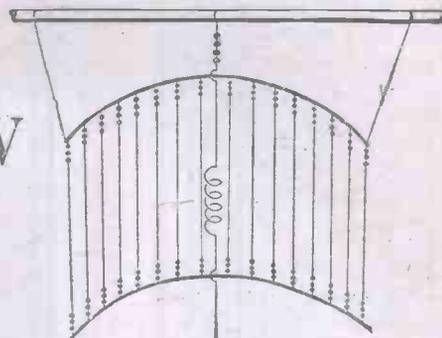


Fig. 14.—Short-wave Directional Aerial with Tuned Reflectors.

ONE hears a lot about directional effects of the normal inverted L-type aerial, and poor reception is often put down to directional effects. In actual practice directional effects do not occur on normal wavelengths and with normal types of aerial unless the total length of the aerial (above the lower capacity) is at least ten times as great as its effective height.

In order to carry out successful directional transmissions two alternatives are available: (a) the use of large frame aerials and the employment of normal wavelengths, or (b) the use of specially designed antennæ on short wavelengths of 50 to 1 or 2 metres.

Frame Aerials

The directional properties of frame aerials are too well known to need discussion at length here, but one would not imagine, in view of all the theory of transmitting antennæ described, that any range could be obtained by the use of a frame aerial. Remember, however, that the power radiated is equal to I^2R_r , and that as long as one of these factors is sufficiently big a large amount of power will be radiated.

It will be obvious that a frame aerial,

and much serious directional work may be carried out on a frame-type aerial.

Reflector Aerials

There is still the other and better alternative. We may employ aerials having the general characteristic so that their directional power or polar curves depend on their dimensions relative to the wavelength employed; for instance: (a) reflector systems; (b) aerials at right angles to the working direction, correctly adjusted as regards phase; (c) Beveridge-type antennæ, as used for directional reception.

Classes b and c may at the outset be considered as highly inefficient for amateur use, and although experiments with the long horizontal Beveridge-type aerial may prove interesting, successful results will be hard to obtain.

Reflector systems, however, may be employed provided that the wavelength of transmission is extremely short—that is, in the neighbourhood of 10 metres; probably the most efficient reflecting system has a radiation somewhat similar to a parallel beam of light which has passed through a slit in an opaque screen. Fig. 14 illustrates such a system.

Many interesting experiments may be conducted on such a system, but obviously the arrangement constitutes an interesting laboratory layout more than a practical proposition.

A rather more practical scheme is illustrated in Fig. 15, a scheme in which a number of tuned wires are carefully insulated at their free ends, the other extremities being joined to the transmitter. The aerial may, of course, be rectangular or fan-shaped (Fig. 16), and copper earth mats simply laid on the ground appear to form the most efficient earthing system.

Dimensions naturally vary with the wavelength employed, but for general purposes (wavelengths about 15 metres) the vertical posts may be about 20 ft. high and the same distance apart. The wires must be very carefully insulated, as brush discharge and eddy-current losses are liable to be considerable. The point of contact of the wires should not be less than 6 ft. from the ground connection, which latter must be situated immediately under the aerial.

Aerials for Duplex Work

The question of duplex working is com-

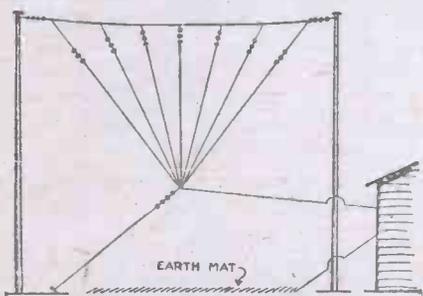


Fig. 16.—Directional Aerial with Fan-shaped Tuned Screen.

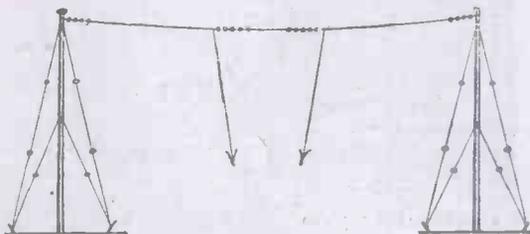


Fig. 17.—Arrangement of Transmitting and Receiving Aerials for Duplex Working.

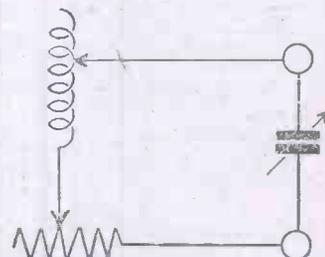


Fig. 18.—Connections of Phantom Aerial.

even of large dimensions, may be constructed having a very low actual ohmic resistance, and we thus expect a very large value for I_t , several times larger, in fact, than would be obtained were the same transmitter coupled up to an outdoor aerial system. Radiation resistance, however, will be very small, and the great dielectric and absorptive losses will prevent any great range of transmission being obtained. Still, great things may be done,

It will be noticed that the system consists essentially of two vertical wires forming the upper and lower capacities, supported at a focal distance from a reflecting screen equal to one-quarter of a wavelength. The reflector consists of a light wooden frame supporting a large number of carefully insulated wires, each tuned to the wavelength of transmission, and thus acts as an opaque screen to transmissions on this wavelength.

ing more and more to the front, as the send-receive switch is decidedly a nuisance, and simultaneous reception and transmission is impossible. More will be said of partial and true duplex systems later, but for the moment it will be assumed that two aerials—one for transmission and one for reception—are necessary.

If minimum interference is to be caused in the receiving side, and if minimum metalwork is to be included in the trans-

mitting aerial field, transmitting and receiving aerials must lie with the free ends in opposite directions (see Fig. 17).

Even if it is not desired to carry out experiments in duplex working it will be advisable to employ a separate aerial for reception, and this should be carefully situated so that it is not likely to enter into the field of the main aerial.

Artificial Aerials

Although actually an artificial aerial is no aerial at all, it has been considered advisable to include a few remarks on the operation and construction of dummy aerials, as so many amateurs are licensed only to use a station with such an aerial;

also many experienced transmitters prefer to carry out preliminary tests in private.

The artificial aerial consists of a definite inductance, capacity and resistance arranged so that no appreciable radiation is caused, and is constructed so that when the inductance tuning coil and resistance are substituted for the outside aerial system across the aerial and earth terminals, no other change takes place—that is, the constants of the main aerial are the same as the constants of the dummy.

The connections of such an arrangement are shown by Fig. 18. The actual form of the apparatus will be described later.

KENNETH ULLYET.

(To be continued)

SOMETHING TO WRITE FOR

A LIST of Sunco wireless sets and parts has been received from the Sun Electrical Co., Ltd., of 118, Charing Cross Road, W.C.2.

B.T.H. valves are the subject of literature sent us by the British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2.

From Superlamp, Ltd., of 197, Old Street, E.C.2, we have received a catalogue of wireless sets and components.

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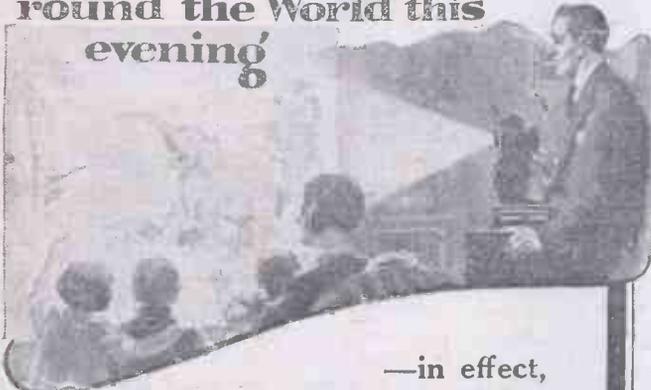
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High



—Announcing
the **SUPRATONE**
2-valve amplifier

—The vital **LINK** between
DETECTOR and **LOUD-SPEAKER!**



View from side
showing terminal
mounting.

After considerable research and experiment, we are now able to place upon the market a 2 Valve Amplifier of the highest quality and workmanship throughout.

**ALL USERS of CRYSTAL or SINGLE VALVE SETS CAN NOW
WORK A LOUD-SPEAKER WITH FULL AND CLEAR VOLUME**

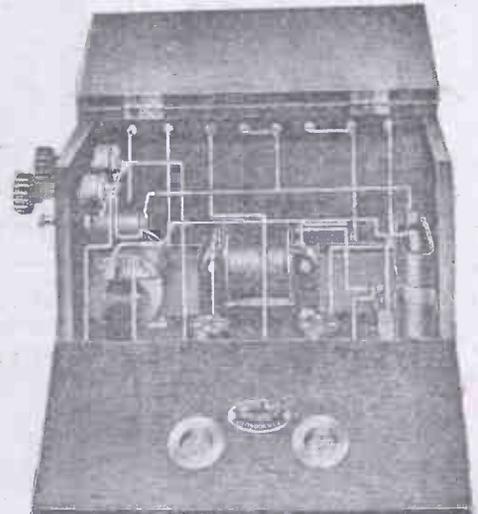
by simply connecting their present set to the input terminals of the SUPRATONE Amplifier, and batteries and loud-speaker to terminals indicated.

OUTSTANDING FEATURES.

- 2 Supra Transformers, 2 Microstats, 83-5-Y
- Pull-Push Switch for Filament Circuit, Negative
- Grid Bias, 2 Valve Inspection Windows, all
- Terminals mounted on Ebonite.

As will be seen from the accompanying illustration, this Amplifier is a really first class and handsome instrument throughout.

The mahogany cabinet is strong and beautifully finished. Further, it represents the finest value for money obtainable.



View from front with hinged top and side open.

PRICE:

£4

Send to-day for our interesting 1924-5 Catalogue.

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12, 13, 14, Great Queen Street, Kingsway, W.C.2.

'Phone: Gerrard 575 & 576.

'Grams: Zywateseng, Westcent.

Works: LONDON, BIRMINGHAM & WESTCLIFF.



BBROADCASTING is responsible for what is undoubtedly the shortest address ever used for a postal communication. The B.B.C. received a few days ago a postcard that bore the brief, but apparently sufficient, address, "2 L.O."

Chelmsford has been heard repeatedly in India on a three-valve set and several times in North Africa with a crystal.

Listeners who are musically inclined need have no fear when they read that Turner Layton and Clarence Johnson, the American syncopated duettists, are to broadcast; their rhythm is extraordinary and their diction perfect.

The West Riding Education Committee have sanctioned the use of wireless in one local elementary school.

Professor Bruevitch has presented the Soviet Government with an invention that is claimed to be a method of secret wireless communication.

Further experiments in wireless control have been conducted by Signor Fiamma. The Italian inventor has succeeded in controlling a motor-boat of 24 tons in spite of rough seas and a strong wind.

Radio-Paris, in conjunction with the French wireless journal *Radioélectricité*, broadcast the first of four query programmes on November 18. *Radioélectricité* provided the prizes.

It is satisfactory to note, says the B.B.C., that the millionth receiving licence has been issued.

That broadcasting will be most effective in warning farmers to be on the lookout for the symptoms of contagious animal diseases is the opinion of the Ministry of Agriculture.

A number of tenants in one Liverpool district have received notice from estate agents to remove wireless attachments fixed to the chimneys.

More than 13,000 postcards of appreciation and friendly criticism have been received by the Rev. Shepherd, who conducted services recently relayed from St. Martins-in-the-Fields.

The possibilities of wireless in the development of trade are to be discussed by the Hull Chamber of Trade.

