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Vol. V. No. 126.

SATURDAY, NOVEMBER 1, 1924

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PRINCIPAL CONTENTS

WITH A JUNK SET IN
IRAQ

MAKING A HETERO-
DYNE WAVEMETER

EXPERIMENTAL
TRANSMISSION

MULTI-PHONE RECEP-
TION

WIRELESS IN NEW
ZEALAND

ADDING THE AMPLI-
FIER

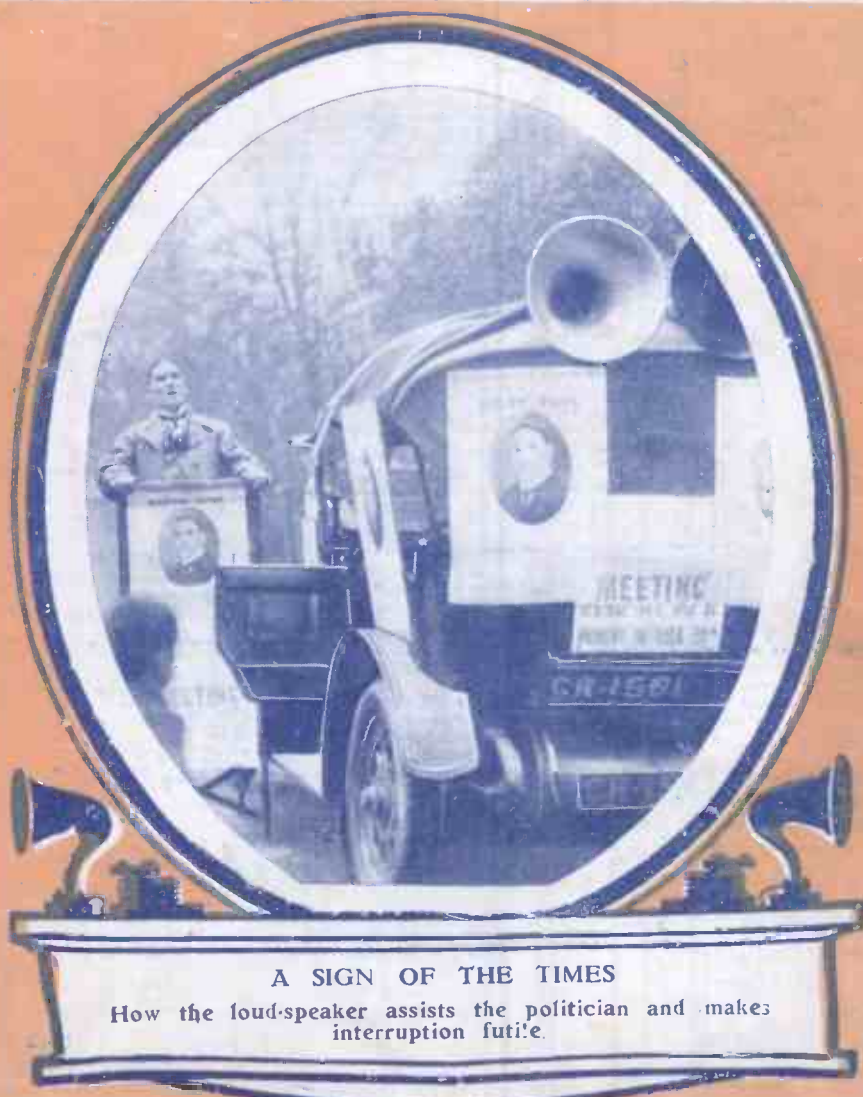
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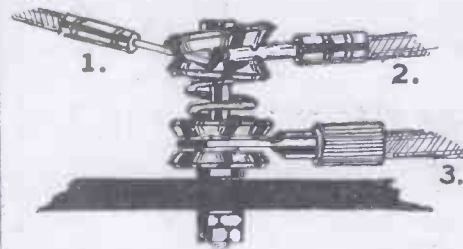
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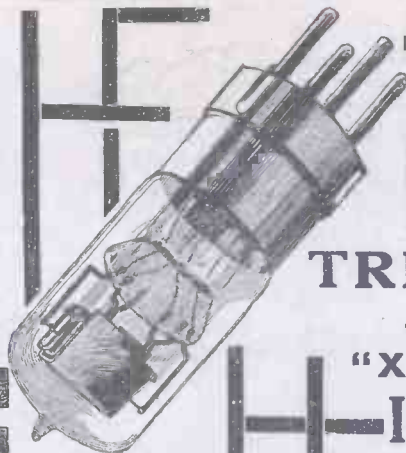
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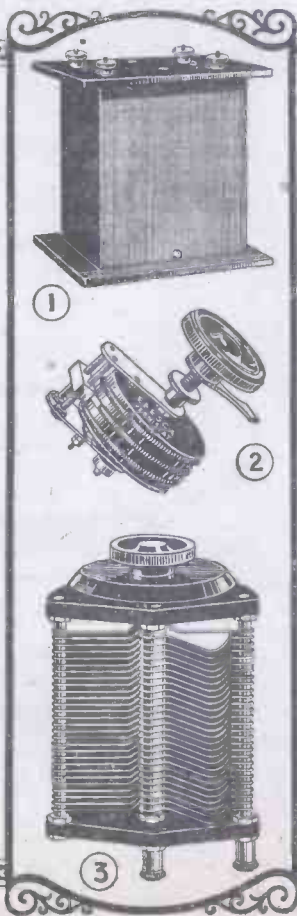
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Amateur Wireless

and Electrics

Vol. V. No. 126

November 1, 1924

WITH A JUNK SET IN IRAQ

THE following is a description of what the writers believe to be a unique effort to receive the British telephony stations in Iraq. The great initial difficulty was lack of apparatus, so it was decided to make anything unobtainable. It was originally decided to use seven valves, but owing to the high-frequency amplifier proving rather unstable the number was cut down to five. The arrangement of the valves was two high-frequency, one detector and two low-frequency, the H.F. being on the well-known tuned-anode system. The circuit is shown in the accompanying diagram.

The tuner consists of a solenoid coil 4 in. in diameter and $4\frac{1}{2}$ in. high, wound with No. 26-gauge d.s.c. wire with five tappings and a .0005 variable condenser in series. This tuner is mounted on the same base-board as the H.F. amplifier, and gives a range of wavelengths from 280 to 600 metres.

The high-frequency unit is, as mentioned, of the tuned-anode type, the coils being of the basket type with tappings; the second anode coil is wound on an ebonite tube 2 in. in diameter and 6 in. long; these coils are also wound with No. 26 wire and the latter coil has twelve tappings taken from it.

Small condensers were placed across the anode coils; these were made by cutting discs of brass, two discs being used for each condenser; one disc is screwed to the baseboard and the moving disc is mounted on a brass spindle which screws into an insulated nut on the face of the fixed disc. As the spindle is rotated the moving disc is brought up to the fixed, and so varies the capacity.

The coupling condensers were made with copper-foil and mica dielectric, and grid leaks were made of red fibre with a pencil line between two terminals.

Filament rheostats consist of iron wire wound on pieces of wood, which are mounted on the baseboard; these are a little noisy, but were the best that could be produced under the circumstances. For the low-frequency unit, only two burnt-out

$1\frac{1}{2}$ in. with four pieces of waxed paper. All terminals were taken from old dry cells, these being mounted on odd pieces of ebonite.*

Valve holders were unobtainable and so it was necessary to make them. Pieces of ebonite were cut with holes drilled to conform to the valve pins, the sockets themselves being made by winding a few turns of brass wire round a drill shank; these were pushed through the holes in the ebonite and connections soldered to the brass spirals. Condensers were constructed to go across the primaries of the transformers, also across the telephones and H.T. battery.

Reaction was obtained by inserting a basket coil in the anode circuit of the detector valve and coupling it to the aerial coil by means of a hinged bracket.

The aerial was slung between two electric-light standards, one of the wires of the electric-light system being earthed.

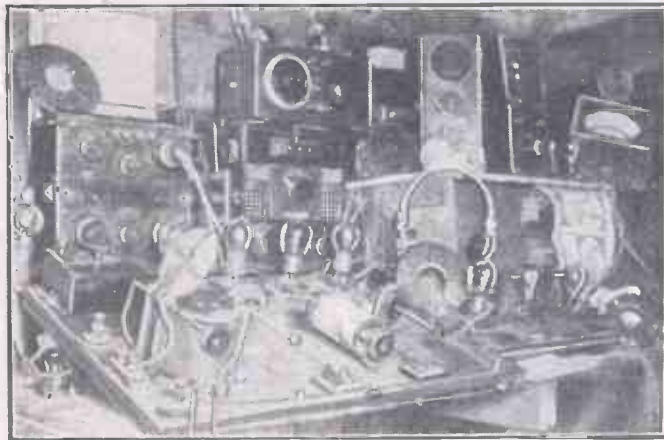
Readers will imagine the surprise when on testing the familiar sound of a carrier wave was heard. On tuning more carefully English speech was heard, and once or twice NO was distinguished. This was presumed to be 5 NO, for on tuning with a Townshend wavemeter the wavelength was found to be round about 380 metres.

The speech received at present is slightly muffled, but with a little more experimenting it is hoped to hear very plainly. Other stations are also heard, but they are not as distinct as

the assumed 5 NO. The distance of the received signals is about 2,000 miles and is practically all over land.

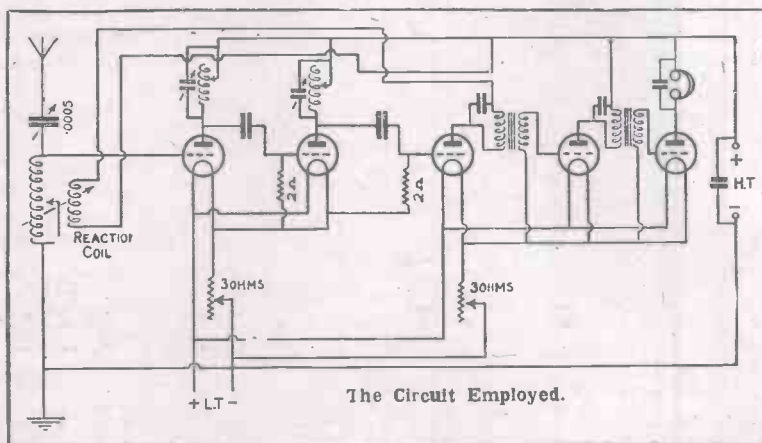
A study of the photograph of the receiving station will show how crude is most of the apparatus employed and serve to emphasise the remarkable results obtained.

J. A. and P. M.



The Apparatus Used by the Authors.

transformers of the army type were available. However, these transformers had to be rewound, and, thanks to Mr. Henry Ford, of motor-car fame, they were re-



The Circuit Employed.

wound with the wire from his coils. The old windings were cut from the transformer and the secondaries of the Ford ignition coils wound on to the bobbins by means of a breast drill. The results far exceeded expectations.

The grid condenser was made by separating two copper plates 2 in. by

MANY DIFFERENT PHONES ON ONE CRYSTAL SET

Constructional Details of an Adaptor Panel for the "A.W." System of Multi-phone Reception. Invented by John W. Miller.

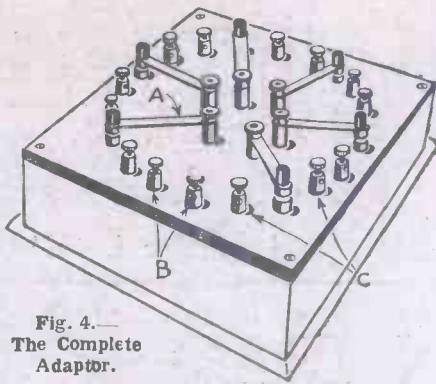


Fig. 4.—The Complete Adaptor.

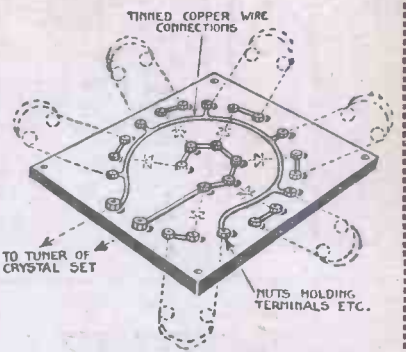


Fig. 5.—Details of Wiring.

THIS article describes the actual construction of an instrument to enable the reader to take advantage of the new "many phones on one crystal set" system (described in October 18 issue of "A.W.") without the trouble and expense of building a new set.

It will be remembered that when a crystal is connected in series with each phone in use the effect is to render the working of each phone entirely separate, as if, for instance, each one was in connection with a separate aerial, earth and set. In addition the system allows phones of any resistance to be used at the same time.

Multi-phone Detector

It is an easy matter to construct a panel having six crystals and suitably provided with six pairs of telephone terminals. With such a panel it will be possible for six people to listen in and each to have control over his own phones, and also to get the same strength as if they were using their phones alone on the same set. The others, in fact, would not be aware of any addition or removal of their fellow-listeners' phones.

As will be seen from Fig. 1, the ebonite for the panel should measure 7 in. square and should have six holes arranged in a circle to carry the mountings for the detectors, the type of which is shown by Figs. 2 and 3. Also there will require to be a larger circle of holes for the crystal cups actually fixed to the panel; a pair of telephone terminals (C, Fig. 4) are arranged one on each side of the detectors as shown. There will also be two terminals (B) to be connected to the set in use. Terminals with long stems should be chosen so that the connecting wires may be soldered to the ends without unduly heating the ebonite. It will be noticed from the wiring diagram, Fig. 5, that none of the connecting wires cross each other, so that thick bare wire may be used for the connections.

By tracing out the wiring diagram it will be seen that it is similar to the instrument illustrated in the previous article.

The detector may appear very crude and unwieldy, but it is actually the most efficient for the purpose. Although experi-

ments have not actually been made with any of the "whisker" crystals, there is every reason to believe that such crystals would be unsuitable for this particular purpose, if only for the fact that a knock

a height of 6 or 8 in. on to a bare wooden table. It is suggested that experiments should be made with various combinations of crystals in order to ascertain which are the best.

Stability

Stability is important when using this panel, as there will be six people adjusting their crystals at once, and a crystal detector which would not stand a certain amount of vibration would be useless, for every time one listener adjusted his contact he would probably put the other five off.

Of course any type of detector may be used in place of the one illustrated, but readers will find this type to be very stable. There are several types of detector using combination crystals that are suitable for external connection to existing sets.

In conclusion, it will be as well to remember that this system of "crystal-per-phone" applies equally as well to very weak signals, and should prove a boon to the enthusiast who is lucky or skilful enough to get long-distance stations and would like to share his reception with others.

When using this device for connection to an existing crystal set, the crystal on the set should be short-circuited or the whisker pushed against the brass part of the cup. When a crystal set is not available, this device may, of course, be connected direct to a variometer or any other tuning apparatus, without the addition of anything else except the phones.

PHONE DIAPHRAGMS

CHEAP phones are often provided with diaphragms which are thick and therefore not sensitive.

Thin and sensitive diaphragms can be easily made from the inner covers of hermetically sealed containers of invalid and baby foods (covers in which lettering is stamped are useless for the purpose). Great care should be exercised in cutting the metal to avoid buckling.

If after a time the diaphragms become "dished" by the pull of the magnets, reversing them will give them another span of service.

A. H. P.

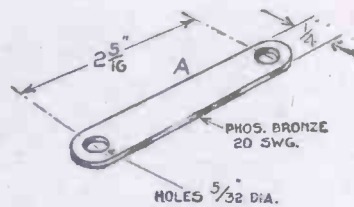


Fig. 2.—Detector Arm.

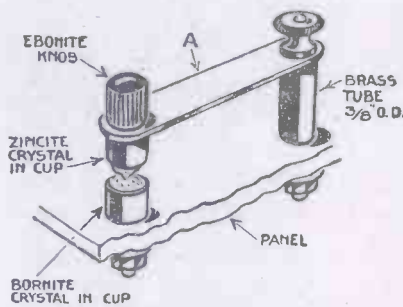


Fig. 3.—Details of Detector.

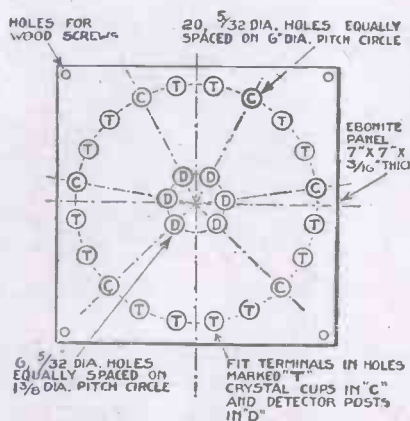


Fig. 1.—Plan of Panel.

or jar will easily put them out of action. With most of the combination crystals this does not usually happen. The writer has had crystals in use in detectors somewhat similar to those described which have resisted all reasonable efforts to jar them out of contact, even to the extent of picking the whole set up and dropping it from



Fig. 4.—The Complete Wavemeter.

A HETERODYNE WAVEMETER

desired range is covered. Probably the second pair will be most useful to the experimenter, as this band of wavelengths is crowded both with British and American broadcasting. The figures given are only approximate, and it may be impossible to cover the given range with one pair of coils, but it is certainly possible to cover the broadcast waves with one pair whatever winding is employed.

The coils used by the writer are of the ordinary basket type with single winding, although double winding may be employed with no decrease in efficiency. The coils were wound on fibre formers and not shellacked. If it is preferred, the reader may wind the coils on a spider former

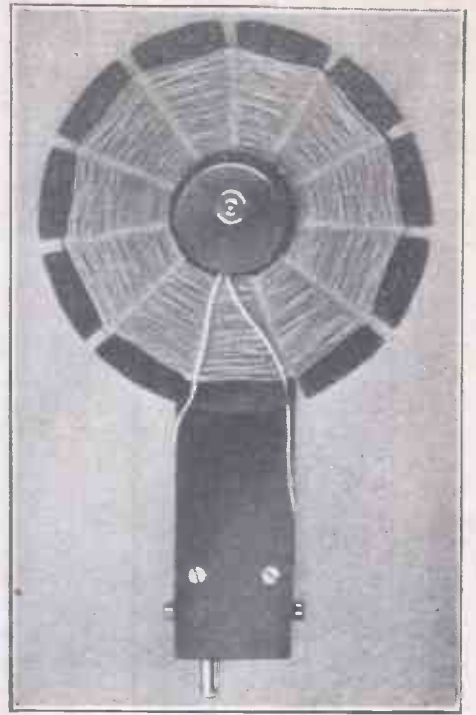


Fig. 2.—Pair of Coils.

ONE of the most essential things for the real experimenter to possess is an efficient wavemeter. Unfortunately they are expensive and not many amateurs wish to purchase one, as five pounds or so can be put to a more advantageous use. In this article the writer will attempt to remove all difficulties which may exist in the construction of this useful instrument, which need not cost more than twenty-five shillings. There are two main types of wavemeter, the buzzer and the heterodyne. The former, as its name shows, employs a buzzer to generate the necessary oscillations, whereas the latter takes advantage of the oscillating valve. The buzzer wavemeter, although slightly cheaper to construct, is by no means so efficient as the heterodyne from the point of view of accuracy.

The Circuit

The circuit shown by Fig. 1 will be recognised as being the usual local oscillator circuit. The inductance L_1 is shunted by a variable condenser, which may be of the order of .001 microfarad. It will also be noticed that the coil L_1 is coupled to a reaction coil L_2 at a fixed angle. This angle must obviously be constant, because if the coupling is varied the wavelength of the tuned circuit will be altered and the condenser readings thrown out.

The best and easiest method of overcoming this difficulty is to clamp the coils together in a basket-coil holder as shown in Fig. 2, and connect up L_1 to the plug and L_2 to two extra terminals. Thus, when changing the coils, it is only necessary to remove one pair of wires. This method also keeps the coils rigid. The first pair of coils could have a range of, say, 150 to 300 metres, the second pair 300 to 500 metres, and so on, until the

with mica dielectric. The main advantage gained from using this type of condenser will be explained. When the pointer is moved towards the increase position the wavelength increases proportionately instead of the capacity, as is usually the case with air-dielectric condensers. This is a great advantage, for when the graph is plotted it will be a straight line. In the case of the ordinary condenser, the first few degrees of the scale cover a large band of wavelengths compared with the last few degrees. In the Polar condensers the wavelengths are equally distributed round the scale. This advantage will be more apparent when the meter is calibrated.

Calibration

When the components are mounted and wired up according to the circuit in Fig. 1, the next step is to calibrate the wavemeter. For this purpose it is necessary to have either (1) a wavemeter already calibrated, or (2) a valve set with direct aerial coupling and also at least one stage of high-frequency amplification. It should be noted that once the meter has been calibrated the H.T. and L.T. must be kept constant in value.

The wavemeter should, first of all, be placed near the receiver and connected up to high- and low-tension, separate batteries being employed where possible.

Le Petit Parisien station, which usually works on 340 metres, could be tuned in on the set. When clear signals are obtained, turn up the filament of the wavemeter valve and rotate the condenser knob until a chirp is heard in the phones. If there is no sound the reaction coil should be reversed. The object now is to find the silent point between the chirps in a similar way as an ordinary carrier wave would be treated. When this has been obtained with

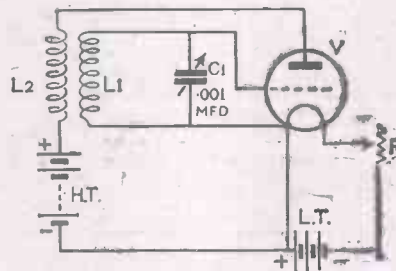


Fig. 1.—Circuit Diagram.

and shellac them, but as they are much more fragile in this condition the former method should be used.

The panel may conveniently be 9 in. by 5 in. by $\frac{1}{4}$ in. in order to accommodate a Polar condenser, Ormond rheostat, valve holder and six terminals. Any standard hard valve will do, so an R-type valve holder is mounted on the panel. The valve in the photograph is a Cossor P2. The connections were made with No. 18 tinned-copper wire, all joints being soldered.

The variable condenser used was a Polar

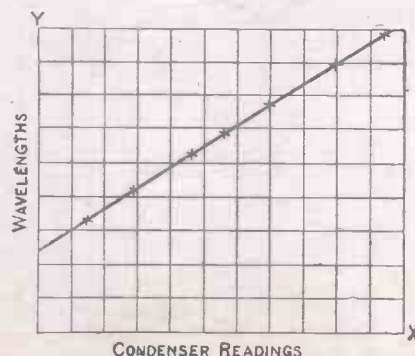


Fig. 3.—Example of Wavemeter Graph.

the greatest possible accuracy, make a note of the wavelength and condenser reading, which should be as near to the beginning

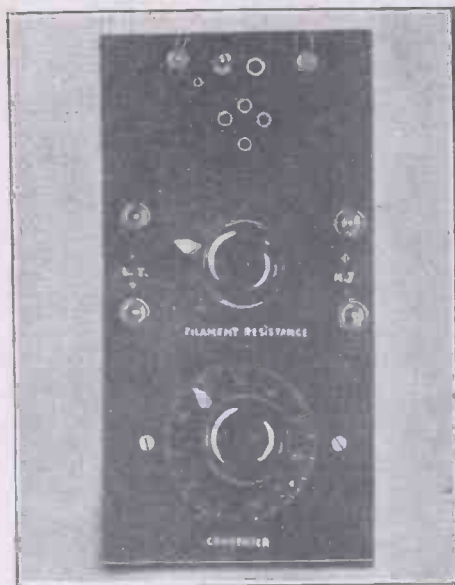


Fig. 5.—Top Side of Panel.

of the scale as possible. This, then, is the first point of the graph for the pair of coils in use. Other points must be plotted at, as near as possible, regular intervals.

Assuming that a series of points covering the condenser scale have been successfully obtained, a graph may now be plotted. The graph will be a straight line, as shown in Fig. 3. Thus separate graphs may be plotted for any number of pairs of coils, giving the wavemeter an almost unlimited range, but it is rarely necessary to exceed 3,000 metres.

Utility

The writer finds it most useful on broadcast wavelengths, especially for testing the range of new receivers and for receiving American broadcasting.

When employing the wavemeter to find the wavelength of an unknown station the proceeding is similar to that of calibrating it. When clear signals are obtained, the condenser knob is rotated until the chirps are heard. Note the condenser reading at the silent point and read off from the graph the wavelength corresponding to that particular setting. If the wavelength of the station is known, a description of the transmission and the time, it is usually easy to deduce its origin.

Another use of the wavemeter is that of facilitating the finding of a distant station. Suppose it is desired to receive an American station on 385 metres; all that is necessary is to set the wavemeter to the position which corresponds to the wave-

length and tune the set until the chirp is heard. Having found the silent point, the receiver is tuned to 385 metres. Providing the apparatus is capable and the conditions good, the desired station should be heard when the wavemeter is switched off.

Such is the operation of an instrument which will prove of great value to any

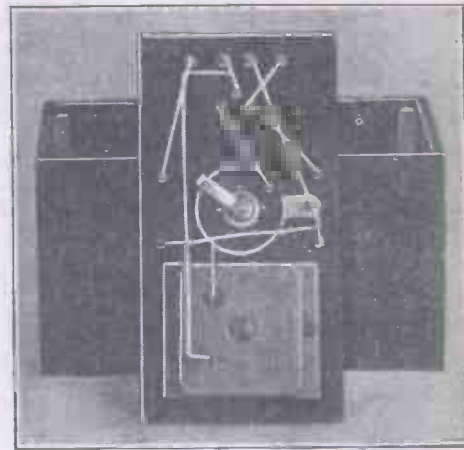


Fig. 6.—Under Side of Panel.

amateur who takes the trouble to construct one on these lines. The other photographs, Figs. 4, 5 and 6, show the completed instrument and the top and under sides of the panel. E. L. M.

WIRELESS IN NEW ZEALAND

IN New Zealand it is only during the last few months that the general public has become at all interested in wireless and even now the popular impression is that wireless is only for scientists and millionaires. To a certain extent there are some grounds for this belief, for anyone whose purse will not run to at least three valves has but little inducement to take up wireless.

Few Transmissions

Being so far from the commercial centres of the world, the ether is by no means overburdened, and the crystal enthusiast has but a poor time. There are usually a few messages to be picked up from ships, but air station transmissions are non-existent. There is not a great number of land stations either, for although each of the four centres—Auckland, Wellington, Christchurch and Dunedin—has its Government-controlled station, there are only two other high-power stations of any importance. These are Awanui in the north and Awaroa in the south.

Time signals are transmitted from the Post Offices of the four cities, but apart from these there is not very much doing except Government official messages, unless one is provided with the necessary

amplifiers to receive Sydney, Suva, etc., and the nearer American stations.

Broadcasting

Broadcasting is carried out in an entirely different manner from that in England. In Auckland there are now two broadcasting stations, and one of these is run by a corporation of wireless-apparatus dealers, while the other station is in the hands of a gramophone company. Up to the present the broadcast programmes have not reached a high state of perfection, owing possibly to a kind of deadlock existing between broadcasters and amateurs. The companies will not take any important steps to improve their transmissions until they are assured of a greater sale of apparatus, while people are not inclined to buy sets until the broadcasting shows a decided improvement in quality.

Auckland

The larger of the Auckland stations, 1YA, works four nights a week on a wavelength of 260 metres, with a power of 400 watts. Two of the remaining nights a week the other station, 1YB, transmits on 90 watts, and once a month, on Sundays, the same station broadcasts sermons. Several amateurs have taken out transmitting licences near Auckland,

and occasionally they do a little low-power broadcasting on 140 metres.

In New Zealand there is only one kind of licence for receiving apparatus, and this will allow the use of any kind of set, whether it is a crystal or multi-valve, bought or home constructed. The only restriction is that reaction must not be coupled direct to the primary of the aerial tuning inductance. The dimensions and type of the aerial are unlimited. The total cost of taking out the licence is eight shillings. C. G. P.

PRESS TRANSMISSIONS

FOR some time past Reuters, by agreement with the General Post Office, have been using Northolt for the transmission of Press news simultaneously addressed to numerous correspondents in countries abroad.

In view of the satisfactory results obtained, the French Administration, in conjunction with the Havas Agency, has decided to establish a similar service. The W.T. station of Tours (Saint-Pierre-des-Corps) YG, 6,000 metres, has been adopted for the purpose. Tests are already being made at 08.10, 08.50, 10.00, 13.10, 14.15, 14.40 and 16.00 daily. In most cases the transmission is in slow Morse.

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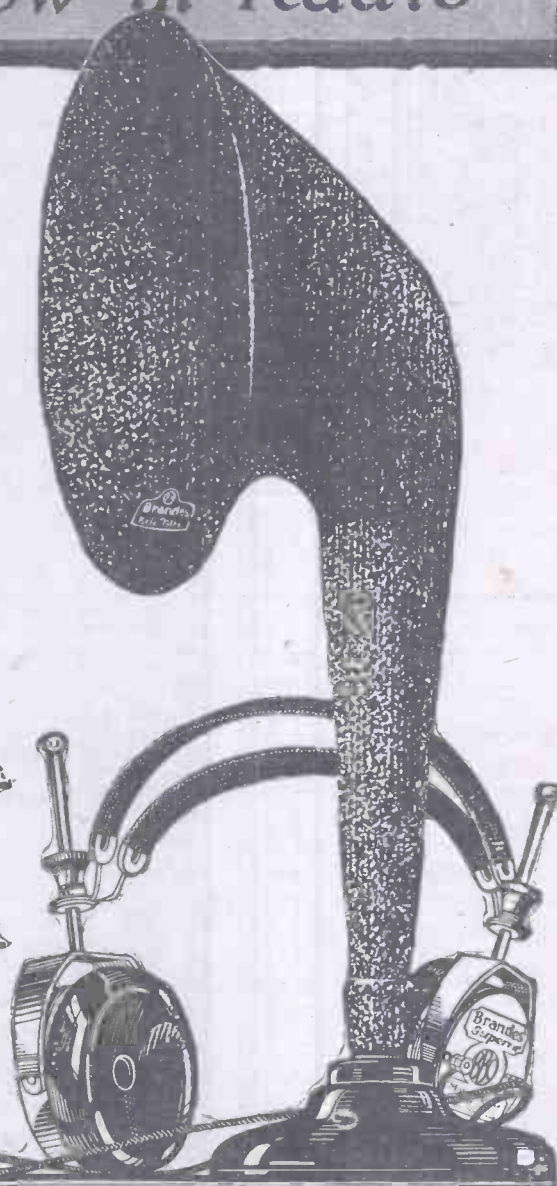
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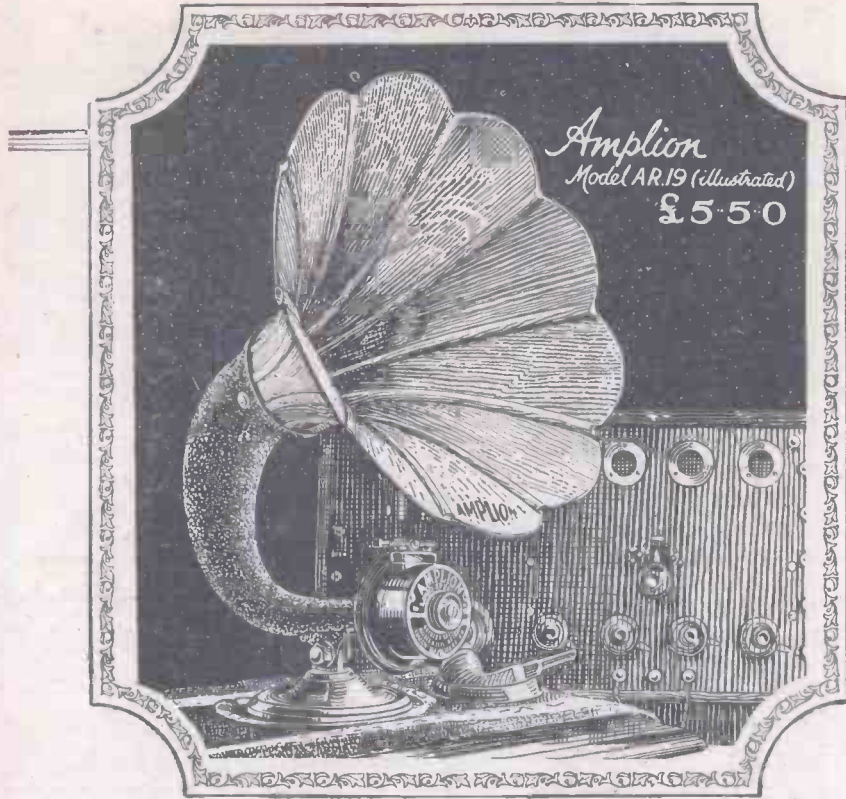
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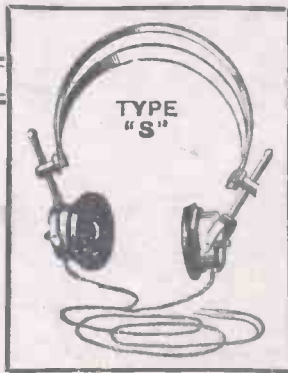
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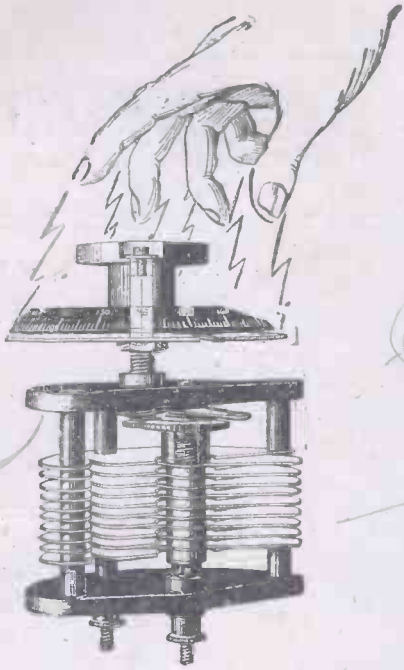
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On Your Wavelength!

American Stations

THE U.S.A. broadcasting stations are coming in extraordinarily well in this country at the present moment. In fact you may safely say that whenever two or three wireless men meet just now all with one accord start telling of their Transatlantic achievements. One in my neighbourhood, who had never before heard America, picked up WGY quite by chance the other night when he was not even attempting to get hold of anything from across the water. As a matter of fact, he was using an indoor aerial, so you may imagine his feelings of triumph. Since then he has tried three times for him and got him at once on every occasion.

WJZ and WBZ are also giving healthy signals, which are by no means difficult to get hold of if your set and aerial are efficient. On the short waves—that is, 100 metres and below—WJZ and KDKA are both going strong. The latter is now transmitting simultaneously on three wavelengths, his ordinary broadcast length, 100 metres and 68 metres. The 68 transmission is by far the strongest of the three in this country, but it takes a bit of getting down to with most receiving sets. One of the greatest difficulties is that there are, so far as I know, no reasonably-priced wavemeters on the market at the moment which register below 100 metres. There should be a good opening for an instrument reading from 40 to 180 metres if some maker cares to take up the idea.

American amateurs, by the way, are going in most heartily for short-wave transmission. The shortest wavelength allotted to them is 5 metres. Of course you cannot receive that kind of thing on any sort of straight set, but the super-sonic or the super-heterodyne is now one of the most popular types of receiver in the States and with its help you can go down without any difficulty to these amazingly low wavelengths.

Girdling the Earth

My very best congratulations to those amateurs who have recently achieved the remarkable feat of working with New Zealand confrères. Considering the small power used and the enormous distance to be covered this perhaps is one of the most remarkable feats yet recorded in wireless transmission. Mill Hill School is making quite a name for itself in wireless, for this station was one of the first, if not actually the first, to accomplish two-way working with American amateurs.

It is a pity, I think, that more schools do not make a special point of encouraging wireless as a hobby amongst boys. It is a thing that most boys are wildly keen

about, and it offers a wonderful opportunity of driving the elements of chemistry, physics and electricity into a boy's head without his realising that he is working. The schools are pretty well off in wireless gear, for O.T.C.'s obtained a splendid issue of transmitting and receiving sets, as well as gadgets of all kinds, after the war. Some of them do not go in for it very strongly.

The Big Station

It seems to be fairly well settled now that the B.B.C.'s permanent big station will be situated somewhere in the neighbourhood of Northampton. This should be quite a good position, since it is a very central one.

The chief consideration that has decided the B.B.C. to adopt this part of the world is that there is an underground main trunk telephone cable from London; the underground cable is essential for good working at any distance, and it must be a cable of a special kind. The existing north-west cable is the only one which fulfils all requirements.

I thought when we first started our big station that America would feel compelled somehow to go one better. I see now that a project has been mooted in the States for the erection of a central broadcasting station with a power of 50 kilowatts. If this comes into being, as I have no doubt it will, the reception of American broadcasting stations on a crystal set should become an everyday, or, rather, an every-night, matter in this country. Whether or not they will be able to overcome the enormous difficulty of modulating such an immense output is another matter altogether, but one feels sure that Uncle Sam's engineers will manage to tackle the problem in a satisfactory way.

The European Stations

If you have not picked up Madrid yet, do so without delay and you will be surprised. On most evenings he goes on for a long time after our own broadcasting stations have closed down. This is very fortunate, for otherwise he is apt to clash rather badly with Newcastle. His wavelength is given in all tables as 392 metres, but when I picked him up the other night I took the opportunity of measuring it with a very accurate wavemeter and found that it was actually 405. He seems to vary a little in his tuning, for slightly different adjustments were needed on the following night, though as I had no wavemeter by me I could not on that occasion verify the wavelength.

You will be amazed at the power with which he arrives. At my station he is quite as good as Birmingham only 75 miles

away, though his own distance as his waves wobble is ten times as far. You may say in your haste that this is due to his coming straight across the sea. Take your map and lay the ruler between London and Madrid. You will be surprised to find that he has first of all to travel over a very long stretch of Spanish country of a mountainous type, and after crossing the Bay of Biscay, Brittany must be passed on the way. Besides their strength the transmissions are amazingly good, there being a surprising absence of mush or of any of the other kinds of interference that so often accompany long-distance transmissions.

I picked up a quaint French station the other night that I have not heard before. It was very feeble at first, but I managed to tune him in to good audible strength. It was not the quality of his programme which attracted me, for this consisted entirely of gramophone records of the baser and scrapier sort. It was the fact that this station turned out to be that of the S.E.R. (Société Electrique à Radio-téléphonie), situated in the Boulevard Malesherbes in Paris. The power at which it is rated is only 100 watts. If this was all that he was using at the time—and he certainly was not using very much—it is rather remarkable for one to hear him so plainly over 250 miles.