Many complaints have been received by the B.B.C. of the increase of oscillation in the Ilford district, which has hitherto enjoyed the reputation of having the smallest number of complaints in the London area.

On November 27 the French Minister of Colonies will inaugurate the wireless service between Paris and Bamako (West Africa).

In a recent speech made by the Secretary of State for the German Post Office it was stated that Berlin already numbered 120,000 listeners. To popularise wireless to a greater degree the German authorities had decided to increase the number of broadcasting stations, and the scheme in view would eventually do away with all the unsightly outside aerials [*sic*]. Arrangements were also being made for the exchange of International programmes, and the German public would be pleased to learn that there was every possibility of relaying a London transmission.

(Continued on page 848)

BEGINNER'S GUIDE TO WIRELESS

If you wish to make Wireless Sets which are **UNBEATABLE in PRICE, QUALITY, or EFFICIENCY**, this is the book you must have. Everything is so clearly explained that any beginner, without previous experience, can make the most efficient receiving sets obtainable. Full instructions are given for making complete Crystal Sets, 1 and 2 valve Amplifiers, Dual Amplification Sets; also the very latest 2, 3 and 4-valve Tuned Anode Receivers. 160 pages. (28 DIAGRAMS) **1/3 POST SATISFACTORY GUARANTEEED or money returned.** **1/3 POST FREE SAXON RADIO CO. (DEPT. 12) SOUTH SHORE, PLACKPOOL**



"MORRIS" SOLID OAK STANDARD CABINET WITH LOCK

for any kind of receiver. Bottom cupboard with lock for accumulators and stores. Height, 3 ft. 6 in.; width, 2 ft.; depth, 15 in. Back Panel removable. Further particulars on application.

Price **£4 10s.** part carriage and packing 7 6 extra

Solid Oak Wireless Table with large drawer and bottom shelf for accumulator. Length, 25 in.; width, 16 in.; height 26 in., 27/6 cart. pd.

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Challenge Crystal Sets

No. 40. A new Radiax production. Designed and built on entirely new principles, it is the result of much experiment and test, our object having been to obtain the utmost power of which a crystal set is capable. Range 300 to 500 metres. Price £2 2s.



No. 41. LONG WAVE.

100-1,600 metres. Uniform with No. 40, but incorporates the Radiax Universal principle and enables by means of a switch, perfect results to be obtained on the lower wave band or on the new 1,600 metre High Power Station. Price, £2 10s.

Write for List of full range of Radiax Universal Receivers, 1, 2, 3 & 4 valves. Complete or for Home Construction.

RADIAX LTD.,
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Barclays 373



ACCUMULATORS RE-CHARGED FREE IN YOUR OWN HOME

and from your ordinary electric installation, where you have direct current 100 volts to 250 v lts. The "CHASEWAY" CHARGER (D.C.) can be connected by the merest amateur is automatic in action and requires no attention. It saves its cost in a short time by doing away with the weekly re-charging expense, besides avoiding that last minute "let down" and all the usual accumulator trouble. Whilst you are using the current for lighting, ironing or any other purpose, the "CHASEWAY" automatically re-charges your accumulator free.

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Cross Cheques and P.O. "not negotiable."
THE CHASE ELECTRICAL MANUFACTURING Co., Ltd.
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Trade Enquiries Invited v.p.

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PRECISION TESTING SETS

Combined 120 volt, 6 volt, 3 milliamperes, 300 M.V. moving coil instruments, ebonite encased. An ideal instrument for wireless tests. With each instrument, a leaflet is supplied explaining its application, including the method for measurement of resistances from 100 ohms to 2 megohms.

PRICE 35/- POST 6d.

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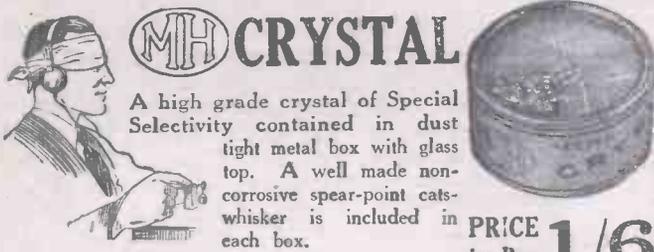
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A high grade crystal of Special Selectivity contained in dust tight metal box with glass top. A well made non-corrosive spear-point cats-whisker is included in each box.

It is so sensitive that a blind man can use it.

PRICE in Box **1/6**

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IN CONJUNCTION WITH **B. HESKETH LTD**
RADIO CORNER, 179 STRAND, LONDON, W.C.2.

Barclays 2-8



16 THE CRYSTAL SUPREME!

Experimenting with crystals is a thing of the past—for why seek to improve on perfection?—if you buy the

VALPO
(Valve Power) CRYSTAL

Trade Enquiries Welcomed.

Super-sensitive all over—no dodging around the crystal during the "star" item! Use a "VALPO" Crystal and your catswhisker becomes a fixture. Each "VALPO" Crystal tested and GUARANTEED. Loud reception on crystal alone; beautiful pure tone for an hour by one, two, or more valves. Price 1/6 complete with silver catswhisker. Of all reliable Wireless Stores, or post free direct from

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It MUST be a MARS!
—the secret's in the spiral spin.

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"POPULAR WIRELESS" says:
"We have no hesitation in recommending the 'MARS' aerial wire to the attention of our readers, and intend to discard 7/22's in the case of our own aerial in future."

RADIOSTAT in the "SUNDAY CHRONICLE" says:
"If you want the very best get the new 'Mars' Aerial. This will give you 35% more power."

30,000 Mars enthusiasts agree.

If you want the best aerial get

It's good for
COILS
Try it!

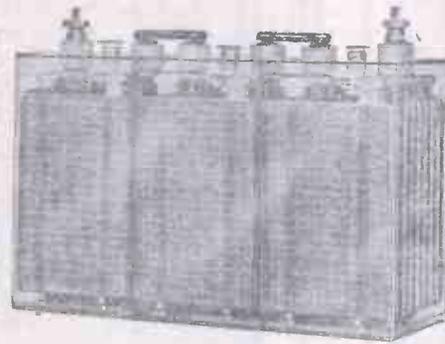
The
MARS
SUPER
AERIAL

9/6 from all leading dealers or from the Sole Manufacturers and Patentees: E. & W. G. MAKINSON, LTD., Wellington Works, Wellfield Road, PRESTON.

WIRELESS DEMANDS THE BEST

—and you get Best Results from

I.M.I. ALL BRITISH POPULAR ACCUMULATORS



DO NOT LET THE PRICE DETER YOU, AS EFFICIENCY IS GUARANTEED.

20A	40A	60A	80A	100A	IGNITION CAPACITY.
7/6	9/10	12/3	15/6	17/6	2 Volts
14/2	18/8	23/6	29/6	33/-	4 Volts
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I.M.I. Popular Accumulators have been used in conjunction with the Motor Industry since 1907.

Over 70,000 sold for Wireless during 1922/24.

THE I.M.I. LONGLIFE H.T. BATTERY

—This title was used after satisfying ourselves as to the Long Service obtained.

—Cheapness Combined with Absolute Efficiency.



I.M.I. 60-volt Longlife High Tension Battery. Price, **9/-**

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The Imperial Motor Industries, Ltd.

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Telephone : Gerrard 3347.

Telegrams : Giftedness West Cent.

RADIOGRAMS (continued from page 845)

In December two concerts will be given from the London studio, one broadcast simultaneously to all stations by land-line and the other transmitted from the high-power station at Chelmsford.

George Bernard Shaw is reported to have stated that there are splendid oppor-

According to a leading figure in the gramophone industry, the past two years have shown that the greater the vogue for broadcasting, the larger the demand for gramophones.

Tests have been conducted by the German postal authorities to prove the possibility of connecting wireless to ordinary

Marconi's Wireless Telegraph Co., Ltd., worked for forty-three years without a holiday.

Tests have been made at the new broadcasting station erected at the Pic du Midi Observatory (France), one of the highest sites in the world. All material necessary for its building had to be taken up about

WE invite every reader to send us by first post on Monday, December 1, 1924, an interesting letter, of from 250 to 400 words, on "My Ideal Wireless Christmas."

To the writer of the letter adjudged by the Editor to be the most interesting, a prize of Three Guineas will be awarded, and to the writers of any other letters published half-a-guinea will be paid.

A CHRISTMAS COMPETITION FOR ALL

A First Prize of Three Guineas and Other Prizes of Half a Guinea in a Simple Competition Open to All.

RULES.—The Editor's decision will be final; letters must be written on one side of the paper only; the copyright of all letters published will be ours; all letters must be received not later than first post on Monday, December 1, 1924. No correspondence regarding the competition can be entered into.

Envelopes must be addressed: Competition, The Editor, "Amateur Wireless," La Belle Sauvage, London, E.C.4.

tunities in the broadcasting of plays for old actors and actresses, regardless of their age, appearance and memory.

Signals transmitted in America with a power of only 5 watts have been heard by a French amateur.

The Copenhagen broadcasting station is continuing its experiments on a wavelength of 750 metres. Transmissions usually take place on Sundays, Wednesdays and Thursdays.

house telephones for communication with ships at sea. Duplex telephony is not yet possible.

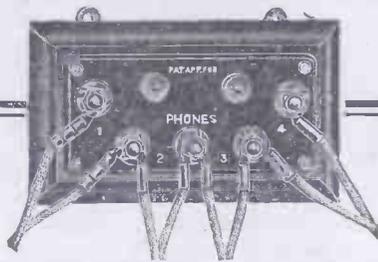
There is an effort on foot in some quarters to change the name "broadcasting" to "radiocasting," but the majority of listeners prefer the more euphonious word to "radiocasting"—tongue-twisting and scarcely descriptive.

Mr. Godfrey Isaacs, who has just resigned from the managing directorship of

9,000 ft. by pack-mules. The masts are over 100 ft. high and the station works on a wavelength of 350 metres, using about 300 watts power.

Over 600 letters of appreciation have been received by those in charge of the Dundee relay station. Many of these letters indicate crystal reception in Errol, St. Andrews, Perth, Monifieth and Arbroath.

(Continued on page 850)



IGRANIC TELEPHONE CONNECTOR

Make your radio set take more head-phones

How often do you have to leave someone "out" just when some particularly good music, interesting news, or other broadcast item is coming through the ether? Maybe your receiver has only two telephone terminals—but it's perfectly simple to fit the Igranic Telephone Connector and any number of 'phones up to four pairs can then be instantly fitted. Moreover two or more connectors may be connected together allowing of any number of additional head 'phones. Supplied with nickel-plated terminals and mounted upon a polished mahogany baseboard. Price 8/6



INCLUDE

Honeycomb Coils, Filament Rheostats, Tri-plug Coil Holders, Battery Potentiometers, Variometers, Vernier Friction Pencils, Vario Couplers, Bi-plug Coil Holders, etc.

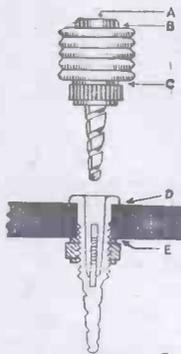
All carry a six months' guarantee

Reputable Dealers carry stocks. Write for List, Z337.

IGRANIC ELECTRIC CO., LTD.,

149, Queen Victoria Street, London. Works: BEDFORD. Branches: Birmingham, Bradford, Cardiff, Glasgow, Manchester, Newcastle,

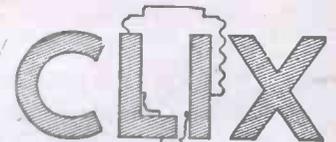
Solder all connections, Where you can't—use "CLIX"!



CLIX may be wired at points A, B, C, D, or E. F affords an ideal point for soldering when permanent connections are required.

Retail Prices

CLIX with Locknut, 3d.
CLIX INSULATORS (Six colours) 1d. each.
CLIX BUSHES (Six colours) 1d. pair



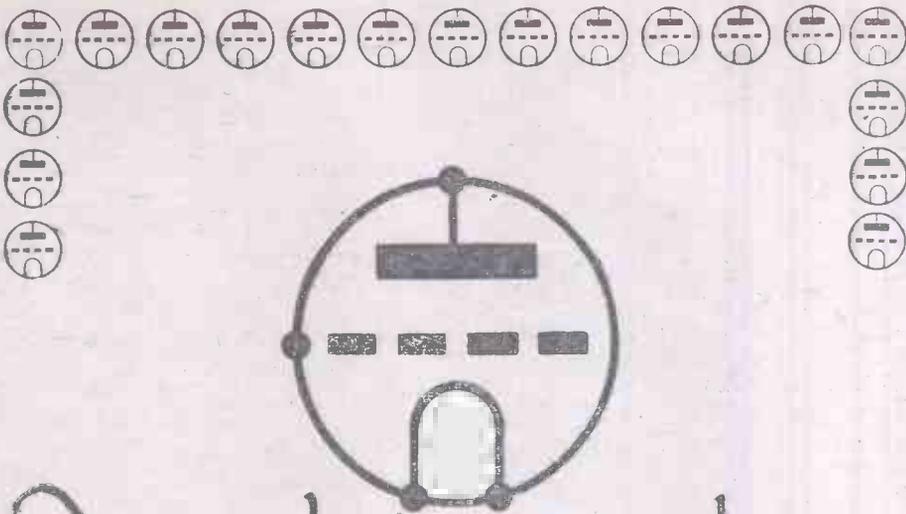
The Electro-Link with 159 uses

Obtainable from all Wireless Dealers or direct from the Patentees and Manufacturers:

AUTOVEYORS LTD

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84 VICTORIA ST., LONDON, S.W.1



A Symbol with a Story

IT'S a symbol that has become a commonplace . . . you see it in wireless articles . . . two or three times in most wiring diagrams. Everybody knows that it represents a valve. Ever thought how long that symbol took to evolve? The original one didn't look like that; it was just like the picture



in the corner here. That was 30 years ago. Many

years passed before the broken line was added. It indicated the grid—the *third* electrode which made broadcasting possible.

The original symbol had its beginnings in the Ediswan laboratories, where the world's first valve was made. In every Ediswan Valve you have an accumulated experience dating back to Fleming's momentous discovery.

Ediswan Valves will bring the best out of your wireless set—get some on the way home and enjoy a better programme from to-night onwards. All dealers sell them.

THE EDISON SWAN ELECTRIC CO. LTD.
QUEEN VICTORIA ST., LONDON, E.C.4.

An interesting study of early wireless history may be made at the Science Museum, South Kensington, London, where the complete series of Dr. Fleming's experimental valves can be seen.

EDISWAN VALVES

RADIOGRAMS (continued from page 848)

A special concert for the benefit of British listeners was broadcast from CKAC, the Canadian high-power station, on November 19 on a wavelength of 425 metres.

The U.S. Government has sanctioned increase in the power of experimental broadcasting stations, beginning with 1½ kilowatt and increasing gradually in 500-watt stages until a maximum of 5 kilowatts has been reached.

A new Belgian broadcasting station is being constructed at Ruysselede. It will probably be ready at the end of 1925; no broadcasting, however, is scheduled to begin until 1926.

The War Office has decided on the erection of a wireless station on Yap Island (in the west of the Caroline Islands) in accordance with the Japan-American Yap agreement.

8AE, the small transmitting station belonging to the Paris wireless journal *La T.S.F. Moderne*, has now resumed its weekly tests. A lecture is given, on a wavelength of 200 metres, every Tuesday and Friday at 21.00 G.M.T. Apart from this transmission, a series of tuning signals is sent out every Friday from 22.00 G.M.T. for the benefit of experimenters.

Motoring talks will be given each day at 6.40 p.m. for a whole week, beginning on December 15.

5QV (of Clacton) has received signals from 1CMP (United States) on a two-valve Reinartz receiver.

The Rana Radio Klubo, of Copenhagen, is now giving concerts and lectures in Esperanto. This society has been very active in advancing Esperanto as a uni-

versal language for wireless communication.

A prominent French scientist has refuted the generally accepted theory that each electron possesses a magnetic field, and that the magnetic field of a current is the sum of the separate fields of the electrons.

THE FAMOUS

"WORK" & "AMATEUR WIRELESS" HANDBOOKS

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Basket Making. Beehives and Bee-keepers' Appliances. Bent Iron Work. Bookbinding. Boot Making and Mending. Building Model Yachts. Camera Making. Clay Modelling and Plaster Casting. Clock Cleaning and Repairing. Conjuring Apparatus. Cycle Repairing and Adjusting. Domestic Jobbing. Dynamo and Electric-motor Building. Dynamo and Motor Erection and Management. Dynamos, Small. Electric Accumulators. Electric Apparatus, Small.	Electric Bells and Tele-phones. Electric Clocks. Electric Lighting. Electric Primary Batteries. Electro-plating. Fishing Rods and Tackle. Furniture Repairing. Gilding, Silvering and Bronzing. Glass Writing, Embossing and Fascia Work. Gramophones and Phonographs. Household Repairs. House Painting and Decorating. Incubators and Chicken Rearers. Induction Coils. Knotting and Splicing Ropes and Coradge. Lathe, Simple, and Accessories.	Lathes, Small. Magneto Repair and Adjustment. Metal Turning Made Easy. Miniature Electric Light. Model Aeroplanes. Motor Cycles and Side-cars. Mounting and Framing Pictures. Oxy-acetylene Welding. Patents, Designs and Trade Marks. Photography Simplified. Pianos: Their Construction, Tuning and Repair. Poultry Houses and Appliances. Pumps and Hydraulic Rams. Rustic Carpentry. Sewing Machines: Their	Construction, Adjustment and Repair. Soldering, Brazing and Welding. Tailoring. Taxidermy: Skinning, Mounting and Stuffing Birds, Mammals and Fish. The Handyman's 1,000 Practical Receipts. Ticket-writing and Sign-painting. Tintplate Working. Toy Making. Violin Making and Repairing. Watch Cleaning and Repairing. Wood Finishing. Workshop Appliances, Small. Workshop Arithmetic. Workshop Hints for Metal Workers.
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Wireless Telegraphy and Telephony. | Simple Crystal Receiving Sets. | Simple Valve Receiving Sets. | Wireless Component Parts.

Wireless Telegraphy Explained.

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A famous name for a famous Valve.

NELSON MULTI



3
FILAMENTS



NELSON MULTI



15
COMPLETE

The "NELSON MULTI" contains three separate filaments, each of which can instantly be brought into use by a switch device incorporated in the valve cap. Adapted to fit any standard Four-pin socket. No loose wires. Three times the life of any other valve. Filament Voltage 4-6. Telephone: Wimbledon 172.

The "NELSON MULTI" will function as a Detector, L.F. Amplifier, or H.F. Amplifier. Owing to its unique construction it is unequalled for pure clarity of tone. Packed in specially constructed boxes. Entirely British Made. Anode Voltage Detector 60-80 Amplifier 80-120. Telegrams: "Nelson, Wimbledon 172."



THE RULER OF WIRELESS WAVES

BRITISH MADE

The NELSON VALVE CO.
138, KINGSTON ROAD, MERTON PARK.
LONDON, S.W.19
From all Wireless Dealers and Electricians.



ANOTHER SENSATIONAL OFFER!

7-DAY

As an advertisement we have decided to dispose of a limited number of **New and Superior FEATHERWEIGHT ADJUSTABLE PHONES** at the astounding figures below.



11'6
PER PAIR
Post 6d.

2 PAIRS
22'6
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3 PAIRS
33'6
Post 9d.

These first-class phones are exceptionally light, comfortable, do not catch in the hair, and the adjustment enables you to obtain maximum sensitivity on weak signals and full volume without distortion on loud signals

SCIENTIFIC SUPPLY STORES,

Head Depot: 80, NEWINGTON CAUSEWAY, S.E.1.
Branches: 126, Newington Causeway, S.E.1. 7, St. George's Circus, S.E.1. 16, Manette St., Charing Cross Rd., W.1. 207, Edgware Rd., W.2. 84, Church Rd., Upper Norwood, S.E. Phone: Hop 4177.



Dubilier Grid Leak Resistances 0.5, 1, 2, 3, 4, 5 Megohms.
2/6 each.
Grid Leak clips, per pair 6d. each.



Dubilier Anode Resistances complete with holder as illustrated, from twenty thousand to one hundred thousand ohms. 5/6 each.

LITTLE THINGS THAT COUNT.

A lost collar stud, a broken shoe lace. You know how often the bigger issues in life depend upon the attention paid to detail.

It is just the same with your wireless set; if you want to make sure of good results, pay attention to details.

An uncertain grid leak will ruin the reception of an otherwise carefully constructed set. We realise the importance of having a grid leak which can be relied upon to remain constant in action under widely varying conditions of service. That is why all Dubilier Grid Leaks are carefully tested on 100 volts D.C. before they are offered to you.

Similarly Anode Resistances are tested on 200 volts D.C., and will carry the Anode current of a valve indefinitely without altering in resistance. Here, as with all other products, we do our best to ensure that the name Dubilier shall enable you to feel entire confidence as to results. Eighty per cent. of complete-set manufacturers in Britain, as well as thousands of experimenters, fit Dubilier products as standard in their sets. They have to pay slightly more for them, but they very wisely place reliable working before the saving of a few pence, and *they know that if reliable components could be made cheaper, Dubilier would be making them.*



Ducoň Works,
Goldhawk Rd.,
London, W.12.

DUBILIER
CONDENSER CO. LTD

Telephone :
Riverside 1084.

Telegrams :
Hivoltcon, Phone,
London.



Experimental American Broadcast

SIR,—I have received a letter from Mr. E. T. Flewelling (inventor of the famous Flewelling super-regenerative circuit), who wishes to know if any amateurs on this side would listen in for his station. 9 X B G (Chicago, Ill.), on a wavelength of 70 metres, as he is confident he can get his signals over to this side, it being only necessary to have a prearranged time for working.

If any amateurs interested would care to communicate with me (through "A.W.") I shall be only too pleased to send Mr. Flewelling their names and addresses, and also forward to them the times and dates arranged.—J. H. E. (Manchester).

Loading Coils

SIR,—Many amateurs, upon adding a loading coil to a set employing a fixed reaction coil inside the set, find that the small reaction coil is insufficient to make signals louder. This can be overcome by

connecting another coil in series with the fixed reaction coil and coupling this to the loading coil by means of a two-way coil holder. This increases the volume and also enables 5 X X and Radio-Paris to be easily separated. Care should be taken to see that the coil is connected the right way round, for if it is not signals will be weakened instead of increased.—J. R. V. (Southampton).