A Cheerful Evening

Bournemouth's anniversary programme on October 17 was a great success. It had all been arranged before it was known that Mr. Asquith's speech was to be relayed from all stations in the early part of the evening. A less hardened soul than the Bournemouth Director of Programmes would have made big cuts in the items and would have finished up at some time round about the normal time. This kind of thing does not appeal to 6 B.M. They went straight through, giving every item as originally arranged, and closed down at what must be almost the record hour of 12.45 a.m. I do not know how many people heard the programme out, but I did, for I had decided on that night to sit up for America. Those who did prefer the delights of phones or loud-speaker to the comfort of bed will admit that they had a jolly good entertainment. The company seemed to be enjoying themselves most thoroughly—in fact I do not know when I have heard a cheerier piece of broadcasting than "The Little Tin Soldier," in the rendering of which the orchestra joined most enthusiastically, "helping" the singer with twiddly bits on various instruments. It is a good many years now since I first heard this song, and I must have listened to it scores of

On Your Wavelength! (continued)

times altogether, but I am quite sure that I have never heard a more effective rendering. At the close of the proceedings the station director apologised for, so to speak, closing down with the milk. Personally I was rather grateful, for it kept me pleasantly amused during what would otherwise have been a rather dead time and it gave me WGY's tuning, which might otherwise have been rather a trouble.

The Amateurs

Two stations which interested me immensely the other evening were 6UT and 6HC. They both appear to use alternating current as a source of high-tension and their speech consequently suffers with the usual "pea in the microphone effect"; but what interested me more than anything was the fact that they both constantly sent out test calls on wavelengths very close together, and that although I heard upwards of half a dozen stations respond to their calls both on C.W. and speech, neither of them appeared to hear these responses. I wonder if their local A.C. hum spoils their reception as well as their transmission.

I referred to 6TD the other week. I have since learned that his H.T. potential is 700 volts and on 93 to 113 metres his set is remarkably efficient in the way of aerial radiation. His aerial is badly screened locally, so that the way in which his signals travel is remarkable.

Less Oscillation

I don't know whether it is the same in all districts, but I notice that the oscillation nuisance is becoming less and less. It is true that someone a few weeks back shook half the London area with a superheterodyne or something similar, but apparently he was localised, for I heard some amateurs bitterly complaining about him. Apparently he heard it, for we have not been troubled by him since.

Sound Waves

Prof. Bragg's lecture from 2LO on "What is Sound?" has profoundly impressed some people. I have a friend who is almost afraid to move since then for fear that he should set up too many sound-wave trains and add to the noises of London. Apparently it has never occurred to many otherwise intelligent citizens that sound may be reflected. I have often heard a perfectly good loud-speaker accused of uttering uncouth sounds, when the cause of the trouble was really a hall or open space totally unsuitable for the instrument owing to the fact that the projected sounds were reflected and flung about by the echoing space.

Why Short Waves Travel

The remarkable travelling power displayed by the shorter waves as compared

with long waves is exercising the mind of the amateur at the present time, and various theories for this have been advanced. I have a friend, Pro. Microvolt, a man read and learned in the wireless art, and in order to place the opinion of this learned man before my readers I called and asked him to make a short statement on the subject. Before beginning to speak he took the R.M.S. value of a couple of incoming carrier waves, found the inductance value of a lattice-wound coil two feet in diameter, and calculated the velocity of an electron travelling between the plate and grid. After plunging his slide rule into cold water and setting a fan in motion to disperse the steam, he began to speak, whilst I hung on his carrier with eagerness.

"The use of short wavelengths result in a greater carrying power if they go further than the longer ones," he said. "Two amperes of current in an aerial transmitting on 100 metres or lower is likely to go further than a smaller reading on a higher wavelength. Providing that there are no hills, valleys or land intervening between the aeriels, the signals are likely to reach their required destination. If they are screened in the north you will receive them in the south if that is not screened." He fell into a brown study, and whilst he absentmindedly plotted out the angles of lag in my brain, I crept away to place this valuable information at your disposal. I learn that he has not spoken since that day.

Earths

I wonder if you have noticed what an enormous difference a bad earth makes to reception. If you have not, try the following little experiment and note the results. Tune in a distant station, first of all using your own good earth. Then remove the 7/22 earth lead, which is or should be there, and replace it with a piece of No. 30 or even finer-gauge copper wire. Twist the end of this round a metal rod—do not solder it—and push the rod an inch or two into the earth. Now try again and you will find some strange results. In the first place your stability will have gone to pot, whilst your wonted selectivity no longer exists. Lastly, you will most probably discover that the distant transmission has entirely disappeared or that it is so weak that you can barely get hold of it.

The moral is quite obvious. Many amateurs are so situated that they cannot obtain a really satisfactory earth. To these I would say, try a counterpoise instead. The simplest kind of counterpoise consists of a coil of, say, 20 yd. of flex, which is simply thrown on to the floor anyhow near the set. This gives surprisingly good results. A more ambitious counterpoise takes the form of a second aerial wire just as carefully insulated as the first

slung not less than a couple of yards from the ground. In most cases such a counterpoise gives greater signal strength than the best earth and it nearly always adds considerably to the selectivity of the set.

Be careful, though, of one thing: The aerial and counterpoise system is a very powerful radiator, therefore whatever you do, do not let your set oscillate when you are using it. A very good counterpoise can be made from a single length of the copper ribbon which is now sold for aeriels.

The Vicar of Mirth

I see that clever portrayer of clerical humour, Mr. Vivian Foster, is touring all stations. His friendly burlesques of the old-time unctuous country clergyman are thoroughly enjoyable, and evidently cause no offence to the real clergy. If I remember, Mr. Foster was the first real music-hall comedian to broadcast from Marconi House, as well as being in "Business as Usual" at the Hippodrome and "Tabs" at the Vaudeville. To quote his own famous catchphrase, "Yes, I think so."

Amongst the Moderns

I believe in being patriotic, but between ourselves I am not an enthusiast for the British composer of the ultra-modern school. If he would only try to write a tune instead of trying to describe catching the last train home on the tube railway, he'd be all right; but, no, he leaves off in the middle, and you spend the next minute or so trying to add the last notes for him or waiting till he's thought of it for himself, till you hear the dulcet tone, "Two minutes' interval, please."

However, Newcastle decided that we should hear some good modern pianoforte music, and we did too. Debussy's chromatic scales may not please everybody; personally they send cold shivers down my spine and make me think of the superstition that someone is walking over my grave. You know the kind of feeling, don't you? early morning before the Kruschen. Still, when it comes to pianoforte studies, Debussy is all there, and his "Poisson d'Or" and "Jardins sous la Pluie" (quite simple to translate) are excellent examples of pyrotechnics.

Tongues of Brass

I don't mean some of the election speeches, although—well, never mind, I mean some of those brass bands. The bands are all right, mind you, but their selections are not. I have the greatest admiration for the brass band that played last week, but when it comes to playing the "Entry of the Gods into Valhalla"—well, frankly, it sounded more like one of the German variety making for the nearest—er—Corner House. Choose suitable works, and then brass away for all you're worth.

THERMION.

WJAZ



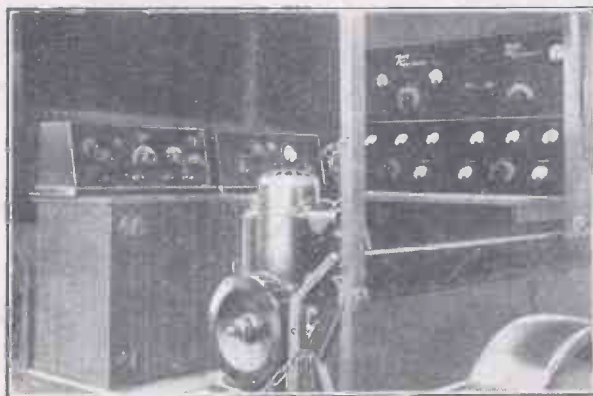
The Mobile Broadcasting Station, W J A Z.

THE photographs show the Zenith Portable Broadcasting station, W J A Z, which is claimed to be the first entirely self-contained broadcasting station in the world. The station can be set up in the middle of a field without any other power supply than its own and operate indefinitely, as it is equipped with a complete charging outfit which is able to charge the batteries while the outfit is in broadcasting operation. The transmitter has four 50-watt valves—two as oscillators and two as modulators.

The aerial when raised is 53 ft. high. It consists of four heavily braided copper cables of extremely fine wire. These wires are provided at each end with snap hooks, which are attached to rings which fasten to two spreaders. The entire framework and body of the truck, including the iron strip on the floor, are connected together and earthed, the earthing strips all being brought to one point at the side of the truck, where a heavy connecting lug is attached.

A 24-volt battery is used, which is of 320 ampere-hours capacity. Three microphones may be used, one for announcing, one for

orchestral and one for studio purposes, where these are necessary. Cable is provided whereby the microphones can be



Close-up View of Interior.

A U.S.A. MOBILE BROADCASTING STATION

placed as far as 300 ft. from the truck, allowing the broadcasting of performances in halls, etc., whilst the truck is outside.

The wavelength is 268 metres and the call letters are W J A Z.

Special switching arrangements are provided whereby the generating outfit not only charges the 24-volt battery, but also charges the lighting and ignition batteries of the truck at the same time, and also operates a 24-volt to 350-volt motor generator which serves to charge the H.T. batteries.

A complete receiving set with loud-speaker is provided for checking the modulation and also for maintaining communication if this is desired at any time. In the transmitter proper the Hartley oscillator circuit is used with Heising modulation.

The truck is electrically lighted with lights on the panels as well as a number of lights so placed that they illuminate the aerial mast.

In a recent test the broadcasting was concluded at 12 a.m. and at 12.10 p.m. the aerial was down and packed up and the truck under way to another district in which to begin further operations.

FALSE ECONOMY

MOST listeners at some period of their wireless career decide that the reception of the local broadcasting station alone does not satisfy their ambition. The next step of those who possess a mechanical bent is the home construction of a more elaborate receiving set. Here the amateur should be warned against the purchase, from a point of view of economy, of cheap, unbranded or unknown components, mostly of foreign make, which are usually sold at "cut prices."

True and False Economy

To construct a two-, three- or four-valve set, which at the lowest estimate must cost several pounds, and then, with the idea of saving a few shillings on the total expense, to incorporate one or two cheap—or apparently cheap—components is truly false economy.

It is possible to cut down the cost of a receiver by using good seasoned wood as a substitute for an ebonite panel, providing all parts are adequately insulated. Such a method is quite a practical one, but to stint a few pence or shillings on such im-

portant components as fixed or variable condensers, coil holders, coils, valve sockets, etc., is not only courting disaster but further expense.

As a convincing proof of this argument, a few facts may be given regarding the unreliability of some of the wireless parts which find their way—mainly from Germany—to the English market. Take fixed condensers, for example. According to a statement made by a German engineer in a Berlin wireless journal, samples were drawn from various manufacturers, and the capacity of these goods varied from 43 per cent. to 90 per cent. of their stated value. In some tests the condenser leaked. This might at first sight appear to be an unimportant defect, but apart from one position, that is, where the condenser is included in a one-valve receiver, with the grid leak across it, it must be leakproof. If such a faulty component were used to connect the H.F. and detector valves in a tuned-anode circuit, the inevitable result would be that the second grid (detector valve) would be rendered totally ineffective. In the case of cheap

grid leaks and resistances it was found that out of ten samples chosen at random variation was equally considerable.

Several patterns of honeycomb coil of foreign manufacture have at various times been imported. Here, again, inaccuracy was established not only in the windings, but in the diameter of plugs and sockets, and their distance from each other. In some cases the mounts were so roughly made that actual contact did not exist.

Foreign Components

Against foreign-made valves less adverse criticism can be offered, but here again the mounts were of poor manufacture, of rough finish and diameter, and spacing of valve pins deviated from the standard.

Of all the foreign-made cheap components variable condensers were found to be the worst. Not only were some bought where bad contacts existed between spindle and bush, but many had wobbly plates.

The amateur is therefore strongly advised to buy his components from reputable firms. Most of these, if not all, advertise in the columns of "A.W." J. G. A.

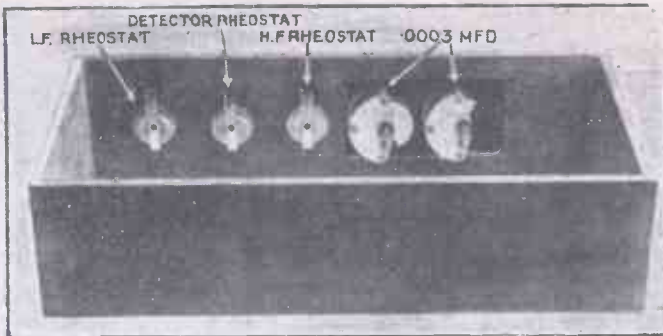


Fig. 17.—Rheostats and Condensers Mounted.

WE can now proceed to fix up the high-tension battery condenser and those shunted across the primary of the first transformer and the telephones. This being done, we can fix the first stiffener in place. The best position for it is between the two L.F. transformers. Lay the board face downwards upon the table and place the frame over it. Then push the stiffener down until it just touches the various wires which are already soldered up. At the point of contact with each lead make a pencil mark. Then withdraw the stiffener and make arches in it to clear the wires.

A simple method of doing this is as follows. Using a set-square, draw a line from end to end of the stiffener about $\frac{3}{4}$ in. from the bottom. At the points where the vertical and horizontal lines intersect drill $\frac{1}{8}$ -in. holes right through the wood, afterwards cutting into them from the edge with a small saw. A final trim-up with a rasp and some glass-paper completes the process. Fix the stiffener down by screws driven into it from the surface of the panel. We can now tackle the second stage of the wiring.

It is best to begin with the second low-frequency transformer, removing the first temporarily from the panel. If this is done one has a good deal more space to work in than would be the case if the first transformer were dealt with before the second. Take a lead from each of the transformer terminals to the terminals provided for its connections upon the panel. It is best that these leads should be soldered at both ends, but if the transformer had good strong screw connections these

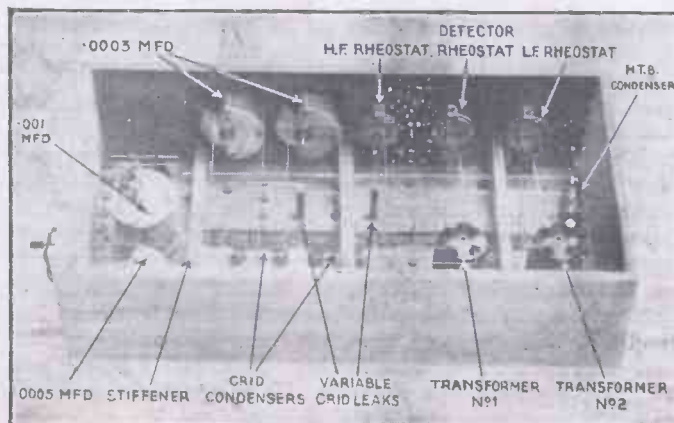


Fig. 18.—Another Stage of the Wiring.

will serve quite well, provided that the nuts are turned hard down. We now put back the first transformer and wire it up, connecting also the condenser which is in shunt with its primary. At this stage the telephone condenser and the high-tension battery condenser may also be wired up. We next wire the A.T.C. and the small variable condenser to their terminals. The photograph Fig. 16 shows this stage of the wiring completed.

It will be best now to turn our attention to mounting upon the frame the condensers and rheostats which it carries. Fig. 9 (p. 477, No. 123) shows how the front is marked out. To make the hole measuring 8 in. by 4 in. for the two anode condensers, drill a 1-in. hole near each of the four corners and cut with a keyhole saw.

The anode tuning condensers are now mounted upon their small panel, which is fixed to the frame by screws (see Fig. 17). The rheostats, which need not be insulated from the wood, for the reason already given, are fixed directly to the frame, and we are ready to continue with the wiring (Fig. 18).

Connect the positive grid-battery terminal to L.T. negative, and take a lead from the other grid-battery terminal to the single terminal which is placed just below the extra H.T. plus busbar. This lead may conveniently run along the top of the first stiffener, a space of $\frac{1}{2}$ in. or so being allowed between it and the wood. Next connect the legs of the fixed coil holders above valves 1 and 2 to the terminals provided. The second and third stiffeners are now fixed to the panel in the most convenient positions, being placed so that all three are as nearly as possible at equal distances.

THE THOUSAND-CIRCUIT BOARD.—V

Fixing the Components and Wiring

We now fix the panel to the frame by means of round-headed wood screws—do not use countersunk screws or you will probably split the plywood at the short edges.

And then comes the only stage of the wiring that is at all difficult; it is difficult simply because the sides of the frame rather cramp our efforts with the soldering-iron. Connect L.T. negative busbar

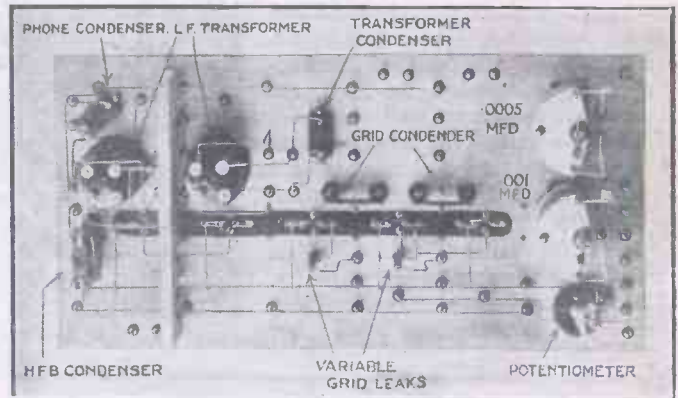


Fig. 16.—Wiring on Under Side of Panel.

to one contact of each of the rheostats, joining the other contact of the first to the wire between the negative legs of valves 1 and 2, that of the second to the negative legs of the rectifier, and that of the third to the link between the negative legs of valves 4 and 5. If five rheostats are used instead of three, each will, of course, be connected separately to its particular valve.

The last stage of all is to take leads from the anode condensers to the terminals, to which the coil holders above valves 1 and 2 are connected. The board is then complete, and nothing is required but to rub down the edges of the plywood with glasspaper so as to make the joints between the panel and the frame neat.

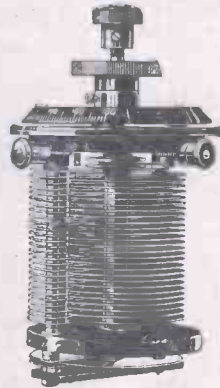
Some constructors may wonder whether it is really necessary to use the three stiffeners which have been recommended. The set will, of course, work without them, but their presence serves a double purpose. In the first place, plywood is rather inclined to warp, and even if it is quite thick the piece obtained will seldom be perfectly flat. If we fasten it to the frame merely by screws round its edges we shall probably find that it is

(Continued on page 645)



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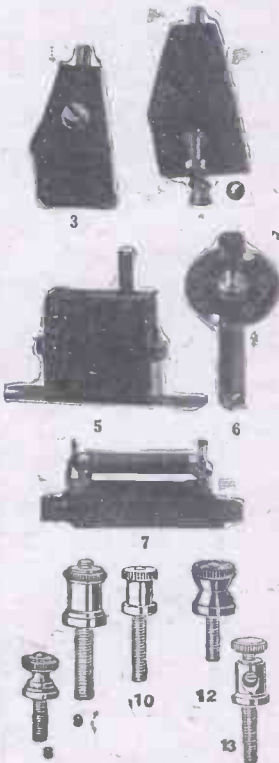
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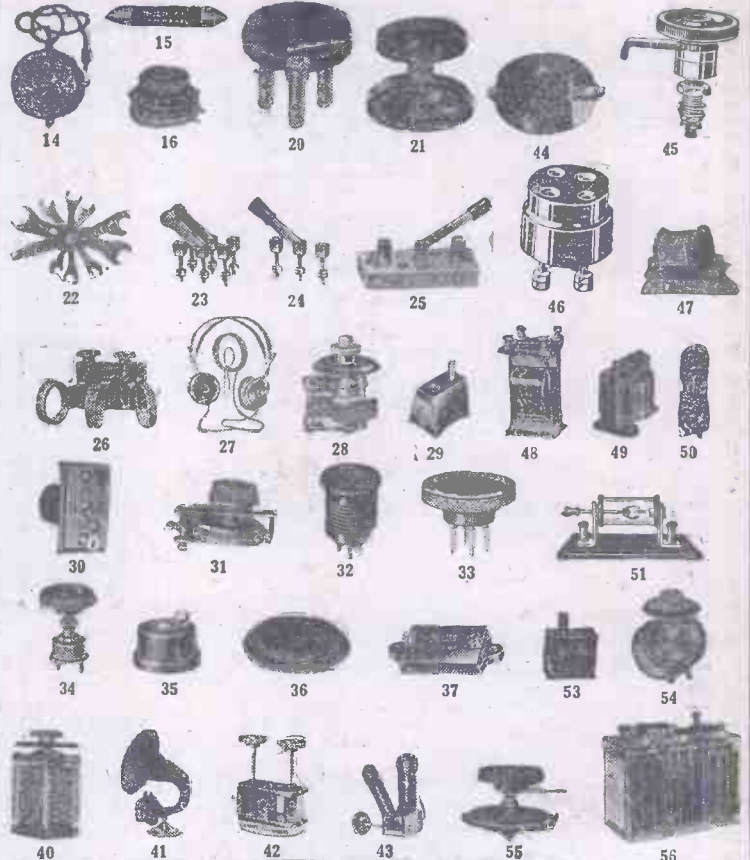
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.0003	4/11
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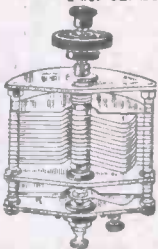
Vernier, .00005 3/9
With the knob and dial
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With Vernier.
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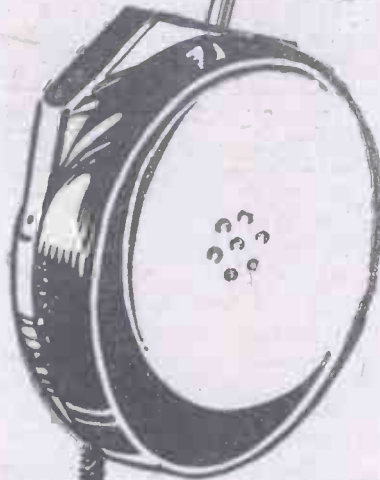
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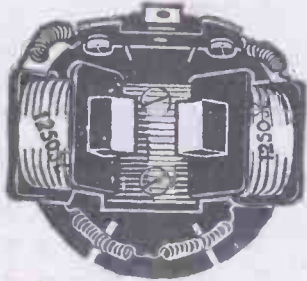
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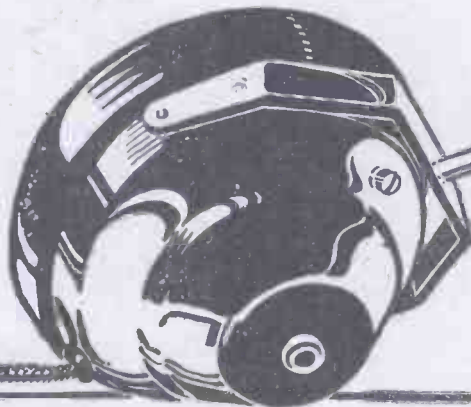


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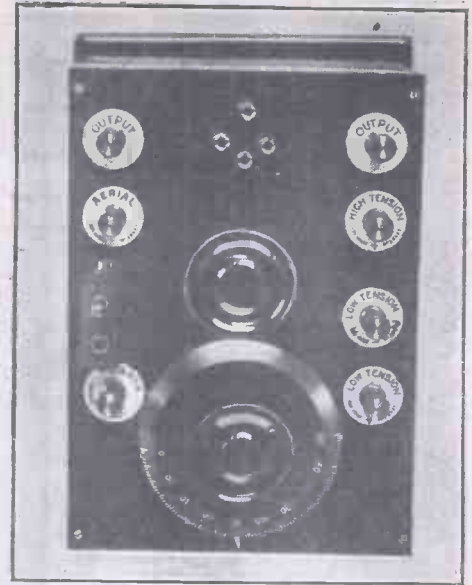
The Complete H.F. Amplifier.

ADDING THE AMPLIFIER

fication is employed, which, in the opinion of many experimenters, is more efficient than the well-known transformer coupling.

Readers who decide to construct the amplifier should obtain a hard-wood box as shown in Fig. 1 and a 1/8-in. or 1/4-in. ebonite panel to suit. Drilling details of the panel are given in Fig. 2, while Fig. 3 gives the positions of the various components. A .001-microfarad variable condenser of the one-hole fixing type is fitted in the 1 1/2-in. diameter hole; this, as an extra refinement, may be fitted with vernier attachment. The filament rheostat is of the general-purpose kind (in the set constructed by the writer a Microstat is used). The plug-in coil holder, terminals, etc., may be of any good type.

Wiring up, using the usual square- or round-section tinned-copper wire of a



Top View of Panel.

THE high-frequency amplifier described in this article has been designed for addition to any existing crystal set, and if correctly used will be found greatly to extend the normal crystal range without greatly sacrificing that purity of reception for which the crystal is unequalled.

The tuned-anode method of H.F. ampli-

gauge preferably not smaller than No. 18, should be carried out as shown in Figs. 4 and 5. Special care should be taken to space out all leads as much as possible in order to prevent possible interaction, particular attention being paid to the connections to the valve sockets.

(Concluded in third column of next page)

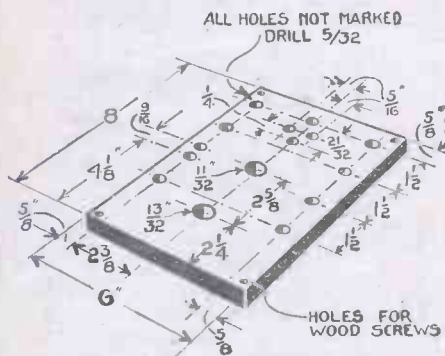


Fig. 2.—Panel Drilled.

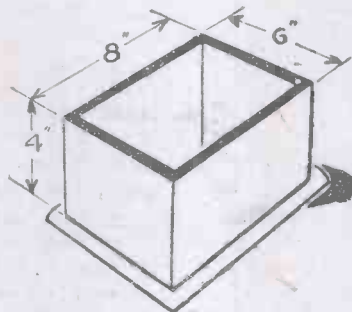


Fig. 1.—Details of Case.

Fig. 6 is shown on the next page.

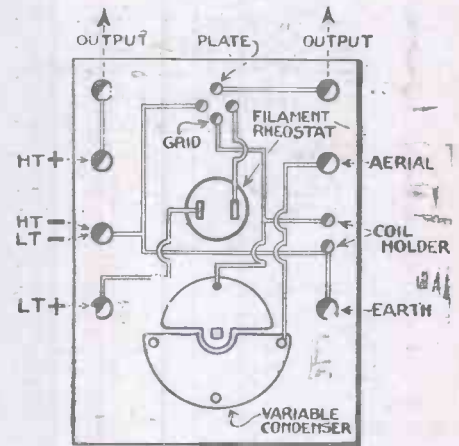


Fig. 5.—Details of Wiring.

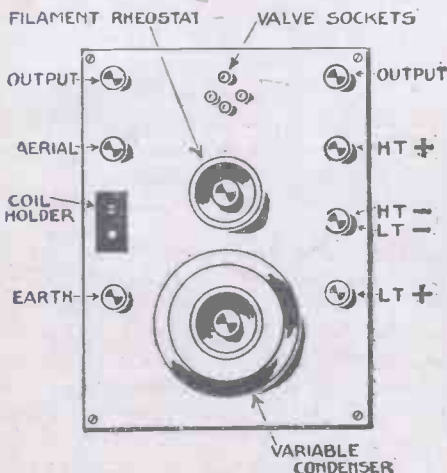
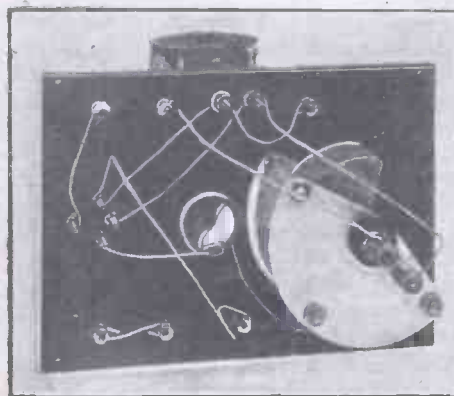


Fig. 3.—Plan of Panel.



Under Side of Panel.

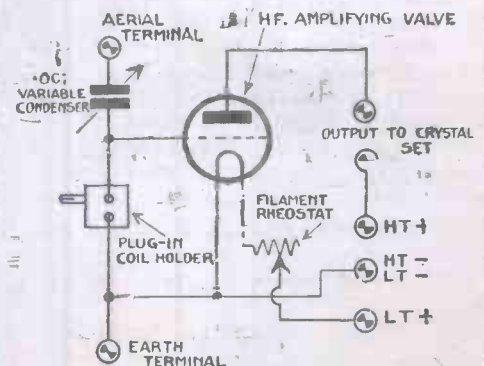


Fig. 4.—Circuit Diagram.

MUSINGS BY MAGNET



Climax Earthing Tube.

AFTER aeriels we come to "earth." I found a good earthing device at the All-British Exhibition at the Albert Hall. The device, which is shown by the photograph, is in the form of a copper pipe, with a pointed end, drilled with holes and fitted with a brass flange at the top to stand a fair amount of slopping. I have had two similar devices in use for the past eighteen months, and the idea is distinctly good.

The pattern on show could with advantage have a larger hole at the top, so that water could be poured in without slopping it over the earth terminal.

Earths are strange things, and, like sets made of soap-boxes and bell wire, often work "much better than they should." I know of an aerial which has a "lead-in" of about three feet, which part of the aerial is generally supposed to be the vital element of the collecting business. The "earth" goes upstairs, and is finally connected to a hot-water tank in the attic. And the results? They are unusually good, so excellent that I advised the user to let well alone.

Counterpoise Earths

Where circumstances allow and space is no object, I'll back the capacity or counterpoise every time. Some of the finest results I have ever obtained have been from fairly-well insulated capacities in lieu of direct earths. On one occasion a bank of area railings set in concrete gave splendid results. The railings were drilled and proper contact made by inserting a terminal. Concrete when dry is quite a passable insulator. Another type of counterpoise was made by putting five fence wires in parallel, the whole amount of wire comprising some 300 ft. Here again reception was excellent.

With regard to lightning arresters, the only really safe method of arresting lightning is to have the gap in a straight line from lead-in to earth. The usual "loop," formed when the lead comes in and the earth goes out, is just the thing to tempt high-power oscillatory currents, and the consequence is that should a really heavy charge accumulate in the aerial, the potential will leap across the loop and probably blow the side of the wall out.

Such an accumulation is naturally rare, as also are "direct hits." The average earthing arrangement is better than none, as it does keep the aerial constantly discharged, but it is not ideal by any means,

I am glad to see bright-emitters still going pretty strong. Candidly, I have never found a dull-emitter of the "nought six" type worth having. On the other hand, the former type is distinctly good.

A Personal Opinion

My own experience is that the ordinary type of dull-emitter is lacking in volume, microphonic in use, and dear to buy. I am no advocate of cheapness as such, but I do believe in getting something for the money, especially when the figure is 100 per cent. over and above that of the bright-emitter. Now if anybody has got a dull-emitter that will give equal results to the ordinary average "twelve-and-six" valve, I wish he would step right up with the dope. What a blessing the use of "getters" has been—to the makers—and what a mess these dopes make of the bulbs. In the case of dull-emitters it is extremely difficult to gauge the filament temperature and to see if the grid and filament are keeping at a respectful distance. For my own part I go for a clean bulb whenever possible, and the fact remains that one or two firms can and will take the trouble to exhaust the bulbs to a high state of vacuum without chemical wangling.

A Muse

After a wander right round the "at home" condescendingly held by the N.A.R.M. I sank into an easy chair and, after the manner of Magnet, I mused.

On the stand opposite was a type of loud-speaker I had not noticed before. The horn was a rather long funnel of square form, tapering up to a mouth of some three feet square, across which was fixed a sort of film or fine screen. As I speculated as to the purport of the device the screen lit up with a flicking light, which gradually cleared and finally resolved itself into a picture in colour. Sunshine flooded a sandy shore flanked with palm-trees, which waved and nodded in the breeze. The surf came rushing on in long rollers, which broke far up the beach with a soft muffled thunder. Beyond high-water mark lay several dug-outs, and through the palms came dusky figures, who deposited their weapons in the primitive craft and chanted as they ran the little vessels down to the water's edge. A moment's battle with the surf, the swift plying of paddles amid sharp cries from the skipper, and then a rhythmic stroke from the bronze arms and a resumption of the crooning chant as the craft swiftly passed out of the picture.

The sun went down a ball of fire, and darkness, following on the heels of day, as is the way in the tropics, brought out another flotilla with lights in the prow and Herculean arms wielding harpoons,

which now and then brought a writhing glittering victim to the surface.

The scene changed. It was Piccadilly Circus at night. Animated signs winked and flashed, advocating somebody's bread, someone else's gin and the motor-cars of yet another.

The theatres and halls were emptying, and the cries of the newsvendors and the roar of the traffic came up in an almost deafening chorus. As the various phases of the scene were revealed I read the words "Radio-chromo-scope," 1929 patents, on the side of the pavilion—and woke up. I had been asleep in the drawing-room!

MAGNET.

"ADDING AN AMPLIFIER" (continued from preceding page)

Fig. 6 illustrates the method of coupling the amplifier to an existing crystal set, which, it will be noticed, is of the parallel-condenser tuned type, the maximum capacity of the condenser being in the neighbourhood of .0005 microfarad.

Readers who desire to use crystal sets of the slider or tapped-coil types should shunt the turns included, or in the case of variometer-tuned set the whole wind-

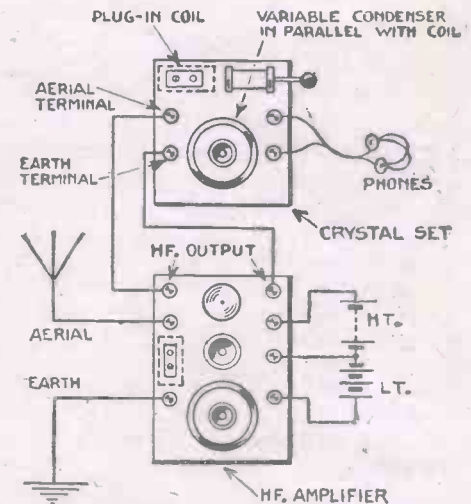


Fig. 6.—Method of Connecting Amplifier to Crystal Set.

ing, by a fixed condenser of .0002 or .0003 microfarad capacity.

A series-tuning condenser in a crystal set must, of course, be short-circuited or altered to the parallel position in order to allow of the free passage of the H.T. current in the amplifier circuit.

In tuning the combined amplifier and crystal set, as the aerial-tuning inductance value is increased or decreased the tuned-anode turns or inductance—that is, the inductance across the crystal detector and phones—must be increased or decreased simultaneously.

R. N. W.

PRACTICAL ODDS AND ENDS

Basket-coil Tip

WHEN making cardboard basket-coil formers one segment should be cut about an inch longer than the rest and a small hole made in it. This segment serves to mark a complete turn when winding,



Useful Tag on Former.

to hold the coil when shellac is being applied to it, and to hang it up when being baked.

It is also sometimes useful when mounting the coil. N. N.

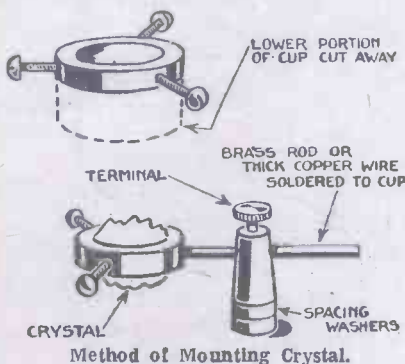
Soldered Connections

NO set is really as efficient as it might be until all the connections are soldered. When soldering use as little flux and solder as possible—better joints will result. The best flux for electrical work is resin. S.

Mounting Crystals

A NEAT method of securing a crystal so that either side can be brought into contact with the catwhisker without altering the setting of the crystal itself is shown by the diagram.

The lower portion is removed from an ordinary crystal cup by means of a metal saw or a half-round file. One of the



Method of Mounting Crystal.

clamping screws is then removed and is substituted by a brass rod or copper wire, which is held in a phone-pattern terminal attached to the base of the set. This is clear from the diagrams. R. N. W.

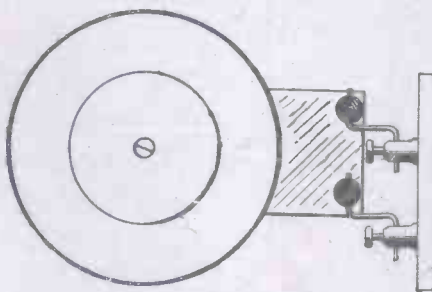
Valve Hints

NEVER leave valves lying about on a bench; put them in boxes when not in holders on a set. Clean valve legs and sockets periodically; the surfaces become oxidised when exposed.

Use the recommended value of H.T. and L.T.; do not overrun the filaments. A small fuse in the filament circuit may save you many shillings. Valves do not last for ever; the filaments all burn out sooner or later. R.

Coil Mounting

THE following method of coil mounting is efficient and easily accomplished. Basket coils are mounted by clamping them lightly between a strip of thin ebonite about 5 in. long by 1½ in. wide and a circular piece of cardboard. At the end of the strip two small phone terminals are fitted 1 in. apart with the wire holes in



Method of Coil Mounting

line. The ends of the wire forming the coil are clamped under the terminal nuts as shown.

The coil stand consists of a pair of phone terminals mounted on a piece of ebonite attached to the side of the cabinet, or direct on the panel if it is vertical or nearly so. The holes should be vertically in line, and a piece of stiff wire, shaped as shown, should be tightly clamped in each terminal. R. H. B.

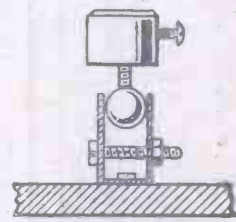
Short-wave Reception

FOR receiving on wavelengths of the order of 50 to 100 metres a long aerial is of no advantage over a short one—in fact a short wire will give better results. A loose-coupled tuner can be used, and the primary of this need not be tuned.

Between fifteen and twenty turns will be needed for 100-metre reception. The condenser for tuning the secondary should not be larger than .0005 microfarad, and a vernier adjustment should be provided for ease in tuning. D.

Crystal Holder

IT is frequently a matter of difficulty to explore the whole exposed surface of a crystal when using the ordinary type of crystal detector—that is, with single ball



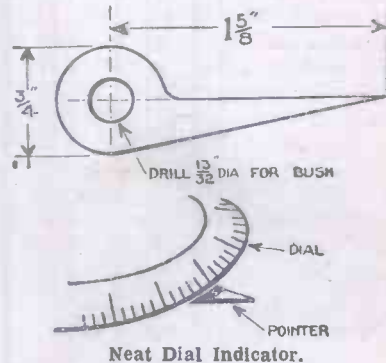
Improved Crystal Holder.

joint on the catwhisker arm. The following is a simple method of overcoming this trouble.

The crystal cup is provided with a ball-and-socket joint, so that the top or sides of the crystal may be exposed to the catwhisker. A steel cycle ball (¼ in.) soldered to a short piece of threaded rod may be utilised, while springy strip brass, bored and bent to shape, will provide the socket. If preferred, the ball joint of a bought holder may be adapted to serve the same purpose. W. W.

Dial Indicator

A DIAL indicating pointer which is clamped in position by the nut holding the variable condenser or variometer to the panel is shown below. Made preferably of white ivory or aluminium, the pointer is adjusted to its permanent position before tightening up the nut.



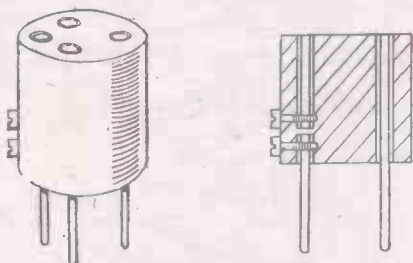
Neat Dial Indicator.

The dimensions given are for the standard size bush and dial. If other size parts are used the length of the pointer and diameter of the centre hole will have to be modified. R. N. W.

PROGRESS AND INVENTION

Adding Grid Bias

IT is well known that to get the best results from a low-frequency amplifying valve grid bias must usually be applied. The adaptor shown in Patent No. 221,571/24 (W. E. H. Humphrys, of Hendon, Middlesex) enables the operator



Adding Grid Bias (221,571/24).

to do this without making structural alterations to the set.

In use the adaptor is placed in the valve socket proper and the valve placed in the adaptor, the desired bias being easily applied.

The Kathodophone

KNOWN as the kathodophone, a recently developed German microphone makes use of the fact that free

electrons are given off from the surfaces of certain oxide-coated metals when in a rarefied gas, this holding good in normal air pressures.

The usual high velocity of the electron is not apparent, however, for the free electrons settle on air molecules and become ions. If the glowing oxide body is made the cathode, the ions will drift comparatively slowly to the anode and thus become current carriers affected by speech waves in the air.

Aerial Insulators

WHETHER in reception or transmission, aerial insulation is an all-important point. Direct conduction and dielectric absorption losses must be avoided. In Patent No. 221,242/24 (W. J.



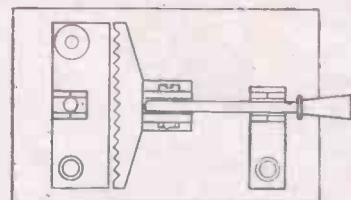
Aerial Insulator (221,242/24).

Polyblank, of the Air Ministry, London) it is proposed to use insulators made of a number of links in series, which are connected together with approximately point, knife-edge or line contact.

The links may be made of glazed porcelain, ebonite, or other insulating material. If they are made to twist relatively to one another the freeing of snow or other accumulations is facilitated.

Earthing Switch

TO combine as a single unit an aerial earthing switch, lightning and static spark-gap arrester, terminal block and



Earthing Switch (221,618/24).

lead-in tube is the object of Patent No. 221,618/24 (E. A. Brennan, of Hampstead, N.W.6), "thus economising space and time, reducing trouble, expense and damage to decorations; also affording protection to operators and instruments from lightning and static charges arriving upon aerials in or out of use at any time." The arrangement is clear from the diagram reproduced above.

AROUND THE SHOWROOMS

Murray Valve Holder

THERE are a number of excellent points about the new Murray valve holders of which every amateur should make note. Briefly they consist of four metal sockets, placed in the panel separately, which are covered by a disc of ebonite that is provided with holes for accommodating the valve. The result is that they lie practically flush on the panel.

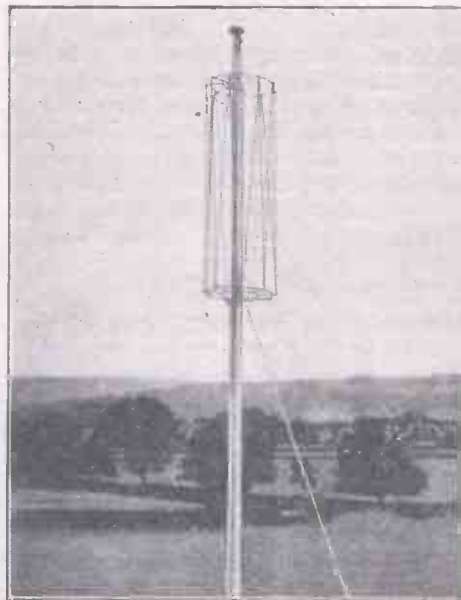
Clearing holes only have to be drilled, and the disc acts as a template. No nuts are required, as connections to the sockets are kept in position by set-screws. These holders, which sell at 1s. 3d. each, are made by Murray, Son and Co., of 387A, High Road, Tottenham, N.17. Each holder is supplied mounted on a card with full directions.

Novel Aerial

It seems that the good old 100-ft. single-wire aerial is gradually being superseded by more up-to-date types which take up less space. Such an aerial is shown by the photograph; this is made by Mr. H. Ashton, A.M.I.E.E., of 8-10, Bull's Head Chambers, Hopwood Avenue, Market Place, Manchester.

This aerial comprises seventeen vertical

loops, each 5 ft. 10 in. long, connected in series. The loops are laced on porcelain bobbins between galvanised-iron spreaders, the lead-in being taken from the bottom spreader. It is claimed that such



Ashton Aerial.

an aerial gives excellent results where space is limited and only one pole can be used.

Milophone Supertone Crystal

SUPPLIED carefully protected with cotton wool and enclosed in a glass tube, Milophone Supertone crystal has a "clean" look about it that leads one to suspect that it will give good results. Nor is one disappointed in this direction; a specimen that I tested gave excellent signals, and sensitive points were not difficult to find. This crystal is supplied by the Bancroftian Co., of 78, Bishopsgate, E.C.2.

Newey Snap Terminals

NOWADAYS everybody is in a hurry to get things done and wireless enthusiasts are no exception. The most pressing need is for a device that simplifies the changing of connections; a number of such devices have made their appearance recently.

The latest is the Newey snap terminal, which takes the form of a stud fixed on to a panel and a socket connector that fits over this. The principle is that employed for snap dress fasteners and results in a method of quickly changing connections when desired.

VANGUARD.

EXPERIMENTAL TRANSMISSION.—II

AERIAL EFFICIENCY

LET us now consider aerial efficiency from another point of view. Where I_t = current in transmitting aerial (amperes). I_r = current in receiving aerial (amperes).

shown by Fig. 4, but the effect of aerial capacity is not great, and the effects will only be touched on as found necessary. The fundamental wavelength of the standard L-type aerial is 4.6 (approx.)

along an oscillating unloaded antenna, for it is not generally realised that the voltage is greatest at the free end. In Fig. 5 E = voltage and I = current. The distance from aerial shows increase.

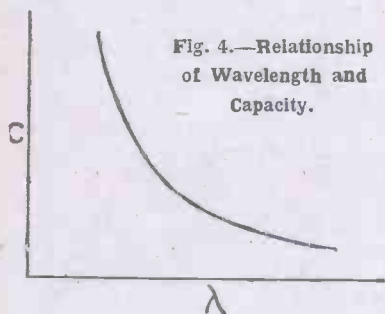


Fig. 4.—Relationship of Wavelength and Capacity.

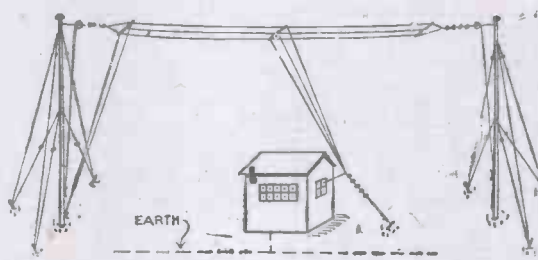


Fig. 6.—Arrangement of T-type Aerial with Direct Earth Connection.

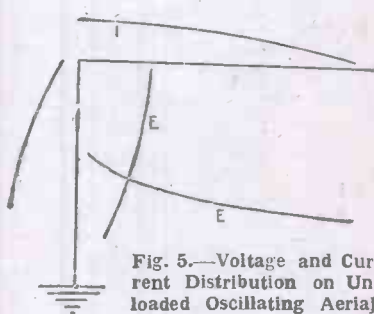


Fig. 5.—Voltage and Current Distribution on Unloaded Oscillating Aerial.

h_t = effective height of transmitting aerial (kilometres).
 h_r = effective height of receiving aerial (kilometres).
 R = total resistance of receiver (ohms).
 d = distance of stations apart (kilometres).
 λ = wavelength (kilometres).

$$\frac{h_t I_t}{\lambda} = \frac{d R I_r}{377 h_r}$$

The left-hand side of this equation is dependent on the transmitter, and it will be seen that, as in the formula for R_r , the transmitting aerial should be as high as possible; it will also be evident that the transmitting current should have as large a value as possible.

It would again appear from the position of λ that greater received current, and hence greater range, is obtained on short wavelengths. Absorption effects, however, tend to counteract this ideal state. The formula is correct in that for short distances a greater value of I_r is actually obtained; but it cannot be increased with a proportional diminution of I_r owing to absorption effects.

Transmission Formula

We have as yet no proof of the validity of the Austin transmission formula on these short waves and for long distances.

The power actually in the aerial is equal to $I^2 R$, where I is the aerial current, measured at the point of maximum current, that is, the earth lead. R is the radiation resistance. As mentioned before, this $I^2 R$, the power radiated, must be as large a percentage of the input power as possible. This percentage is known as the "per-cent. efficiency" of the transmitter, and, needless to say, should be the maximum. 0.85 efficiency is obtained by many commercial stations, while 0.7 should be obtained by most amateur transmitters.

The capacity of an aerial varies with the wavelength (a fact not often realised), as

times its length in metres from the free end to the lower capacity. It will be seen that at or near the fundamental, R_g and R_d are at minimum, while R_r is theo-

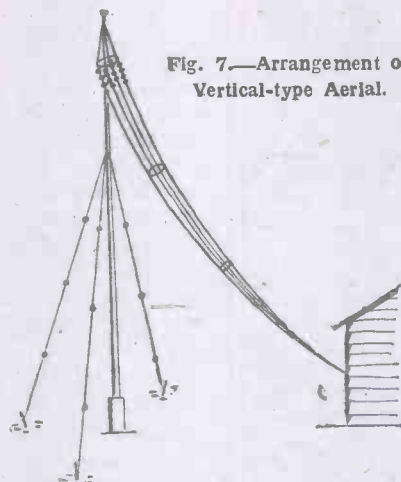


Fig. 7.—Arrangement of Vertical-type Aerial.

retically infinite, and so it appears that if the transmitter can be worked on its fundamental without loss, it is working at the most effective point. In most cases, how-

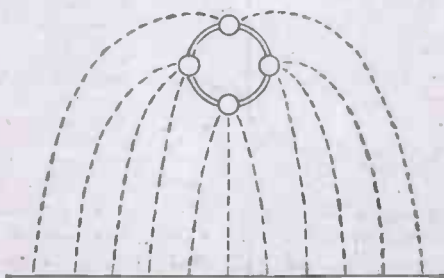


Fig. 8.—Electrostatic Field of Cage Aerial.

ever, it does not seem that any advantage is gained, since the condensers generally used are the seat of further losses.

It may be interesting to note the relative magnitude of the voltage and current

Practical Considerations

Sufficient theory has been now dealt with to show that the type of aerial used for broadcast reception is highly inefficient when employed for transmission purposes.

It would, of course, be futile to offer suggestions for the actual aerial construction and erection to those who are about to take up the more advanced side of wireless; but it is desirable, having enumerated the essential points of radiating system design, to point out the various types and their separate advantages.

Let us deal with the upper capacity first. The most suitable radiation for the wavelength band allotted to the amateur would consist of a metallic sphere having a radius of about 70 ft. and suspended at a considerable height from the ground. The writer cannot remember having seen a garden adorned by this ideal type. Omitting freak aerials (generally theoretically incorrect and practically unworkable) and special designs (dealt with later), we are left with the three types—that is, the inverted L- and T (Fig. 6) and vertical aerials (Fig. 7). Any of the three may consist of a number of parallel wires on horizontal spreaders or of the cage type, so popular in the U.S.A. Before deciding which of these three types is most efficient let us consider whether the flat-top or the cage type is the more preferable.

Fig. 8 shows a diagram of the electrostatic field that surrounds a cross section of a cage-type of antenna. Notice that all the wires have approximately the same number of lines of force connected to them; all wires are worked at the same efficiency. This type of aerial is also efficient because of its tubular construction, for it is well known that owing to "skin effects" the metallic tube is the most suitable and efficient conductor of high-frequency currents.

KENNETH ULLYET.

(To be continued)

THE object of the writer in designing and constructing this set was to meet the demand of the members of his family for a means whereby they could enjoy the programmes broadcast from 2 L O without being dependent on the rather complicated manipulation of the four-valve experimental set already available in the house,

but which could only be operated properly by the experimenter himself.

It was decided, therefore, to construct a set capable of operating a loud-speaker in an average-sized room situated about thirty miles from one of the main broadcasting stations, and possessing the following advantages: Neat in appearance, simple in construction and operation, low in cost and economical in upkeep, absence of complicated controls, proof against damage to valves and batteries when operated by inexperienced hands and true distortionless reproduction of speech and music. Truly an exacting ideal! Nevertheless, the set described and illustrated in this article fulfils all these conditions, and the writer can confidently recommend other experimenters, faced with similar demands, to construct such a set or, at any rate, to produce something on similar lines.

For the benefit of those readers of this journal deciding to construct this set who are unable to follow a theoretical circuit diagram (Fig. 1), a special wiring guide (Fig. 2) is included.

The Box

The case (see Fig. 3) is made of 3/8-in American whitewood, stained dead black and polished with ordinary french polish to which has been added a little gas black. A not too highly polished surface gives the article a real ebony appearance. Provided the wood is well trued up, the box can be assembled by means of countersunk screws, the holes in the wood being neatly filled in before

polishing. The loose lid or door consists of three-ply wood, framed with fancy beading of sufficient thickness to allow for the insertion of a small ball catch at the bottom edge of the lid; the top edge merely rests against a thin strip of wood fixed inside the opening of the box. By this means the lid is easily slipped into position when the set is not being used, the ball catch keeping it secure. This form of loose lid was found preferable to a hinged door in many ways, one being that it can be placed right out of the way when the set is opened for use.

The Panel

This is of good-quality matted ebonite 1/8 in. thick. It is fixed at right angles to the baseboard by means of two metal angle brackets or wooden supports. The panel should, of course, be drilled, as shown by Fig. 4, before being fixed to the baseboard. The absence of brass parts on the front of the panel enhances the latter's appearance, and the following devices have been adopted to achieve this end.

The connections for aerial, earth, loud-speaker and accumulator are ordinary valve sockets treated with black enamel, except, of course, at the threaded portions and the fronts where contact is required. Plug connections for the loud-speaker and

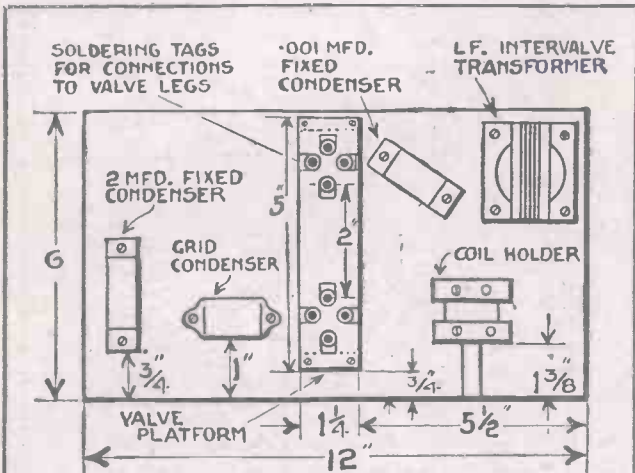


Fig. 7.—Arrangement of Components on Baseboard.

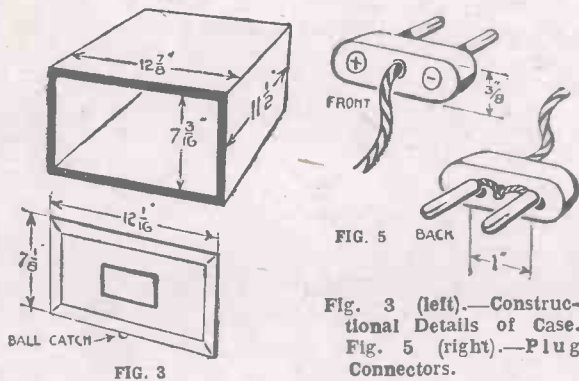


Fig. 3 (left)—Constructional Details of Case. Fig. 5 (right)—Plug Connectors.

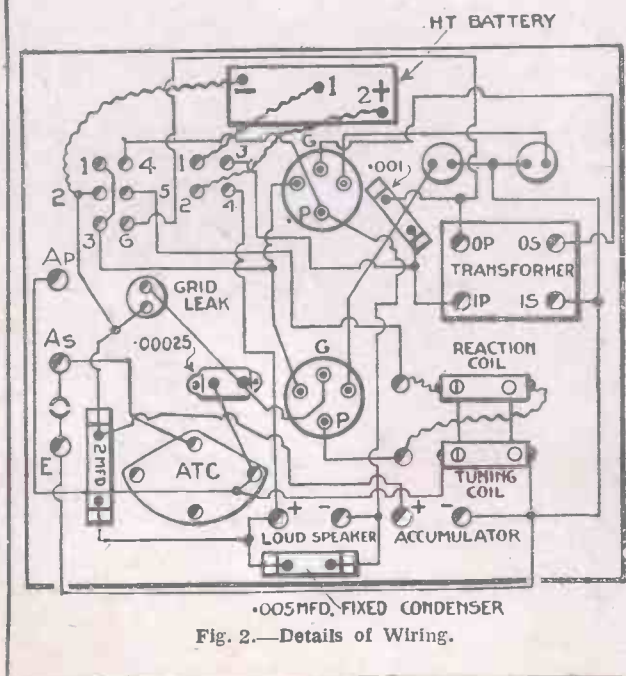


Fig. 2.—Details of Wiring.



The Receiver in Use.

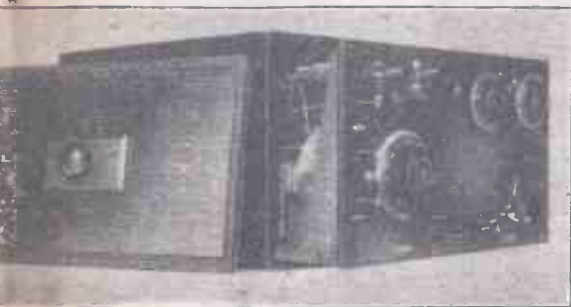


The Panel

A FAMILY BROADCAST RECEIVER

IN SIMPLE FOOL-PROOF LINES

The Making of an Ideal Two-valver



The Receiver Partly Open.

accumulator are illustrated in Fig. 5. This arrangement not only provides quick connections and a smart appearance, but accidental short-circuiting becomes practically impossible when the accumulator leads are hanging loose. This form of plug is easily made from scrap ebonite, drilled and tapped to a sufficient depth to receive short valve pins and nuts to which the connecting wires, after being passed through the small hole in the centre, are secured. The heads of the screws fastening the panel to the baseboard and supports are also enamelled black; and the labelling is done with the white-on-black variety obtainable in celluloid strips. The whole presents a pleasing black-and-white effect.



Case.

The valve window is merely a hole $\frac{3}{4}$ in. in diameter, with a piece of plain glass secured at the back of the panel by means of Chatterton's compound.

With regard to the switches, the key pattern with black ebonite levers has been adopted by the writer, but this is a matter of individual taste. The circuit diagram shows the ordinary panel switch, but the constructor desiring the most efficient and convenient switch should obtain the latest anti-capacity type with the black ebonite lever.

The series-parallel arrangement, illustrated in Fig. 6, requires no further ex-

planation except perhaps with regard to the brass strips. These should be fairly wide and the ends at the plug hole should be slightly shaped and turned back to facilitate the insertion and withdrawal of the plug. The latter can be made from any scrap piece of metal rod of fairly large diameter, with a small ebonite knob affixed thereto.

Baseboard

Fig. 7 shows the distribution of the various components required on the baseboard, all other parts of the set being fixed to the panel. The board should be fixed to the panel before finally arranging the position of the coil holder;

the two-coil holder in the writer's set is of the vertical or V-type, which, placed in the position shown, allows for the use of either honeycomb or basket coils without fouling any other component. If any other type of holder is to be used, the distribution of parts on the board will probably require a little modification.

The ebonite valve platform, which is screwed to two narrow strips of wood of sufficient depth to raise the ebonite just high enough to prevent the nuts of the valve sockets touching the baseboard, is secured from underneath by means of countersunk screws. Care should be taken that these, or any other screws used on the baseboard, do not project underneath and so interfere with the smooth withdrawal of the instrument from its box. Ordinary valve legs are used, with copper tags at their bases to which the wire connections are soldered.

It will be seen from the dimensions of the base-

board and box that when the instrument is pushed far enough inside the latter to allow the loose lid to fit flush with the front, a space of about 4 in. is reserved at the back of the box for the H.T. battery. It is obvious, therefore, that flexible leads sufficiently long to allow for the withdrawal of the instrument

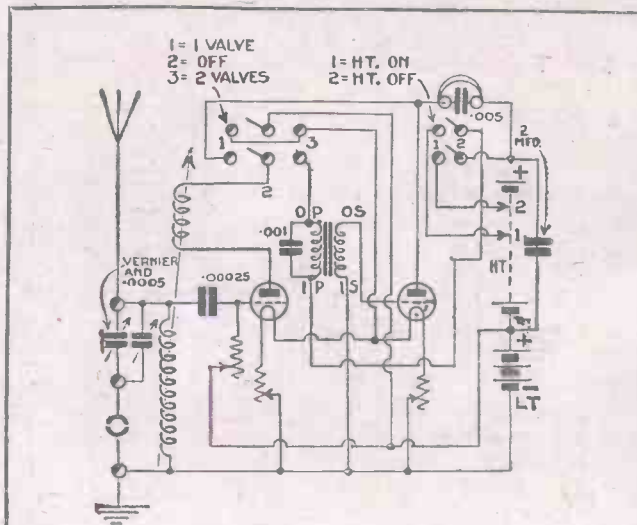


Fig. 1.—Circuit Diagram.

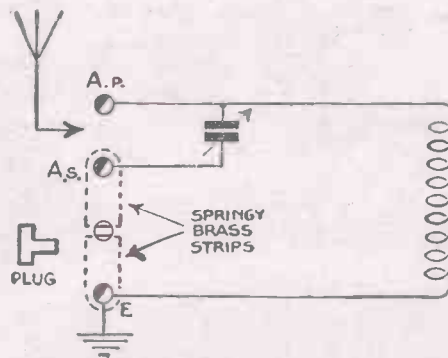


Fig. 6.—Series-parallel Connections.

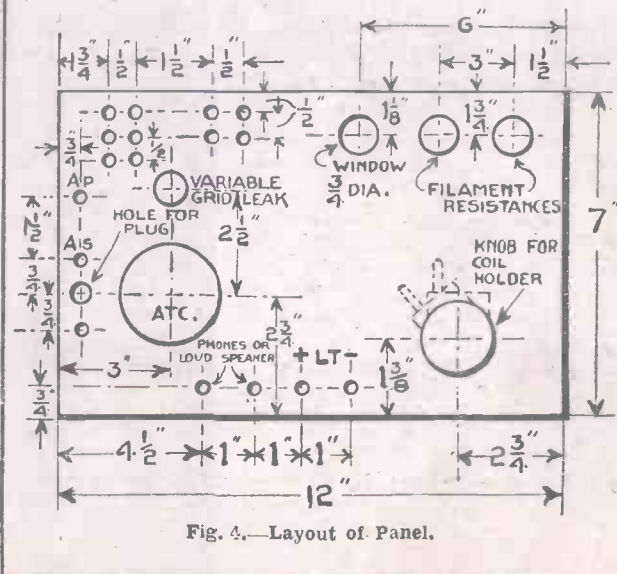


Fig. 4.—Layout of Panel.

must be used for the connections to the battery. These should be three in number, one for the negative and two for the positive, the two latter having their wander plugs numbered 1 and 2 respectively, as shown on the circuit diagram and wiring guide. When two valves are in use, No. 1 (feeding the detector) plugs into the lower voltage, while No. 2 (feeding the amplifier) plugs into the higher voltage—45 and 66 volts respectively in the case of DE3 valves, as used by the writer. When the detector valve only is in use, No. 1 wander plug can be left disconnected and No. 2 shifted to the 45-volt socket of the battery.

Miscellaneous Notes

A good variable condenser suitable for this set is Raymond's one-hole-fixing type of .0005 microfarad capacity, having a three-plate vernier controlled by a small knob on top of the knob proper. This condenser is cheap, takes up little room and is very efficient.

A carbon-granule type of filament resistance (the Microstat) controls each valve; and once the setting of these resistances has been found it is seldom necessary to touch them, as the switch on the panel puts the filament current on or off as required. When, however, it is desired to use the detector valve only, the filament current to the second valve should be turned off at the right-hand resistance.

The L.F. transformer should be carefully selected. An alternative position for the fixed condenser is across O.P. and I.S., instead of across I.P. and O.P., but this depends to a great extent on the nature of the valve and of the transformer; therefore both should be tried before finally soldering the connections. A negative grid bias on this set is not considered necessary.

Dull-emitter valves are recommended, preferably of the 06 variety. A 6-volt 20 ampere-hours (actual) accumulator will last fully a month on one charge with two such valves, working them from three to four hours daily.

The variable grid leak should be carefully set, having detector the valve only and a pair of headphones in use when doing so, until clear undistorted speech is obtained. After that it need not be touched unless, of course, the valve is changed.

A word or two in conclusion about wiring the set. The amateur constructor who knows how to use a soldering-iron successfully is advised to solder all connections; one not experienced in the art of soldering should confine himself to nuts well screwed home. Soldered connections are undoubtedly better, but a well-tightened nut is far more reliable than a badly-soldered joint. J. H. W.

Please mention "AW" when you write to Advertisers.

ANOTHER EXHIBITION

A WIRELESS exhibition is to be held at the White City, Shepherd's Bush, London, W., from November 15 to November 29 inclusive.

Many of our readers will be aware that the firms who exhibited at the recent exhibition at the Albert Hall were mostly members of the National Association of Radio Manufacturers, which organised that exhibition for its own members only. The choice of exhibitors was the affair of the association, and they were therefore able to include or debar whom they wished. This being the case, many firms were unable to show the public their goods.

Free to readers of
"Amateur
Wireless"

A Copy of

"The Amateur Mechanic"

Edited by Bernard E. Jones. The contents of this money-saving weekly for handy men are always Practical, Reliable and Straightforward. Week by week it gives just the kind of advice on the thousand and one domestic jobs and hobbies which every handy man or woman needs to ensure the best results from his or her work. Whether you own only a few simple tools or a fully equipped workshop, "The Amateur Mechanic's" weekly help will make all the difference to your pleasure and your success, and will show you how to make and save money by using your spare time profitably.

Send a postcard with your name and address to the Editor, "Amateur Mechanic," Room 97, Cassell's, La Belle Sauvage, E.C.4, and a free copy of this practical weekly will be forwarded to you post free.

Feeling that the public desire to see all that the industry has to show instead of the products of a section only, Radio Exhibitions and Wireless Conventions, of 46, Cannon Street, London, E.C., are organising an exhibition, which will be open to the entire British industry regardless of associations.

Without doubt everything that is new will be seen on the various stands, and the exhibition will be a really representative show of the entire industry. One point which will make a special appeal is the attention that the organisers are giving to catering for the home constructor. Component parts will take an important place in the exhibition and many new ideas will be shown.

The new Copenhagen station has not yet definitely fixed its wavelength, but tests and concerts are being given almost daily.

Haeren (B A V) now transmits every Monday at 13.00 G.M.T. a short survey of aerial traffic with Belgium during the preceding week.

BRIDGING 12,000 MILES OF SPACE

How English Amateurs Communicated with New Zealand

SOMETHING of the romance of Senatore Marconi's first "S" signals across the Atlantic has been recalled during the last fortnight by the accomplishment of two-way communication between English and New Zealand amateurs. On this occasion the amateur has shown the professional what short-wave transmissions can do, and, although still in the nature of freaks, too much attention cannot be given to the results that have been achieved. If short-wave signals have travelled 12,000 miles once there seems to be no logical reason why they should not do so again.

To Mr. E. J. Symonds (2 O D), of Gerrards Cross, goes the honour of being the first English amateur to hear a New Zealand station and also the first amateur to have his signals received in that Dominion. For reception this enthusiast uses a four-valve super-heterodyne set and transmits with an input power of only 105 watts on a wavelength of about 90 metres.

"ZAAA Calling U6ARB"

Whilst listening at 6.30 a.m. on Thursday, October 16, Mr. Symonds heard the call sign Z4AA, which was transmitted for half an hour. Z4AA was calling U6ARB, an American amateur station, on a wavelength of 80 metres. The New Zealand station is operated by a Mr. F. Bell, of Waihenno, Dunedin.

On Friday 2 O D transmitted test signals to Z4AA on 95 metres, and it was afterwards learnt that these were received strongly in New Zealand. Mr. C. W. Goyder, using the set at Mill Hill School (Z S Z) established two-way communication with New Zealand for an hour early Saturday morning. Thus the feat of exchanging messages across the world was achieved.

Afterwards Mr. J. A. Partridge (2 K F), of Merton Park, and Major Secretan (5 L F), established two-way communication with New Zealand. It seems that conditions were favourable in other countries than England, for an amateur in the Pyrenees is reported to have received messages regularly from New Zealand and Australia.

Dawn and Dusk Overlap

It is thought that communication was only possible because of the overlap of dawn and dusk in both countries. In every case signals were best between 6.0 a.m. and 7.0 a.m., and 6.30 a.m. in England is approximately 6.0 p.m. in New Zealand.

The New Zealand Prime Minister, Mr. Massey, has congratulated both Mr. Bell, of New Zealand, and Mr. Goyder, of Mill Hill, on their achievement, which he characterised as a very important event in the history of wireless—as, indeed, it is.



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. 663).

Condenser Losses

Q.—Recently I came across the word "hysteresis," evidently used to cover losses in condensers. What losses do condensers have?—A. K. (Wimbledon).

A.—Condenser losses may be put down to resistance losses in the plates. Resistance losses are very low in parallel plate condensers. Leakage over the edges of the plates and conduction currents through the dielectric are two other losses to which condensers are subject.—D. R.

L.F. Transformer Terminals Unmarked

Q.—I have a low-frequency transformer with the four terminals mounted on a strip of ebonite on the top of the transformer. These terminals are unmarked, however. Is there any method whereby I may find out which is the primary and which the secondary of the transformer?—F. F. (Leith).

A.—You may make the following test with a small dry battery and a pair of phones. Connect one transformer terminal to one

phone lead, and the other phone lead to one terminal of the dry battery. Another connection must be made from the other side of the dry battery to the three remaining terminals of the transformer in turn. You will hear a click in the phones when a complete circuit has been made through one of the windings of the transformer. Note how loud the click is heard in the phones. Now connect the phones and battery across the other pair of transformer connections and note the loudness of the click in the phones. The winding which gives the louder click is the primary, the other winding, of course, being the secondary.—D. R.

Charging Accumulators.

Q.—With reference to your article on the accumulator appearing in "A.W." No. 120, I am desirous of charging my accumulator from the house mains if possible. Unfortunately my house is supplied with A.C. Is it possible to apply the principle of your sketch to this case? If not, please inform me what

is required to alter the current from A.C. to D.C.—S. B. H. (Bristol).

A.—The method of charging accumulators from direct current is quite different from that of charging from alternating current. Unfortunately you have omitted to give the voltage and frequency of your supply, without which it is impossible to give details for the construction of a suitable static transformer. Besides a transformer you will need a rectifier. Particulars of charging accumulators will be found in the "Work" Handbook "Electric Accumulators" (1s. 8d. post paid).—D. C. R.

Flux for Electrical Connections

Q.—What sort of flux should be used for soldering the wires to the terminals of a wireless set?—Q. (Islington).

A.—Resin is the most suitable flux for all soldered connections in electrical work. Spirits of salts should never be used, as the soldered part will soon corrode under the chemical action of these salts on the metal.—H. R.

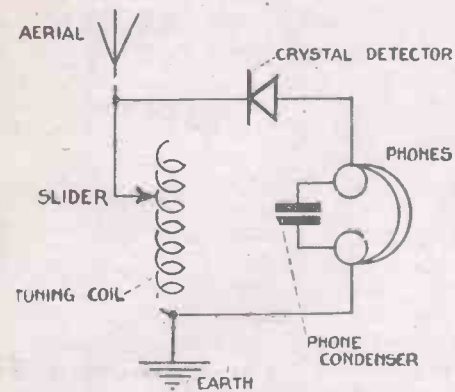


Fig. 1.—In this circuit use is made of a tuning coil with one slider, which is very simple to adjust. The crystal detector is first adjusted and the slider moved up and down.

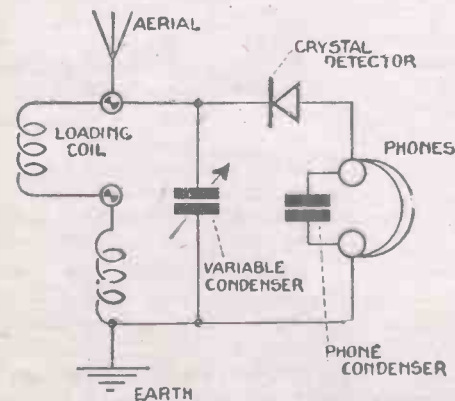


Fig. 3.—Should it be desired to receive on long wavelengths, a loading coil can be inserted as shown above. Note that the variable condenser is connected across both coils.

SIMPLE CRYSTAL CIRCUITS

WHATEVER kind of crystal circuit is used, the aerial and earth system is of the utmost importance, for it is almost entirely on the efficiency of this part of the installation that good results depend.

Normally the catwhisker side of the crystal detector is connected to the aerial end of the tuning coil. It is desirable that the coil itself should be wound with thick wire, so that the resistance to high-frequency currents is low.

In all the circuits shown the phone condenser (which should not be omitted) should have a value of approximately .004 or .002 microfarad.

Good insulation is an important factor in getting strong crystal results, and the cost of a few square inches of good ebonite should not be begrudged. It is true that dry wood is a good insulator, but it is safer to use ebonite.

In wiring up any of the sets the resistance should be kept as low as possible. This means that leads should be kept short and made with thick wire. Attention to details such as these makes a great difference in the results obtained. Never be satisfied with signals that are merely "good enough."
D. S. R.

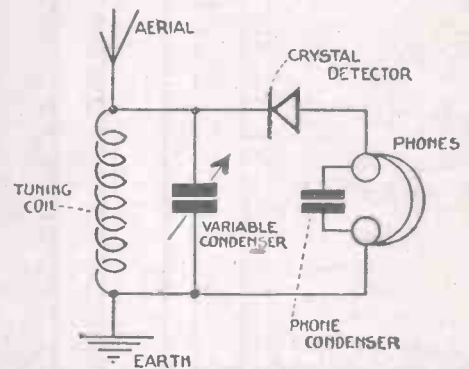


Fig. 2.—Here tuning is effected by means of a coil and variable condenser. The latter should have a value of .001 or .0005 microfarad. Adjustment is made by turning a knob.

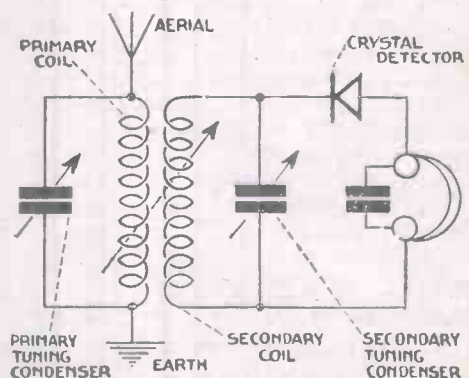


Fig. 4.—This circuit should be used where interference is experienced from other stations. The primary tuning condenser should have a value of .001 microfarad and the secondary condenser of .0005 microfarad.

A GREAT EVENING WITH WGY

THE AMERICAN SEASON BEGINS

THE darker nights are, of course, by far the best for general wireless reception. For some reason which is at present unknown November and December are out and away the best months of the year for receiving Transatlantic broadcasting. It is possible to hear American stations at other times of the year—in fact, the writer actually picked up two of them on midsummer night this year—but at no time can you rely upon such steady and uninterrupted reception as during the two months mentioned.

With a Single-valver

I believe that it is now possible for anyone who possesses an efficient valve set, even if it only a single-valver, to hear American broadcasting, if not regularly, at any rate upon specially favourable nights. One further proviso must be made: it is essential that both the aerial and earth should be thoroughly good. Of this we will speak more in detail in a moment. There is no need to get down to the very short waves—in fact, to reach the 68 metres upon which KDKA is now transmitting is quite beyond the powers of all sets but those constructed with special attention to the elimination of stray capacities and unnecessary resistance.

The powerful station WGY transmits upon 380 metres, which brings it well within the compass of any broadcast receiver. Nor is it necessary to sit up all night, as used to be the case, for you can now pick up WGY as a general thing about midnight, and sometimes, if he is doing an early afternoon transmission—remember that New York time is seven hours behind our own—you can get him almost as soon as our own broadcasting stations close down.