Dance Music

SIR,—In a recent number of "A.W." one of your correspondents aired a grievance regarding the curtailment of the B.B.C. winter programmes. It does not strike me that the actual closing down of the local station at 10.30 p.m. on four nights out of seven inflicts much hardship on the holders of broadcast licences. A matter of more importance, in my opinion, is the relay of the Savoy bands three times weekly. I have no doubt that this class of entertainment appeals to quite a number of listeners possessing loud-speakers, but surely users

of headphones must constitute a majority, and in their case the performance is not suitable for three nights weekly.

Were the London station alone to relay the bands, possessors of valve sets would not be so badly hit, but the B.B.C. also employs 5 X X to broadcast the dances. This prevents, in most cases, the possibility of tuning in, say, Radio-Paris without interference from Chelmsford.

I suggest that the B.B.C. should limit their dance transmissions to Wednesdays and Saturdays and that they should S.B. to half the stations alternately.

From a regular perusal of Continental papers I can assure you that as 5 X X is the best received station in Europe, a false impression is being given to foreigners of our musical education and artistic tastes.—J. C. (London).

American Stations

SIR,—With reference to your list of American broadcasting stations, you state that the W B Z transmits upon 339 metres.

According to a letter from W B Z, dated October 31, the wavelength is given as 337 metres, or a frequency of 890 kilocycles, and a power of 1,000 watts. Times of transmission are 6 to 11 Eastern time (five hours later than G.M.T.). I was able on October 13 to receive this station from approximately 04.15 to 06.45 G.M.T., the programme consisting of various items in celebration of St. Columbus Day.—J. A. P. (London, S.E.).

(Continued on page 854)

HULLO!! C.Q., WILL DAY CALLING

You could not give a more acceptable gift for XMAS to your friend than one of our DAYZITE

COMPLETE RECEIVING SETS

All Passed by P.M.G. and Guaranteed to Standard.

No. 1.—Crystal Receiving Outfit, fitted with best Dayzite crystal detector, one pair 4,000 ohms British made Headphones, 100 ft. aerial wire, 4 insulators, 9-inch insulated lead-in tube, 10 yards leading-in wire, one book, *Wireless at Home*, one earth clip, one aerial to earth switch. Complete. £3 15s. Stamped B.B.C. Receiving Set alone, as above, apart from outfit, £1 15s.

LIVES THERE A MAN WITH SOUL SO DEAD
THAT NEVER TO HIMSELF HAS SAID

!!! TRY DAYZITE !!!

A recent letter received from one of the thousands of delighted users writing from Nottingham, states:—

"A valve used as a detector is a waste of current when your 'Dayzite' is available. Please send me another crystal for which I enclose 2/9." (Signed) W. P.

MAKE NO MISTAKE IN YOUR SELECTION. Do not keep wasting money on crystals of unknown repute.

GET A CRYSTAL THAT HAS STOOD THE TEST OF TIME

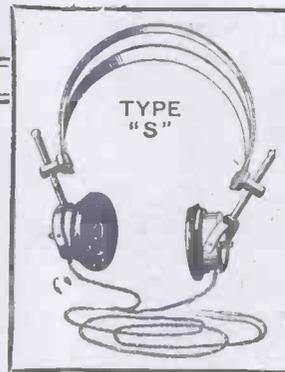
DAYZITE Regd.

Sold only boxed with Silver Cat's-whisker, 2s. 6d. each, postage 3d. extra. Makes excellent contact with Zincite for a Perikon Detector.

WILL DAY, LTD.,

19, LISLE STREET, LEICESTER SQUARE, LONDON, W.C.2.

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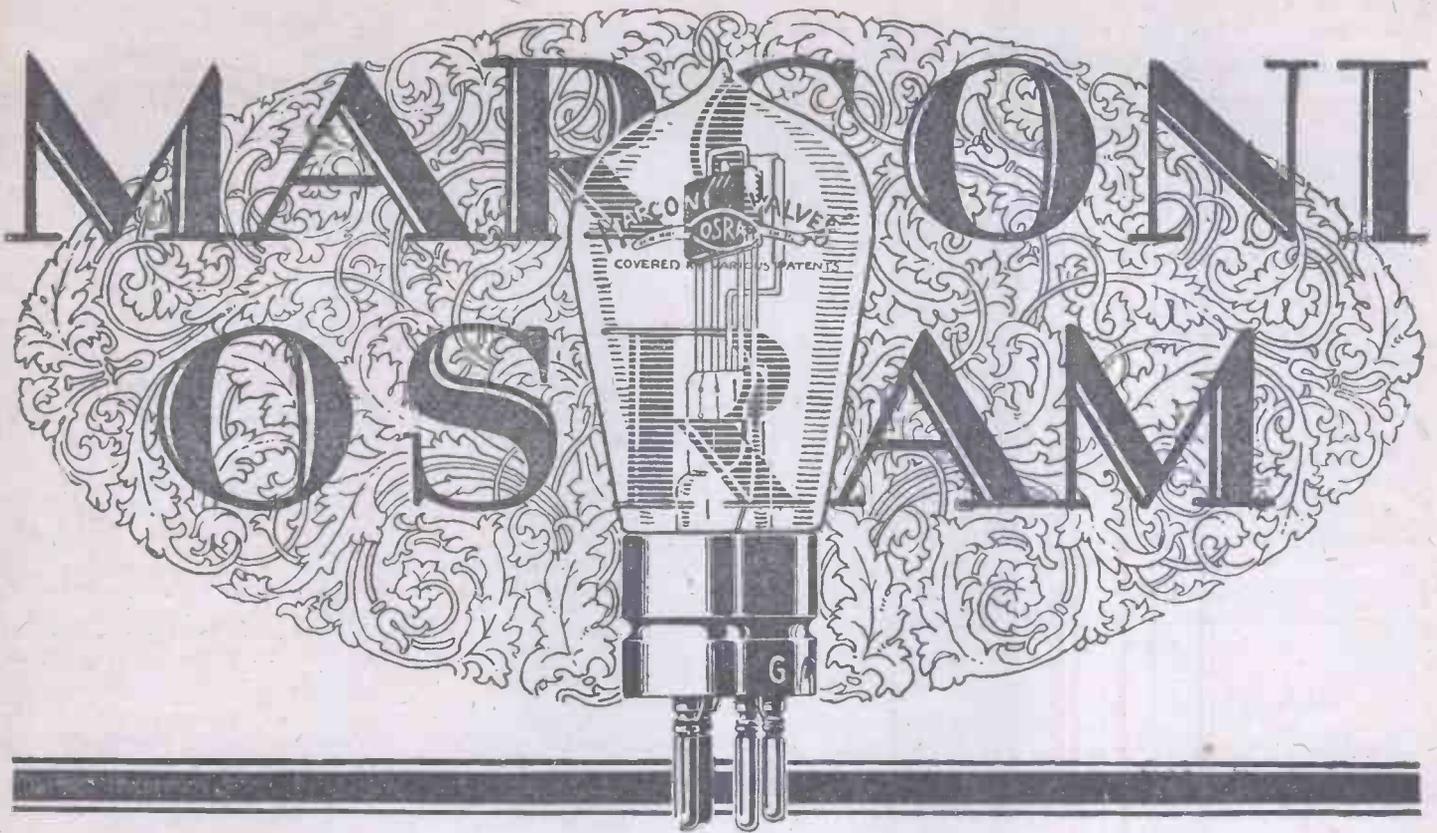
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NOTE.—In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.

GREAT BRITAIN

The times given are according to Greenwich Mean Time.

London (2LO), 365 m. 1-2 p.m., con.; 3-15-3-45 p.m., lec.; 4-5 p.m., con.; 5-30-6-15 p.m., children; 6-40 p.m. talk; 7-7-30 p.m., time sig., news, talk; 7-30-9-30 p.m., music; 9-30-10-0 p.m., time sig., news, talk; 10-0-1-30 p.m., music. Mon. and Wed. the Savoy Bands are relayed until 11-0 p.m., and on Sat. until midnight. Sat. only, 4-5-30 p.m., con.

Aberdeen (2BD), 495 m. Belfast (2BE), 435 m. Birmingham (5BT), 475 m. Bournemouth (6BM), 385 m. Cardiff (5WA), 351 m. Glasgow (5SC), 420 m. Manchester (2ZY), 375 m. Newcastle (5NO), 400 m. Much the same as London times.

Bradford (2LS), 310 m. Dundee (2DE), 331 m. Edinburgh (2EH), 328 m. Hull (6KH), 335 m. Leeds (2LS), 346 m. Liverpool (6LV), 315 m. Nottingham (5NG), 322 m. Plymouth (5PY), 335 m. Sheffield (6FL), 304 m. Stoke-on-Trent (6ST), 306 m. Programmes relayed.

CONTINENT

The times are according to the Continental system; for example, 16.30 is 4.30 p.m., and 08.00 is 8 a.m. (G.M.T.).

AUSTRIA.

Vienna (Ravag), 530 m. (1 kw.). Daily: 08.00, markets; 10.00, time sig., con.; 12.20, weather; 14.30, Stock Ex.; 15.00, time sig., news, con.; 16.15, children (Tues. and Fri.); 18.30, news, weather; 19.00, time sig., con., news; 21.00, dance (Wed. and Sat.).

BELGIUM.

Brussels (SBR), 265 m. (1½ kw.). 17.00, orch., children (Wed. and Thurs.); dance (Tues. and Sat.); 18.00, news; 20.00, lec., con., news (opera, Mon. and Wed.).

Haeren (BAV), 1,100 m. 13.00, 14.00, 16.50, 18.50, weather.

CZECHO-SLOVAKIA.

Kbely (OKP), 1,150 m. (1 kw.). Weekdays: 09.00, 10.30, 12.30, 16.00 and 17.00, Stock Ex.; 18.15, lec., news, weather, con. (time sig., 19.00), daily; 10.00, con. (Sun.).

Komarov (OKB), 1,800 m. (1 kw.). Weekdays: 13.00, Stock Ex., weather, news; 09.00, con. (Sun.).

DENMARK.

Copenhagen (Kjobenhavns Radiofonstation), 750 m. 19.00, con. (Sun. and Wed.).

Lyngby (OXE), 2,400 m. Weekdays: 18.20, news and Stock Ex.; 20.00 and 21.00, news, weather and time sig.

Ryvang, 1,025 m. 18.30, Eng. lesson (Wed.); 19.00, con. (Tues. and Fri.).

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 11.00, markets (exc. Sun. and Mon.); 11.15, time sig., weather; 14.45, 15.35, 16.30, Stock Ex. (exc. Sun. and Mon.); 18.00, con. and news (not daily); 19.00, weather; 22.10, weather (exc. Sun.).

* On 1st and 15th of each month at 16.45. Radio-Paris (SFR), 1,700 m. (10 kw.). Sundays: 12.45, orch.; 13.45, news; 16.45, con.; 20.30, news, con.; 22.00, dance. 12.30, news, Stock Ex., orch.; 16.30, markets, Stock Ex., con.; 17.45, Stock Ex., news, women's hour;

20.30, lec., news, con.; 22.00, dance (not daily). Special con. by *Le Matin*, Paris, every 2nd and 4th Sat. in month at 22.00.

1. Ecole Sup. des Postes et Télégraphes (PTT), 449 m. (500 w.). 16.00, lec. (Tues. and Thurs.); 20.30, Eng. conv. and con. (Tues.); 20.30, lec. or con. On 3rd Sun. of each month, organ recital, 20.45.

"Le Petit Parisien," 340 m. (500 w.). 21.30, con. (Sun., Tues., Thurs.).

Lyons-la-Doua, 480 m. 10.30, news and con.; 11.30-11.45-12.15, 16.15, Stock Ex.; 20.00, news and con.