The Conditions

What conditions make a specially favourable night? In the first place, we want one when atmospheric are not bad. You can easily tell whether this is the case by means of your reception of British stations during the evening. Secondly, there are certain nights, as you have probably noticed, when near-by stations seem to take on added strength and clarity whilst distant ones, which cannot be picked up in the ordinary way, come in quite well.

If you are thinking of sitting up for America one night, make preliminary tests by tuning in the most distant British or European station that is within your range, and do not bother to stay awake beyond your normal time unless you find that reception is really good. Reference to my diary shows that the best results from

America have been obtained on the whole on thoroughly dirty nights, the kind of night, I mean, when rain is coming down in torrents from a pitch-black sky and the wind is blowing half a gale. The barometer, too, seems to give a fairly good indication of what one may expect. If it is quite steady, and if there have been no violent variations in the temperature during the preceding twelve hours, atmospheric are usually not very bad. So much for conditions. Now a word about the apparatus itself.

Aerial Requisites

The aerial, in the first place, must be as high as you can get it, and so far as is possible unscreened by buildings or trees. Personally I have strong preference for a single wire with at least two shell insulators in series at each end and a lead-in made of well insulated 7/22 cable. Care must be taken to see that there are no leaks on the way in through wall or window frame; a thoroughly good lead-in tube is therefore necessary.

If you cannot get a first-rate aerial, then pay particular attention to your earth, for if the aerial is bad any extra resistance in the earth makes a tremendous difference to reception. You cannot beat an ascending water main or a biscuit-tin buried in damp soil. All connections should, of course, be soldered. In the set it is desirable to use inductances of an efficient type, so that no losses may occur through the presence of self-capacity or of high resistance. The variable condensers should not be too large—.0005 is as big as should be used in the aerial circuit and .00025 or .0003 for tuning secondary or anode circuits. If larger condensers are used fine tuning is extremely difficult, since quite a small movement of the knobs makes a big difference in the wavelength.

Tuning

WGY's wavelength of 380 metres makes him quite easy to find. If you can get Bournemouth, tune your set sharply to his wave earlier in the evening, and then advance your condensers a tiny bit. The reaction coil should be brought up to such a position that the set, though in a sensitive condition, is away from the oscillation point. Should Bournemouth be outside your range, either Manchester or Newcastle will help, the former being 20 metres above WGY and the latter 5 metres below him. It is not usually difficult to guess the adjustment which will give approximately the right difference in wavelength, and as WGY's is a very strong transmission you can often hear him when your tuning is not dead sharp.

Having adjusted the set as nearly as possible to 380 metres switch off, leaving the controls untouched. Make a note on a piece of paper of the exact reading on each scale. At midnight switch on and see whether anything can be heard. Before you touch the condensers try very slight adjustments of the reaction coil, but avoid getting the set into oscillation so far as you possibly can. Should nothing be heard wait half an hour and try again. If the second attempt produces no result the chances are that you will be successful at one o'clock, when there is usually a musical programme to hear.

Strength

As an indication of the strength of WGY's signals I may tell you that I have had him more than once on an indoor aerial consisting of a piece of double-cotton-covered bell wire slung across the room corner-wise and uninsulated except for its own covering and the short lengths of string by which it was attached to nails on the picture rail.

His strength at my station, which is thirty miles north-west of London, is about the same as that of Aberdeen. On a good night speech and music come through so well on the loud-speaker that the low-frequency valves must be dimmed a little to avoid waking up other members of the household who are all in bed and sound asleep. There is one point, by the way, that is of importance. Like nearly all long-distance transmissions, WGY is apt to suffer from fading at times. Therefore, if signals become faint after a period of good strength, do not try to chase them by moving your controls. If you do so you are quite likely to lose them altogether. Leave things alone and signals will soon return to their normal loudness. Though it is a little bit early in the year yet, conditions just now are quite favourable, and WGY may be picked up with a fair amount of certainty on any night. On October 17 he was as good as I have ever heard him.

A Personal Experience

I could not try for him very early, since Bournemouth, who was doing an anniversary programme, did not close down until 12.45, but I got him within two minutes of the time that 6BM said good night. A song was in progress at the time, which was followed by a duet. By the time that this had finished I had switched over from phones to loud-speaker, and was sitting in the next room with the folding doors between the two rooms open.

The announcer then stated that WGY

(Concluded on page 656)



"BLOSSOM" will have a busy time on November 4, when John Henry (as concert director, announcer and general factotum) gives a programme from his own studio. The fun begins at 8.45 p.m.

The Ministry of Health approves of the installation of broadcast receivers in work-houses—apparently more for their educational value than the entertainment they afford.

Listeners who hear a bird's song on November 3 should not jump to the conclusion that it is another nightingale. It will be Mde. Marie Saberonne, who is a whistler of extraordinary ability.

On November 5 a new instrumental trio will make its bow at 2 L O with a chamber-music programme.

Provided that no interfering regulations are adopted, an American corporation is reported to be ready to erect a 50-kilowatt broadcasting station near New York.

Songs by Mr. George Parker (baritone) and the Beethoven No. 3 Concerto in C Minor, played by Mr. Maurice Cole, are to be included in 2 L O's "Night with the Old Masters" on Nov. 7.

Although broadcasting has only just started there, Johannesburg already has a bus equipped with a four-valve set.

A series of puns on musical terms forms the foundation on which the "Roosters" programme on Nov. 8 is built up.

Successful experiments have been carried out in Port Phillip between the *Maloja* and a lifeboat equipped with a special Marconi set.

At the time of going to press no announcement has been made, nor can any official information be obtained, as to whether or not the closing ceremony at Wembley will be broadcast. It is to be expected, however, that, equally with the opening, the closing of Wembley will attract the enterprise of the B.B.C., especially as on this occasion the Prince of Wales will make his first public appearance since his return from the United States and Canada.

It is estimated that £8,692,135 worth of apparatus was manufactured in the U.S.A. last year. This includes 1,889,614 pairs of phones, 414,588 valve sets and 116,497 crystal sets.

A new military band, that of Princess Patricia's Canadian Light Infantry, will perform for 2 L O on Nov. 2. In the evening De Groot and the Piccadilly Orchestra will "appear."

Prof. Edouard Branly's eightieth birthday will be celebrated on November 6 by a great banquet, organised by the Radio Club de France.

Suitable premises for the Dundee station have been found. The studio and adminis-

CHIEF EVENTS OF THE WEEK

SUNDAY (November 2)

London	3.0	Band of Princess Patricia's Canadian Light Infantry. Religious Address. De Groot.
Bournemouth	8.35	Religious Address.
Aberdeen	9.0	Old Psalm Tunes. Anthems and Choral Pieces.
Glasgow	3.0	Orchestral Concert. Religious Service.

MONDAY

ALL STATIONS (Except Belfast)		"Old Times" Programme.
Belfast	7.35	Popular Night.

TUESDAY

London	7.30	City of Birmingham Symphony Orchestra. Popular Programme.
Birmingham	7.30	Symphony and Dramatic Programme.
Bournemouth	7.30	Band of 2nd Battalion (Loyal North) Lancashires.
Newcastle	8.55	"The Man in the Street" (a play in one act).
Glasgow	7.45	Irish Night.
Belfast	7.30	Ulster Poetry in Song.

WEDNESDAY

London	7.30	Chamber Music and Songs.
Birmingham	7.30	City of Birmingham Police Band.
Bournemouth	8.0	Bournemouth Municipal Orchestra.
Cardiff	7.30	Two Plays.
Manchester	7.30	Harmony—Humour—History.
Newcastle	7.30	Delius and Vaughan-Williams Programme.
Aberdeen	7.30	Special Dance Night.
Glasgow	7.45	Festival Prize Winners' Night.

THURSDAY

ALL STATIONS (Except Manchester and Belfast)		"La Cigale" (Audran).
Manchester	7.30	Glees, Madrigals and Some Humour.

FRIDAY

London	7.30	Third Night with Old Masters.
Birmingham	7.30	Popular Programme.
Bournemouth	7.30	Light Symphony and Operatic Night.
Manchester	7.30	A Trip to Fairyland.
Belfast	7.30	Scottish Programme.
Glasgow	7.0	Opening of New Studio.

SATURDAY

London	7.30	The "Roosters" Concert Party.
Birmingham	7.30	"A Tale of Two Cities."
Aberdeen	7.30	Operatic Night.
Belfast	7.30	Belfast Mayfair Glee Singers.

tration offices will be at 1, Lochee Road, and the transmitter in rooms at Caldram Works (Harry Walker and Sons, Ltd.), St. Salvador Street.

The afternoon programme at 4 p.m. on Nov. 1 is being given by the Wireless

Octet under Mr. S. Kneale Kelly. After 7.30 p.m. the programme consists of comic opera items and variety turns, together with ballads.

A new site for the Leeds transmitter has been found in Stanley Road, Harehills.

At 10 p.m. (S.B. to all stations), on October 30, Mr. A. J. Alan, the successful raconteur who made such a success with his "Adventure in a Flat in Jermyn Street," and later his quaint information concerning the "B.B.I.," will tell of his adventure on Dartmoor.

There is a movement on foot to erect a wireless station on Guernsey Island.

Readers of AMATEUR WIRELESS may like to listen-in to Russia. On October 30, at 1.45 p.m., G.M.T. (wavelength 3,200 metres), the Moscow station will broadcast a talk in Esperanto on "The Seven Years' Dictatorship of the Proletariat." The speaker will be P. F. Jakovlav, president of the Sovietland Esperanto Union.

Some enthusiast has estimated that 2 L O's transmissions total over 15,000 hours.

That a broadcasting company should be formed to serve all parts of India and that it should receive 80 per cent. of the licence fees is a provisional proposal of the Government.

Four Greek firms have installed Marconi sets as an aid to the conduct of their business, the regulations permitting the private use of this means of communication.

Nearly 10,000 licences have been issued in the Nottingham district already.

Wireless seems to offer the best medium for the transmission of photographs, for greater power can be used than can be sent over a telegraph line. This is the opinion of an expert in that branch.

That wireless distracted the pupils' attention from more essential subjects and found no real part in modern education was a protest made at an educational committee meeting.

A seaplane built for service in British Guiana between plantations and the nearest town, 200 miles distant, has been equipped with wireless apparatus.

Two French scientists have carried out experiments with mercury-vapour arc amplifiers.

Recently a New York broadcasting station "imitated the sounds of a boiler shop." Perhaps they had their pet Ford tied up in front of the microphone?

Compared with England and America, France has been rather behind in manufacturing dull-emitters.

Mental patients frequently write to the Ministry of Health and complain that they are being poisoned by wireless.

When a rumour went round the Hyson Green district that a raid by the authorities

was to be made on all houses where it was suspected that unlicensed apparatus was installed, a large number of people rushed home and took down their aeri-als!

Ceylon wireless is in its infancy. No amateur transmitting licences have yet been issued and no receiver must tune to more than 900 metres. The Government Telegraph Department is making experiments in broadcasting, but in Colombo (the capital) there is only one wireless dealer.

At a sitting of the Royal Commission on Awards to Inventors it was suggested that, while the use of a loop for direction finding was well known to experts at home, the knowledge did not seem to have penetrated to G.H.Q. in France during the war!

For over six months severe practical tests of an experimental wireless beacon have been carried out by Marconi's at Nash Point (between Swansea and Cardiff) with most satisfactory results.

At least one French amateur is annoyed by the clause in the new transmitting licences that forbids English amateurs to work with other countries.

"Pirating" seems to be causing trouble in Australia in much the same way that it did here when broadcasting started.

School broadcasting facilities have been extended by the L.C.C. Education Committee, but it has been decided that no

school shall receive broadcast lessons on more than two afternoons a week.

In France furniture is always "period" in style, but it seems a little odd to speak of a Louis XV five-valve set!

Most Soviet wireless stations are allocated call signs beginning with R.

Wireless "spongers" are so numerous in Germany that the authorities have threatened a general raid on all houses suspected of harbouring unlicensed apparatus.

In order to increase the number of sensitive spots on a crystal it is suggested that it should be powdered and the cat-whisker placed in a small heap!

As the result of a workman being injured by a fallen aerial, Blyth Corporation have asked a committee to consider the whole question of aeri-als with a view to preventing such accidents.

"THE THOUSAND-CIRCUIT BOARD" (continued from page 630)

curved a little in the middle. Even should it be quite flat when fastened it will tend to warp when exposed to varying temperatures. The stiffeners flatten out the panel and prevent it from warping. If they are not a very tight fit for the frame they may be secured to it by screws driven in at the front and back.

The second duty of the stiffeners directly

concerns the quality of one's reception when using the set. You have probably noticed that if you tap one of the valves in any set a "pong" is heard in the receivers. This is caused by the valves being to some extent microphonic. The tap which you administer jars the electrodes, causing the distance between the grid, filament and plate to vary.

If the panel is not supported by stiffeners it will be like the top of a drum and will vibrate with the slightest shock, communicating its vibrations to the valves mounted upon it. Hence whatever type of valve is used the set, if the panel is unsupported, will be very microphonic. In an early model of the Thousand-circuit Board I made the mistake of using no stiffeners. The result was that when one walked across the room the loud-speaker registered a "pong" at each footstep. Further, the vibrations set up by strong signals upon certain notes were sufficient to cause the panel to vibrate with the most horrible results upon reception. Should the particular valves used be at all microphonic this nuisance can be checked by standing the set upon a pad of felt.

(To be continued) J. H. R.

An automatic system of transmission and reception, capable of reaching a speed of 190 words a minute, works by means of musical notes, and is claimed to solve the problem of keeping transmissions secret.

The mechanically sound Variometer

Amateurs with an appreciation of soundness in design will value the Woodhall No. 1 Variometer as being right mechanically.

The spindles of the Rotor are not screwed in; they are firmly moulded in, in perfectly true alignment. They cannot come loose or out of alignment, causing the Rotor to foul Stator.

Because of the degree of accuracy in alignment, we do not need a "safety-margin" of clearance, and therefore the coupling between Rotor and internally wound Stator is closer than in any other Variometer.

The spindle also has a metal bearing, giving a smooth "feel" of rotation that makes extremely fine tuning possible.

All connections are internal, by spring contacts from Rotor to Stator. Two

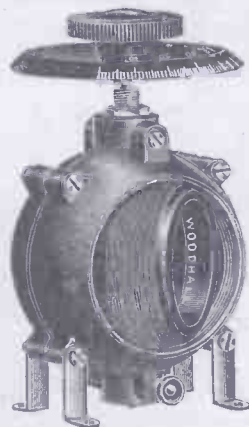
terminals are provided. One-hole fixing for panel mounting; brackets adjustable for upright or horizontal mounting. Wave length 250 to 750 metres on 100 ft. aerial.

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not the actual singing you are listening to. Only a copy. With an Ediswan Valve you would probably not notice the difference. That is one of the advantages of a really good valve.

Ediswan Valves are highly sensitive and operate with a complete absence of noise. They are the outcome of 30 years' experience.

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.

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The first valve ever made was produced in the Ediswan laboratory

EDISWAN VALVES

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 inspected.

162-6



Loud-speaker Results

SIR,—I notice in No. 124 a letter from Messrs. Alfred Graham and Co. which infers that most present-day imperfect results from loud-speakers are due to the receiving set and not to the loud-speaker.

My experience until recently was that the average loud-speaker results obtained by most amateurs were really not worth listening to. Having constructed a three-valve resistance-coupled receiver that gives me wonderful volume with absolute crystal clarity of tone and no distortion on an Amplion Junior, I have come to the conclusion that, provided one has a good loud-speaker, faults should be sought in the sets themselves.

I might mention that the only interest I have in Alfred Graham and Co. is that of an extremely satisfied user.—H. L. C. (Staines).

Amplification

SIR,—Being a firm believer in the superiority of H.F. over L.F. amplification for both range and purity of recep-

tion, I recently carried out a series of comparative tests to settle the question to my satisfaction. My aerial, situated about 15 miles south of 2 L O, is unfortunately a poor one, but the earth connection is short and efficient.

On a valve detector alone 6 B M, S B R, 2 B D and S F R were received at excellent phone strength; the other B.B.C. stations were rather weak. A stage of L.F. was then added. 6 B M, S B R, 2 B D and S F R could be heard on the loud-speaker, but the weaker stations, owing to Morse jamming, were not so good.

After this the L.F. valve was switched off, and replaced by a carefully-designed H.F. unit employing tuned-gnode coupling.

There was certainly not much difference so far as the nearer stations were concerned, but for the more remote transmissions the improvement was remarkable; mush and other interference were far less troublesome with this H.F. unit

To sum up, the merits of H.F. and L.F. amplification for the reception of fairly-

powerful transmissions are about equal, but for weak signals and for selectivity the former is miles ahead.—G. J. M. (Sutton).

The Thousand-circuit Board

SIR,—Many correspondents have written to ask questions about the Thousand-circuit Board, constructional details of which are appearing in current issues of "A.W." Rather than send individual replies to each querist, I should be greatly obliged if you would allow me to sum up the questions and to answer them in one general letter.

(Continued on page 650)

WIRELESS ACCUMULATOR TROUBLES BANISHED

A.M.C. is a business devoted entirely to Wireless Accumulator HIRE or MAINTENANCE.

A.M.C. hire charged accumulators of suitable size for any set, and deliver regularly every week. Or maintain your own, and if you have only one, lend you one alternate weeks while your own is being re-charged.

A.M.C. Service keeps you continuously supplied with correctly-charged accumulators from 1s. 2d. per week by quarterly subscription anywhere within 10 miles from Charing Cross.

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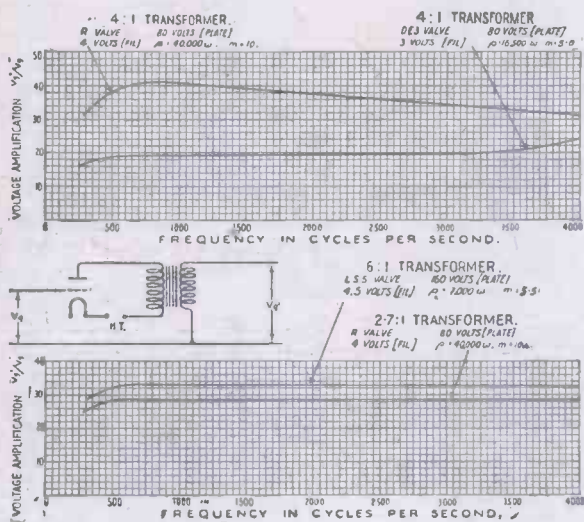
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The great claims of the Marconiphone "Ideal" Transformer for highly efficient and distortionless amplification are upheld by the guarantee which each instrument carries.

And apart from its excellent performance, it is only necessary to examine the materials and workmanship of the Marconiphone "Ideal" Transformer to realize that in price it is moderate.



The Guarantee

which goes with each Marconiphone "Ideal" Transformer guarantees that the amplification curve at all points comes within 5 per cent. of the examples shown above, when used with a valve with the same constants as quoted. The guarantee also provides for free replacement where a break in the winding occurs within six months.

IN THREE RATIOS:
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TRANSFORMER

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THE MARCONIPHONE COMPANY LTD.,
Marconi House, Strand, London, W.C.2.

CORRESPONDENCE (continued from page 648)

Question 1. *Is it necessary to use components of the makes specified?* No, any components of reliable make will answer. It should, however, be remembered that the Thousand-circuit Board does not merely exist on paper. It is the result of practical experience and of a great many tests with parts of all kinds. The components mentioned in the specification do give thoroughly good results, and if the constructor uses them he need have no fear about the working of his set when it is finished. The greatest care should be exercised in the selection of condensers if makes other than those mentioned are employed. It would certainly be an improvement to use square-law condensers in place of the ordinary type. When the Board was originally made up the only square-law condensers on the market were sold at a very high price.

Question 2. *Can the set be constructed in a cabinet behind glass doors with the panel in a vertical position?* Yes, but it must be remembered that in the original design the condensers and rheostats are mounted upon the front member of the frame. It would therefore be necessary to make the dimensions of the panel 24 in. by 16 in. instead of 24 in. by 12 in. in order to allow the space necessary for them. Stiffeners would be absolutely essential with a panel of this size. If the panel is made vertical the constructor must be careful to see that his variable

condensers are so adjusted that the moving plates will not fall back by their own weight.

Question 3. *Is it better to use ebonite rather than ply-wood for the panel?* Ply-wood fitted with bushes of good quality answers very well, and no fear need be entertained that if the set is made in this way the insulation will not be efficient. The original set, made nine months ago with a ply-wood panel, has never failed to work efficiently whatever circuit was wired up on it. It has been in daily use since that date and is in every way as good as ever it was. Remember that the bushes *must* be of the best quality and that care must be taken not to let Fluxite or glue cover the under surface of their bosses or there will be leaks between the brass of the terminals and the wood of the panel. This state of affairs actually occurred in a circuit board made up by a friend.

Question 4. *Would it not be better to use Clix instead of terminals?* Clix are very handy, and if expense is no object then they may be used with advantage. It will be necessary to keep on the wireless table a selection of flex leads of different lengths fitted with a Clix at each end.—J. HARTLEY REYNOLDS.

"An Interesting Experiment"

SIR,—Regarding the letter in "A.W." on page 558, under the above heading, the effect referred to is due to nothing more

or less than the excess current which will always flow from an accumulator when first switched on, and it has nothing to do with the valves warming up.—H. P. (Highbury).

Other Correspondence Summarised

W. H. B. (Co. Durham) wishes to know the identity of the station that transmitted at 10.20 p.m. on a wavelength of about 250 metres on October 6. The final word spoken was "Cheerio." He would also like to know the identity of the station which transmitted a concert, apparently in French, the same evening on a wavelength of about 240 metres.

E. A. (Deptford) would like to know which station it was that transmitted "Abide with Me" on October 12 at 10.45 p.m.

F. T. L. (Hanwell) gets consistently good reception of K D K A on his one-valve dual set, and was successful in receiving Capt. Eckersley's talk on October 12.

E. H. B. (Wavertree) states that his crystal set, made from instructions given in No. 121, gives as good results as a one-valve set.

S. P. (Redcar) wishes to know which station transmitted a Church service at 12.35 a.m. on October 13. The wavelength used was about 380 metres.

J. C. S. (Westcliff-on-Sea) found that his phone leads being wet was the cause of the faint signals which he was receiving.

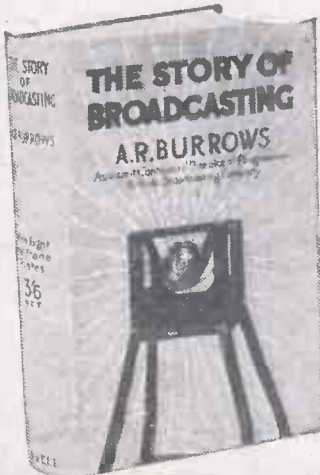
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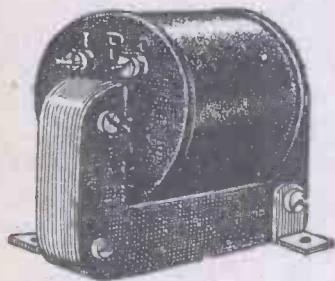
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NOTE.—In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.

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** (5IT), 475 m. **Bournemouth** (6BM), 375 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. **Edinburgh** (2EH), 325 m. **Hull** (6KH), 320 m. **Leeds** (2LS), 346 m. **Liverpool** (6LV), 315 m. **Nottingham** (5NG), 322 m. **Plymouth** (5PY), 335 m. **Sheffield** (6FL), 301 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 (Radio-Wien), 530 m. (1 kw.). 10.00, con.; 11.50, time sig.; 12.15, weather; 14.25, Stock Ex., news, con.; 17.00, children, lec.; 18.40, news, con.

BELGIUM.

Brussels (SRB), 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.). 18.15, lec., news, weather, con.; 10.00, con. (Sun.).

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

Prague (PRG), 1,000 m. 18.00, weather, orch. (irr.).

Straschnitz (near Prague). Will shortly take over Kbely programme.

DENMARK.

Copenhagen (Radio-Klub), about 500 m. 19.00, con. (irr.); 16.00, con. (Sun.).

Lynby (OXE), 2,400 m. (10 kw.). 09.30, 15.50, 20.45, weather; (2,700. m.) 18.20, (2,400 m.) 20.00, news; 11.00 and 19.10, con. (Sun.).

Ryvang, 1,025 m. 19.00, con. (Tues., Fri.); 11.00, con. (Thurs.).

Yorks Passage, 440 m. New station testing almost daily, 19.00.

Viborg, 1,400 m. 19.00, con. (irr.).

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 11.00, markets (exc. Sun.); 11.15, time sig., weather; 14.5, 15.35, 16.30,* Stock Ex. (exc. Sun. and Mon.); 18.00, con.

(Mon., Wed.); 18.30, news only (Sun., Tues., Thurs., Sat.); 19.00, weather; 22.10, weather (exc. Sun.).

* From Nov. 1, on 1st and 15th of each month, at 16.45.

Radio-Paris (SFR), 1,780 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).

L'Ecole Sup. des Postes et Télégraphes (PTT), 458 m. (500 w.). 15.00, con. (irr.); 16.30, lec. (Thurs.); 20.00, 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, 470 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, 300 m. New high-power station testing daily.

GERMANY.

Berlin (1), Vox Haus, 430 m. (700 w.); (2), 300 m. (1½ kw.). 09.00, markets; 09.15, news; 10.35, markets*; 11.15, Stock Ex.; 11.55, time sig.; 12.05, news; 13.15, Stock Ex.; 14.00, markets*; 15.00, markets*; 15.30, orch.; 16.00, markets*; 17.30, lec., children (Wed., Sun.); Eng. conv. (Mon.); 18.00, Eng. conv. (Mon.), children (Wed.), lec.; 18.45, lec. (exc. Sun.); 19.30, con., news, time sig.; 21.30, dance (Thurs. and Sat.). Evening lec. and con. from 18.00 relayed by Berlin (2) on 500 m. * On W.L. 500 m. only.

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

Königswusterhausen (LP), 680 m. (4 kw.). 09.40, con. (Sun.). 2,450 m.: 10.20, con., 2,550 m. (5 kw.): Wolff's Büro, 06.30-19.40, news. 2,800 m. (4 kw.): 10.50, con. (Sun.). 3,150 m.: Telegraphen Union, 06.00-20.00, news. 4,000 m. (10 kw.): Express news service, 06.00-20.00.

Breslau, 415 m. (1½ kw.). 10.00, sacred con. (Sun.); 10.15, Stock Ex., weather; 11.55, time sig., weather (Sun.); 12.25, time sig., weather, Stock Ex.; 14.00, Berlin news; 15.00, children (Sat. and Sun.); 16.00, orch., lec. (Sun.); 18.30, Esperanto (Mon.); 19.30, con. (Sun.); Eng. conv. (Thurs.); con., lec. (other days).

Frankfort-on-Main, 467 m. (1½ kw.). 07.00, sacred con. (Sun.); 10.10, news; 10.55, time sig. and news; 14.00, children (Sun.); 15.10, news; 15.30, orch., lec. (Tues.); 18.30, lec., Esperanto (Fri.); 19.00, lec., Eng. conv. (Wed.); 19.30, con., opera (Thurs.); 20.30, news, weather; 20.50, tech. lec., women's corner; 21.00, time sig.; con. (exc. Sun., Mon. and Thurs.).

Hamburg, 387 m. (1½ kw.). 06.25, time sig. and news (07.55, Sun.); 10.15, sacred con. (Sun.); 10.55, markets; 11.58*, time sig.; Stock Ex.; 12.15, con. (Sun.); 14.00, lec.; 16.00, women; children (Sun.); 17.00, con., lec.; 17.30, children (Wed.); 19.00, con. or play; 21.00, weather, markets, sport; 21.50, news (in English).

Königsberg, 460 m. (1½ kw.). 07.10, markets (Wed., Sat.); 10.15, markets; 10.30, sacred con., sermon (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 (Sat.).

Leipzig, 452 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, 407 m. (1½ kw.). 06.55, time sig.; news; 11.15, Stock Ex.; 12.00, time sig.; 14.00, markets, news; 14.45, orch.; 18.15, weather, news; 19.00, con., dance (Sat.); 20.15, news. Sun.: 14.45 and 19.00, con., news, dance.

Nuremberg (relay), 340 m. Programme relayed from Munich (q.v.).

Stuttgart, 437 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.). 11.00, con.; 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., con. (irr.).

ITALY.

Rome (IRO), 422 m. (1½ kw.). 19.30 to 21.30, con.

(Continued on page 654)

THE STORY OF BROADCASTING
A.R. BURROWS
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Mullard

THE MASTER VALVE

BROADCAST TELEPHONY (continued from page 632)
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.

SPAIN.

Madrid (Radio Iberica), 392 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.

SWEDEN.

Stockholm (TV), 440 m. 10.10, service, relay (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.). 12.15, lec. No Sun. transmissions.
Lausanne (HB2), 850 m. (500 w.). 07.05, weather; 12.30, weather, markets, time sig., news; 16.00, children (Wed.); 17.55, weather, news; 19.15, con. (exc. Wed.), dance (Thurs. and Sat.).
Zurich (Höngg), 650 m. 12.00 and 16.00, weather, news, Stock Ex.; 17.15, children (Mon., Wed., Fri.), women's hour (Thurs.); 18.00, weather, news; 19.15, lec., con.; 21.00, news. Sun.: 11.10 and 19.15, con.; 21.00, news.

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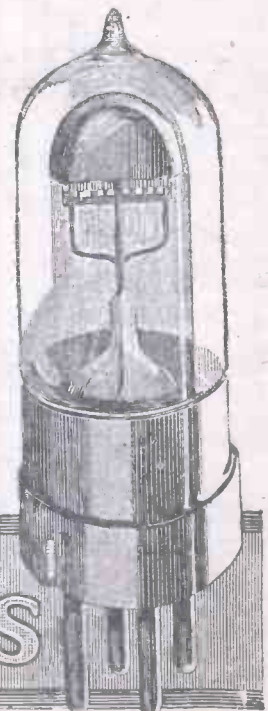
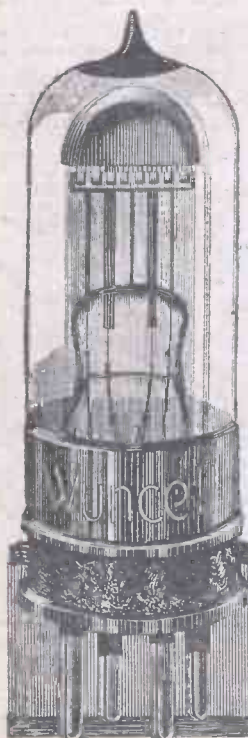
Instead of merely producing another Valve of similar characteristics to any already on the market, the Cossor Research Staff went boldly to the root of the problem and succeeded in producing a Valve which will be as popular in its class as the wonderful P-type Cossor Bright Emitter.

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But true progress does not end with Valve design—service counts for something, too. In

the new Cossor packing scheme every Valve will be finally packed in its wrapping of cotton wool and sealed in its carton. Your Dealer will not find it necessary to break the seal to prove to you that the filament is intact. His Cossor Showcard will prove it by a flash when the carton is placed in contact with it.

Thus every Cossor user is guaranteed an absolutely new and unused valve.



Cossor Valves

"A GREAT EVENING WITH WGY" (continued from page 644)

was switching over to Chancellor's Hall in Albany, New York, where Mr. Secretary Hughes was to address a meeting. There was a slight pause and then the announcer said that as it would be ten minutes before Mr. Hughes spoke, two more vocal items would be given. During this time conditions were becoming better and better, and the second song, "If I Built a World for You," came through as clearly and with almost as good strength as if it had been transmitted from 2 L.O.

After this the relay board switch was turned over, the confused murmur of the crowd talking quietly in the hall coming through. There followed a burst of applause as the chairman rose to introduce Mr. Hughes. The chief speaker

received a tremendous ovation, and his speech, which lasted for more than an hour, was splendid. He spoke upon the American Constitution and of his country's great need of personal service from all ranks of his citizens. When I tell you that his speech came through just as well as that of Mr. Asquith, relayed earlier in the evening from Paisley, you will realise something of the thrills of Transatlantic reception.

Just before the end of the speech spark interference became rather bad, and this marred the next two items. Atmospheric also were on the increase. The last part of the programme that I heard consisted of the relaying of the proceedings at a students' meeting, which was a very cheery business. Delegates from various places were introduced first of all, each being

greeted with shouts, songs, witty remarks, with the blowing of a whistle and the ringing of a cow bell. The chairman thumped the table heartily in vain attempts to obtain order. This was still going on at half-past three, when I decided that it was high time for me to close down and go to bed, especially as atmospheric conditions had become very bad indeed.

That is what we may call a sample evening, and I have no doubt that if you go for WGY you will succeed in picking him up, provided that you select your night carefully and that your apparatus is in an efficient condition. J. H. R.

Owing to the continued expansion of Amplion business both at home and abroad, Alfred Graham and Co. have decided to organise an independent overseas section.

"Radio-Wien," the Vienna broadcasting station, has made a good start, the city already having 15,000 licence holders. A relay station is to be erected at Graz.

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Has received all B.B.C. and CONTINENTAL Stations. Operates Loud Speaker 15-20 miles. Simple to operate. Marvellous range and power.

43/- Including B.C. Coils. Plus Royalty Genuinely worth 5/-

Numerous letters of appreciation arriving from all parts of the country. SELLING like WILDFIRE!

Buy the World's Best Now.

WORLD'S WIRELESS STORES. WALLINGTON

Packed in airtight tin, with silver catswhisker 1/6



The 'Six-Phone' Crystal

The volume of clear bell-like reproduction yielded by this wonderfully sensitive crystal is such that it will effectively work six pairs of 'phones—or even more, under suitable conditions. It is not only completely sensitive (with no "dead spots") and at least 50 per cent. "louder" than the hosts of "ites"—it is also fully guaranteed.

What Correspondents say:
Manchester (38 miles away) received on Neutron as clear and loudest crystal I have ever known.—"H. B.," Liverpool.
Bakewell.

Concert Tested and Guaranteed



The World's Greatest Radio Crystal Stocked by the Best Radio Dealers. Insist on Neutron, in the Black and Yellow Tin—or send 1s. 6d. and Dealer's name, and this wonderful Crystal will be mailed by return.
Neutron, Ltd., Sicliff House, Southampton Row, London, W.C.1. Phone—Museum 2577.
Sole Distributors: V. Zeilina and Sons, 144, Theobald's Rd., London, W.C.1. Phone—Museum 379 and 6841.

See Stand No. D2, British Wireless Exhibition, White City, Nov. 15 to 29



FALLON'S FIXED CONDENSERS

are made of the highest quality mica and copper foil, each one tested and guaranteed. Fitted with soldering tags and nuts for making clean connections

FIX "FALLON" CONDENSERS—they improve results for all Sets Capacities up to .003, 1/3 each. Capacities up to .003, 2/- each

FALLON'S VARIOMETER

Inside winding, suitable for broadcast reception on any P.M.G. Aerial, extraordinary close coupling ensuring large tuning range. Inductance, the highest possible—9.5 to 1. Metal feet can be adjusted to four different positions. As used in the Single Valve receiver for all wavelengths, described and illustrated in "Moderna Wireless," July issue.

PRICE 10/- POSTAGE 6d.

Write Direct for Trade Terms:

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The Condenser People. Tottenham 1936

White Ribbon Works, Broad Lane, TOTTENHAM, N.15.

All Correspondence and Post Orders to above address.

City Depot: 143, Farringdon Road, E.C.4. Manchester Depot: 3, King Street West, Deansgate. Scottish Depot: 120, Wellington, St., Glasgow.



SQUARE LAW CONDENSERS at the price of ordinary. Write for particulars of other Fallon Specialities.

"GOLSTONE" (REGD.) RECEIVING SETS

BRITISH MADE

ELEGANT APPEARANCE
HIGHLY SELECTIVE
SIMPLICITY IN TUNING

Designed for receiving on any Wavelength. The Two-Valve Set clearly receives British Broadcasting and Continental Stations, and for Loud Speaker Reception the Three, Four- and Five-Valve Sets have proved entirely satisfactory in all parts of the Kingdom. Polished Cabinet. Removable back. Ebonite Panel, fitted with Valve Holders, Filament Resistances, Condensers for Tuning Aerial and Anode Circuits, Knife Switch for High and Low Tension Circuits, etc.

Provided with Plug-in Coils, to receive British Broadcasting Stations. Plug-in Coils to receive Paris, Berlin and other high-wave stations are interchangeable and can be supplied.

Both the Low Tension and High-Tension Batteries can be fitted inside the Cabinet, and the only wires on view are the aerial and earth.

TWO VALVE CABINET, £7-10-0.

THREE-VALVE CABINET £10-10-0.

FOUR-VALVE CABINET £13-10-0.

FIVE-VALVE CABINET, £18-18-0.

Marconi Patent Royalties, 25/-

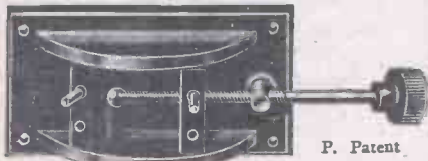
Marconi Patent Royalties, 37/6

Marconi Patent Royalties, 50/-

Marconi Patent Royalties 62/6

See Catalogue for full details, together with particulars and prices of above Sets for "Home Construction."

"GOLSTONE" (Regd.) Micrometer Regulating COIL HOLDER

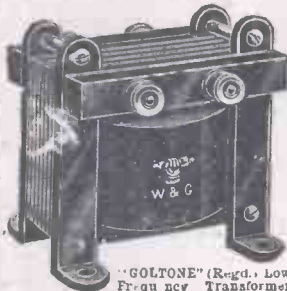


P. Patent

Enables the finest possible tuning and adds considerably to the efficiency, selectivity and reliability of the Receiving Set.

2 Coil Type 9
3 Coil Type 12/6

Large fully illustrated 32 pp. Radio Catalogue No. R/110 post free on request. Enclose Business Card for Trade Terms.



"GOLSTONE" (Regd.) Low Frequency Transformer

Unsurpassed for silence, efficiency and reliability. Provides remarkable amplification with freedom from noise and distortion. Equally suitable with every type of valve. No make of Transformer gives better results than this one.

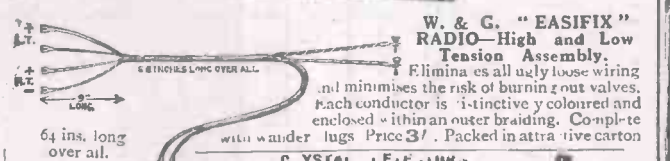
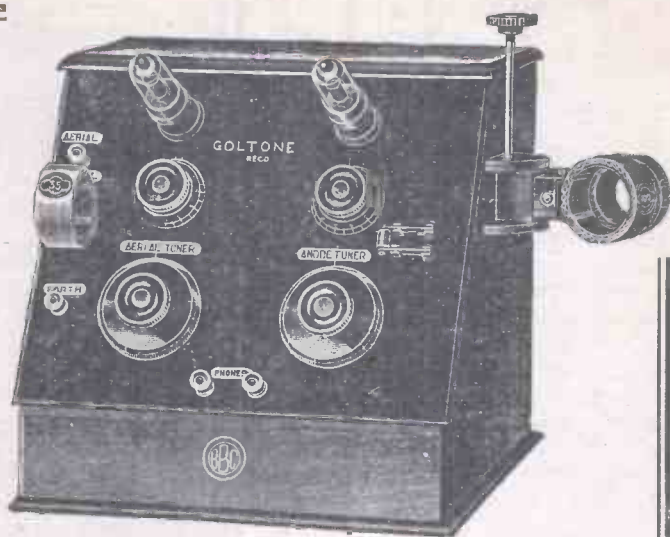
We can also supply at same price ratio to to 1 Transformer recommended with "Undyne" High Tension Circuit.

H. H. M. Broughton, Lances, I am very pleased with the results from using W & G. Low Frequency Transformers. I have built many sets with them, and have always found them to be free from distortion though I can in volume. They give much better results than any other make I have tried.

These lines are stocked by all high class Radio Stores. Write direct if unobtainable.



Address all communications to Head Office and Works, PENDLETON - MANCHESTER. Stocks also held at Glasgow Depot 93 Pitt Street



W. & G. "EASIFIX" RADIO—High and Low Tension Assembly.

Eliminates all ugly loose wiring and minimises the risk of burning out valves. Each conductor is distinctive in colour and enclosed within an outer braiding. Complete with wander lugs. Price 3/-. Packed in attractive carton.

CRYSTAL L.E.D. LUMPS

Improved type Vertical Detector, mounted on Ebonite Base, fitted with Glass Shield.

No. R4/12 ... 1/9 each
Parts only for Panel Mounting.

No. R4/10 ... 1/6 each
Vertical Type (as illustrated) and Horizontal Type supplied at same price.

RADIO WIRES

of every description including S.W.G. (cut), and Enamelled Wires, Aerial Wires, Leading-in wires, Telephone Receiver and Loud Speaker Cords, etc. Prompt Deliveries.

KEEN PRICE S.

Every Phone Its Own Amplifier!

You don't require valves to be able to use more phones on your crystal set. Owing to a new discovery, tested, approved and fully explained in "AMATEUR WIRELESS" article, October 8th, MANY PHONES ON ONE CRYSTAL SET. It is now possible to use as many phones as you wish, irrespective of resistance, without weakening strength of signals.

THE EXTRAPHONE

WONDER-DETECTOR

Patents Pending

Designed and manufactured by the inventor of "Amateur Wireless" system, John W. Miller

WHAT THE "EXTRAPHONE" DOES

1. Enables phones of any resistance to be used at the same time.
 2. Enables as many phones as you want to be used without loss of strength.
 3. Equally as efficient on weak or strong signals. Every phone in use is as strong as it would be if used alone.
- Fits any Crystal Set without alteration. Extraphones fit into each other if using more than one. No other detector necessary.

ON SALE EVERYWHERE 2/9

If not obtainable locally, please send direct for one or more of these wonderful appliances, giving name and address of local dealer. Postage will be paid on all post orders.

JOHN W. MILLER
68, Farringdon Street, E.C.4.

A famous name for a famous Valve.

NELSON MULTI

3 FILAMENTS

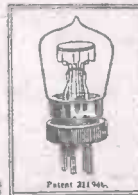
15' COMPLETE



NELSON MULTI
THE RULER OF WIRELESS WAVES
BRITISH MADE

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

B.B.C. WINTER PROGRAMMES

EVERYONE is aware of the splendid advance in the technique of broadcasting that has been made by the B.B.C. within the last year, and it is with hesitation that one ventures to grumble at an organisation which, on the whole, so ably caters for our entertainment. But in the matter of winter programmes, which came into operation on September 29, there seems to be reason for fair criticism.

Throughout the summer the B.B.C. provided excellent programmes that lasted until 11 p.m. every evening, except Saturday, when the Savoy bands were relayed until midnight. Now that winter is approaching (!), however, they have seen fit to start their evening programmes half an hour earlier, but, and this is the grievance, the transmissions are also to end half an hour earlier. That is, instead of having something to which to listen until 11 p.m. every evening, all stations will normally close down at 10.30 p.m.

Perhaps there is a good reason for this, but it is difficult to see. Although people do not stay out so late in winter as in summer, they *do* sit up later. Rather than finish half an hour sooner in winter, most listeners would appreciate an extension of the evening programme until, say, 11.30 p.m. That at least seems to be a more logical course than the arrangement now adopted.

G. W.

ELIMINATING THE FILAMENT BATTERY

AMERICAN scientists have discovered that it is possible to extract quite a considerable stream of electrons from an unheated filament by using 200,000 volts on the plate. If this is boomed as a solution to the problem of "eliminating the L.T. battery," the time will be ripe for the long-suffering amateur to show signs of peevishness.

M. A. L.

WIRELESS IN THE NEXT WAR

IN a recent lecture before the Académie de Marine, General Ferrie, the head of the French Wireless Service, pointed out that although short waves of the order of 100 metres or less were rapidly proving their superiority for ordinary long-range transmission, they were practically useless for submarine work. The power of wireless energy to penetrate depths of water increased in proportion to the wavelength employed.

He added that amongst the factors to be reckoned with in the next war were the wireless-controlled torpedo-boat and the bombing aeroplane. These were in fact already *un fait accompli*, the control mechanism being not only effective and accurate, but also immune from interference by enemy jamming.

Secret systems of transmission in which the emitted wavelength was continually varied in an irregular manner would remove one of the present drawbacks of wireless signalling for war work. Directional installations would eliminate much of the danger of secret naval movements at night or in foggy weather, whilst the new cable leader-gear system would prove invaluable both for guiding aeroplanes to difficult landing-places and for steering submarines through a maze of harbour mines.

M. A. L.

FOUR
"AMATEUR WIRELESS"
HANDBOOKS—1s. 6d. EACH

WIRELESS TELEPHONY
EXPLAINED

SIMPLE CRYSTAL
RECEIVING SETS

WIRELESS COMPONENT
PARTS

SIMPLE VALVE
RECEIVING SETS

CASELL & CO., LTD.,
LA BELLE SAUVAGE, E.C.4.

HELLO! HELLO!! "UNCLE TOM" CALLING

"Uncle Tom," Newcastle's First Station Director, Calling "UNCLE TOM" OF PAYNE & HORNSBY, LTD.
The Pioneers of Cheap Prices in the North and the Only Firm in Great Britain with actual Broadcasting Experience

INSULATING TAPE, per box, 6d.
KNOBS—2 B.A. bushed 1 1/2 in. dia., 2d.; 2 B.A., 1d.; 4 B.A. bushed 1 in. dia., 1 1/2d.
LOUD SPEAKERS—Ampion Junior, 27/6; T.M.C. (Copper Horn), 57/6; Baby Sterling, 55/-; Sterling (Black and Gold), 60/-; Claritone Junior, 55/-; Claritone Senior, 115/-; Sparta (Fullers), 95/-; and many other makes kept in stock.
LEADING IN TUBES—6-in., 8d.; 9-in., 10d.; 12-in., 1/-.
NUTS—4 B.A., 2d. doz.; 2 B.A., 2d. doz.
NAME TABS—Circular with hole for fixing under terminal, 1d.; straight type, 1d.; strips of 12 names, 8d.; Aerial, Earth and Phones, 1/6; Pointers, 1/6.
PHONES—Sketaphones, 16/6; The New T.M.C., 6 ozs., 22/6; Brown's Feather Weight, 25/-; Sterling, 25/-; G.E.C., 25/-; B.T.H., 25/-; Western Electric, 25/-; Claritone, 25/-; Siemens, 25/-. All 4,000 ohms.
SINGLE EAR PHONES—2,000 ohms, 6/6; 4,000 ohms, 7/6.
PULLEYS—Aerial, 6d. and 8d.
POTENTIOMETERS—Special line, 4/6; T.C.B., 5/-; Igranite, 7/-; Lissen, 12/6.
PHONE PLUGS—G.E.C., 2 pin, 1/8.
ROTORS—Wood, 2 1/2 in., 1/-; Ebonite, 2 1/2 in., 1/9.
ROTORS AND STATORS—2 Statots and 1 Rotor, complete set, 3/-.
RESISTANCES (FIXED)—Mullard, 100,000 ohms, 2/8. (Clips for above, 8d. per pair.)
RESISTANCES (VARIABLE)—Woodhall 100,000 ohms, mounted on Ebonite, 2/8; Allen, 50,000 to 100,000, 1/6; Lissen, 50,000 to 100,000, 2/6; Watmel, 50,000 to 100,000, 3/6.
RUBBER PHONE EAR-CAPS—"Sorbo," per pair, 1/6.

SCALES—Half circle, 0-180°, 2d.; complete circle, 360°, black or white, 4 1/2d.
STAPLES (Insulated)—Per doz., 3d.
STAPLES (Tin)—Per doz., 1d.
SLIDERS AND PLUNGERS, 3d.; G.W. type, very efficient, 9d.
SHELLAC—Per bottle, 5d., 7d., & 10d.
SWITCHES—S.P.D.T. Miniature panel mounting, 1/-; D.P.D.T. Miniature with nut and mounting, 1/6.
SWITCHES (EARTH AND AERIAL)—Mounted on Ebonite, S.P.D.T., 1/3 & 1/9; D.P.D.T., 3/6. (Above fitted with Terminals.)
SYSTOFLEX—Per yard, 4d.
SPRING WASHERS—(Copper), per doz., 5d.
SWITCHES for Flush Panel mounting, 1/11; Switches, round, (Toggle), 2/-.
SWITCH ARMS—Best quality, 10d.; second quality, 6d.
TERMINALS—Small fancy, 1d.; small W.O., 1d.; large W.O., 1 1/2d.; Telephone, 1 1/2d.; Nickelled, 2d. (All above complete with nut and washer.) Red and Black Terminals, per pair, 1/-; Screw Spade Terminals, each, 1d.; screw pins, each, 1d.; "Clix" Terminals, complete, 4d.
TERMINAL TAGS for connecting Aerial Wire to Earth Wire, per pair, 1 1/2d.
TRANSFORMERS (Low Frequency)—General Radio Co., 15/-; Powquip "Bucks" for Reflex Circuits, 12/-; Powquip Shrouded, 18/6; Burndept Cheap Type, 15/-; Lissen T.2, 16/6; Lissen T.3, 25/-; Silvertown, 21/-; Igranite, 21/-; Fuller Shrouded, 22/-; R.J. new type, 25/-; Eureka Concert Grand (the finest transformer made), 30/-; Eureka 2nd stage, 22/6.

TINFOIL—Per sheet, 4d.
TRANSFERS—"Easic-fix" Aerial, Earth Phones, per set, 2d.; large sheet of Words and Scales, 9d.
VARIOMETERS—Small Brown, excellent value, 1/11; L. Variometer, 2/8; L. Variometer with Ball Rotor, 3/8; Ebonite Variometers with Knob, 4/3 4/11 and 6/8. Igranite and Sterling always in stock.
VALVES—Thorpe K.4 for Unidyne circuit, 17/6; Cossor, B.T.H., Marconi R., Marconi R.5V., Mullard-Ora, Ediswan, Myers, all at 12/6.
DULL EMITTER VALVES—Marconi D.E.R., 21/-; Ediswan A.R.D.E., 21/-.
VALVES, DULL EMITTER, .06—Marconi D.E.3, 25/-; B.T.H. B.5, .25/-; Ediswan A.R., .25/-; B.T.H. 6 Volt Power Valve B.4, 35/-; Mullard and F.A.I., 35/-.
VOLT METERS, 0 to 15 Volts, 5/-; double reading, 0-10, 0-100 volts, 12/-.
VALVE HOLDERS—With 8 nuts and washers, 8d.; 5 Leg Valve Holders for K.4 Valves, 1/3; Valve Holders for Flush Panel Mounting, per set, 8d.; Valve Pins, 1d.; Valve Sockets with nut and washer, 1d.; Valve Windows, 8d.
BELL WIRE—Single, 2 yards, 1 1/2d.; Bell Wire, Twin, per yard, 1d.; Bell Wire, Rubber-covered, for connecting up, per yard, 1d.
WIRES—Tinned, No. 18 gauge, 3 yards, 2d.; Tinned, Square, 2 ft. lengths, 1 1/2d.; Tinned, No. 18 gauge, for connecting up or for Aerial, 100 ft., 1/6.
DOUBLE COTTON COVERED WIRE—No. 20, 1/2 lb. Reels, 8 1/2d.; No. 22, 1/2 lb. Reels, 8 1/2d.; No. 24, 1/2 lb. Reels, 10 1/2d.; No. 26, 1/2 lb. Reels, 11 1/2d.; No. 28, 1/2 lb. Reels, 12 1/2d.; No. 30, 1/2 lb. Reels, 14/-.
WIRE (Rubber-covered)—For Lead-in, Earth, Earth or Aerial, 2d. and 2 1/2d. per yard.

Valves and High Tension Batteries sent through post at purchaser's risk only and are not returnable. Price Lists Free.

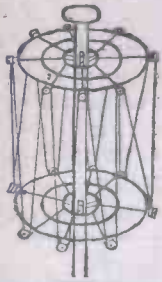
Business Hours - - - 9 to 8 daily.

TRADE SUPPLIED.

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Telephone: 3804 CENTRAL
10, QUEEN VICTORIA STREET, LEEDS. Phone: 22267 Leeds.
66, Camden Street, North Shields. Roker Avenue, Sunderland.
Russell Street, Ocean Road, South Shields. Shortly Opening at CASTLE STREET, BELFAST and STONEY STREET, NOTTINGHAM.

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Mail orders dispatched same day. Please send ample postage. Excess will be returned.



ASHTON'S PERFECT AERIAL SPREADER

(protected)

12/- PER PAIR

GETS ALL STATIONS

ASHTON'S
8-10, Bull's Head Yard,
MANCHESTER.

HEADPHONES

with new type headbands, very comfortable. No callers.

4,000 ohms **9/6** PAIR Postage 6d. per pair
T. BUXTON, 10, Crofton Avenue, HILLSBORO', SHEFFIELD.



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. **SPEEDWELL PRESS CO., LTD.,**
CLEBE ROAD, LETCHWORTH, HERTS.

ADJUSTABLE

LOUD SPEAKERS 12/6

fitted with flexible connection to fit any gramophone or horn. Stalloy diaphragm, Adjustable magnets Brand new, not reconditioned. 2,000 ohms, 12/6. 120 ohms, 13/6. Post free, complete in box, with money-back guarantee. Quick delivery.

STALLOY DIAPHRAGMS, all sizes, 12 in. 4d. to 4 in., 1/2. Micro-nut fitted, 8d. extra.
JOHN W. MILLER, 68 FARRINGDON ST., E.C. 4. Phone: CENTRAL 1950

EVERYTHING for WIRELESS
Send for new bargain list of all components. Headphones from 15/6. Loud Speakers 22/6. Crystal Sets from 19/6. Amplifiers from 42/-. Valve sets from 77/6. Direct from actual manufacturers.
Townshend's, Ltd., Ernest Street, Birmingham.

BEGINNERS GUIDE TO WIRELESS

This book gives more practical information about building wireless instruments than others at ten times the price. **HOW TO ERECT, CONNECT AND MAKE** all kinds of wireless apparatus, including crystal and dual amplification sets, one and two valve amplifiers, also the latest two, three and four valve tuned anode receivers. 160 pages including 28 diagrams.
SAXON RADIO CO.,
(Dept. 12), South Shore, BLACKPOOL.

SIMPLE AND CLEAR

Wonderful results from using the New and Improved

CATSEYE

FIXED DETECTOR PRIC **2/6**



Listen-in in comfort at once. No waiting, no adjusting. Users are delighted. Order from your dealer, or send P.O. 2/6 and 2d. stamp to—**COMREX CO. (DEPT. 2), 119, FLEET ST., E.C. 4**

SINGLE RECEIVERS

2,000, ohms, British make tested and guaranteed **5/-**

BRITISH PHONES, 4,000 ohms, Double Headband, guaranteed, 13 3 per pair.

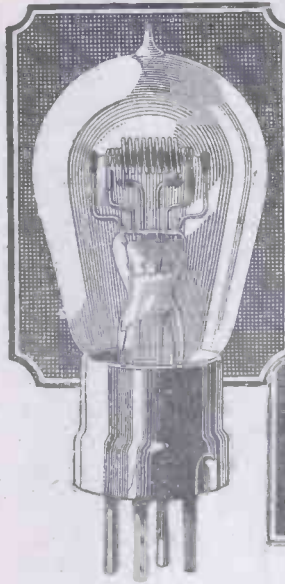
L.F. TRANSFORMERS 5 : 1 10/6

FILAMENT RHEOSTATS 1 hole fixing 1/9

VARIABLE GRID LEAK 5-5 1/9

Trade Supplied

F. HOWE, 67, Little Heath, Charlton, S.E. 7.



Louden



Have you noticed it?

10/-

IF you listen intently to your gramophone you will become aware of the light scratching of the needle. But although you hardly notice it unless you listen specially, it is there all the while.

Once you could hear gramophone music against a background of complete silence you would never be content to return to the obligato of scratches and hisses which you now cheerfully endure.

It is the same with Wireless Reception; you hardly notice the continuous breathing sound going on in your loud speaker, but—unless your set is fitted with Louden Valves—it is there, and it is preventing you from getting the best possible results from your set. The Louden Valve has been designed specially with the object of eliminating all those "mush" or breathing sounds so prevalent with valves of the ordinary type. If you would care to know how this is achieved, your dealer will supply you with a folder giving full information.

But we feel that you are concerned with *results* rather than with *reasons*, so our advice is that you should not consider your present reception perfect, but fit Silver Clear Louden Valves and see how much better it can be.

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.



Dorking and District Radio Society

Hon. Sec.—A. J. CHILD, High Street P.O., Dorking. The opening meeting was held on October 6, when Mr. R. J. Hibberd gave a lecture on "The Development of Wireless."

South Croydon and District Radio Society

Hon. Sec.—G. H. TOZER, 218, Brighton Road, South Croydon. At the last meeting a lecture was given by Capt. L. F. Plugge on "My Experiences with a Portable Receiver in Central Europe." The society meets every Tuesday at the headquarters, "The Swan and Sugar Loaf Hotel."

Croydon Wireless and Physical Society

Hon. Sec.—H. T. P. GEE, Staple House, 51, Chancery Lane, London, W.C.2. At the meeting of the society held on October 14 Capt. A. Hinderlich delivered a lecture on "Winding with Fine Wire." He gave practical demonstrations showing how to solder wires together, including partial winding of telephone magnets, and explained how such coils can be successfully wound by hand.

Sale and District Radio Society

Hon. Sec.—J. L. RICHARDS, 14, John Street, Sale. The annual general meeting of the society was held on October 17. Councillor J. U. Thornton gave a resumé of the year's working, and the secretary presented the balance-sheet. It was proposed to open the society's rooms every evening on and after October 27.

Sunderland Wireless and Scientific Association

Hon. Sec.—H. W. HODGES, Westfield House, Sunderland. The association held its first meeting of the new session on October 18. Mr. Jeffrey, the new president, gave a paper on "Scientific Ideals."

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

Hon. Sec.—J. T. COWLEY, 4, St. Paul's Street, Belfast.

On October 14 Major R. Stanley delivered a lecture on "The Electron Theory and the Fundamental Principles of Valve Action." He described electrons in relation to different forms of matter; also the theory of the valve as used in wireless receivers.

Kensington Radio Society

Hon. Sec.—J. MURCHIE, 33, Elm Bank Gardens, Barnes, S.W.13. At the October meeting multi-valve resistance-capacity coupled receivers, special types for transmission and reception work, buzzer and valve wave-meters, and coil winders were exhibited and explained.

Coventry and District Co-operative Radio Society

Hon. Sec.—A. CURTIS, West Orchard, Coventry. At a recent meeting members submitted papers on "Aerials and Earths," which were read and submitted to the vote for a monetary prize which had been offered to stimulate interest in the theory of wireless. The chairman described a one-valve set with reaction, and components were wired up in this circuit and the set given a trial on the society's aerial.

Stoke-on-Trent Wireless and Experimental Society

Hon. Sec.—W. H. REID, 73, Stafford Street, Lenton, Stoke-on-Trent. At the meeting held at the Y.M.C.A., Hanley, on October 16 a talk was given by Mr. H. Bishop on "The Broadcasting Company and the Difficulties It has been up Against."

Battersea and District Radio Society

Hon. Sec.—G. P. PHILLIPS, 183, Lavender Hill, Battersea, S.W.11. At the headquarters on October 9 Mr. A. E. Duffield, chairman, gave a most interesting lecture on "Resistance-capacity Coupling."

**"Wireless Telegraphy
and Telephony"**

The most Practical Handbook for the Amateur. The price is 1/6 net.

Cassell & Co., Ltd., La Belle Sauvage, London, E.C.4

Eiffel Tower (F L) has altered its wavelength to 2,650 metres and also its times of transmission, and it is not likely that the spark set will close down yet awhile. Experiments have been made with the new valve transmitter, but this has made other reception, even on short wavelengths, impossible in many Paris districts.



ANNOUNCEMENTS

"Amateur Wireless and Electrics." 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.

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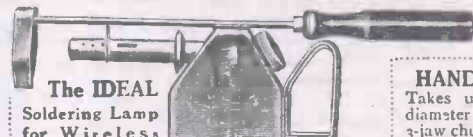
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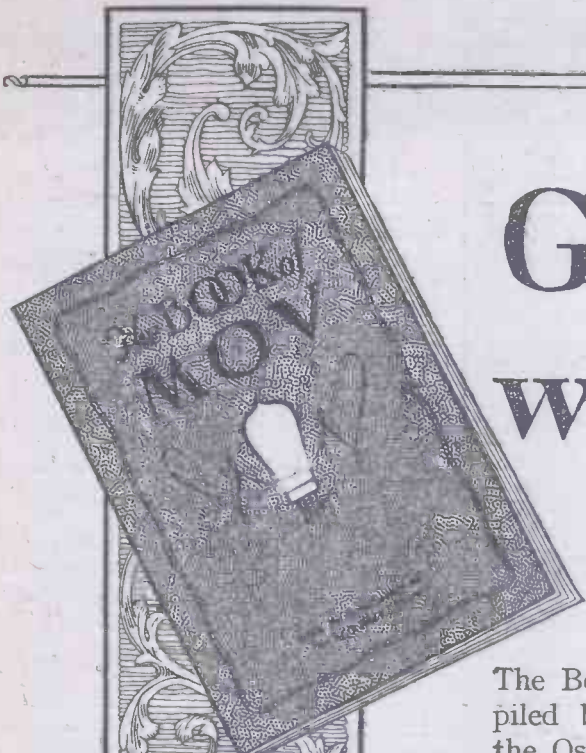
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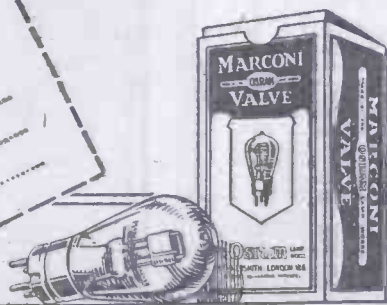
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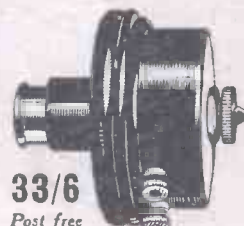
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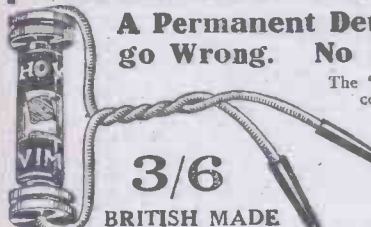
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S.S.A.



Autumn Leaves

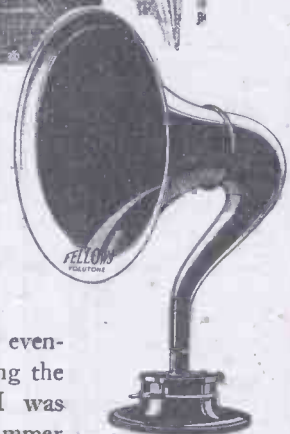
Standing at my window the other evening watching a gusty wind whirling the dead leaves round my sundial I was forced to admit that our short summer was over. All too short it seemed to me; just a few bright days and before we knew where we were, Autumn had set in with Winter unpleasantly close—well, not altogether unpleasantly. I rather look forward to long winter evenings. It's a restful change from being harried by the children to go and play in the garden as they insist on my doing when it's light till ten.

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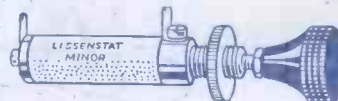
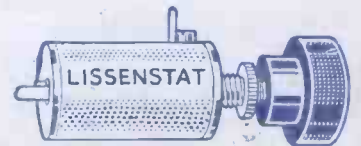
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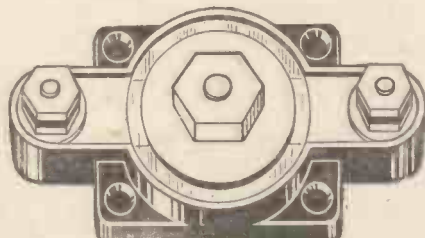


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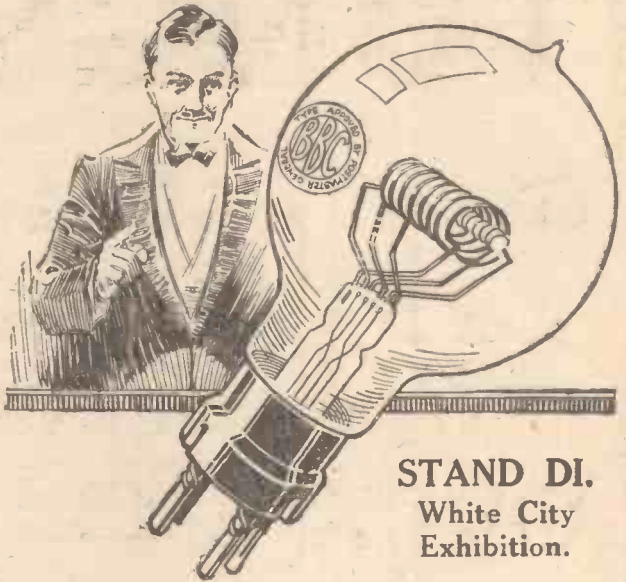
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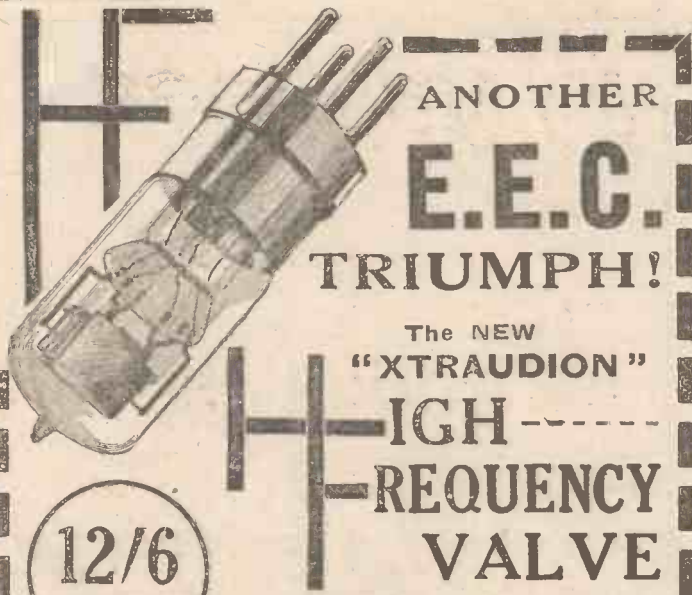
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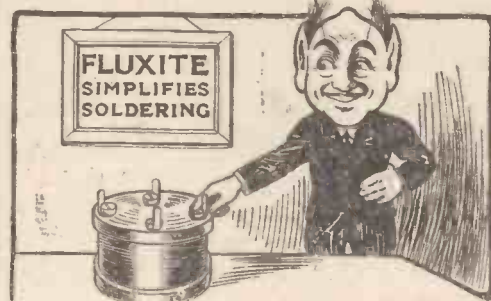
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Amateur Wireless

and Electrics

Vol. V. No. 127

November 8, 1924

IF YOU CAN'T READ MORSE—RECORD IT!

Constructional Details of a Simple Instrument that will Obviate the Need for Learning Morse

THE recording of spark and C.W. signals opens up a new and interesting branch of wireless to all those who are unable to read Morse, and even if Morse can be read at an average speed the automatic receiver will record the fastest messages.

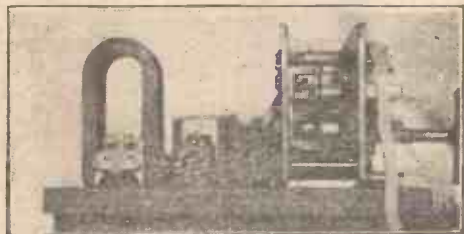


Fig. 1.—Front View of Recorder.

The relaying of the signals is the first consideration, and it will be found that it is the most difficult. There are many relays now on the market, but nearly all require a four-valve set for their proper operation; perhaps the most sensitive and least expensive is the Weston moving-coil relay, but even this requires three or four valves.

The Inker

The Weston moving-coil relay has been described elsewhere, but its chief drawback has not been alluded to before, namely, that only a very small current can be put across the platinum contacts. When the relay is used to complete the circuit of a 4-volt battery with little resistance in the circuit, such as that of the electromagnets of a Morse inking machine, it will be found that the moving platinum pointer will adhere to the platinum contact and will only spring back when the current is cut off.

This is to say that the relay will not work a Morse inking machine direct, but necessitates the use of a small high-resistance electromagnetic relay of the G.P.O. pattern. These small relays are on sale at the ex-Government stock depots. The largest and most expensive part of the recording apparatus is the inking

machine, but these can be obtained second-hand at a greatly reduced figure from ex-Government stock dealers. These three instruments, together with some flashlamp batteries, will be all the apparatus required. The set which operates the apparatus described in this article is a three-valve receiver—one H.F., one detector and one L.F.; this is sufficient for all the powerful stations, but two L.F. valves or a power amplifier are required for the recording of the lesser spark stations.

The Main Relay

The first and most important piece of apparatus is the main relay, working direct from the output of the last valve and in series with the phones. In this case the Weston moving-coil relay will be referred to, but any other reliable relay will suffice. When the moving-coil terminal tags have been joined in series with the phones and the H.T. and filament of the last valve switched on, the moving pointer will flick over to one or other of the contact stops, depending upon which way the current is passing through the coil. Before the relay will function the moving pointer must be brought to a vertical position again, and this is done by either adjusting the two springs at the back to take up the pull, by putting a

power amplifier, the springs of the relay will not take up the pull, and therefore one of the other methods must be adopted.

The points of contact of the Weston moving-coil relay were the next consideration. Since the moving pointer made inefficient contact with the platinum stop, it



Fig. 2.—Side View of Recorder.

was decided to try another method, namely, breaking the circuit every time a signal came through. Therefore instead of allowing the moving pointer to move over to the stop, it was adjusted so that the pointer broke away from the stop every time a signal was made.

This method works well, but, of course, a second relay must be included in order that the signals may be made positive before reaching the Morse inking machine, and also because the current required to work this machine prevents the moving pointer from breaking away satisfactorily.

The Second Relay

The second relay can be seen in Fig. 1 between the Morse inking machine and the Weston moving-coil relay. It is a small G.P.O. electromagnetic relay of 1,000 ohms. This relay had to be altered so that when a message came through and the Weston moving-coil relay broke the circuit the pole-piece, which had hitherto

been attracted down by the magnet, sprang up under tension of a spring at the back, and made contact with the two points, which had to be fixed above the pole-piece instead of below it. Unfortunately Fig. 1 does not show the relay in its altered con-

(Concluded in third column of next page)

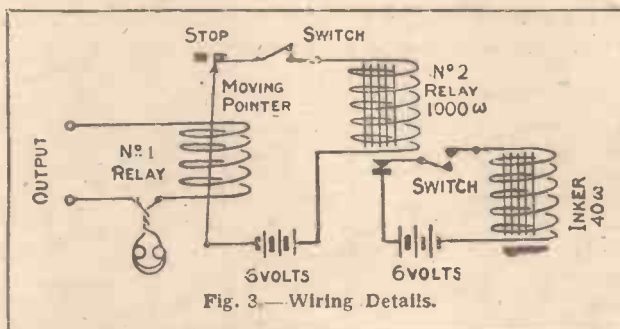


Fig. 3.—Wiring Details.

negative bias on the grid of the last valve, or by putting a small current across the moving coil in a reverse direction to that passing through it from the last valve. This current should be about 1 volt with 1,000 ohms in series. When the plate voltage of the last valve is high, as in a

FLEX CIRCUITS

By BOSPHOR PRONZ

FLEX circuits have evidently come to stay, and no home constructor can be considered quite abreast of the times if he does not possess an adequate knowledge of the theory and practice of these wonder circuits.

A few weeks ago I placed a large and cumbersome dictionary across the top of my high-tension battery, the idea being to impress upon my wander plugs the necessity for remaining in their appointed sockets. It has become a habit with me these days to consult my high-tension dictionary whenever I wish for enlightenment on some particular word used in wireless.

The Dictionary Habit

I am rather proud of this dictionary habit of mine. Other habits I have acquired in wireless have had nothing like the same pleasing effect. For example, I have been somewhat unfortunate over the common habit of touching the aerial terminal with a moistened finger. So often did I moisten the first finger of my right hand for the aerial terminal test that nature came to the rescue, and, in some unbelievable manner, I gradually acquired a permanently moistened finger. Useful as that finger is for the aerial terminal test and for fixing stamps to my correspondence, it is a source of great annoyance to me when, with reckless abandon, I don a boiled shirt and a clean collar in order to be suitably clad to eat a dinner for which I do not pay.

To return to this dictionary habit of mine. No sooner had I first come across the word flex in connection with wireless circuits, than I had taken my dictionary from off the high-tension battery and was hunting up the word. I actually found it under the f's, although I had a shrewd suspicion that it might have been found hiding amongst the ph's.

Happy Memories

Not only does my high-tension dictionary give the meanings of the words, but it gives the derivations. Flex, I found, is a word derived from the Latin word *flecto*, I bend. How the memories of my happy schoolboy days came back to me. *Flecto*, I bend; *flectis*, thou bendst; *flectit*, he bends, and you got it exactly where you were bending.

Thrusting from my mind those recollections of the occasions on which I flexed, I applied my newly-acquired knowledge to the word flex as used in wireless. A flex circuit, I reasoned, must be a bent circuit. Simple, is it not?

The oldest circuits in wireless are known to us as straight circuits. The newest circuits are known to us as bent circuits. Simple, is it not?

Wait a minute, though. Where is that

high-tension dictionary? We had better have a look at that word circuit, which we wireless men use so glibly. Here we are—circuit, a roundabout course which brings you back to where you started from. Exactly, just what it has done. If a circuit is a roundabout course which brings you back to where you started from, how can you have a *straight* circuit?

That's the worst of this dictionary habit. Sooner or later you are bound to run up against contradictory expressions. There's a tremendous need for a wireless dictionary which will not contain contradictory expressions. In the ideal non-contradictory wireless dictionary, if you turned up the word anode you would find a full explanation condensed in the one word plate, and if you turned up the word plate you would find a full explanation condensed in the one word anode. What a boon such a dictionary would be to us and how helpful it would be.

The Straight Circuit

To return to this wireless misnomer, the straight circuit. Let us see what the word straight means apart from straight. Dictionary again, please. Thank you. Here we are. S-t-r-a-i-t, a narrow neck of water, salt, fresh or soda. Something wrong here evidently. We're on the wrong wavelength. This is better. S-t-r-a-i-g-h-t, a word meaning *direct*, as, for example, in the phrase straight from the horse's input. Now we have it. A straight circuit must be a direct circuit—that is, a circuit which gives results directly or immediately. A flex or bent circuit, on the other hand, must be an indirect circuit—that is, a circuit which gives results indirectly or after a time or fashion.

Flex circuits, in spite of the many advantages they possess, suffer from one most serious disadvantage. They buzz. So naturally does the flex circuit buzz that many a novice in the use of such circuits has been seen standing over his flex set with a fly swotter in his hand.

This buzzing in a flex circuit is due to a variety of causes. Sometimes it may be directly attributed to facial distortion brought about by ear-flattening phones of low elasticity. At other times it is due to a leaky grid bias placed too near the flexure of the characteristic curve of the modulated oscillatory discharge.

In my own particular experience of the flex circuit, I found that the most troublesome buzzing came from valve vibration. Practically anything will set the valves of a flex set vibrating. The biggest vibratory nuisance that one can run up against in the use of a flex circuit is the domestic cat. My landlady's cat practically lived with me at the time I experimented with

flex circuits. I think the animal rather liked me. Whenever I got my flex set working well that idiotic cat would commence a high-frequency hind-leg attack on one of its ear-pieces. This would invariably set my set buzzing like a hive of angry wasps. Naturally I complained in the interests of science, but I was always told that the cat was the senior lodger in the house, and that it dated back to a time when there was no such thing as wireless. It looked it.

"IF YOU CAN'T READ MORSE—RECORD IT"

(continued from preceding page)

dition, but it is quite a simple matter to fix the two platinum points above the two arms of the pole-piece.

The E.M.F. required to work this second relay is about 6 volts, and since the resistance is so high the current consumed is negligible; however, a switch should be included in the circuit, for current is passing all the time that no messages are coming through.

Using 6 volts the pull on the pole-piece is fairly strong, therefore the spring may be tightened up and it will enable the pole to make efficient contact with the two points above; the amount of movement should be very small. No. 2 relay works the Morse inker direct; from 4 to 6 volts is the E.M.F. required.