Toulouse Aerodrome (MRD), 1,525 m. 09.42, 19.42, weather.

Agen, 335 m. New high-power station testing daily

Issy-lez-Moulineaux, 1,600 m. Tests.

GERMANY.

Berlin (1), Vox Haus, 430 m. (700 w.); (2), 505 m. (1½ kw.): 08.00, sacred con., educational lec. (Sun.), markets, news; 10.35, 11.15, Stock Ex.; 12.00, time sig., news, weather; 13.15, 14.00, Stock Ex.; 14.30, children (Sun. and Wed.); 15.15, Stock Ex., orch.; 17.20, women, lec.; 18.00, French lesson (Mon.), lec. (other days); 19.30, con. or opera, weather, news, time sig. All daily except where otherwise stated.

Berlin (Telefunken Co.); 750 m. (1 kw.). 10.30, con. (almost daily); 19.00, con., tests (irr.).

Königswusterhausen (LP), 680 m. (5 kw.). 09.40, con. (Sun.). 2,500 m.: 10.20, con. (irr.). 2,550 m. (5 kw.): Wolff's Buro. Press Service: 06.00, 19.40, 2,800 m. (5 kw.): 10.50, con. (Sun.). 3,150 m., Telegraphen Union: 06.00-20.00, news (weekdays). 4,000 m. (10 kw.): Express News Service, 06.00-20.00 (daily).

Bremen, 330 m. (1 kw.). Relays con. from Hamburg.

Breslau, 418 m. (1½ kw.). 10.15, Stock Ex., weather; 11.00, sacred con. (Sun.); 11.55,

(Continued on page 858)

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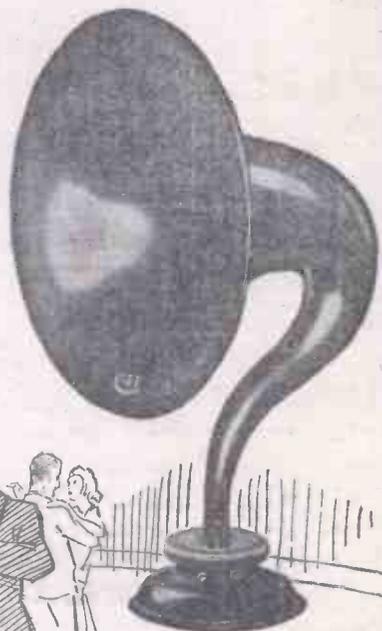
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enables you to spend a delightful evening in this way, thanks to the excellent dance programmes now being broadcast. An efficient set, plus a C.A.V. LOUD SPEAKER, gives all the advantages of a first-class orchestra at an infinitesimal cost.

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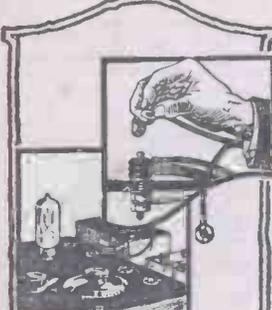


This simple Connector can be clipped to the end of any lead with a pair of pliers. When pressed on to the terminal perfect contact is immediate and permanent.



Could anything be more simple? One movement does the trick.

No more "Odd man out"!



Fool-Proof Battery Terminals and Connections in Colours are provided as an efficient safeguard against the burning out of valves.

Each box contains:

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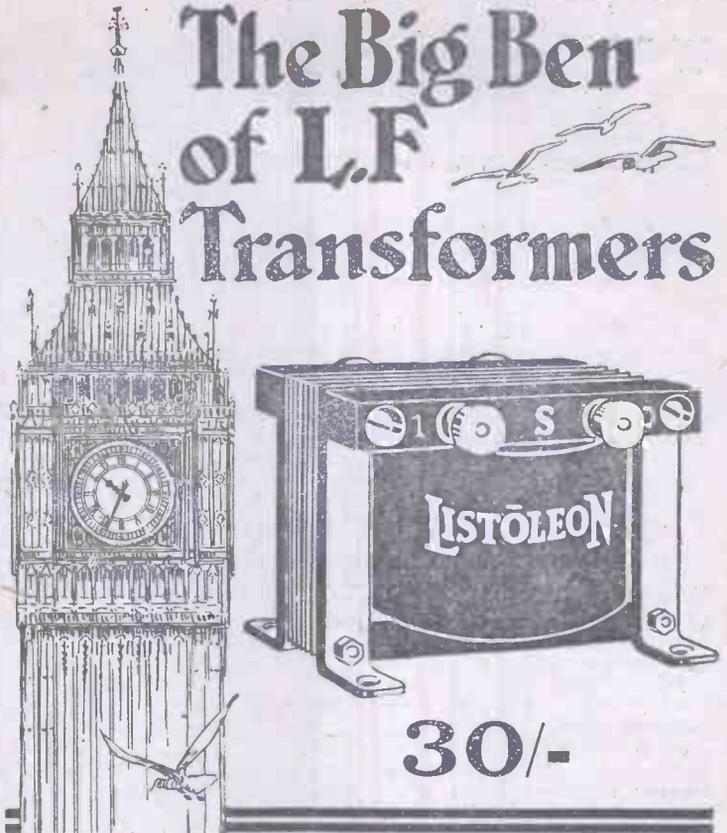
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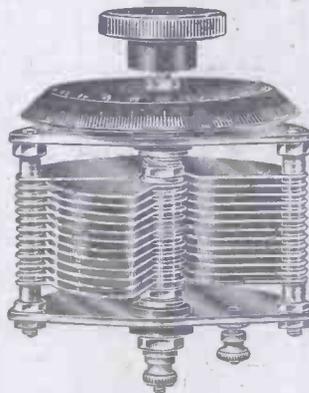
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.001	8/-	9/6	5/-	.0002	5/-
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.0005	6/-	7/6	.00005	4/-	
.0003	5/6	7/-			
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BROADCAST TELEPHONY (continued from page 856)
time sig., weather (Sun.); 12.25, time sig., weather, Stock Ex.; 14.00, Berlin news; 15.00, children (Sat. and Sun.); 16.30, orch., lec. (Sun.); 18.30, Esperanto (Mon.); 19.30, con. (Sun.); Eng. conv. (Thurs.); con., lec. (other days).

Frankfort-on-Main, 470 m. (1½ kw.). 07.00, sacred con. (Sun.); 10.10, news; 10.55, time sig. and news; 15.00, con. (Sun.); 15.10, markets; 15.30, orch.; 16.00, children (Sun.); 17.00, lec.; 18.30, lec.; Esperanto (Fri.); 19.00, lec., Eng. conv. (Mon. and Wed.); 19.30, con., opera; 20.30, news, weather; 20.50, tech. lec., women's hour; 21.00, time sig., con. (irr.).

Hamburg, 395 m. (1½ kw.). Weekdays: 06.25, time sig., news; 11.45, markets; 12.00, time sig.; 13.30, markets; 14.00, news, women, markets; 17.00, con.; 18.00, lec.; 19.00, con. or opera; 21.00, weather, markets, sport; 21.50, news (in English), dance (not daily). Sundays: 07.55, time sig., weather, news, lec., women; 10.15, sacred con.; 11.15, chess; 12.15, con.; 14.30, photo talk; 15.30, children; 16.30, con.; 17.45, English conv.; 19.00, con. or opera; 21.00, on as weekdays.

Königsberg, 463 m. (1½ kw.). 07.10, markets (Wed., Sat.); 08.00, sacred con. (Sun.); 10.15, markets; 10.30, con. (Sun.); 11.55, time sig.; 13.15, news, Stock Ex.; 15.00, markets; 15.30, orch., children (Wed., Fri.); 18.00, lec.; 19.00, con., weather, news; 20.10, dance or con. (irr.).

Leipzig, 454 m. (1½ kw.). 08.00, sacred con. (Sun.); 10.55, markets; 11.58, time sig.; 12.00* and 15.00*, Stock Ex. news; 15.30, con., children (Wed.); 17.00*, markets (exc. Sat.); 18.00, lec., Esperanto (Mon.); 18.30, lec., chess (Wed.); 18.45, Eng. lec. (Tues.); 19.15, lec., con. or opera; 20.30, news; 21.00, dance (Sun.). * Except Sunday.

Munich, 485 m. (1½ kw.). 09.30, sacred con. (Sun.); 13.00, time sig., news, weather; 15.30, con.; 16.00, children (Wed.); 16.30, Eng. conv. (Mon.); Esperanto (Thurs.); 17.00, markets, news, women's hour (Tues. and Fri.); 17.30 and

18.30, con., lec.; 19.30, con., news, weather, time sig.; 20.00, dance, news, weather, time sig. (Sat.).

Munster, 410 m. (1½ kw.). 06.55, time sig., news; 10.00, sacred con. (Sun.); 11.30, Stock Ex.; 12.00, time sig.; 14.30, markets, news; 15.00, orch.; 18.40, children (Wed. and Sat.); weather, news; 19.15, con. dance (Sat.); 20.15, news, Sun.: 19.00, con., news, dance.

Nuremberg (relay), 410 m. Programme relayed from Munich (q.v.).

Stuttgart, 443 m. (1½ kw.). 10.30, con. (Sun.); 11.00, markets; 15.00, con., time sig., news (Sun.); 15.30, news; 16.30, markets, con., weather, time sig., children (Wed., Sat.), women (Fri.); 17.00, news, time sig. (Sun.); 17.30, weather, time sig.; 18.30, lec. (Mon. and Tues.); Eng. lec. (Fri.); 19.00, lec., con., weather, time sig., news.

HOLLAND.

Amsterdam (PA5), 1,050 m. (200 w.). 19.40, con. (Wed); 20.40, news; 21.10, con. (irr.). (PCFF), 2,125 m.: News and Stock Ex. almost hourly from 07.55 to 16.10.

Ymuiden (PCMM), 1,050 m. 20.10, con. (Sat.).

Hilversum (NSF), 1,050 m. (500 w.). 19.40, con. (Sun.); 20.40, lec. (Fri., irr.); 19.45, children (Mon.).

HUNGARY.

Buda-Pesth (MT1), 950 m. Half-hourly from 06.45, news, Stock Ex.; 10.00, con.; 11.30 news (daily).

ITALY.

Rome (1RO), 425 m. (1½ kw.). 19.40 to 21.40, con.

JUGO-SLAVIA.

Belgrade, 1,650 m. (2 k.w.). 17.45, con. (Tues., Thurs., Sat.).

PORTUGAL.

Lisbon (Aero-Lisboa), 375-410 m. 20.30, tests, music, speech (irr.).

Montesanto (CTV), 2,450 m. (15 kw.). Tests, music (irr.); 13.00 and 23.00, weather.

RUSSIA.

Moscow, 3,200 m. 13.30, speech or lec. (Esperanto) on last day of each month.

SPAIN.

Madrid (Radio Iberica), 302 m. (1½ kw.). 19.15, weather, time sig., Stock Ex., con.; 22.45, con., time sig. (23.14); 23.30, con., dance.

Barcelona, 325 m. (100 w.). New station testing. 18.00 and 21.00.

Seville (EAJS), 350 m. (100 w.). 18.30, con., weather, news, etc.

SWEDEN.

Stockholm (TV), 440 m. 10.10, service, relayed (Sun.); 11.35, weather, time sig.; 18.15, con., news.

Stockholm (Radio-Akt), 470 m. 19.10, con., news (exc. Mon., Wed. and Fri.).