The Morse Inker

Fig. 2 shows the side view of a Morse inking machine, of which there are many different kinds, but all possess the same features—that is, a large electromagnet which pulls down a lever, the other end of which, in the form of a disc, comes in contact with a tape.

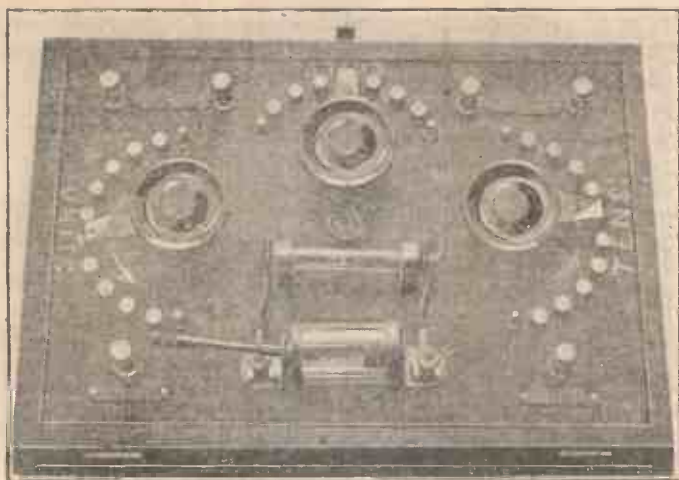
The disc rotates in ink and hence is never dry. An electric or clockwork motor feeds the tape through and the speed is regulated by a governor.

For fast Morse the speed of the tape must be increased, and this can be done easily by fastening down the arms of the governor. Red ink is very good and can be easily seen on the tape, although any ink which is clear comes out well.

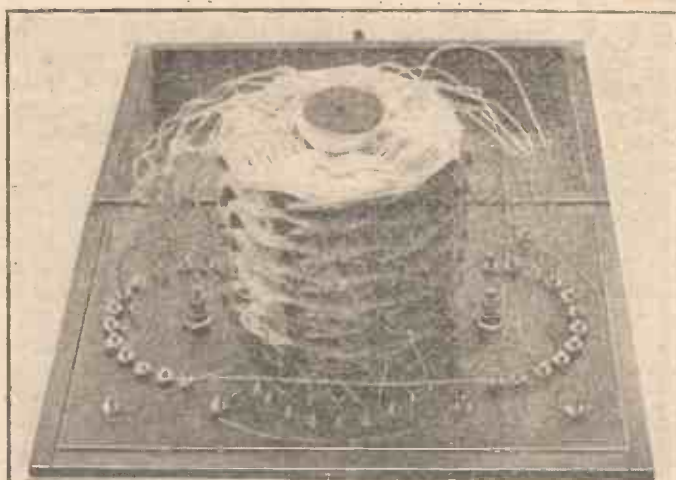
The stops controlling the lever arm should be carefully adjusted, so that when the arm is pulled down by the electromagnet the disc at the other end does not press on the tape so heavily as to prevent it being pulled through by the motor. A good sharp pull should be given by the electromagnet in order that the dots may be distinct.

Fig. 3 shows the wiring of the circuit with all values stated, and if everything is carefully followed out no difficulty should be experienced with the recording of Morse signals.

J. W. M.



View of Top of Panel.



Under Side of Panel.

AN ALL-RANGE CRYSTAL SET

THE big Chelmsford station with its wavelength of 1,600 metres makes the owner of the variometer-tuned crystal set realise the limitations of the range of his apparatus. The set about to be described has a wavelength of roughly 2,500 metres on the one side and low enough to receive London amateurs on the other. It gives good reception of 2 L O on an indoor aerial at fourteen miles, and Chelmsford comes in a little louder at a distance of over thirty miles as the crow flies.

Components

The set is fitted with both double and single crystals, as the writer has found that the catwhisker and hertzite, while being best on the shorter wavebands, is not so good on the higher. For the latter a combination of Gillingham and bornite is used. The following is a list of components required:

Mahogany box with lid, inside measurement 9 in. by 6 in. by 5 in., depth of lid inside 2 in.; ebonite panel 9 in. by 6 in. by $\frac{1}{4}$ in.; ebonite rod $1\frac{1}{4}$ in. in diameter by $4\frac{1}{2}$ in. long; three 40-in. lengths of

ebonite rod $\frac{1}{4}$ in. in diameter; one crystal detector and hertzite crystal; one double crystal detector; three switch-arms; thirty contact studs; six stop pins; six terminals; four name tabs; $\frac{1}{2}$ lb. of No. 26 d.c.c. wire.

Tuning Inductance

As will be seen from the photograph of the panel (back view), the tuning inductance consists of seven basket coils wound upon one holder, each spaced $\frac{1}{2}$ in. apart, and the whole secured to the panel by a nut.

Take the piece of ebonite which is $4\frac{1}{2}$ in. long, square up the ends, mark off the centre of one end and centre-punch. Now mark off seven lines round the circumference, commencing 1 in. from the end that is centre-punched and then every $\frac{1}{2}$ in. forward. Strike a line down the length of the rod, and with the dividers mark off the top and bottom lines into nine equal parts. Draw lines through the centres and then centre-punch. The rod will now be divided into seven rows equally spaced into nine divisions; the

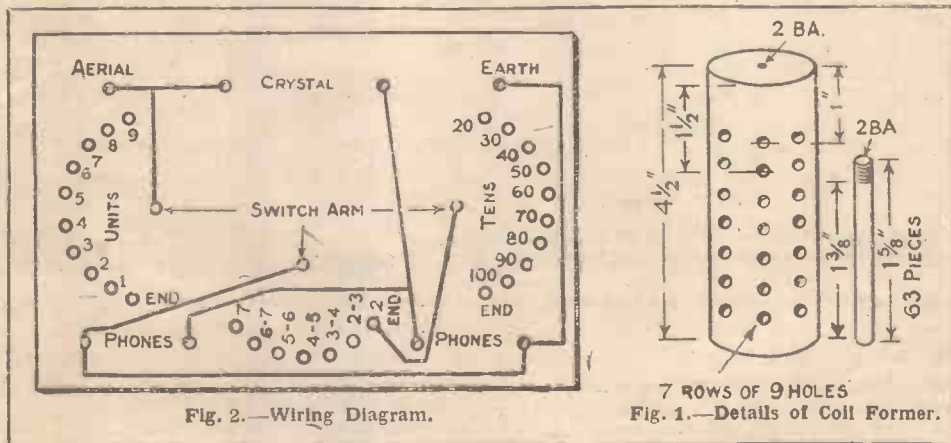
whole sixty-three holes can now be drilled with a $\frac{9}{64}$ -in. drill to a depth of about $\frac{1}{2}$ in. and tapped 2 B.A. The end marked off can be drilled and tapped 2 B.A. also and a piece of 2 B.A. rod screwed in, leaving about $\frac{1}{2}$ in. projecting for securing the holder to the panel.

Now take the 40-in. lengths of ebonite rod and cut off sixty-three pieces each $\frac{5}{8}$ in. long. Cut a thread on one end of each piece to the depth of $\frac{1}{4}$ in. (see Fig. 1). If stocks and dies are not at hand the holes for the spokes in the rod could be drilled $\frac{1}{8}$ in. and the spokes secured with a little Chatterton's compound. If this method is followed care should be taken to drill holes only to a depth of $\frac{1}{4}$ in. Fit nine of these pieces into the first row of holes in the rod 1 in. from the end. The holder is now ready for winding the first coil.

Winding

Drill a small hole in one of the spokes as near the inside as possible to receive the commencing end of wire and one hole at the outside end of the spoke for securing the end of the coil. Pass the wire through the inside hole, leaving about 8 in. for connections, and wind on until holder is full. Finish off, leaving about 8 in. for connections. Repeat this operation five times, taking care that all the coils are wound in the same direction.

The last coil to be wound is the tapped coil, and this consists of 110 turns wound in the same direction. Pass the wire through the hole at the inside of the spoke, leaving the usual amount for connections and wind on, making tappings by making a twisted loop at the 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th, 20th, 30th, 40th, 50th, 60th, 70th, 80th, 90th, 100th turns, finishing off at the 110th turn. The tappings should be made to follow the



7 ROWS OF 9 HOLES
Fig. 1.—Details of Coil Former.

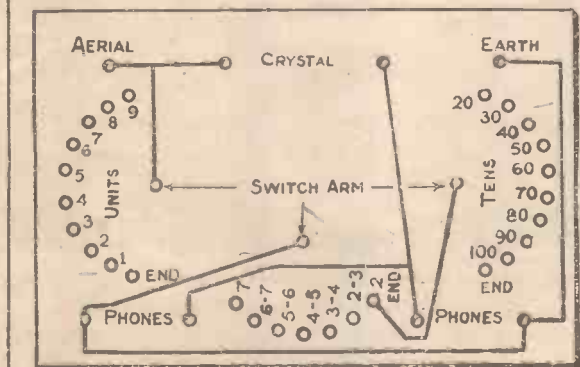


Fig. 2.—Wiring Diagram.

same direction as the studs to which they are to be connected.

Connecting Up the Coils

As will be seen from the wiring diagram (Fig. 2), the first or tapped coil is connected as follows:

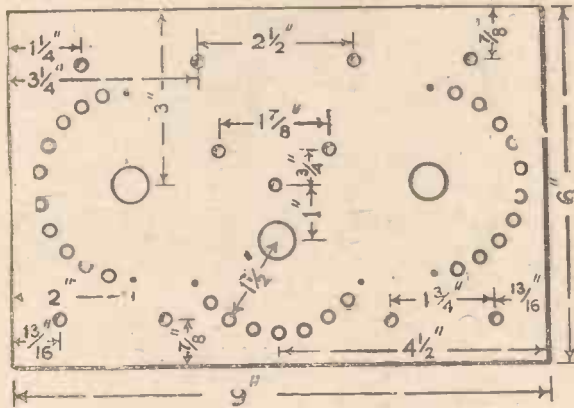


Fig. 3.—Lay-out, of Panel.

The inside end of the coil is taken to the first stud of the unit switch, the single tappings following on in rotation, the first tapping of 10 turns (the 20th turn) is secured at the first stud of the tens switch, each following on in order. The end is fixed to the last stud on the tens switch.

The inside end of the next coil is connected to the first stud on the coil switch, commencing at the end nearest to the tens switch and following on in the same direction. The outside end of the second coil and the inside of the third coil are looped together and connected to the second stud.

The outside end of the third to the inside of the fourth to the third stud. The outside of the fourth and the inside of the fifth to the fourth stud. The outside of the fifth and the inside of the sixth to the fifth stud. The outside of the sixth and the inside of the seventh to the sixth stud. The end of the seventh coil to the seventh stud. All the coils are now connected up in series and there will be no "dead-end" effects, as the portion or coils not in use are short-circuited. Mark off the panel to the dimensions given in Fig. 3, of course

allowing for any variations in the sizes of the components used. Make sure that all points are marked off correctly, as one misplaced hole will spoil the appearance of the whole panel. Having got all the centres marked correctly, drill with a 1/8-in. drill. This size will be right

for the terminals, switch-studs and stops and for the crystal detector, and will serve as pilot holes for the switch-arm bushes; these can be drilled out to suit.

Positions should now be marked off for the name tabs and holes drilled to take small brass rivets by which the tabs are attached to the panel. Next fit in the switch studs.

The other components may now be mounted.

Wiring the Set

All wiring possible should be done before the coil is fitted to the panel, as it is then more accessible. No difficulty should be met with if the wiring diagram, Fig. 2 is carefully followed. It will be seen that only the single crystal is connected directly in the circuit; the double crystal connections are made on the top of the panel to the single crystal detector. When it is desired to use the double crystal the catwhisker is lifted, thus leaving the double crystal in action. All wiring connections should be soldered. This is not shown in the photographs as the panel was only roughly wired. A few turns of wire will be noticed on the bottom of the coil holder. These were there owing to insufficient room having been allowed, but this is allowed for in the dimensions given. E. E. H.

HOW NOT TO DO IT

HAVE you ever noticed when you have invited friends to your house to listen-in how frequently it happens that your set lets you down? In preparation of a demonstration by which you hope to impress your friends with the wonderful selectivity of your receiver, you may have held one or two perfectly successful dress rehearsals, but as soon as your audience has been ready to enjoy the concert nothing went right. Whether this is due to neglect or nervousness on your part, or merely to the general cussedness of things, is sometimes difficult to establish; but the fact remains that what one can achieve in solitude is frequently a ghastly failure in public.

Careful Preparation

Whenever the writer has given "wireless hospitality" to friends he has made it a rule to tune in carefully in advance to one particular station. The receiving set may be quite capable of doing all that is asked of it, but to tune in different stations in rotation requires patience and care. The bulk of amateurs will agree that this cannot be done successfully in a room full of impatient listeners beguiling the time with cross-talk. All sympathy goes out to the man, who is not strong enough to resist sundry invitations such as: "Let's get to Berlin or Stockholm,

Newcastle, Madrid, Leipzig, Paris and Prague."

The writer has in mind one or two evenings spent with a friend who boasted a five-valve receiver, which in his opinion placed the whole of Europe within his grasp. We would all be comfortably listening to an excellent transmission of a song, say, from 2 LO when he would feverishly twiddle the condenser knobs, change coils rapidly, and take us a couple of hundred miles or so farther away. A few minutes would be required to tune in more or less correctly, and by that

time we usually got the closing sentences of a talk or the last bars of some dance music. Rapidly resuming operations, this friend would seek another wave, and jumping from one station to another never gave us one complete item. In most cases either tuning or signal strength were not to his liking—nor were they to ours—and the result was that his constant play with coils, condensers, rheostats and coil couplings (to the accompaniment of ether-rendering howls) harrowed everyone's nerves and spoilt what might otherwise have been an enjoyable entertainment.

Finishing Touches

It is wiser to leave the finishing touches to the end of an item, or to tune in on the speaker's announcement of the next number. This method does not spoil other people's enjoyment. If the concerts received are for the benefit of the entire family, it is selfish to use the transmissions for the sake of experiments. There are some evenings on which the programmes may not be to one's liking, and these should be chosen for the trial of new circuits.

The average amateur feels, no doubt, that once he has "felt his feet" in wireless he is bound to seek pastures new. The desire is quite a laudable one, but should first be practised in solitude. J. G. A.



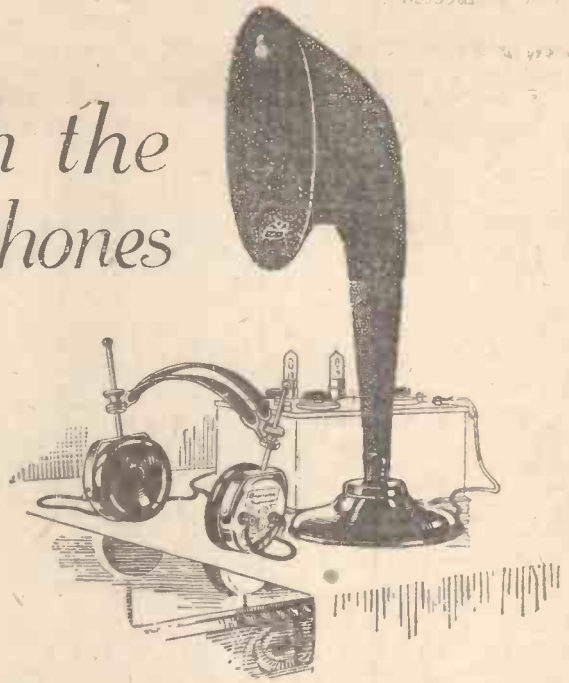
The day of the "freak" set has not passed. Here is a receiver in a matchbox.

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



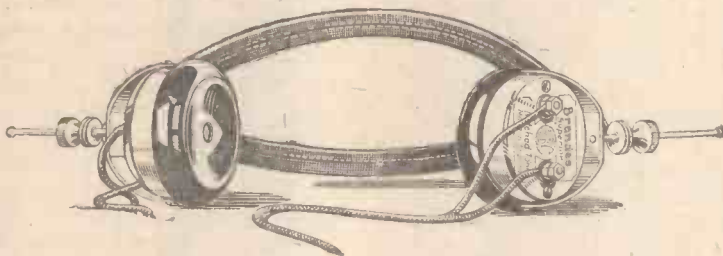
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All Brandes products carry our official money-back guarantee, enabling you to return them within 10 days if dissatisfied.

The *Table-Talker* is a Brandes quality product at a moderate price. The non-resonant, specially constructed horn is matched to the unit so that the air resistance produced will exactly balance the mechanical power of the diaphragm. This means beautiful sound-balance and remarkable tone qualities. It is twenty-one inches high, has a self-adjusting diaphragm and is finished a shade of neutral brown ... **42/-**



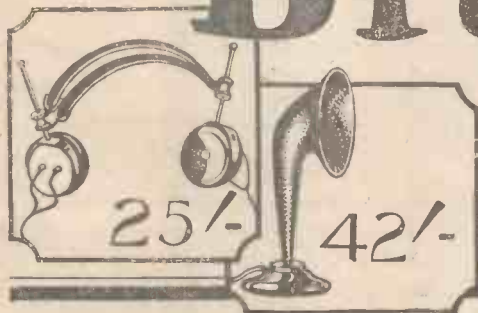
The "Matched Tone" feature means that both your ears hear exactly the same sound at the same instant—and you learn a new beauty of tone. They are tested and re-tested for just this one vital point, and in addition their strength, long-wearing comfort and reliable efficiency make them undoubtedly superior ... **25/-**

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Experience

The name
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Yesterday

—the explorer braved hardships to chart the seas.

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W.1. (For Detector and L.F. use).
Operating at 1.8 volts ... 21/-
W.2. (With red top) for H.F. use.
Operating at 1.8 volts 21/-
Types W.R.1 and W.R.2 as
above but with resistance incor-
porated in base to operate off 2,
4 or 6-volt accumulator 23/6

The Wuncell is fully described in a comprehensive Folder which will be sent post free to any experimenter on receipt of a postcard. Don't invest in a Dull Emitter Valve until you have read about the Wuncell.

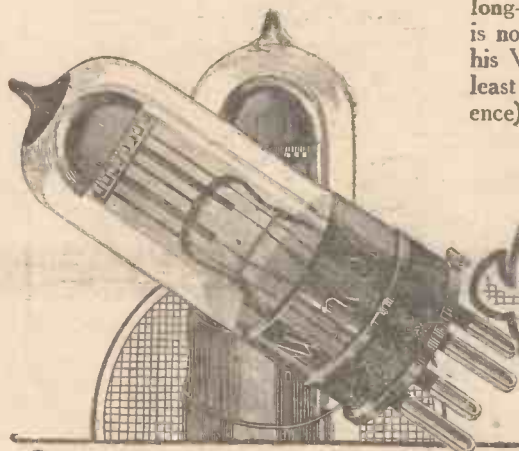
WHILE the explorer of long ago had to set sail and face almost incredible hardships in his praiseworthy efforts to chart the globe, his successor sits by the fireside and logs Foreign Broadcasting Stations with almost absurd ease. From America to the borders of Russia and from Scandinavia to the shores of the Mediterranean the ether is available for his exploration.

But the man who is enthusiastic over long-distance reception will see that he is not handicapped either by his Set or his Valves. His Set should employ at least one stage (and two for preference) of high-frequency amplification,

and for his Valves he should use those which have been specially developed for the work

Undoubtedly the most popular high-frequency amplifier to-day is the Cossor P2—the Valve with the red top. Hundreds of thousands of these Valves are in use at this moment among all grades of wireless enthusiasts—from the expert to the novice—and everywhere it is giving the most complete satisfaction.

Its striking success is undoubtedly due to its design. As every wireless enthusiast knows, the working of a Valve depends upon the correct use being



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Get Cossor Valves—they cost no more

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To-day

—he charts the ether from the comfort of his fireside.

made of its electron emission. You must have noticed that when your accumulator begins to fail and the filaments of your Valves grow dim that your Set falls off in sensitiveness and volume. A clear case that the emission from the filaments has decreased.

Obviously, therefore, the quantity of the electron emission is an important factor in Valve efficiency.

Now compare the Cossor P2 with an ordinary Valve. Instead of a hood-shaped Anode and Grid totally enclosing an arched filament and almost completely entrapping its electron

stream, we see that at each end of the tubular Anode the filament is exposed and that a large proportion of the electron stream is obviously leaking away.

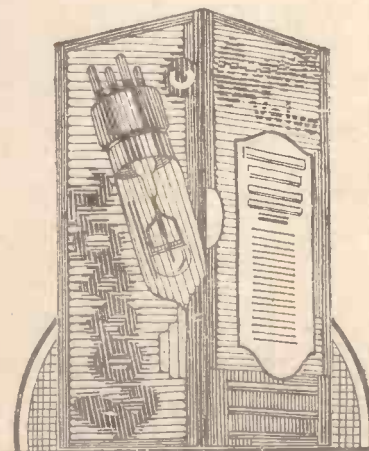
Remember that for high-frequency use you cannot afford to risk efficiency—feeble oscillations from Stations thousands of miles away will strike your aerial and you'll be none the wiser if your Valves are not sensitive to them.

The remedy is in your hands—for high-frequency use select the Valve specially developed for the purpose and chosen by the vast majority of Valve users in this country—the wonderful Cossor P2.

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P1 For Detector and Low-Frequency use 12/6
 P2 (with red top). For H.F. use only 12/6

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Valves

but what a difference in results!



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THE Smith demands the highest degree of accuracy from his steam hammer.

It must respond instantly, and deliver a giant blow of twelve tons or a light tap barely sufficient to crack a watch-glass, and it must never make a mistake.

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You should see that no component finds its way into your wireless set unless you can feel entire confidence in it.

Eighty per cent. of the complete set manufacturers in Britain as well as thousands of experimenters employ Dubilier Condensers and Resistances in their sets.

They know that a product bearing the name Dubilier can be trusted implicitly to do what is expected of it, and they count the few extra pence spent on it a sound insurance against disappointment.

YOU should specify Dubilier.

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On Your Wavelength!

New Zealand

QUITE a number of amateurs have luckily been able to pick up New Zealand transmissions. The reason probably why more people have not reported New Zealand reception is that many of those who listen on the short waves cannot read Morse. The signals appear to come through very strongly indeed, and anyone who has a set designed for working with KDKA and other short-wave broadcasting stations has an excellent chance of hearing one or more of the New Zealand amateurs if he cares to sit up very late or to rise very early.

Talking of KDKA, any enthusiast who cares to take any trouble in building a set should be able to get him. On these very high frequencies it is of little or no use to employ high-frequency amplification—in fact H.F. stages are quite unnecessary, for the signals come in at quite good strength on a detector valve followed by a note magnifier. Several firms now make efficient inductances specially designed for short-wave work, and with these the task is not at all difficult for the average experimenter. It must not be expected that the set will be as easy to control or that tuning will be as simple as, for example, when on the ordinary broadcast band. A .0003-microfarad variable condenser is quite big enough to place across the secondary circuit, and even here a vernier condenser in parallel will be an advantage.

Hand-capacity effects, by the way, are apt to be rather bad, so that it is almost essential to have extension handles for the various controls. KDKA is well worth going for, for his is quite the most reliable of the Transatlantic transmissions. For some reason not too well understood the fading which one finds on WGY and other stations using the normal broadcast band hardly occurs at all when you get down to the short waves.

Far-fetched Programmes

I have been asking a lot of people of all kinds lately whether they care about what I call the "far-fetched" programme. By this I mean the sort of evening in which you are asked to imagine yourself in the gondola of a Zeppelin cruising over the Atlantic, whilst the captain, the crew, the cabin boy and the stewards burst in the most unexpected way into song or dialogue from moment to moment. I can call to mind two such programmes, both of which, I must confess, bored both me and all of those to whom I have spoken absolutely stiff. One was an evening in a Welsh farmhouse arranged some time ago at Cardiff and S.B. from London. The other demanded that the listener should fancy himself on the deck of a man-of-war of

the most unconventional kind cruising in the Channel. In both cases I tuned to 1,780 metres and imagined myself in Paris.

With all due respect to those who organise programmes, I do not think that this kind of thing is wanted. What the average listener most enjoys is a straightforward programme consisting of musical items interspersed with light turns. I have talked to scores of people on this point and have not yet found one vote given in favour of the far-fetched.

Radio Iberica

Quite a lot of friends tell me that they have not yet got hold of Radio Iberica, the splendid Madrid broadcasting station. In most cases it is simply because they have not tried, and that means that they are missing a good deal. I think that this transmission is, so far as quality goes, the finest that I have ever heard. Even at the respectable distance of 750 miles it is so absolutely free from any kind of distortion that every syllable spoken by the announcer comes through perfectly distinctly. A Spanish-speaking friend who listened to my loud-speaker the other evening was able to follow every word. Even if you do not know Spanish you can understand a good deal. A single-valve set will bring in Madrid excellently at good headphone strength, and on a three-valver you can often get him on the loud-speaker.

The Jamming Question

I have been rather interested in the answer returned by some people to those who complain that they cannot separate Radio-Paris and 5XX. Those who complain are told as a rule that the fault lies in the lack of selectivity in their receiving sets. The other night I made a few rather interesting experiments. In the first place, I switched on with aerial and earth attached but with no coils of any kind in any of the holders of the set. Chelmsford came in quite strongly on the loud-speaker. Next I rigged up a set consisting of two tuned-anode coupled high-frequency stages and a rectifier. I tuned this carefully to 2,600 metres to get FL's transmission. With a single circuit tuner the Eiffel Tower's dots and dashes were accompanied by a musical selection from 5XX, who was thus audible 1,000 metres above his wavelength on a circuit that is pretty selective. I should mention that this is a very special circuit, using coils wound with thick wire and with no damping introduced by potentiometer or otherwise. There should be no lack of selectivity here.

Next I converted the single-circuit tuner into a loose-coupled one and tuned to 1,780 metres. By using the loosest coupling possible I was able after a good deal

of bother to get Radio-Paris strongly, with 5XX almost suppressed. Though he did not interfere much when anything was coming through from Radio-Paris, he was distinctly audible during the short intervals between items. This should, I think, dispose of the idea that lack of selectivity is responsible for failure to separate the two stations. If you can find anything more selective than a set with loose coupling, with all possible damping eliminated and with two tuned H.F. circuits, I would like to know what it is. 5XX's power is, I think, so great that he sets our aerials vibrating in much the same way as an atmospheric does and so comes in audibly over an enormously wide band.

Second Station for London?

I see that it is suggested that London should have two main broadcasting stations in future. This is, I think, an excellent idea, especially if both of them are up to the standard of our present 2LO. After all, London probably serves three or four times as many listeners as any of the other broadcasting centres. I have seen a good many of the towns in which the main stations are situated, and I do not know one in which the aerial forest sprouts so luxuriantly as it does in and around London. The idea of having the second station would be, I imagine, to send out two programmes of entirely different kinds so that both local listeners and the relay stations could take their pick. I have often thought that this sort of thing would have to come, since tastes differ so much.

I am quite sure that if the second station is opened and if we do get, say, a high-brow programme from one and a low-brow show from the other the army of listeners will be enormously increased. The only difficulty that I can foresee is that it will be rather hard to fit two powerful stations into the limits of the present broadcasting waveband. As it is, many enthusiasts living in London complain that they can get nothing else, except perhaps Aberdeen, when 2LO is working. If we imagine 2LO senior working on 500 metres and 2LO junior on 300 there will, I think, be many people who can get nothing but one or the other of the two, and quite a number who will get both at once. However, the B.B.C.'s skilled men will doubtless devise some means of overcoming this difficulty as they have overcome difficulties in the past.

A Short-wave Set

In view of the increasing use of the shorter waves I recently built a simple "short-waver," which performs exactly as I could wish. Apart, perhaps, from a

On Your Wavelength! (continued)

super-heterodyne receiver, I do not think that any set will give greater satisfaction for the reception of C.W. and telephony than an ordinary two-valve set consisting of an anti-capacity detector valve and one stage of audio-frequency amplification with a straight circuit and reaction on the aerial. The values of the coils are somewhat exacting, of course, and stray capacities in the leads are to be avoided "like the plague," but for a novice like myself such a set does all that is asked of it and it is certainly simple to construct and manipulate. "Trick" circuits are all very well when the novice has got used to the strange antics of the short waves, but until then they are best left alone.

A heterodyne wavemeter is also a valuable and almost indispensable adjunct for working these waves satisfactorily, and can, of course, be made for a very few shillings and a little patience. The only drawback is that separate L.T. accumulators are necessary for this instrument, otherwise if the wavemeter is fed off the same set of accumulators as the receiver slight variations in tuning the wavemeter will vary the tuning of the receiver—at least, so I find.

Those H.T. Batteries

I referred recently to the minute current capacity of the standard H.T. batteries at present on the market. Since then this has been forcibly brought home to me by the fact that a 66-volt battery made by a reputable firm, which gave a full 66-volt potential a fortnight ago, can now only show a voltage of 60 volts in spite of the fact that it has only been used on two valves! So owners of multi-valve sets should choose their batteries with an eye to their size as well as their price, and even this is not always a guide, for I have come across one (of foreign make) which was one-third full of sawdust packing!

Sleight of Hand

A neat little trick has been worked on a dealer friend of mine. A customer called, and after inquiring about R valves and having handled them, left with two valves, for which he paid. My friend, after he had left, had reason to believe that he had placed the stock valves in the wrong wrappers, and on opening the boxes in order to ascertain whether or not this was the case was astounded to perceive that the genial customer had substituted two "dud" valves for the new ones and had taken not two new ones, but four, though he had only paid for two!

More "Legalities"

I see that a London stalwart has announced his determination not to pay the ordinary receiving licence fee, and is apparently prepared to defend his views

against the P.M.G. in court if necessary. His contention is that under the Wireless Telegraphy Act no licence is required for mere *reception* as distinct from *transmission*, because of the following passage:

"Provided that nothing in this Act shall prevent any person from making or using electrical apparatus for actuating machinery or for any purpose other than the *transmission* of messages."

I remember the same point was raised by a daily newspaper about eighteen months ago, accompanied by some rather extravagant statements concerning the position of the P.M.G. and B.B.C. with regard to licence fees already paid, if this passage could properly be interpreted at its face value.

The point was put by "A.W." at the time to a legal authority, who pointed out that this particular passage was simply a proviso to sub-section 7 of the Act, and was merely intended to exempt (from the P.M.G.'s general monopoly) apparatus of the same general nature as that used in wireless, when it was in fact used for a different purpose, such as for automatically controlling machinery, or for medical treatment by high-frequency currents.

A Cheap Service

The opening clause of the Act in question is the one that essentially governs the whole situation. This states that "a person shall not establish any wireless telegraph station or *install or work any apparatus for wireless telegraphy* in any place . . . except under and in accordance with a licence granted in that behalf by the Postmaster-General."

As wireless telegraphy is defined in the Act to cover any system of wireless communication, and as the phrase "working any apparatus" obviously covers the process of reception, I am afraid that any litigant will stand a poor chance of upsetting the present generally accepted position with regard to receiving licences. Quite apart from mere technical quibbles of this kind, I imagine there are very few listeners who consider ten shillings a year too much to pay for the services now being given by the B.B.C. I have just re-read the stalwart's letter, and cannot escape the conviction that had he mixed a little more courtesy with his courage (in writing) his letter would have deserved more attention but would have escaped perhaps some of the flaring publicity which it has received but scarcely deserved.

Lucky Dip Programmes

I always like the "round-the-stations" programmes from 2 L O. There is something very interesting in never knowing what is coming next, and a further point is that if you are using a crystal set it enables you to become acquainted with other stations besides your own. Per-

sonally I would like to see the lucky dip principle adopted more often, for I always think that happy-go-lucky evenings come as a very welcome change from the set programmes. Our broadcasting programmes, by the way, are becoming every day and in every way better and better. I do not think that there can be very many complaints about them now, for all tastes are catered for in the most wonderful way. We have got to remember, though, that what is one man's meat is another man's poison. There are certain items the very announcement of which makes me leap from my chair and dash for the switch.

Loud-speaker Use and Abuse

A great number of people have the idea that the loud-speaker must necessarily produce distortion. At this I am not really surprised, for the demonstrations given in wireless shops are usually so appalling that a person hearing one of them would go away with the idea that a wireless set was not a desirable possession for anyone with a musical ear. Recently I visited the showrooms of five well-known firms in London, and in every case the loud-speakers were blaring forth the most ghastly sounds. Demonstrators seem to have the idea that mere noise is the thing to be desired above all others.

The Home-made Supply

Speaking generally, we are a nation of grumblers, and there is not a trade or a profession which does not grumble at the lack of appreciation shown by the public. The British composer, however, though the loudest, has really little cause to complain, especially since the era of broadcasting. Judging from some of the examples I have had lately, I consider that unfair advantage is being taken of us listeners-in, who cannot punctuate our objections with the time-honoured hiss or boo.

I am sure I am not the only one who has had a surfeit of Elizabethan music. Mind, I am not blaming the Virgin Queen for that, but although milk and water is an admirable diet, still one likes a little cake occasionally.

Sunday Programmes

The Sunday programme still continues to be a grave difficulty with most stations, but 2 L O may be commended for the one which included the J. H. Squire Octet, with Mayer Gordon as violinist. On this brilliant player may literally be said the mantle of Wieniawski has fallen, for I know of no other violinist who plays this virtuoso's music so well. Later the same day we had Miss Nellic Norway, the bell expert. Most of us remember her at Maskelyne and Devant's, and it is good to know that she is going to appear there again, as well as, let us hope, broadcast frequently.

THERMION.

CRYSTAL TALKS.—III

TUNING INDUCTANCES

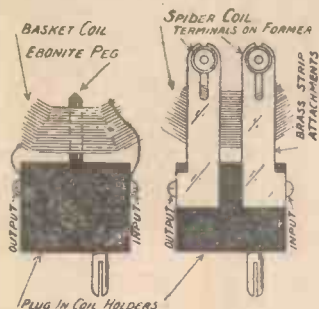


Fig. 2.—Methods of Mounting Coils.

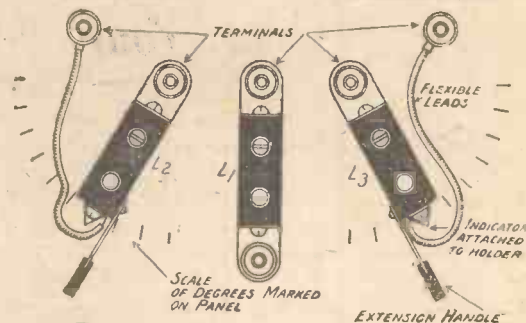


Fig. 3.—Simple Tuning Arrangement.

A VERY important factor in all wireless receivers is the tuning arrangement employed. Almost anyone can make a simple crystal receiver, but it is quite another matter to choose a design which is not only simple but efficient. A little ingenuity will result in making a set very selective and a thing of interest. A constructor will often tire of a set because, having used it some little while, it offers no further attractions simply because it has its limits. On the other hand, a receiver which offers many interesting forms of experiment is a thing of more lasting joy.

Gauge of Wire

Let us first consider a few practical details. To obtain the best results from most receivers wire of a coarse gauge is used, especially for short-wave reception. The most popular gauge is No. 22 S.W.G. A coarser wire, say No. 18 S.W.G., will often give even better results, but it is usually ruled out by reason of the fact that it occupies a considerable amount of space and is somewhat difficult to wind satisfactorily. For most of our experiments we will therefore choose No. 22 S.W.G.

The next point of consideration is the insulation. This is a matter which varies in importance, according to the type of inductance to be made. Enamelled wire is highly favourable for those inductances which are operated by means of a sliding contact. Double-cotton-covered (d.c.c.) wire is useful for most practical purposes and is most favoured. Many constructors erroneously make a point of shellacking the cotton covering after they have wound a coil; this should not be done unless absolutely unavoidable, owing to capacity effects. Single- or double-silk-covered (s.s.c. or d.s.c.) wire is, of course, a luxury which is hardly necessary as a rule to the experimenter. In most instances d.c.c. wire will be found the best for practical use.

Types of Inductance

The most common type of inductance is a cylindrical cardboard former, around which a given number of turns are wound. The former could be square or even flat, but the greatest degree of efficiency is obtained from the cylindrical type. This type of inductance may be tuned to the desired value in two ways: (1) by means

of a sliding contact, or (2) by means of tappings which are taken from the winding itself at convenient intervals and thence to contact studs. The tapped coil is usually of the most practical use. Next we may consider basket or spider coils.

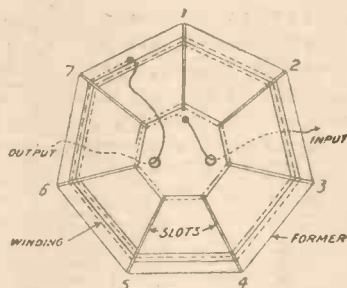


Fig. 1.—Basket-coil Former.

Tuning can be effected with these by means of relative movements of the coils.

Basket coils are in the writer's opinion the best of all for experimental work. The variometer, while thoroughly satisfactory in use, does not lend itself to such a varied number of purposes. Lastly, there are

duolateral coils and pile-wound coils, which are useful for loading purposes when working on long wavelength ranges. The type of coil which is best for all purposes is one which can be plugged into the receiver and not one which is embodied in the instrument itself. With plug-in coils one may experiment on all wavelengths and try out several arrangements.

Basket coils may be purchased or made as desired. If purchased a waxless type should be chosen. Spider coils may be made on cardboard or ebonite formers cut as shown in Fig. 1. The diagram shows also how the wire is wound upon the former. The next point to consider is the plug-in adaptor. The complete coils may be simply made by purchasing a set of plain coil plugs and attaching the basket or spider coils to them, as shown in the two examples given in Fig. 2. Further coil plugs will be required to attach to the receiver.

Perhaps the simplest and best method of tuning two or more plug-in coils is shown in Fig. 3. RADIO.

TESTING FOR PHONE FAULTS

PERHAPS the most common failure of a pair of phones is that due to the diaphragm touching the pole-pieces of the magnet. This can be brought about in phones which have thin and frail outer cases by knocking or dropping them. The air gap between the pole-pieces and the diaphragm is adjusted by placing paper or metal washers under the diaphragm, or in the better class of phones by a milled adjusting screw on the back.

The best method of testing the air gap between the diaphragm and the pole-pieces is to tap lightly the diaphragm with the little finger nail when, if the diaphragm is off, the sound will be loud and hollow, and if touching the sound will be faint and solid. By this means the diaphragm may be adjusted to be as close as possible without actually touching.