Gothenburg, 460 m. 18.10, con. (Tues., Fri. and Sat.). 680 m.: 18.10 (Mon., Wed. and Thurs.).

Boden, 2,500 m. 17.40, con. (Tues. and Fri.); 16.40, con., news (Sun.).

SWITZERLAND.

Geneva (HB1), 1,100 m. (500 w.). 13.15, lec. No Sun. transmissions.

Lausanne (HB2), 780 m. (500 w.). 07.05, weather; 12.30, weather, markets, time sig., news; 16.00, children (Wed.); 17.55, weather, news; 20.15, con. (exc. Wed.), dance (Thurs. and Sat.).

Zurich (Hoengg), 650 m. (500 w.).

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1. EFESCA LOW-FREQUENCY TRANSFORMER, TYPE B. A one-hole fixing transformer of unique design. A special feature is that the windings and laminations are totally enclosed in an insulating compound, thus giving absolute immunity from Atmospheric Humidity. This transformer gives maximum amplification without distortion and is enclosed in metal shroud which eliminates all parasitic noises. Ratio 4-1, 22/6.

2. EFESCA VERNISTAT (Pat. applied for). Of unique construction, the Vernistat gives extremely delicate control and is smooth and silent in operation and is specially suited to High Frequency and Detector Valve filament control. Resistance 5 ohms, 6/- each, complete as illustrated.

3. EFESCA VARIABLE CONDENSER gives a high standard of accuracy. Vanes are spaced with micrometer exactitude, the construction providing smooth action coupled with stability. One-hole fixing. .001 mfd. 12/6, .0005 mfd. 8/6, .0003 mfd. 7/-, .00005 mfd. 5/6.

The full range of Efesca parts and Efescaphone receiving sets will be found in Catalogue 522. Send for it to-day.

For those not interested in the constructional side of wireless, there is a wide range of complete Efescaphone sets from the simple crystal set to the multi-valve receiver for loud-speaker and long range work.

Components you can rely upon

SELECTIVITY, Loud Signals, Tonal Qualities—these are but a few of the many aims and desires of the wireless enthusiast. Efesca components are designed to aid you in reaching your objective.

Efesca components are a new departure in wireless parts—each the result of careful thought and embodying many unique and novel features designed to produce the utmost efficiency. If you want better results—build with



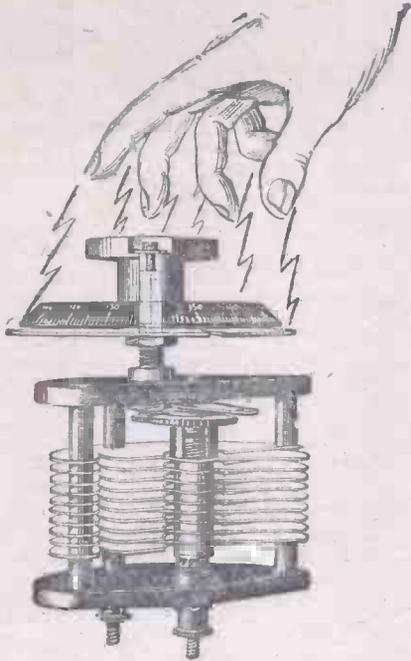
ONE-HOLE FIXING COMPONENTS

Sold by all Wireless Dealers, Ironmongers and Electricians.

Wholesale only

FALK, STADELMANN & Co. Ltd.,

Efesca Electrical Works, 83-85-87, Farringdon Road, LONDON, E.C.1 and at Glasgow, Manchester and Birmingham.



FINER TUNING

THE NAYLOR "FULSTOP" CONDENSER enables tuning to be carried out with a wider range of accuracy than has hitherto been obtained. In addition to being a square law condenser, which avoids the overcrowding of stations at any particular point, the dial of the "Fulstop" Condenser is graduated over the complete circumference and geared at two to one in relation to the moving plates, thereby giving twice the rotary movement of any other condenser, and enabling stations to be picked out with the greatest of ease. Further still, the abolition of all hand capacity effects is guaranteed unconditionally by the makers.

Read what "Modern Wireless" says:

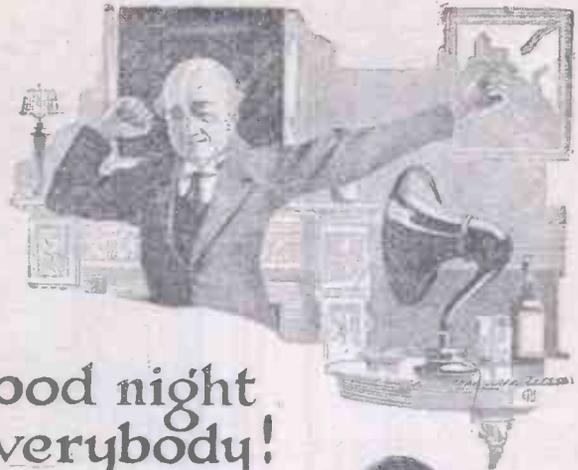
"We can strongly recommend this type of geared condenser for careful tuning and for use in situations where hand capacity effects are troublesome." October, 1924.

Protected Throughout the World

PRICES: { .001 ... 13/6 | .0003 ... 10/3
 .0005 ... 11/3 | .0002 ... 9/6

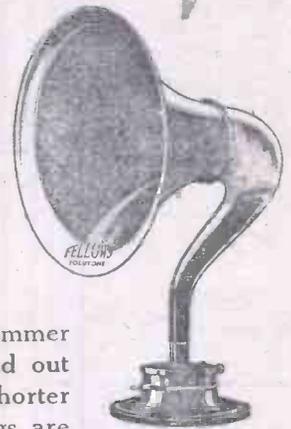
Stocked by most Wireless Dealers, but if you have any difficulty write to:

J.H. NAYLOR, Ltd., Engineers, WIGAN



Good night Everybody!

"Good night, everybody," says my Volutone Loud Speaker, and I find myself saying "Good night, thank you, good night." And, after all, why shouldn't I? I know that my Volutone has been a very real friend to me. All through the summer he was with me, indoors and out of doors, and now that shorter days and long, dark evenings are here, I value his friendship more than ever. Ready to talk if I want to listen, to play to me or to sing to me. And if I join in his song (as indeed I do) is he annoyed? What a friend of friends!!



Fellows Volutone
 £4: 10: 0
Fellows Junior
 £1: 10: 0
 Both fitted with adjustable diaphragms.

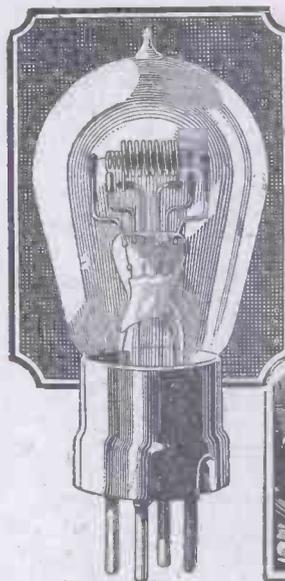
On a boisterous evening when we are all laughing and fooling, the Volutone plays with the loud pedal down and fills the room with music. On such a night as this, when I sit quietly by the fire, he sings softly and sweetly for me alone.

Yes, I will say good night to my Volutone. "Good night, old friend, until to-morrow. Good night, Everybody."

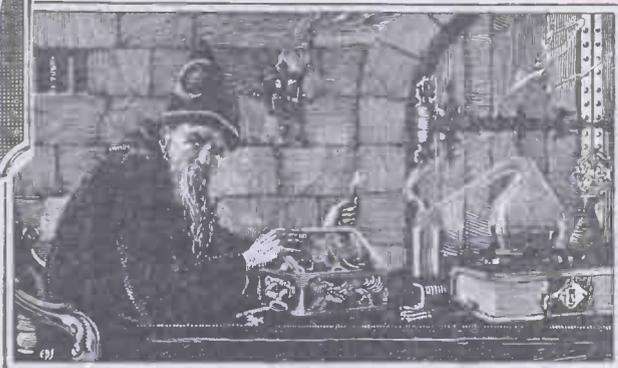
Muel, Fellows

FELLOWS WIRELESS

ADVT. OF THE FELLOWS MAGNETO CO., LTD., PARK ROYAL, LONDON, N.W.10. E.P.S. 91



Louden



The Secret

10/-

MAGICIANS and Sorcerers had their "Secrets of Healing" and "Secrets of Success" which they would dispense for a consideration, but in these less romantic times success is more apt to be won on sheer merit.

Take the case of the Louden Valve. Four months ago it was unheard of—to-day there are thousands of enthusiastic "slaves of the lamp" who will never go back to the old type of valve.

Why? Well, because however you consider the Louden Valve it is a sound investment.

It costs only ten shillings. It takes so little current that your accumulators will last twice as long as they do with ordinary bright filament valves, and in spite of the fact that the anode is "full of holes" volume is, if anything, above the normal, showing that a full use is made of the electron stream.

It is the *unwanted* charges that escape through the turns of the anode, and strangely enough this is precisely what we intend to happen.

It gives a silver clear reproduction which is the delight of all who have heard it, and the life of the filament is exceptionally long.

So naturally the Louden is outstripping all other valves in popularity.

There is no secret—only merit.

Louden VALVES



The plain Louden for detecting and Low Frequency Amplifying. The Blue Louden for H.F. Amplification. Filament Volts.. 4.8-5 Filament Amps. 0.4 Anode Volts .. 40-80

FELLOWS WIRELESS

Manufactured throughout in Great Britain. All Loudens are Silver Clear and free from "mush." The current consumption is very low and the life long.

Louden Valves - Silver Clear

ADVT. OF THE FELLOWS MAGNETO CO., LTD., PARK ROYAL, WILLESDEN, N.W.10.

E.P.S.6



CLUB DOINGS

Tottenham Wireless Society

Hon. Sec.—MR. A. G. TUCKER, 42, Drayton Road, N.17.

ON November 12 Mr. M. C. Butler gave a lecture on Esperanto. A discussion followed, and Mr. Butler gave a ten-minute introductory lesson.

Southampton and District Radio Society

Hon. Sec.—LT.-COL. M. D. METHUEN, 22, Shirley Avenue, Southampton.

ON November 13 Mr. Lyon gave a demonstration with his five-valve neutrodyne receiver. Lt.-Col. Methuen also demonstrated with a single-valve receiver. Mr. Bateman spoke upon his theory of the propagation of short waves.

Coventry and District Co-operative Radio Society

Hon. Sec.—MR. A. CURTIS, West Orchard, Coventry. ON November 12 Mr. E. P. Beaumont gave a lecture on accumulators, including many useful hints on their care and use.

South Dorset Radio Club

Hon. Sec.—MR. J. A. PORTER, 18, Derby Street, Weymouth.

ON November 10 Capt. E. J. Hobbs gave a lecture on "Distortion in Valve Scts."

Croydon Wireless and Physical Society

Hon. Sec.—MR. H. T. P. GEE, Staple House, 51st 52, Chancery Lane, W.C.

ON November 11 a lecture was given by Mr. H. F. N. Riddle on the subject of audio-frequency transformers, the lecture being accompanied by practical demonstrations.

City of Belfast Y.M.C.A. Radio Club

Hon. Sec.—MR. J. J. COWLEY, 4, St. Paul's Street, Belfast.

ON November 7 Mr. J. A. Sang gave a lecture on high- and low-frequency amplification, stating the various methods of coupling and their advantages and disadvantages.

Hackney and District Radio Society

Hon. Sec.—MR. G. E. CANDY, 70, Chisenhale Rd., E.3.

A WELL-ATTENDED meeting was held on November 3 at Kings Hall, Lower Clapton Rd., E.5. Lectures were given by Mr. Samson on "French Polishing"; Mr. A. H. Phillips on "Various Types of Measuring Instruments"; and Mr. D. Wall on "Utilising the Mains for H.T."

Barnet and District Radio Society

Hon. Sec.—MR. J. NOKES, Sunnyside, Stapylton Rd., Barnet.

THE society commenced the winter session with an open meeting, at which an address on "A Day at 2 LO" was given by Mr. A. R. Burrows. The "gadget night" held on November 3 was voted a great success.

Correction.—Owing to a draughtsman's error a wrong dimension appeared on the diagram of a valve-socket template in our "Practical Odds and Ends" page in No. 127. The measurement on the extreme right should be $\frac{13}{32}$ in. instead of $\frac{3}{32}$ in.

WFBM, the Indianapolis station, is unique in that it has no studio. Programmes are picked up from local stations and retransmitted on a wavelength of 268 metres.

To provide rapid communication of sports results by wireless a company has been formed for this purpose in Melbourne (Australia).

The Free Commune of the island of Saint Louis, in Paris, is to have a broadcasting station.

Broadcasting stations are greatly needed in New Zealand, since reception of the two nearest Australian stations, 2BL and 2FC (Sydney) is very uncertain.

Over 3,000 amateur receiving licences have been issued in Australia.

It seems that the best time to hear Australian or New Zealand amateur stations in Europe is at about 6 a.m.

ANNOUNCEMENTS

"Amateur Wireless and Electric." Edited by Bernard E. Jones. Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. It will be sent post free to any part of the world—3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to the Proprietors, Cassell & Co., Ltd.

General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets.

Contributions are always welcome, will be promptly considered, and if used will be paid for.

Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed.

Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," La Belle Sauvage, London, E.C.4.

A new French broadcasting station is to be established at Agen, to operate on a wavelength of 300 metres with a power of 200 watts.

CRYSTALS GIVEN AWAY

Every purchaser of Kenite Panels this week will receive, free of charge, one "A.R." Crystal (value 10d.). Kenite Radio Panels, half the cost, double efficiency, no leakage, easy to work. Black only. Matt finish. 3/16ths thick, 3 sq. inches. Quarter inch 25% extra. Any size up to 3 1/2 in. x 2 1/4 in. Minimum post order, 1/-. Components List post free.

CRAWFORD, 13, BIRKHAL ROAD, LONDON, S.E.6.

"HOLTITE" SUPER CATSWHISKER

NOT WIRE Patent 19100
Ends catswhisker trouble. Entirely indifferent to shocks, etc. "Lurgstallie" say: "Certainly is very efficient"
P.H.: "An innovation in crystal contact."

FROM YOUR DEALER OR 6d. POST FREE FROM: "HOLTITE" 76, Waterloo Rd., WIDNES. SEND NOW. You'll send for half-a-dozen for your friends when you have tried one.

ETHITA THE ETHERITERS FAVOURITE

CARPAX PERMANENT DETECTOR SET
Send for descriptive leaflet about this handsome crystal set utilising permanent detector, with space for phones or valve amplifier. Wonderfully efficient. Beautiful appearance. Write to us or list. Free.
CARPAX COMPANY, LTD., 312, Deansgate, Manchester.

TELEPHONES RE-WOUND

to 4,000 ohms. Guaranteed. All makes 5/6, except Brown "A" 6/6 and Sullivan. Wax filled. 10/6 per pair. Ex-army converted to high resistance 2/6 each carpiece. Re magnetising 9d per carpiece. Postage extra 6d. per pair.
JOHN W. MILLER, 68 FARRINGTON ST., E.C.4
Ground and 3rd Floor. Telephone CENTRAL 1935

CABINETS for Wireless CONSTRUCTORS
PICKETT'S
GILBERT'S
CABINETS
from 1/6 each
They're good Value
Send for constructors list free
PICKETT'S CABINET WORKS
REXLEY HEATH S.E.
Send for Constructor's List (A.M.) FREE



Dampness—the arch-thief of signal strength.

THE wonderful Eureka Concert Grand was not evolved in a day—nor a week—nor a month—nor, for that matter, in a year. It was the direct outcome of much intensive study of the problem of Low Frequency amplification and the possibility of obtaining "power" results without the necessity of using power valves.

From the first, the radio engineers who designed the Eureka worked on original lines. In fact, apart from the fact that the Eureka has a primary winding and a secondary winding it has little in common with ordinary Transformers. Take its superb insulation, for example. In the Faraday House Test Report it is recorded that the tremendous pressure of 2,000 volts was necessary to break down the insulation be-

tween windings and between windings and case.

But that is not all. This tremendously high insulation safety factor is permanent. No matter how old your Eureka its insulation will always be perfect because the Transformer is hermetically sealed up after its last test report.

Dampness cannot affect it. Many L.F. Transformers absorb moisture and naturally signal strength is considerably reduced. If your Set is not as loud as it was, say, six months ago, it is quite likely that your Transformer is the cause. Discard it and install a Eureka Concert Grand. You will get greater purity of sound, increased volume, and freedom from trouble.—Remember that the Eureka is the only Transformer that can be suspended in water for fourteen days, and used immediately without any harmful effects.

PORTABLE UTILITIES CO., LTD.
Fisher St., London, W.C.1.
Concert Grand ... 30/-
Eureka No. 2 ... 22/6
(For Second Stage.)
Scottish Agents:
FULLER, BLACKIE & RUSSELL LTD., 30 Gordon St., Glasgow.



Low frequency Transformer

Gilbert Ad. 1835.

T. W. THOMPSON & CO.

Government Surplus Depot

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Telephone—Greenwich 1259

Agents for Brighton District: A. J. HILL & CO., 8, York Hill, Brighton.

Great Surplus Clearance Sale AT RIDICULOUS PRICES.

*Special clearance of accumulators, all brand new unissued stores with 3 months' guarantee.
Save yourself pounds and deal from us.*

CLIFTON ACCUMULATORS. Celluloid cases, 2 volt 220 amp. To clear at 25/- each. Beautiful teak case to fit given away with every four cells. 300 in stock, brand new.

EXIDE ACCUMULATORS. 2 volt 190 amp. To clear at 20/- each. 200 in stock. Brand new.

HELOVA ACCUMULATORS. 2 volt 110 amp. To clear at 15/- each. 4 volt 110 amp., with teak case and outside terminals, 31/- each. 300 in stock. Brand new.

FULLER'S ACCUMULATORS. 2 volt 120 amp. To clear at 18/- each. 400 in stock. Brand new.

STORAGE BATTERIES. E.P.S. and D.P., in teak cases, lead lined. 2 volt 140 amp. Brand new. 30/- each. Second-hand, have been charged 3 times, perfect, 20/- each. 400 in stock.

SPECIAL BARGAIN OFFER.

6,000 CHLORIDE ACCUMULATORS. Celluloid cases. 2 volt 20 amp., with patent unspillable partition, heavy non-corrosive terminals. All brand new. To clear at 4/6 each. 4 volt 20 amp., 9/-; 6 volt 20 amp., 13/-; Post 6d., 9d. and 1/-; With every 5 cells ordered a teak case to fit given away. Don't miss this opportunity.

2,000 WESTERN ELECTRIC SINGLE EARPHONES. Ebonite covered case. To clear. All perfect and new, at 2/3 each, post 3d.

LOUD SPEAKER BOBBINS. Ready wound to 1,000 ohms each, tested. 6d. each.

INTERVALVE TRANSFORMERS. Very neat type, with the best possible results. The Government knew the best price to clear. 12/6 each, all new; post 6d. 1,000 in stock.

AERIAL WIRE. 7 strands, 50 ft. lengths. To clear at 1/- per coil, post 3d.

WAVEMETER BUZZERS. These are a high-note, very sensitive buzzer, with platinum points; useful to all. Cost 12/- each. Price to clear 2/- each. 500 in stock.

MANSBRIDGE CONDENSERS. 2 M.F., 2/6 each. 1 M.F., 1/6 each. $\frac{3}{8}$ M.F., 6d. each. Post 3d.

VALVE TRANSMITTERS, COMPLETE WITH H.T. GENERATOR. These sets comprise 2 separate units. Transmitter containing tapped coil, inductance (loose coupled), H.F. meter fil. rheo., terminals, etc., and H.T. generator containing neat motor, various condensers, step-up transformers, ammeter, chokes, etc., etc. Complete sets to clear at 60/- each.

3-VALVE AMPLIFIERS. These contain 2 inter-valve transformers, 1 telephone transformer, condenser, res. fil. rheostat, non-capacity valve holders. In polished teak cases, etc. Clearance price, 30/- each, post 1/3.

MK. III 2-VALVE RECEIVING SETS. Brand new. Range 200-1,800 metres. These sets contain neat aerial tuner wound on ebonite with stud tappings, variometer, reaction, Mk. III variable condenser, inter-valve transformer, telephone transformer, grid leak and condenser, other condensers and numerous other fittings such as filament rheostat, etc. In canvas-covered mahogany case. A masterpiece of good workmanship. Price £5 each. 3/- passenger train. Cost £15. These sets are tested on 3 broadcasting stations from our depot, London, Bournemouth, and Manchester, before dispatch. Price complete with H.T. battery, accumulator, 'phones, and valves, £7 8s.

DOUBLE TELEPHONE CORDS, BROWN. A cord that will never break. 1/9 each.

MICROPHONE AND TELEPHONE TRANSFORMERS. A perfect transformer costing 25/- each. $\frac{1}{4}$ -lb. silk wire on each. 500 to clear at 3/- each.

TELEPHONES. Containing hand combination 'phone with sensitive microphone and 120 ohm earphone. Telephone magneto generator. Magneto ringing bell, Mansbridge condenser, and other useful parts in portable case. Cost £4 each. Price to clear, 7/6 each.

SIGNALING LAMPS (German War Stock). Neat, portable metal case. 3 separate bull's-eye lamps—red, green and white, with dash cover. 3 keys, one for each colour, and main switch, and 3 metal filament lamps, 4-volt. 3,000 to clear at 3/6 each. Post 9d. All new.

VOLTMETERS. Everett Edgcombe moving coil, dead beat 0-120 volts panel mounting. 14/- each. Post 6d.

STEEL AND COPPER COVERED AERIAL WIRE. 1/6 per 100 ft.

EXCHANGE BOARDS. 10 line cordless. Brand new. Containing 30 Dewar switches, 10 1,000-ohm indicators, switch, bell, magneto, handphone, etc., etc. Cost £50 each. Price to clear, £5 each.

HETERODYNE WAVEMETERS. Range 500-3,200 metres. These are brand new, complete with Western moving coil galvanometer. £5 each. Post 1/3.

2-VALVE PANELS, ALL NEW. Ebonite. Size 11" x 6" x $\frac{1}{4}$ ". Detector and amplifier, already drilled and beautifully engraved, ready for assembling. 2/6 each.

PARAFFIN WAX. For insulating all coils, etc. 6 lb. for 3/-. Post 9d. 1,000 lb. in stock.

T. W. THOMPSON & CO.

Government Surplus Depot

39-43, LONDON ST., GREENWICH, S.E.10

Telephone—Greenwich 1259.

Agents for Brighton District: A. J. HILL & CO., 8, York Hill, Brighton.