Phones that are used for valve sets should be connected up so that the diaphragm is drawn towards the pole-pieces

by the current that is passing, otherwise the current will tend to demagnetise the permanent magnets.

To test which are the positive and negative leads, the general practice is to pick up nails or bits of iron wire with the pole-pieces and connect the telephone leads to a flashlamp battery; wrong connection will cause some of the nails to drop off.

A better method is to remove the ear cap, leaving the diaphragm with its washers on the case, retained in place by the magnetic attraction.

Place the phone under a light so that the reflection of the light can be seen in the middle of the diaphragm. Connect the phone leads to a 4-volt battery and if the connection is correct the image of the light will be seen to enlarge owing to the increase of concavity of the diaphragm due to the attraction. If the image decreases, the diaphragm is being repelled and the connections are incorrect. W. P. W.

MEASURING THE STRENGTH OF RECEPTION

A USEFUL piece of apparatus for the experimenter's table is a simple audibility meter. With such an instrument permanently attached to the telephone terminals of the set it is only a moment's work to obtain and enter in one's log a fairly reliable record of signal strength. In this way the efficiencies of various circuits or components can be compared. The instrument described in this article can be easily made and is well worth the small trouble entailed.

The Principle

The method employed is to put, as a shunt across the phones, a variable resistance, which is graduated to read the signal strengths instead of the resistances. The resistance is varied by moving a switch arm over a series of contact studs, decreasing the resistance in shunt until the signals are only just audible. The formula to calculate the approximate signal strength is $\text{Strength} = \frac{\text{Resistance of shunt} + \text{Resistance of phones}}{\text{Resistance of shunt}}$

Thus with 4,000-ohm phones, supposing that the signals are just audible when a resistance of 200 ohms is in the shunt circuit, the strength of the original signals would be $\frac{200 + 4,000}{200} = 21$.

It is necessary to state that the method is not capable of great accuracy and only gives comparative results. The actual figure obtained varies according to the keenness of the observer's ear, the sensitivity of the phones, and also the degree of silence obtaining in the room. If, however, the same observer, working with the same phones, under similar conditions of silence, compiles a record of signal strengths, his results will have considerable value.

Materials

A piece of ebonite about 5 in. square; switch spindle, arm and knob; fourteen contact studs; two terminals; bare tinned-copper wire; a short length of flex; some insulated resistance wire. The quantity of resistance wire required depends upon the resistance of the wire and can be estimated later. It is necessary to know the resistance per foot of the wire, and this can be obtained from the dealer when buying the wire.

The wiring diagram of the instrument is given in Fig. 1. This shows the fourteen contact studs and the connections for the series of resistances. The contact arm is shown on stud 3, the resistance in shunt is the sum of the three resistances R1, R2 and R3. The signal strength is 2,000.

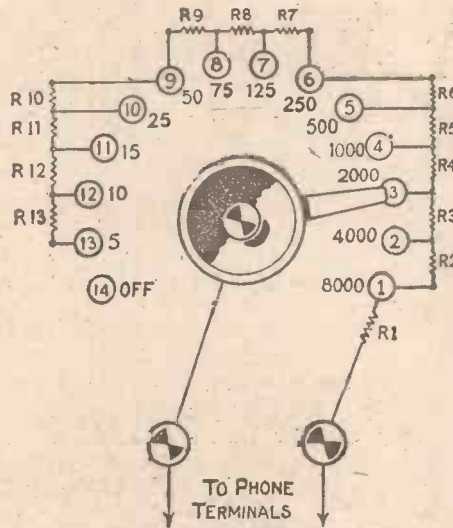


Fig. 1.—Wiring Diagram.

To arrive at the value of the sections of the resistance needed, the following table should be completed:

Signal Strength	Total Shunt in Ohms	Resistances of Sections	Length of Wire for each Section
5	1,000	$R_{13} = 556$ ohms.	$r_{13} = \frac{556}{x} = \text{ft.}$
10	444	$R_{12} = 159$ "	$r_{12} = \frac{159}{x} = \text{"}$
15	285	$R_{11} = 119$ "	$r_{11} = \text{etc.}$
25	166	$R_{10} = 84$ "	
50	82	$R_9 = 28$ "	
75	54	$R_8 = 22$ "	
125	32	$R_7 = 16$ "	
250	16	$R_6 = 8$ "	
500	8	$R_5 = 4$ "	
1,000	4	$R_4 = 2$ "	
2,000	2	$R_3 = 1$ "	
4,000	1	$R_2 = \frac{1}{2}$ "	
8,000	$\frac{1}{2}$	$R_1 = \frac{1}{2}$ "	

Total = ft. (which is the amount of wire required).

Operation

The table is compiled as follows: First

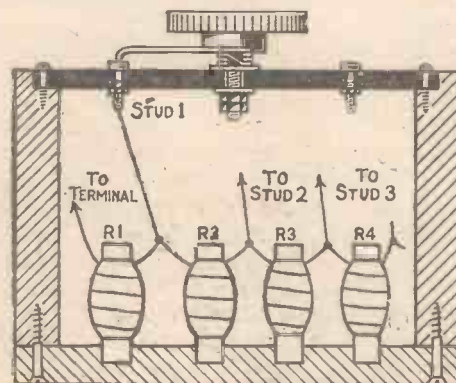


Fig. 2.—Section of Audibility Meter

choose a range of signal strengths to suit your requirements. The one given covers weak crystal reception to moderate loud-speaker strength. The signal strengths chosen are entered in the first column.

The second column contains the resistances required in the shunt circuit approximate to the signal strengths of column one. These are calculated from the formula given earlier in the article.

The third column gives the value of each of the component resistances as numbered in the wiring diagram.

In column four the length of wire required should be calculated and entered as shown. The total of these lengths gives the amount of wire to purchase. The letter *x* is the resistance in ohms of 1 ft. of the wire used.

Assembly

Fig. 2 shows how the instrument may be assembled. The actual method of making the containing-box is immaterial. The ebonite should be marked out and drilled to take the switch spindle, contact studs and terminals.

To make up the thirteen resistances, cut off the required lengths of wire. Take each length and double it on its centre point into a loop, then wrap it round a wooden peg about 1½ in. long and, say, ½ in. in diameter, starting with the loop end. Bind the coil to the peg by wrapping with insulating tape, leaving the two free ends projecting for soldering. On each coil as completed mark its number R1, R2, R3, etc. Mount the thirteen coils on the base of the box by gluing them into suitable-sized holes and arranging them in order of size. The wire is doubled in each coil to avoid self-induction, which adds to its effective resistance (impedance) when used with alternating or fluctuating currents.

Solder a lead of copper wire to one terminal and to one end of R1. The other end of R1 is soldered to one end of R2, and a lead is taken from this joint to stud 1. The other end of R2 is joined to one end of R3 and this joint is connected to stud 2. Continue in this way according to Fig. 1.

Stud 14 has no connection. When the switch arm is on this stud the instrument is cut out and the set works normally. A piece of flex wire from the switch spindle to the remaining terminal completes the wiring. Screw up the box, and attach a neat label on which is printed the appropriate signal strength near to each stud. The instrument is then ready for use.

W. S.

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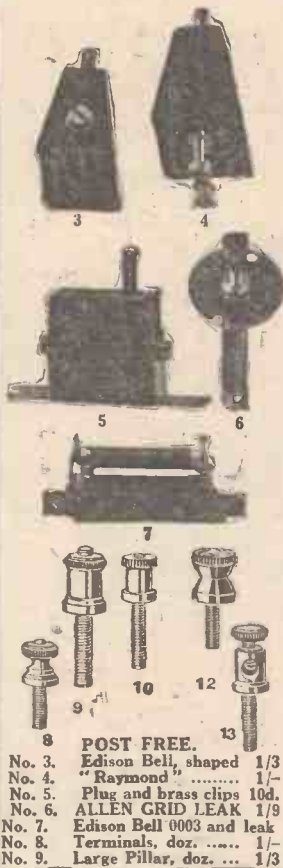
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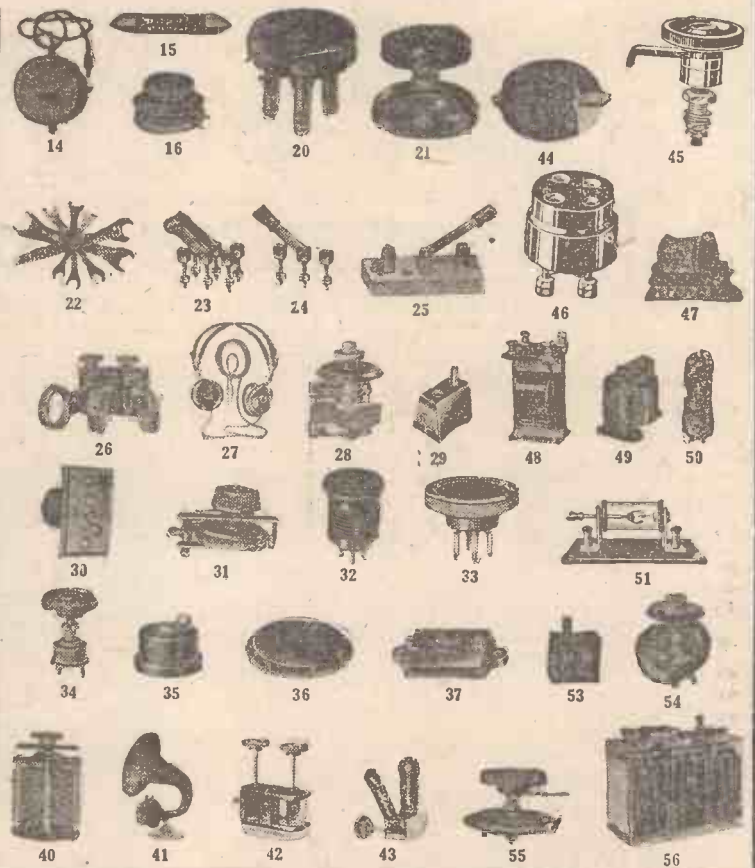


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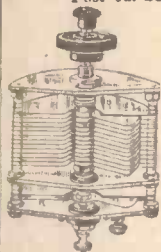
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- Ditto with wrench... 2/11
- Seven Twist Drills... 1/4
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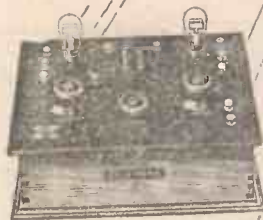
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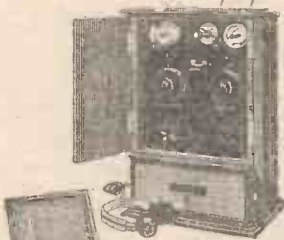
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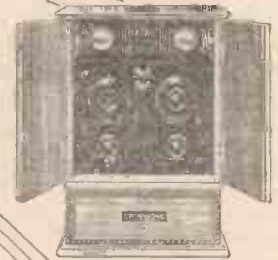
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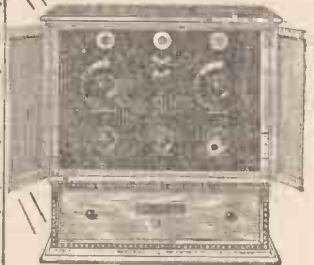
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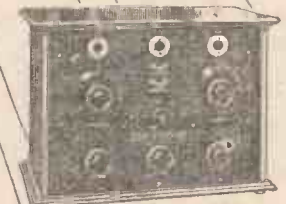
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THE THOUSAND-CIRCUIT BOARD.—VI

MAKING THE COMPONENTS



Fig. 19.—Coil Holder.

It remains now to make up various fittings for the thousand-circuit receiver. By doing so we shall be able to save ourselves a good deal of money. First comes the question of inductance coil holders. If you intend to use inductances fitted with standard plug-and-socket contacts I would recommend you to purchase a two-coil

Upon the panel of the set fix two telephone or push-in terminals as shown in the drawing (Fig. 21). The holes through them may have to be enlarged a little in order to allow the 4 B.A. studding to pass easily. There is, of course, no need to insulate these terminals by bushing them, for there is no contact between them and the coil mounting in the holder. On to the 3½-in. end of the studding place, in this order, a nut, a second nut, a flat washer, a spring washer and a second flat washer, running them down almost to the

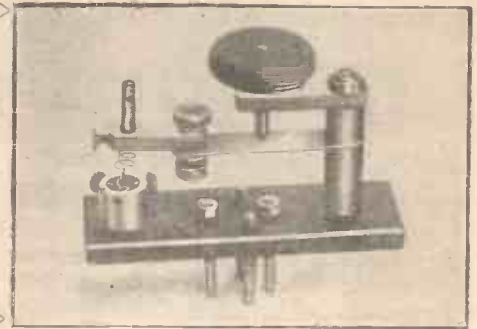


Fig. 24.—Plug-in Detector.

flex to the shank of each valve leg of the swinging coil, the leads being long enough to reach the terminals of the smaller variable condenser. The coil holder is now complete, and it will be found that it allows fine adjustments to be made. Similar holders should be placed above valves 1 and 2.

Long-wave Work

For long-wave work the most convenient type of high-frequency coupling is undoubtedly the resistance-capacity, though

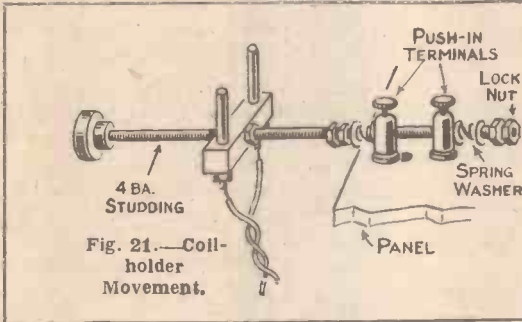


Fig. 21.—Coil-holder Movement.

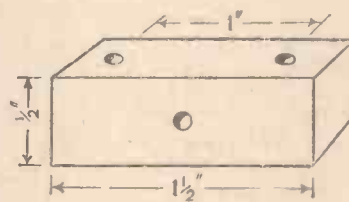


Fig. 20.—Base of Coil-holder.

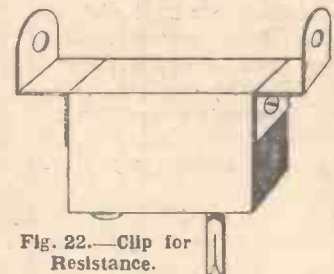


Fig. 22.—Clip for Resistance.

holder for the A.T.I., and others may be fitted instead of the valve legs above valves 1 and 2. A very inexpensive but quite efficient two-coil stand can be purchased from advertisers in AMATEUR WIRELESS.

Basket-coil Mounting

Many experimenters, on the other hand, use basket coils with two valve-pin contacts, and these are exceedingly convenient. Fig. 19 shows a very simple and handy mounting for these. The board was originally designed for these, as will be seen. In the state in which we left it at the end of the last article it contained three valve-leg holders, one for the A.T.I. and the others placed above valves 1 and 2. To each of these we can add a swinging holder.

Cut out a piece of ebonite, as shown in Fig. 20, 1½ in. in length, ½ in. in depth and ¼ in. wide and make three 4 B.A. holes spaced as shown. It is better that these should be tapped, but they can be made of clearance size. Insert two valve legs into the holes 1 in. apart on the upper side and secure them by nuts on their protruding shanks. Now pass a length of 4 B.A. studding through the third hole, allowing about 2½ in. to protrude on one side and about 3 in. on the other. Secure it by a nut.

Pass the end of the studding through the two terminals, then place on it a similar combination of washers, spring washer and nuts in the reverse order. Then tighten down the inner nuts until the compression of the spring washers is sufficient to retain the holder in position wherever it is placed with a basket coil mounted on its valve legs.

The outer nuts are used to lock the inner ones in place so that they shall not shift. This kind of coil holder answers very well indeed for light inductances, such as baskets, but it will not carry heavy coils of honeycomb or other similar design. To the other end of the 4 B.A. studding attach a small knob. Solder a length of

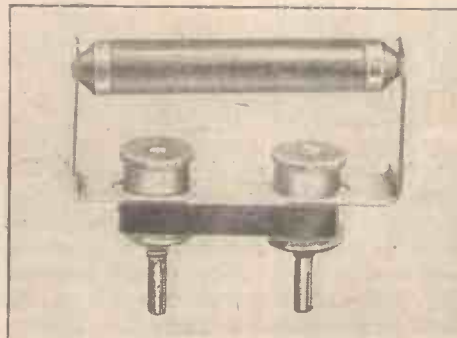


Fig. 23.—Plug-in Resistance.

it is not efficient on short waves. Very neat plug-in resistances can be made quite simply to fit into the fixed coil holders above valves 1 and 2. If plug-and-socket mountings have been provided on the board the easiest way of making holders for anode resistances is to purchase from advertisers a pair of coil mountings provided with plug and socket. Clips are then cut out from sheet-brass, the arms being bent so that the gap is just sufficient to take resistances of the torpedo type, a ⅜-in. hole being drilled in each clip for the pointed ends of the resistances (Fig. 22); 60,000 ohms is a useful all-round value. For valve-leg mounting a similar fitting is made, as shown in Fig. 23. This is made from a piece of ¼-in. ebonite 1½ in. long and ½ in. wide. The shanks of the valve pins go right through, and the nuts which hold them in place serve also to retain the clips.

The detector designed to go with the Thousand-circuit Board has the advantage that it allows a simple crystal circuit to be rigged up very easily and that it can be used to replace the rectifying valve in any circuit. This detector is seen in the photograph (Fig. 24). Any type of detector can be adapted by simply mounting it upon a small base of ebonite provided

(Concluded at foot of third column of next page)

EXPERIMENTAL TRANSMISSION.—III

THE diagram of the flat-topped aerial (Fig. 9), on the other hand, shows that the potential gradient around the wires 1 and 4 is greater than that around the middle wires 2 and 3. This is evidenced by the crowding of the electrostatic lines of force around the outer wires. The two outside wires, therefore, do most of the work, and the top side of the aerial does hardly any work at all. This, of course, indicates that there is more current flowing in the outer wires than in the inner; the difference in current can be determined by actual test.

Admittedly the construction of a cage-type aerial is more difficult than that of the flat-top type, but the results obtained repay the extra trouble involved. Wherever possible erect an aerial of the cage type.

Choice of Type

Now as to the actual choice of type—**L**, **T**, or vertical? Each is suitable, the respective advantages depending largely upon the conditions.

Where a medium amount of space is available the inverted **L**-type is certainly preferable, provided that it is erected at a suitable height (say 60 or 70 ft.), remembering that our desirable R_r is increased by height. If a large open space is available another wing may be added, and the aerial converted to the **T**-type. An increase of current in the aerial may then be expected, but the increase is not generally worth the increased difficulty in construction.

The vertical type of aerial is coming more and more into favour, especially where space is limited and where short-wave working is desired. It is, however, necessary to support these aerials at a considerable height in order to provide a large "top" to absorb energy. Fig. 10 shows a diagram of the vertical flat-topped aerial as employed at the writer's station.

Constructional Details

The details of these three types may now be dealt with together. The wire employed must be of heavy gauge, say No. 18 or 20. Multi-stranded wire and copper strip may be employed with great advantage.

The cage may be constructed of four or six wires secured to wooden hoops about 3 ft. in diameter; a hoop being necessary at every 15-ft. length of wire if the cage is to keep its shape. There is no necessity to insulate the wires from each other; in fact it is best to make actual metallic connection, wire to wire, at each hoop in order to prevent slight eddy-current losses.

If the flat-top type is employed the wires (certainly not less than three in number) must not be spaced closer together than

6 ft. or no advantage from the multi-wire system will be obtained.

The insulation of transmitting aerials requires special attention. Porcelain in-

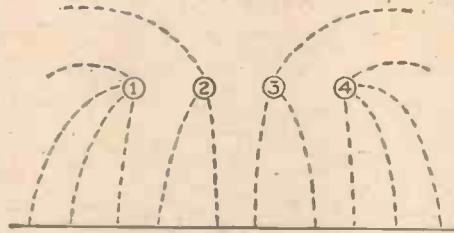


Fig. 9.—Potential Gradient of Flat-topped Aerial.

ulators only should be used. Composition insulators have a tendency to brush on high voltages or, worse still, melt. Insulators should have a large surface in order to reduce leakage and brush discharge to a minimum, but to prevent the formation of eddy currents their actual mass must be small; eddy currents in insulators are sometimes a source of serious loss. It is wonderful how R_d will grow! This unhappy state of affairs is reconciled by the fact that insulators having ribbed and "crinkled" surfaces may be purchased, and these present a length of insulating surface of about 15 in., although their overall length is not more than 8 in.

Remember that the voltage is greater at the free end, and that an extra insulator there may cause an appreciable increase in the value of I_t .

The lead-in wires may be convergent if

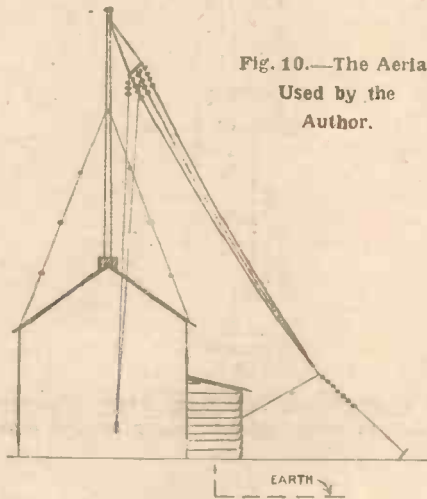


Fig. 10.—The Aerial Used by the Author.

the flat-top type aerial is employed, but otherwise it is better to arrange the lead-in in cage form, as long and straight as possible, as it can then act in the capacity of a vertical aerial. One of our foremost D.X. experimenters attributes his success largely to the design of his lead-in; the cage lead-in in this case is brought in to

the station perpendicularly to upper and lower capacities.

The ohmic resistance of the whole system must, of course, be kept low, and to this end the same heavy-gauge wire that was employed for the aerial should be employed for the lead-in.

The Lead-in

The lead-in insulation requires very special attention, since here we have every opportunity of counteracting all the previous advantages. Dirty unsoldered connections cause high ohmic resistance, whilst large composition lead-in tubes entering through large masses of wood and unprotected by drip-cowls are a great source of loss. A lead-in tube should not be employed if it is possible to bore through an existing window or to insert a glass or ebonite panel in a suitable frame.

If the heavily insulated lead-in wire enters through a drip-cowled hole in the middle of such a panel, dielectric losses, eddy current losses and brush discharges are reduced to a minimum.

A little play should be allowed so that the aerial may alter its length in accordance with weather conditions (on no account should rope be used for halyards); swinging of the aerial must be prevented by means of well-insulated guys.

To reduce losses due to dielectric absorption to an absolute minimum it is essential to break all guy-wires at every few yards and insert small insulators.

A certain number of turns of the aerial inductance are included in the aerial circuit and contribute their share to the total values of R_g , R_d and the natural capacity of the system.

KENNETH ULLYET.

(To be continued)

"THE THOUSAND-CIRCUIT BOARD" (continued from preceding page)

with four valve pins spaced in the ordinary way. The grid leg is connected to the arm carrying the catwhisker and the plate leg to the cup. The two filament legs are left unconnected and serve merely to hold the detector firmly in the valve sockets in which it is placed.

This type of plug-in crystal detector is exceedingly handy. If, for example, it is desired to use a crystal instead of a valve for rectifying purposes after a tuned-anode-coupled high-frequency valve, all that is necessary is to place the crystal in the rectifier's sockets and to disconnect the grid condenser, taking a lead straight from the plate terminal of the H.F. valve to the grid terminal of the rectifier. In other circuits it is just as easy to substitute the crystal for the valve.

J. H. R.

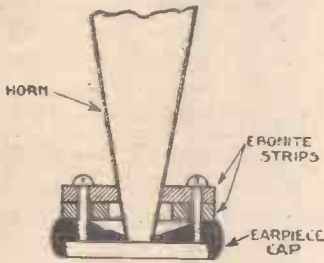
(To be continued)



PRACTICAL ODDS AND ENDS

Loud-speaker Horn

TO fix a horn to a phone without damaging the latter, obtain a spare phone cap to fit the phones and lay the three pieces of ebonite, drilled as shown, across the cap and screw down, care being



Fixing Loud-speaker Horn.

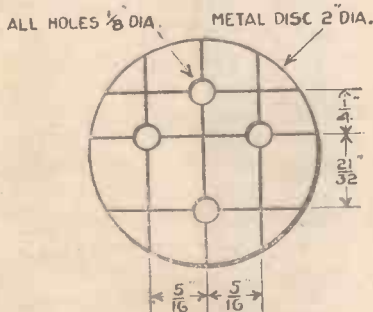
taken not to drill right through the cap. The centre hole in the top strip of ebonite depends on the size of horn, but in any case this must be a dead fit. All that remains is to remove the cap from one side of the phones and screw the new cap in its place.

C. S. A.

Valve Sockets

WHEN centre-punching marks on panels for valve sockets with a template that has large holes there is a possibility of errors. It is a good plan to mark lines across the centres of these holes (see accompanying sketch) to act as a guide for the eye. The template can then be easily placed in position.

The writer has found that it is a good safe plan to drill holes on the large side,



Template with Centering Lines.

say with about $\frac{1}{32}$ in. or more clearance all round, which will permit of final adjustments and save much time and trouble when it comes to mounting the holders.

W. P. A.

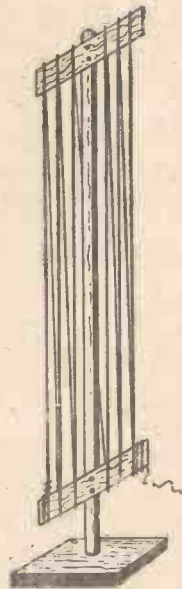
Variable Condenser

A CHEAP variable condenser can be made with two pieces of zinc about 5 in. by 3 in. and an old book. The pieces of zinc are connected to the set by lengths of wire and placed in the book with one or more leaves, according to thickness, between them. To effect tuning, one of the plates, fitted with a wooden or vulcanite handle, is moved in and out.

E. J. G.

Indoor Aerial

RECENT experiments carried out by the writer have proved that in very close proximity to a broadcasting station (within the half-mile "swamping area") a simple crystal set will work quite well without the use of an aerial if the insulated lead-in is held up in a vertical position as high as possible, and that the signal strength falls off considerably when the lead is held in a horizontal position.



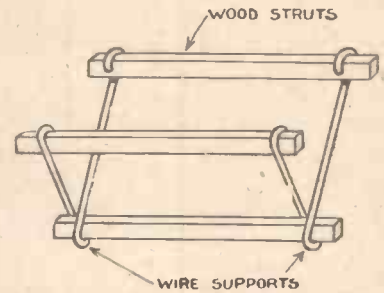
Portable Indoor Aerial.

This illustrates the importance of an "all down-lead" aerial, and it is suggested that flat-dwellers and others who live within a mile or so of the nearest station should try out the experiment indicated in the sketch, where the aerial consists of a few turns of bell wire wound over two arms attached to the ends of an upright piece of broom-handle about 5 or 6 ft. long. Copper tape may be used in place of the bell wire if a better appearance is desired.

O. J. R.

Detector Repair

WHEN using a glass-enclosed detector it sometimes happens that the glass breaks and the detector is rendered useless. If a spare tube is not available,



Device for Repairing Detector.

the method shown in the sketch may be used as a temporary measure.

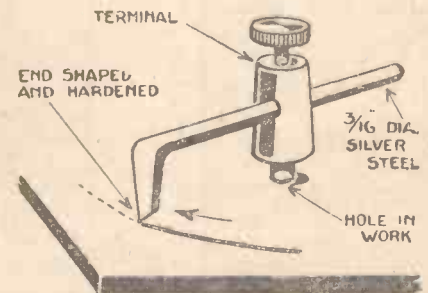
Three match stalks (preferably of the wax-impregnated variety) are taken and wire frames are made to hold them. The wood and wire frame thus made is used in place of the glass tube. The sketch makes the arrangement clear. H. H. W.

Simple Disc Cutter

MANY amateurs find difficulty in cutting out discs of ebonite, but the following adjustable tool simplifies the operation.

A terminal is drilled $\frac{1}{8}$ in. clear, and a $\frac{1}{8}$ -in. steel rod is heated in a fire, flattened at one end, bent at right angles, and ground or filed to the shape shown. It is afterwards hardened by being heated to a dull red and plunged into oil.

In use the tool is set to the required



Simple Disc Cutter.

radius, a hole is drilled in the centre of the material to clear the terminal screw, and the tool then inserted and revolved, thereby cutting out discs of varying sizes.

J. R. V.

AROUND THE SHOWROOMS

Kontax Connectors

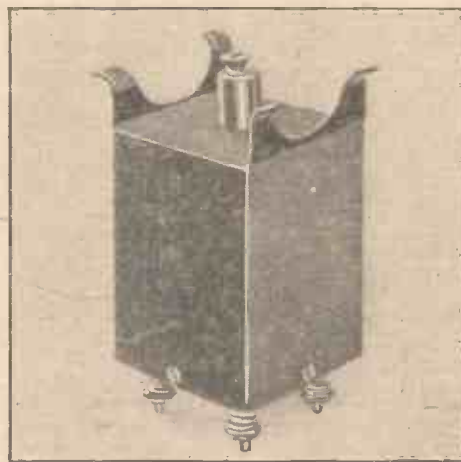
If you were asked to design a simple device that could be pressed from sheet metal, and that combined a spade terminal and a grip connector, you would probably give up the task as hopeless. As it is, you need not trouble, for some brainy person has already done it, and the result is sold by Autoveyors, Ltd., of 84, Victoria Street, S.W.1, under the name Kontax.

Glanced at hurriedly, Kontax look like any other spade terminal, but closer inspection reveals a slot and tongue, by means of which two connectors can be quickly and surely locked together. They should be specially useful in place of ordinary tags, as the phones can then be easily connected in parallel under terminal nuts or in series by the grip connector portion.

Elfin Transformer

Most of us have at one time or another, I suppose, designed a panel lay-out and then on assembling the components have found that the screws for fixing the L.F. transformers come in positions already taken up by other apparatus, or, if not

so bad as that, in positions where they do not improve the appearance of the set. But many such little troubles are



Elfin Transformer with One-hole Fixing.

obviated by using a new transformer that has one-hole fixing, as shown by the photograph. This transformer, known as the Elfin, is small in size but quite efficient

in operation. Housed in a soft-iron case, the wire is not stinted and a ratio of 3 to 1 is provided. The bobbin and top plate (at the bottom in the photograph) are made of solid ebonite, and the terminals and one-hole fixing collar are plated. The makers are Peter Vaughan and Co., of 57, Fetter Lane, E.C.1.

Condenser Capacities

As long as I can remember there has been a grouse in amateur circles regarding the capacities of condensers. This matter is now receiving attention, however, especially as far as fixed condensers are concerned and several firms now supply these, calibrated within a 10 per cent. limit. The trouble now seems to be that the figures denoting the capacity soon become illegible.

Shermays, Ltd., of 78, Cheapside, E.C.2, propose to overcome this difficulty by marking the capacity clearly with black letters on a strip of celluloid, which can be moulded into a fixed condenser case. They have applied for patents and registered designs in connection with this idea, which is a good one. VANGUARD.

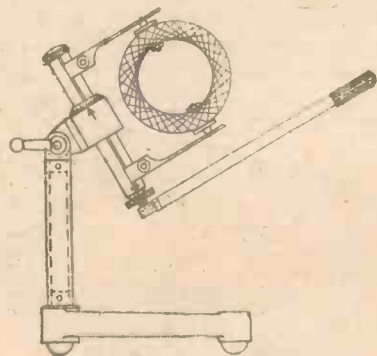
PROGRESS AND INVENTION

Coil Holder

IMPROVEMENTS in coil holders by means of which their use and accurate fine tuning are facilitated are the subject of Patent No. 221,902/24 (Igranic Electric Co., Ltd., A. H. Curtis, S. R. Wright and A. H. Mackley; all of Bedford).

According to the specification, the main carrier rod on which the coil supports are mounted is held at or near its centre by a bracket on a stand or panel.

This central support is so constructed

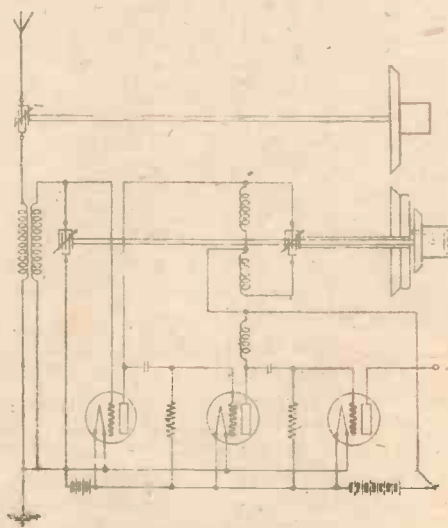


Coil Holder (2.1, 502/24).

that in a three-coil mounting the two outer coils can be turned back quite clear of the central coil so as to form a two-coil holder.

Selective Adjustment

USUALLY at least three tuning adjustments are necessary with a valve set to get selectivity, but the operator cannot move more than two controls at a time.



Selective Adjustment (221, 868/24).

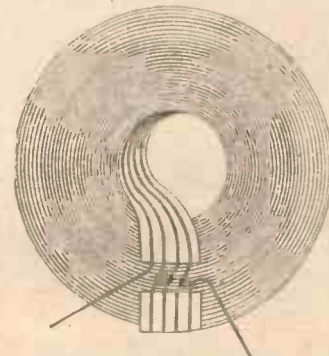
The object of Patent No. 221,868/24 (Western Electric Co., Ltd., of London, and H. Nash, of Sidcup, Kent) is to provide a means by which a number of con-

densers may be controlled by one knob and yet not be mounted on the same shaft.

It will be seen from the diagram that one knob is provided with a bolt which can be put in place or released as desired.

Strip Coils

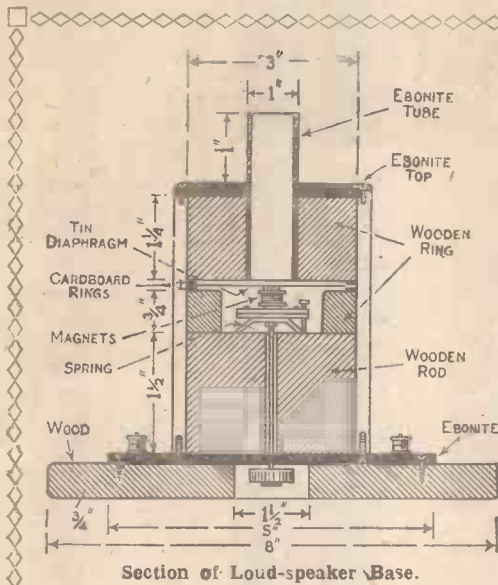
A SIMPLE method of constructing tuning coils is described in Patent No. 221,594/24 (N. P. Hinton, of Golders Green, and Metropolitan-Vickers Electrical Co., Ltd., of Westminster). Several wires are fixed parallel to one another on a



Strip Coil (221, 594/24).

strip of insulating material, and this strip is wound in the form of a coil. The ends are connected as shown in the diagram and the coil is then complete.

MAKING AN EXPERIMENTAL LOUD-SPEAKER



and a hole large enough to clear the magnets is cut out with a fret-saw. The rest of the curtain pole (1 1/2 in.) is then mounted at a suitable height on the 5-in. ebonite base and a 4 B.A. clearance hole drilled through the ebonite and the wood.

The magnets with a piece of bent strip spring brass are mounted on this wood, a tapped 4 B.A. with 4 B.A. terminal screwed on the bottom being fitted so that the magnets may be adjusted as shown in the drawing. Two screws are then screwed into the wood on each side of the magnets to prevent the latter rotating when the adjusting screw is turned.

In order that the adjusting knob can be

accommodated a 2-in. hole will require to be cut in the centre of the base. A pair of terminals connected to the magnet windings complete the instrument, which will be found to give excellent results. B. K. L.

THE loud-speaker described below makes use of a telephone earpiece for its working essential. As an earpiece diaphragm will not give loud-speaker strength, a larger diaphragm is made to take its place. The materials required for its construction are as follows: A piece of ebonite tube 3 in. internal diameter by 3 1/2 in. long; a disc of ebonite (cut with a fretsaw) to fit the top of the tube flush with the outside edge; a piece of curtain pole about 3 1/2 in. long to fit tightly into the ebonite tube; a disc of ebonite 5 in. diameter to act as a support for the wood and the magnets; the inside of a good ear-piece, preferably adjustable; a piece of ebonite tube 1 in. in diameter to hold the horn; a piece of cardboard and a piece of tin; a good horn.

The top ebonite disc should first be cut out with a fretsaw and screwed to the top of the ebonite tube, and then rounded off with a file or sand-papered for the sake of appearance.

A piece, 1 1/4 in. long, should next be cut from the curtain pole and glued into the top of the tube, and a 1-in. hole drilled with a brace and bit through the top of the ebonite and through the wood. Next, the 1-in. tube should be wedged into the hole flush with the inside of the wood and projecting about 1 in. from the top of the ebonite disc to hold the horn in place. This should not be done until the exact diameter of the end of the horn is known.

Two cardboard rings, about 1/8 in. or less in thickness, are made to fit tightly into the ebonite tube on each side of the diaphragm. The depth of these is best found by experiment, but 1/8 in. will be about right. The tin diaphragm is cut out to fit tightly into the tube, and after placing one ring against the wood, the diaphragm is glued to the ring and the other ring glued on top of that.

Another 3/4 in., or enough for the height of the magnets, is cut off this curtain pole,

USING FRAME AERIALS WITH ORDINARY SETS

MANY people are under the mistaken impression that an elaborate set is required if satisfactory reception is to be obtained when using a frame aerial. This is quite unfounded, for actually the usual type of set employing H.F. and detector valves with or without reaction will do quite well. Of course with a frame aerial one stage of H.F. is practically a necessity, and signals cannot be expected to be so strong as with a properly-erected outside aerial, but as compensation one gets greater selectivity and obtains the advantage of portability.