Other Goods in Stock

200 7-Valve Sets; 3 H.F., and 1 Dec. 3 L.F., £5 each. 100 Mk. III Star Crystal Sets, £4 each. 8,000 W.O. 4 B.H. Terminals 2/6 doz. 500 Various Telephones to clear at 7/6 each, 400 Copper Earth Mats, 10/6 each. 300 30-Watt H.T. T.V.T. Units, 15/- each. 2,000 Dewar Switches 2/6 each. 500 Complete Telegraph Sets, 8/6 each. 200 10-line Exchange Board, £5 each. 50 Marconi $\frac{1}{2}$ K.W. Alternators, 25/- each. 600 Aerial Drum Winders, 1/- each. 3,000 Valve Boxes to hold 3 Valves, 1/- each. 200 Remote Control Tuners, 6/6 each. 50 2 K.W. Alternators with condensers and Auxiliary Motor, £4 each. Petrol Generating Sets Keighley 110 volts 20 amps., £50 each. Eclipse Petrol Electric Sets, 65 volts, 27 amps., £35. Austin Sets, Petrol Electric, 110 volts, 10 amps., £30. Norman Sets, Petrol Electric, 30 volts 10 amps., £18. 400 3-Valve Amplifiers at 30/- each. 200 0-1,000 Mirror Reflecting Voltmeters, £4 each. 30 H.T. Motor Generators, Input 12 volts, Output 600 volt 100 milliamps, £10 each. 20 Marconi H.T. Generators, 600 volts, 30 milliamps, hand-driven, £8 each. 400 Marconi 2-Valve Sets, brand new, 40/- each. 1,000 Various Spark Transmitters from 6/- to 30/- each. 8,000 Various Telephone Single Receivers to clear at 1/6 each. 20 7-Valve H.F. Sets, Range 200-5,000 metres, £4 each. 30 Mutual Tuning Inductances, 20/- each. 500 Mk. III Tuning Coils wound Litz wire, 200-700 metres, tapped, 4/6 each. 3 Ton Scrap Wireless and Telephone material, useful to amateurs, 9lb. 5/-, post 1/-. 30 lb. Zincite Crystal, £4 per lb. 600 Telephone Transformers to clear at 3/- each. 50 Power Buzzer Transmitters, complete with 3-valve amplifier, £5 each. 400 Wilson 12-volt Motors, 10/6 each. 7,000 5-ft. lengths 9 m.m. H.T. Rubber covered cable for lead in, etc., 6d. per length. 1,000 1 M.F. Condensers, 1/6 each. 2,000 2 M.F., 2/6 each. 750 Brand new Hand-phones with Microphone and Receiver, 3/6 each. 450 Aeroplane Compasses, 4/- each. 800 pair Prismatic Binoculars, 40/- each. 3,000 German Signalling Lamps, 3/6 each. 60 Bridge Tapped Mica Condensers, 500-volt 4 M.F. in all, 35/- each. 100 Heterodyne Wavemeters, 500-3,200 £5 each. 6,000 2-volt 20 amp. chloride Accumulators, 4/6 each. 200 150-ohm Charging Rheostats, beautiful movement, 5/- each. 3 Mile Copper Braided Super Aerial Wire, $\frac{1}{8}$ dia., 4/- 100 ft. 2,000 pair Brown's Duralumin Headbands, complete, 2/6 pair. 8,000 Shell Insulators, 10/- gross. 8,000 Egg Insulators, 7/6 gross. 200 0-24 Laboratory Mirror Voltmeters, 40/- each. 2,000 pair Plugs and Jacks, 2/- pair. 500 pair, 4,000 ohms. phones, brand new in boxes, 10/6 pair. 4,000 400-ohms Potentiometers, 3/6 each. 90 Milliamp. Testers, 0-50 milliamp. moving coil, 20/- each. 200 G.P.O. Relays, minus points, 6/- each. Paul's Wavemeters, 100-3,500 metres, receive and send, £5 each. 200 Transmitting Variometers, 15/- each. 500 Accumulator Boxes, 5 $\frac{1}{2}$ by 5 $\frac{3}{4}$ by 8 $\frac{3}{4}$, 9d. each, post 6d. 3,000 Lead-in Tubes, Ebonite 14 in. by $\frac{3}{8}$ dia., 2/- each. 40 Mile Twin Cable, 2 single $\frac{3}{32}$ Flame-proof covered, 1/- doz. yds. 500 Variometers, 200-700 metres. List price, 17/-; our price to clear, 8/6 each, etc. etc.

Other goods will be mentioned in our next advt. We are prepared to take any reasonable offer for any of above complete lot.

Amateur Wireless

COUPON
Available until Saturday,
December 6th, 1924

PASSMORE'S NOVELTY STORES

126, CHEAPSIDE, E.C.2.
MAIL ORDER DEPARTMENT, A.W.

Send 3d. for Our Latest
80 Page Wireless Catalogue

WIRELESS CABINETS

In 5/8 In. Oak, French polished,
very low prices for half-dozen lots

Lambert Robinson & Sons,
Gisburn Street, BARNOLDSWICK

LOUD SPEAKERS

ANY MAKE YOU SELECT. Amplion, Sterling,
Sparta, T.M.C., etc., on easy terms. Instrument
delivered on payment of the deposit. *Examples:*
Dinkie, deposit 10/6, 2 monthly payments 10/6.
Sterling Baby, deposit 16/6, 6 monthly payments 6/6.
Brown H.L., deposit 27/-, 6 monthly payments 14/2.

H. W. Holmes, 29 Foley St., Gt. Portland St., W.1
EASY PAYMENTS Mo cum 1414

RADIO "CROXSONIA" PANELS

Black matt finish, insulation perfect, rigid without being
brittle, drills, cuts and taps perfect—7" x 5", 1/-; 6" x 6",
1/-; 8" x 5", 1/2; 7" x 6", 1/3; 8" x 6", 1/5; 9" x 5",
1/5; 9" x 6", 1/7; 10" x 8", 2/1; 11" x 8", 2/3; 10",
x 9", 2/4; 12" x 8", 2/6; 11" x 9", 2/7; 12" x 9", 2/10;
12" x 10", 3/-; 14" x 10", 3/5; 14" x 12", 4 7/8
thick. Post free. Callers, cut any size, and quote by
Post. **Exceptional Terms to the Trade.** Write for sample
and Prices. Manufacturers:

CROXSONIA COMPANY, 10 South St., MOORCATE, E.O.2



**SPRING CONTROL
IS THE SECRET**
of the
S.P.C. DETECTOR

Can be mounted on Valve Holder
or Valve Sockets on Panel.
Perfect micrometer adjustment, giving
absolute positive pressure spring
control.
The most sensitive "spot" being
rapidly found and permanently held.

4/6 each. Post 3d.

Prov. pat.
SPEEDWELL PRESS CO., LTD.,
GLEBE ROAD, LETCHWORTH, HERTS.

**YOUR LOUD SPEAKER
MUST be fitted with the
WAVEOLA
(PAT.) HORN**

If it is to produce perfect results. It is sound-
expanding and tone-purifying. Scientifically
constructed. Two sizes, 25" and 30" each.
LOUD SPEAKER Complete £3 15s.
Head Dept., 142, GRAY'S INN RD., W.C.1
Telephone: Museum 7597. Agents Wanted



Pat. No.
173147/20

A type for every Valve



ACCUMULATORS

C.A.V. Fullers, etc. Guaranteed brand new and perfect but
slightly soiled. We refund cash with carriage both ways if
returned within 7 days.

2V-40A ...	8/6	2V-60A ...	11/6
1V-40A ...	17/-	6V-40A ...	25/-
4V-60A ...	21/9	6V-60A ...	32/6
4V-80A ...	27/8	6V-80A ...	40/-
4V-100A ...	32/8	6V-100A ...	47/6

Special Line, C.A.V., 2V-100A (actual) 27/6.
MAUDE RUBBER CO., 58, Praed St., W.2.

Wasteless Condensers

The new Bowyer-Lowe Square Law Condensers
have a wavelength scale which is equally useful
throughout its length. No crowding at the lower
end. Capacity ratio 150 to 1 in the 0005 Type.
Will increase the wavelength range of any set by
50%. Write now for full particulars.

BOWYER-LOWE CO. LTD., LETCHWORTH

BROWN A. REED TYPE EARPHONES

As used for "A.W." Crystal Loudspeaker Circuit.
Also "A.W." Pleated Paper Loudspeaker. Guar-
anteed equal to new in efficiency. Very limited quantity.
17s. 6d. each. Postage 4d. Any resistance.

"GOODMAN'S," 78 SPENCER ROAD, WEALDSTONE

THIS IMPROVED **Athol** MEANS INSULATION

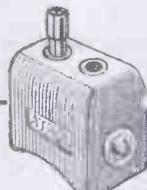


REVERSIBLE VALVE HOLDER

The only single hole fixing
holder that fits any set.

1/3 each

For mounting front or back of
panels, or on base boards.



PORCELAIN COIL MOUNT

With the perfect plug.
Will fit any coil.

1/- each

LISTS FREE.

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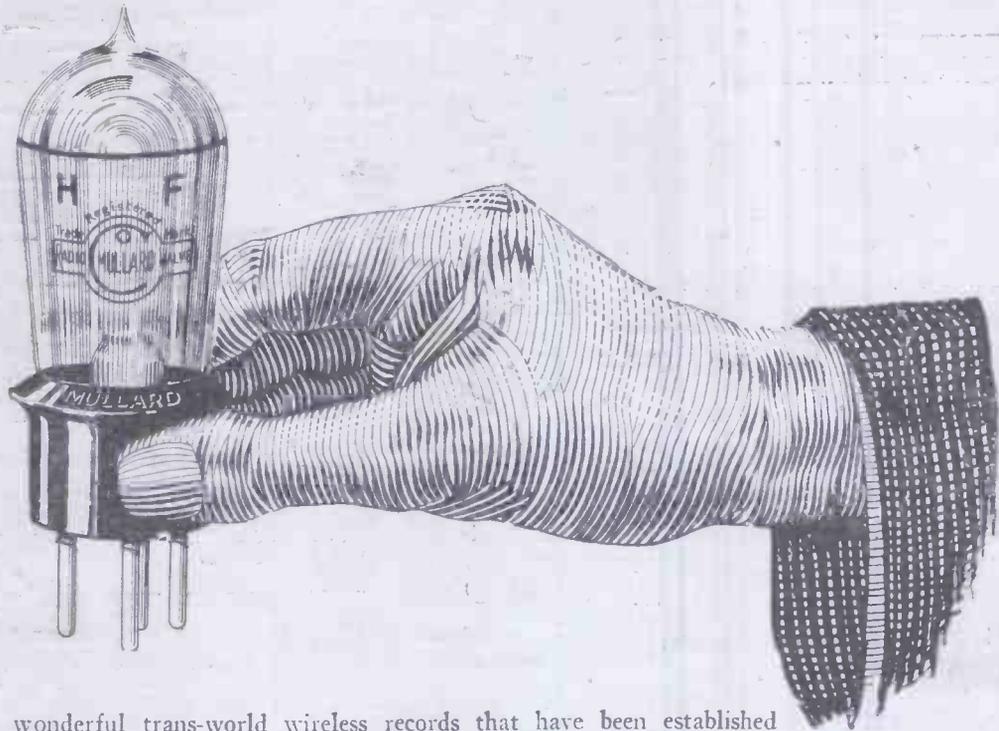
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