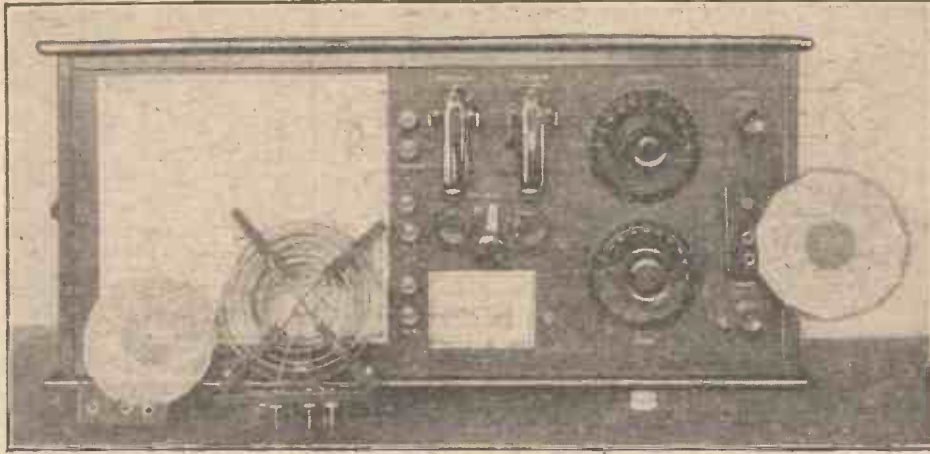
The average frame aerial has a side 2 ft. in length and has about seven turns wound on it, the turns being 1/4 in. apart; this provides for the broadcast wavelength range when tuned with a .0005-microfarad condenser placed in parallel—that is, across its terminals.

Some of these aerials have additional turns wound on them to provide a reaction coil, the coil being coupled to the aerial direct. Of course with this type of aerial there is no risk of causing interference with neighbours by having direct reaction. Connection to an existing set is made quite simply by connecting the aerial terminals to the aerial and earth terminals of the set, but if the existing set employs

plug-in coils the aerial coil must be taken out. Alternatively the terminals of the frame aerial may be connected to a plug similar to a plug on a plug-in coil, and this plug can then be inserted in the set in place of the aerial-tuning coil, the aerial and earth terminals being joined together.

Should the set have a series-parallel switch for placing the aerial-tuning condenser in series or parallel with the coil, take care to see that this switch is in the parallel position. Similarly, should the frame aerial have a reaction coil, this should be connected to a plug and the plug inserted in place of the reaction coil on the set. Having plugged in both these plugs the aerial windings will be placed across both tuning condenser and the grid and filament of the valve, and the reaction winding will be connected in the plate circuit of the first or second valve, according to whether the set was originally designed for reaction between the H.F. and detector valve or director on the aerial in the ordinary way.

A frame aerial has a decided directional effect and should therefore be placed so that it points towards the station from which reception is desired—that is, the windings should be in a direct line with the station. S. M. H.



Front of Short-wave Receiver.

WHEN this receiver was first "put on the stocks" the wavelength range contemplated was a fairly modest one, covering the band given over to the use of the British amateur—150 to 200 metres—with a possible extension of 50 or 60 metres above that band and as far below, down to perhaps 90 metres. The set was intended solely for the reception of amateur experimental work on these wavelengths.

Requirements in Short-wave Work

During the course of the prolonged, but most fascinating, experimental work that the design of the set entailed, however, it was found that, without interfering with the efficiency most desired on the shorter waves, the tuning range could be extended upwards to 500 metres, thus including the fixed wave of 440 metres, which amateurs are allowed to use outside broadcasting hours. Incidentally this extension covered the whole of the broadcasting wave band. As a broadcast receiver it proved quite good.

The average receiver, designed for reception on the broadcast waves, is not usually efficient on the lower waves. The trouble is generally that the components are not suited for the purpose, and there is a very great deal of accidental capacity present. In designing a receiver for the short waves great care must be used to get rid of as much accidental capacity as possible.

Sharp Tuning

Tuning on low waves is very sharp, and one of the first essentials of a short-wave receiver is that it shall be simple to operate, so that searching is easy. This consideration at once precludes the use of a stage of high-frequency amplification, as even when with a great deal of experimenting and very careful construction a high-frequency valve can be made to give any real amplification on low waves, the difficulties of tuning generally make it more trouble than it is worth. The other essen-

tials are stability, smooth control of reaction, and quietness in operation. It is difficult, if not impossible, to pick up and read weak signals against a background of "mush" and rushing noises.

The receiver to be described has the desirable features just mentioned. They have been attained by careful design and careful choice of components. Though the circuit used is a well-known one and of proved utility in picking up weak signals, a great deal of experimental work, with components "hooked up" on the bench, had to be done before real efficiency was approached. Of course, when the components were boxed a different set of circumstances arose, and much of the work had to be done all over again.

Circuit

The circuit is a modification of the well-known Reinartz arrangement, and is shown in Fig. 1. It provides a rectifier and a low-frequency amplifier. The essential controls are two in number, a grid-coil tuning condenser and a reaction condenser. There is no reaction coil, as the condenser itself acts as a capacity coupling. This gives very smooth and easy control. A small amount of control of the reaction can also be obtained with the filament resistance of the detector valve.

As can be seen from the diagram, the aerial and grid coils are connected together as one continuous coil, the division taking place where the connection is made to earth and the positive plate of the low-tension battery. The other difference to be noted is that a high-frequency choke coil is connected between the plate of the first valve and the primary of the transformer. This replaces the ordinary bypass condenser, which must on no account be used. If it is, the H.F. energy will take the wrong path and there will be no signals.

Components

The components of such a set must be of the best. On the quality of the com-

SHORT-WAVE IS THE

THIS ARTICLE DESCRIBES THE CONSTRUCTION FOR SHORT-WAVE RECEPTION, A SUBJECT WORTHY OF A GREAT DEAL OF ATTENTION ON A

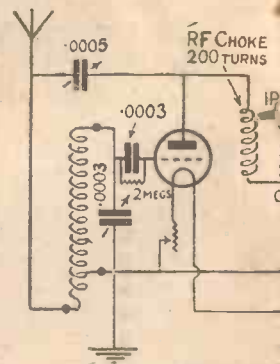


Fig. 1.—T

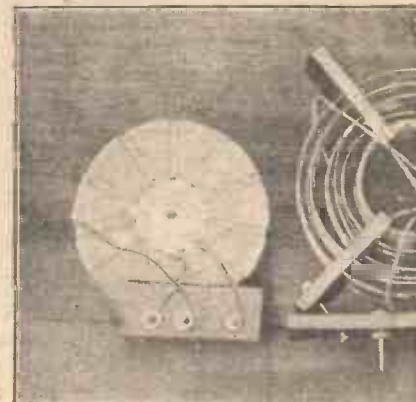
ponents, as much as upon the placing of them and the spacing of the wiring, depends the results that will be obtained.

The variable condensers are the Bowyer-Lowe "square-law" condensers. That for the grid-coil tuning is .0003 microfarad, and that for reaction coupling is .0005 microfarad. These condensers have low minimum capacities — about .000005 microfarad in both cases — which is a desirable feature for variable capacity used in short-wave sets. They also have low losses, which is another desirable feature.

The valves are Marconi Osram DEV's. These are the dull-emitter variety of the well-known V24 type, a type unrivalled for short-wave working, owing to the great reduction of undesirable inter-electrode capacity given by the



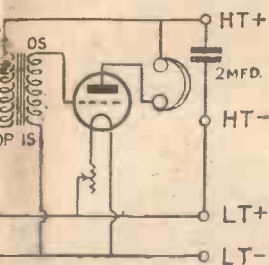
Fig. 2.—Method of Chapman



Some Suitable

WE WORK THING!

SECTION OF A SET SPECIALLY DESIGNED WHICH AT THE PRESENT TIME IS ATTRACTIVE ACCOUNT OF THE PROBLEMS IT INVOLVES.

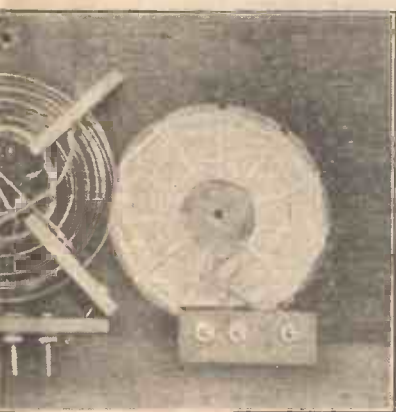


the Circuit.

ampere. They are slightly microphonic, but otherwise very silent in working. They work well on 30 volts H.T. and do not need more.

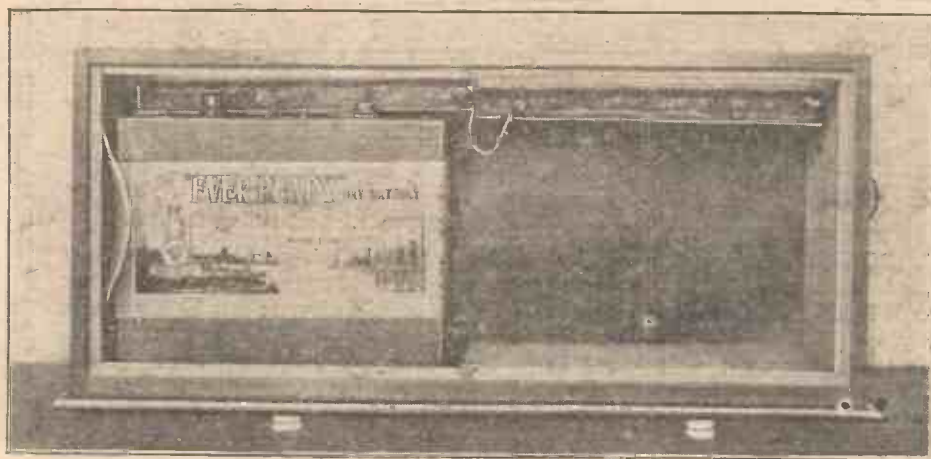
The interval transformer is a Lissen T₁, and does excellently in this somewhat critical circuit. The radio-frequency choke coil is an Igranic coil of 200 turns. The grid condenser and leak are Dubliers of the usual .0003 microfarad and 2 megohms. A variable leak would be desirable, but one of the commercial type was tried and found to be noisy.

The filament resistances are Lissen. The wiring is all done with square wire and care was taken that it was well spaced.



Tuning Coils.

shape. Myers' valves or C-type valves could have been used. The DEV is rated at 3 volts and 0.2 ampere, but actually works at 2.5 volts and about 0.175



Interior of Cabinet.

Many types of inductance coil were tried, with varying success. Then the method invented by Dr. E. H. Chapman for winding Reinartz coils was tried, and was found to give most excellent results, even on the shortest waves that the aerial-earth system would allow the set to oscillate on.

The Chapman coils are basket coils wound in a peculiar manner (shown by Fig. 2). The aerial portion is wound on with the grid portion for the desired number of turns in the aerial circuit, and then the winding of the grid coil is continued alone. We thus have a basket coil with the first few inside turns doubled. The beginning of the grid coil is connected to the end of the aerial turns when the coil is finished. This makes the earth connection. The beginning of the aerial coil goes to the aerial connection, and the end of the grid coil to the grid via the usual grid coupling condenser.

Coil Details

The wavelength of the coils is determined by the portion in the grid circuit, the aerial portion being practically aperiodic. The inductance of the grid coil can be calculated, but the writer is not aware of any satisfactory method of calculating how many turns should be in the aerial circuit to give best coupling. It will be found that two coils will cover from somewhere between 80 and 90 metres to about 500 metres.

Approximate details of these two coils are here given:

No. 1, 280 to 500 metres; aerial coil, 15 turns; grid coil, 70 turns.

No. 2, 80 to 300 metres; aerial coil, 8 turns; grid coil, 28 turns.

No. 1 coil is wound with No. 22 d.c.c. wire in the aerial circuit and No. 24 in the grid circuit on a celluloid former (1¼-in. central diameter), having 11 divisions. No. 2 coil is wound with No. 22 wire on a celluloid former of 11 divisions. Experimental coils for extra efficiency on lower wavelengths can be wound with No. 20 wire. A size that seems very efficient

round about 100 metres has 6 turns in the aerial circuit and 18 in the grid circuit, wound on a 15-spoke former of 4 centimetres (1½ in.) inside diameter. The Haynes method of winding air-dielectric coils, shown in the photograph, is also very useful, but rather difficult for the average home constructor.

To wind the Chapman coils, first cut off sufficient wire to make the aerial portion of the coil. Then having tied a knot in the beginning of this, so as to know it again, take the grid wire and aerial wire together and start basket winding in the usual way. When the end of the aerial coil is reached leave a length for connecting up, and continue winding the grid coil until the complete number of turns is on the former. To complete, join the end of the aerial coil to the beginning of the grid coil. The coils when finished should be mounted on three-pin plugs as shown in the bottom photograph. Note that the coils are fixed on the holder by gripping the celluloid under the Clix plugs. These plug in on the panel, so that they can easily be changed.

Panel

The writer's instrument was made up in an old cabinet, and the old panel was used. This means that considerably more ebonite than is actually needed is in the panel. The actual size of a panel that will carry everything is 10¼ in. by 7½ in. Fig. 3 shows the lay-out with dimensions.

In the photograph a platform will be seen supported by brass rods from the bottom of the panel. This was to have held the solenoid coil that was originally intended to be used. It is now occupied by the L.F. transformer.

The choke coil will be seen to be mounted on the back of the panel away from the coils. If the set is made up in a smaller box, a position as remote as possible from the tuning inductances must be found for the choke coil in order to prevent interference.

(Continued at foot of next page)



CAPT. ECKERSLEY was much impressed with the 100-metre relay station at KD KA, which uses as much as 15 kilowatts in the aerial. His address from this station was not well heard in this country, but when he spoke from WGY one of his staff picked him up casually and wondered for a moment whose voice it was that sounded so familiar!

An appeal is being made by the chief officer of the Margate Fire Brigade for funds to supply wireless sets to the Haine Hospital.

The Cenotaph ceremony on Armistice Day will not be broadcast. The refusal is made on the ground that this would be contrary to the whole spirit of the solemn occasion.

Bradford Corporation proposes to make a charge of 7s. 6d. a year for every aerial that crosses a street.

At a swimming club gala a man sang, made a speech and played a mouth organ in a copper "bell" under water, the items being received on "land" by wireless.

Listeners to the concert from FL were horrified the other night on hearing the music interrupted by an SOS from the ss. *St. Martin*. A few hours later the mystery was made plain that what they had been listening to was a rehearsal of a wireless drama which had somehow become entangled with the Eiffel Tower concert!

It is interesting to note that although reception of America by British amateurs is now a common occurrence, yet American "hams" have so far been unsuccessful in receiving the high-power stations at Chelmsford and Paris (Radio-Paris).

London may have two broadcasting stations in the near future. Present opinion is in favour of sending the London programme through the new high-power station and erecting another station to replace or supplement 2 L O.

"Frying" noises, not thought to be due to trams or oscillation, have been very bad in a certain Bath district.

E A J I, the new broadcasting station at Barcelona, in Spain, is now in operation and transmits on 325 metres from the Hotel Colon.

Extensive experiments are taking place in this country, in France, and in America with wireless-controlled aircraft. At the moment research is being devoted to their use as military weapons.

The President of the New York Board of Aldermen has proposed the broadcasting of bargains in food when there is an over-supply of the latter.

A complete educational programme for the autumn session has been drawn up by the B.B.C.

A Midlands home for incurables has recently been presented with a complete wireless set, including adaptable plugs in twenty-one rooms and five loud-speakers.

The next venture of the B.B.C. may be a new station for short-wave long-distance broadcasting experiments if permission can be obtained. A close study of atmospherics will also be made to obtain better long-distance communication.

That he could have guided the ZR3 to America from any part of the world at any distance, without a human being on board, is the claim of an Italian engineer.

The number of receiving sets now in use in Germany is 350,000, and the increase is about 2,000 daily.

Arrangements are now complete for the broadcasting from a coal mine by the Leeds-Bradford station some time this month by a local comedian.

(More Radiograms on page 694)

"SHORT-WAVE WORK IS THE THING!" (continued from preceding page)

The generous dimensions of the cabinet permit of both filament-heating dry battery and H.T. battery being in it. There is an advantage in this, for when working on low wavelengths trouble is likely to be caused by the fact that the batteries provide an earthed point apart from the legitimate earth. Also if long leads are used they may act as tuned counterpoises, upsetting the tuning. The end of the case containing the large 3-volt battery is lined with rubber from an old inner tube. The whole case stands on four porcelain feet.

The wiring of the set will be easily followed from the circuit diagram, the photographs and the wiring diagram.

The wiring is done with the square tinned wire. The use of insulated sleeving is not recommended in this circuit.

The circuit wants a little adjusting, according to the components used, and may need some slight alterations. Failure will

probably either be manifest as "no signals" or very faint signals, or by the setting up of low-frequency oscillations. The fault will probably be found in the grid leak, the choke coil or the transformer. Suspect the transformer first. Change the primary connections over, so that OP goes to positive H.T. and IP comes from the plate. If this does not bring about the desired improvement try 50 or 100 turns less or more on the choke coil. A pair of 100-turn basket coils connected in series will serve quite well instead of the 200-turn honeycomb coil, and will be easier to experiment with. If there is still no improvement put all the connections back just as they were and try a different value of grid leak. If these changes do not make the set work well, the trouble will be due to a bad or wrong connection or a faulty part. Test all coils and condensers.

A short concluding article in the next issue will deal with the operation of the set.

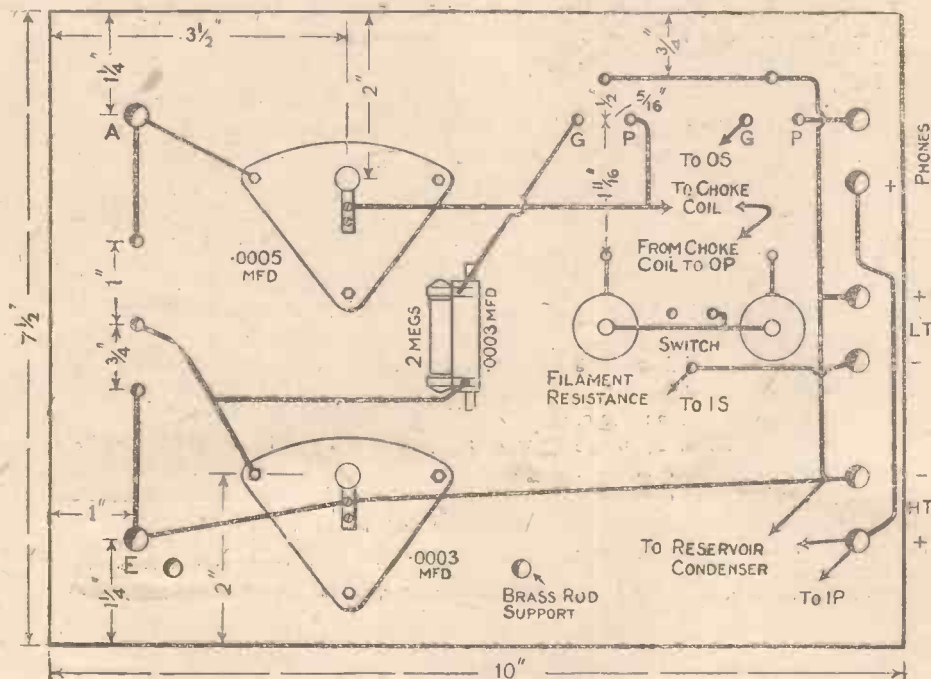


Fig. 3.—Lay-out of Panel.

T. O. BUSS, Scientific Instrument Maker,

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Established 1850.

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TELEFUNKEN 4,000 ohms
Adjustable diaphragms, most sensitive obtainable with cords, weight ozs. (Double Receiver), post free.

N. & K. HEADPHONES—4,000 ohms, 12/9; 6,000 ohms, 13/3.
LOUD SPEAKERS—27/6 Junior Amplifier; 42/- Junior de Luxe; 55/- Baby Starling; N. & K. 21/-.
IGRANIC—Coils: 25, 5/-; 35, 5/-; 50, 5/2; 75, 5/6; 100, 7/-; 150, 7/10; 200, 8/8; 250, 9/-; 300, 9/5; 400, 10/3; 500, 10/-; 600, 11/-; 750, 11/10; 1,000, 12/8.
VALVES—Cossor P.1, P.2, 12/6; Mullard Ora, 12/6; Ediswan, 12/6; Marconi R. and R.5, 12/6; Dull Emitter D.E.R., 21/- Post 6d. each.



Assembled Complete for Cabinet Mounting. With Ebonite Dial.

Capacity Microf'ds.	Price.
.001	7/5
.0005	5/11
.0003	5/2
.0002	4/6
.0001	4/2

With Vernier, 2/- extra or Square Law, 2/- extra Post 6d. set.

FIXED CONDENSERS, .0003, .0005, .002, .003, 10d. and 1/- each. .004, 1/6 each. Post, 3d.

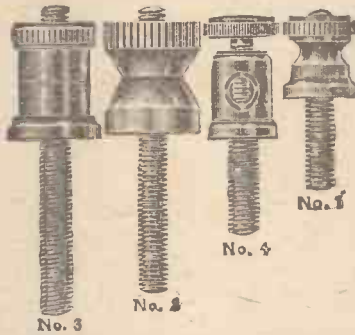
EDISON BELL .. 2/-
.002 to .006 .. 1/3
.001 to .0005 .. 1/3
Grid Leak and Clips 1/3

DUBILIER each
.001 to .006 3/-
.0001 to .0005 2/6

WIRELESS PARTS AND ACCESSORIES.

Aerial Wire, 7/22 bare copper, stranded. Price per 100 ft., 2/8 and 2/4. By Post, 3/6.
Aluminium Vanes, 1 doz., 5d. By Post, 8d.
Basket Coils, 7 in. set, 2/3 set. By Post, 2/7.
Brass Washers, 2, 3, 4 or 5 B.A., dozen, 2d.
" Nuts, 2 B.A., 2 dozen, 3d.
" Nuts, 3, 4 or 5 B.A., 2 dozen, 3d.
" Rod (screwed)—
2 B.A., in 12 in. lengths, each 2d.
3 B.A., in 12 in. lengths, each 2d.
4 B.A., in 12 in. lengths, each 2d.
Contact Studs, 1/2 in. by 1/4 in., complete with nut and washer, 5d. doz.
Copper Foil Sheets, uniform thickness, 12 in. by 3 in., 3d. each.
Crystal Detector, cup enclosed with glass cover, dust-proof, 3/6. By Post 3/9.
Double Phone Cords, 72 in., 1/11.
D.P.D.T. Switch, 2/6.
Ebonite Coil Plugs, 2 for 1/8.
Empire Tape, 1/2 in., 12 yds., 9d.
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Cardboard.
12 X 2, 1/2 4d. Post 2d. 12 X 3, 6d. Post 4d.
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Dutch Valves Tubular 4/9. Dutch Valves "R" type 5/-

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21/- Post 1/-

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Any size and shape to order. Price on application.

BROADCASTING ELECTION RESULTS

FOR the second time in history election results have been broadcast to hundreds of thousands of enthusiastic listeners in Great Britain within a few minutes of the ballot counts being made known officially. Following the procedure of last year, the B.B.C. transmitted music by the Savoy bands in between the announcements. A number of listeners had requested that only the bare announcements should be given, but fortunately for the majority this course was not followed.

The broadcasting of the results was appreciated most by those who were unable to attend the various centres where the results were made public. Besides ordinary wireless broadcasting, loud-speaker installations and public-announcing equipment played no small part in making the results known with the least possible delay. Such an installation was erected at the *Sunday Times* offices, over Kelly's Directories, Ltd., in the Strand, close to Australia House and the Law Courts. The equipment was arranged by the *Daily Graphic* in conjunction with the Marconiphone Co., Ltd.

Quantity of Apparatus

Even the most ambitious and enthusiastic amateur would be impressed by the large quantity of apparatus that is needed to supply two loud-speakers either with broadcast music or direct speech from a microphone.

Before erection the mass of apparatus seemed to be enough to equip a fair-sized research laboratory. Any amateur who could have been behind the scenes in the *Sunday Times* office would have seen three great amplifiers, numerous filament-lighting accumulators of the size used in motor-cars, stacks of 60-volt accumulator high-tension batteries, two huge loud-speakers, heaps of valve boxes, copper earth mats, lead-covered cable, voltmeters and ammeters, and a microphone of the size used in the broadcasting stations.

Arrangement of Amplifiers

Out of chaos, however, soon came some semblance of order, and from what appeared to be stacks of odd components there was built up something that really did look like a workable installation. And,



Operating the Marconiphone apparatus used by the "*Daily Graphic*" at the "*Sunday Times*" office for broadcasting the results. An "*Amateur Wireless*" reporter is giving a hand.

of course, when it was erected it did work excellently.

The apparatus comprised three groups: (1) A receiver for broadcasting, (2) a microphone and two line amplifiers for direct speech, and (3) another amplifier that could be used with both (1) and (2). The broadcast receiver was a Marconiphone V2A long-range model (H.F. and detector); this had been adapted to form a straight circuit instead of the usual reflex arrangement. As the *Sunday Times* office is so close to Marconi House an elaborate aerial was not necessary; it was erected by pulling down a blind, tying to that a 15-ft. length of rubber-covered flex and allowing the blind to spring up again. The earth connection was made by twisting a piece of wire round a supply pipe to a radiator.

Details of Amplifiers

Signals from this receiver were passed on to a three-valve amplifier, which was choke-capacity coupled in order to obviate all risks of distortion and "mushiness." The final power amplifying stage constituted eight valves in parallel. These were supplied with 420 volts on the anode and 140 volts grid bias. Some idea of the power of this installation is obtained when it is known that the output current never fell below 250 milliamperes.

In order to obviate the risk of interference, the Sykes microphone was supported in a cradle of spongy rubber to absorb any vibration. In each line amplifier there were five valves, these being separately mounted on more spongy rubber supports. Thus for making the broadcast music audible thirteen valves were used,

whilst for transmitting direct speech to the loud-speakers eighteen valves were used.

Microphone Sensitivity

The "heart" of the microphone was a flat single-layer coil of very fine wire, this being delicately supported in a strong electromagnetic field. Slight displacements of this coil by sound waves were sufficient to induce in it minute currents, which were then magnified. This type of microphone is sufficiently sensitive to pick up conversations taking place 50 ft. distant. By its aid the results were made

known to a large crowd as soon as they were received on the tape machines at the *Sunday Times* office.

In spite of the bad state of the weather (it poured with rain nearly all the evening), the enthusiasm of the large crowd that assembled was remarkable, each announcement being received with cheers by one section or other of the audience. The gaps between the announcements were filled by the music of the Savoy bands. When the matter being broadcast was not of sufficient general interest gramophone records were used to supply music. From all points of view the demonstration was a huge success.

AVOIDING "FAG" ENDS

A METHOD of avoiding "fag" ends when binding leads is to form a loop in the twine or material used about three times the length of the width of the finished binding, and by placing the loop on the desired spot for binding, commence to bind with the longest end of the twine until the finish of the binding is reached; the twine is then cut, but enough should be left to push through the now small loop.

The other end of the twine is now pulled until both ends are underneath the binding and the surplus twine is cut away. You now have a neat job, which will remain intact providing the twine is bound sufficiently taut.

T. J. S.

Mention "A.W." please when you write to advertisers.

INTERVIEWING—AND THE MICROPHONE

IN regard to the interview given on Friday of last week by Miss Ruby M. Ayres before the microphone at 2 L O, the following notes by the interviewer, Miss Agnes Miall, are of special interest. An interview is an innovation in the programme broadcast by 2 L O, and the idea may appear as simple as the ubiquitous printed interview. Actually that apparently casual ten-minute conversation in the studio represents a good deal of careful work behind the scenes.

The first step taken by the programme organiser is to think of a suitable celebrity and a suitable person to interview him or her. Then a date has to be chosen convenient to the celebrity, the interviewer and the general programme (it is often no easy matter to fit in all three), and a subject for the interview must be selected.

This latter is a ticklish job, because the monopoly enjoyed by the B.B.C. is only theirs under certain very strict conditions, one being that wireless must not be used for any kind of advertisement or propaganda. So it's out of the question to interview Mr. Best Seller on how he writes his novels or Mr. Explorer on what he saw on his expedition to Timbuctoo; this might be construed as "puffing" the gentleman in question. A subject must be found which is free from any such suggestion, yet one on which the well-known person may have information or views which are worth listening to.

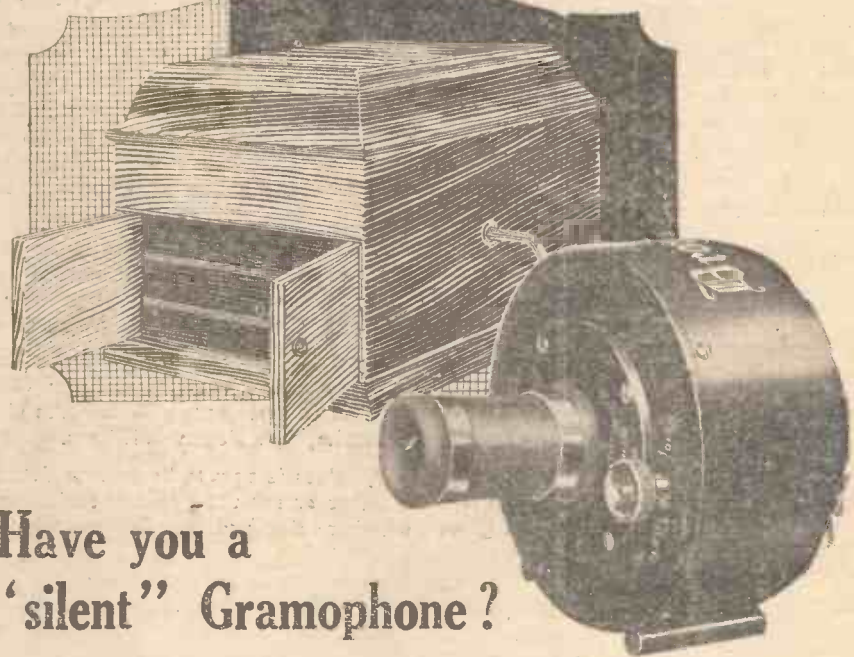
The next step is for the subject of the interview to be seen privately by the interviewer and the talk generally drafted out on paper, usually in the form used when printing the dialogue of plays. The reason for this preparation is two-fold. First, the organiser must know what is going to be said, so that no rules are unwittingly infringed by the parties to the conversation. Secondly, there is the necessity of concentrating the topic discussed within very narrow limits.

Brevity

Think how carefully broadcast programmes are timed, yet how very little people ever time their conversation. They do not have to get all into ten minutes, as a rule, and be saying something worth listening to all the time. But in wireless interviewing the pith of the subject must be extracted rapidly, without wanderings or lengthy reminiscences, and every sentence must be interesting to the countless people listening-in.

The talk, as written out by the interviewer, must be generally, though not word for word, adhered to before the microphone. It is passed, and altered if need be, by the well-known person; passed, and altered if need be, by the organiser at the broadcasting station. Then, and only then, is it considered to be ready for delivery on the appointed day.

Brown



Have you a "silent" Gramophone?

WHY not convert your Gramophone—which probably is little used—into a first-class Loud Speaker? Provided that it is of good design and manufactured by a reputable firm you will obtain excellent results from it. All that you need is a **Brown** Wireless Adaptor (in one of the two sizes described below) and a length of suitable flex.

To convert the Gramophone merely remove its sound box and fix the Adaptor. A rubber connection ensures that the Adaptor will fit all makes of machines.

In some cases when the H.1. type (illustrated above) is used it may be necessary also to lift off the turntable, but apart from this no alterations to the Gramophone are required.

Two minutes and your "silent" Gramophone is doing duty as a Loud Speaker!

Remember that each of these two Gramophone Adaptors operates on the identical principles of the well-known **Brown** Loud Speaker—the cone-shaped aluminium diaphragm and the tuned reed.

As a result the tone from your Gramophone will be most mellow and entirely free from distortion. Ask your Dealer to show you these adaptors—you will appreciate that they are typical **Brown** products.

TYPE H.1. (as illustrated)
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flexible fitting **£4-12-0**

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the room of average size.
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MORE RADIOGRAMS

ON the Canadian-Pacific liner *Montclare* a microphone has been installed which enables the orchestral concerts in the saloon to be transmitted to the third-class quarters of the vessel.

The whaler *Sir James Clark Ross*, which recently sailed from Cardiff for the Ross Sea, has been fitted with a Marconi direction-finder, and is taking with her five others for use on board the small boats associated with her in whaling.

Twenty singers from the Oriana Madrigal Society will give selections from 2 L O on the afternoon of November 9. Instrumental items will be given by the Chaplin Trio.

Further experiments are being made on 750 metres from the broadcasting station at Copenhagen. This station usually transmits on Sundays, Wednesdays and Thursdays on a wavelength of 471 metres.

Speaking of scientific progress, Senatore Marconi said recently that England occupied the foremost position and that the world would soon be presented with great new scientific discoveries.

Sir Edward Elgar's work "For the Fallen" will begin a special Armistice Day programme of appropriate items at 8 p.m. on November 11. Other items include Sullivan's impressive "In Memoriam," a

rhapsody "A Shropshire Lad," by George Butterworth, and new and interesting writings by Julian Clifford and Ernest Farrer.

A dual recital by Miss Irene Scharrer (pianist) and Mr. J. Dale Smith (baritone) will take the place of instrumental chamber music on November 12.

The Prince of Reuss, one of the cleverest wireless experts in Germany, has made successful use of the high-power electric cables for transmitting programmes. Practical use of this improvement will be made in the immediate future, relay stations being installed in the electricity works.

At 8.15 p.m. on November 13 the second half of the S.B. programme will be lightened by three groups of popular part songs by the London Male Voice Octet.

A popular programme on November 15 includes a new tenor, Mr. Evan George, and an entertainer who is becoming a favourite, Mr. Foden Williams.

Wireless is now to be used to determine whether or not the world is shrinking and whether England or Japan are "slipping"!

To promote the sale of herrings and other fish, special announcements have been made from the Hamburg broadcasting station. The broadcast campaign is said to have increased the demand.

It has been suggested that a dirigible could sail over the North Pole and photograph large sections of the Arctic and the mysterious Labrador interior in a two weeks' trip, keeping constantly in touch with civilisation by short-wave wireless.

"There never was a day in the winter and never a night when we did not get news of the world by wireless," said Capt. MacMillan, who recently came home in his schooner *Bowdoin* after fifteen months in the Arctic.

"Noises" from the Zoo are to be broadcast again. On this occasion the transmissions will take place on a Sunday afternoon (November 16).

That Australian listeners should soon be able to hear relayed British broadcasting is a prediction made by one of the greatest wireless engineers in the Dominion.

Receiving sets are to be installed in the medical missions and relief stations of the Grenfell Association, founded by Dr. Grenfell, whose work in the frigid wastes of Labrador is known throughout the world.

His suspicions aroused by the nightly calm that prevailed in a dormitory, a housemaster walked in quietly after lights-out and pulled back the sheets on the nearest bed. He found the occupant and his fellows wearing phones. The ingeniously hidden set was confiscated and used in the master's room!

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IT IS SENSITIVE ALL OVER
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Amplification

SIR,—I have followed keenly the discussion on the respective merits of H.F. and L.F. amplification. After reading the article in "A.W." I resolved to make a few experiments.

I arranged a simple detector valve and noted the signal strength. I next added an H.F. valve, and again noted the signal strength and quality of tone. This valve increased the signals very much, and did not distort the reception in the least. After this I used the second valve as a note magnifier, using a good tested L.F. transformer. While increasing the signal strength, it did not do so to the same extent as the H.F., neither was the tone so clear.

I then assembled a three-valve panel (one H.F. det. and one L.F.). The results from this set were very good, being quite loud enough to work a loud-speaker from 5 NO (40 miles distant). A de-

detector and two note magnifiers were tried, but the results were very inferior.

The signal was not so loud and the tone not so clear. I tried several methods of wiring. Although some of these were better than others, the results were not nearly as satisfactory as the H.F. detector, L.F. circuit.

I have therefore arrived at the conclusion that, situated as I am, one stage of H.F. amplification is superior to one stage of L.F.—G. M. H. (Saltburn).

Harmonics

SIR,—Whilst thoroughly agreeing with THERMION (No. 125) that the first harmonics of the B.B.C. stations are apt to be troublesome on the upper part of the amateur wavelength band, I would like to join issue with him on three points. The first is that the second and third harmonics cause very little trouble. They are sharply tuned and rarely interfere.

The second point is that these B.B.C. harmonics are not suitable for calibrating a heterodyne wavemeter because we are not told the correct wavelength of the stations, which are not all on the wavelengths advertised. They are absolutely constant, but they are not where they say they are.

The third point is that THERMION is surely wrong when he puts the third harmonic of, say, 5 IT on 84 metres. This is the fourth harmonic. The third is on 105 metres, being one-quarter of the fundamental. Whether it is audible or not I do not know, but I do know that when using "URSI" signals to calibrate a heterodyne wavemeter the harmonics from the receiving set can be heard at every fraction, starting from the half, which is the first harmonic. Similarly they can be heard on every whole number multiple, starting with twice the fundamental.—5 Y M (Pirbright).

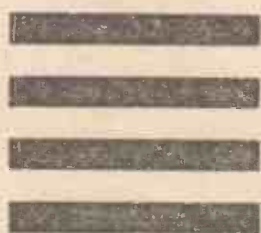
Glasgow Interference

SIR,—It might be of interest to readers to learn that the humming noise heard on approximately the same wavelength as 5 SC is caused by the heterodyning of the 422-metre transmission of IRI (Rome).

He gives a good concert, followed at 9.30 p.m. with news, after which he closes down. The Glasgow transmission then becomes clear.—G. H. (Birmingham).

(Continued on page 698)

**FOUR
GOOD
LINES**



12/6

The "SUPRA" Transformer Different to others! Its windings are in insulated layers each having six sections, which gives remarkably distortionless and pure reception, whilst at the same time getting the maximum amplification out of the valve. Laminated iron core.

RATIO : 5-1



2/6

"CONNECTICUT" Switch Very simple in operation but very sure in action. Very neat in appearance and very saving in space. It has a hundred uses—you make or break your circuit by a simple pull or push. Heavily nickelled. Mounted in a moment. One hole fixing.

"KINGSWAY" Variable Condensers

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.001—	8/-	.00075—	7/-
.0005—	6/-	.0003—	5/6
.0002—	4/6	.0001—	4/-
3 plate vernier—			3/9



"MICROSTAT" Control

Don't be content to just see your filaments burning; control them the MICROSTAT way, which ensures micro-meter variation from zero to 100 ohms. Beyond question the ideal form of filament control for all types of valves, dull or bright emitters. One hole fixing.



2/9

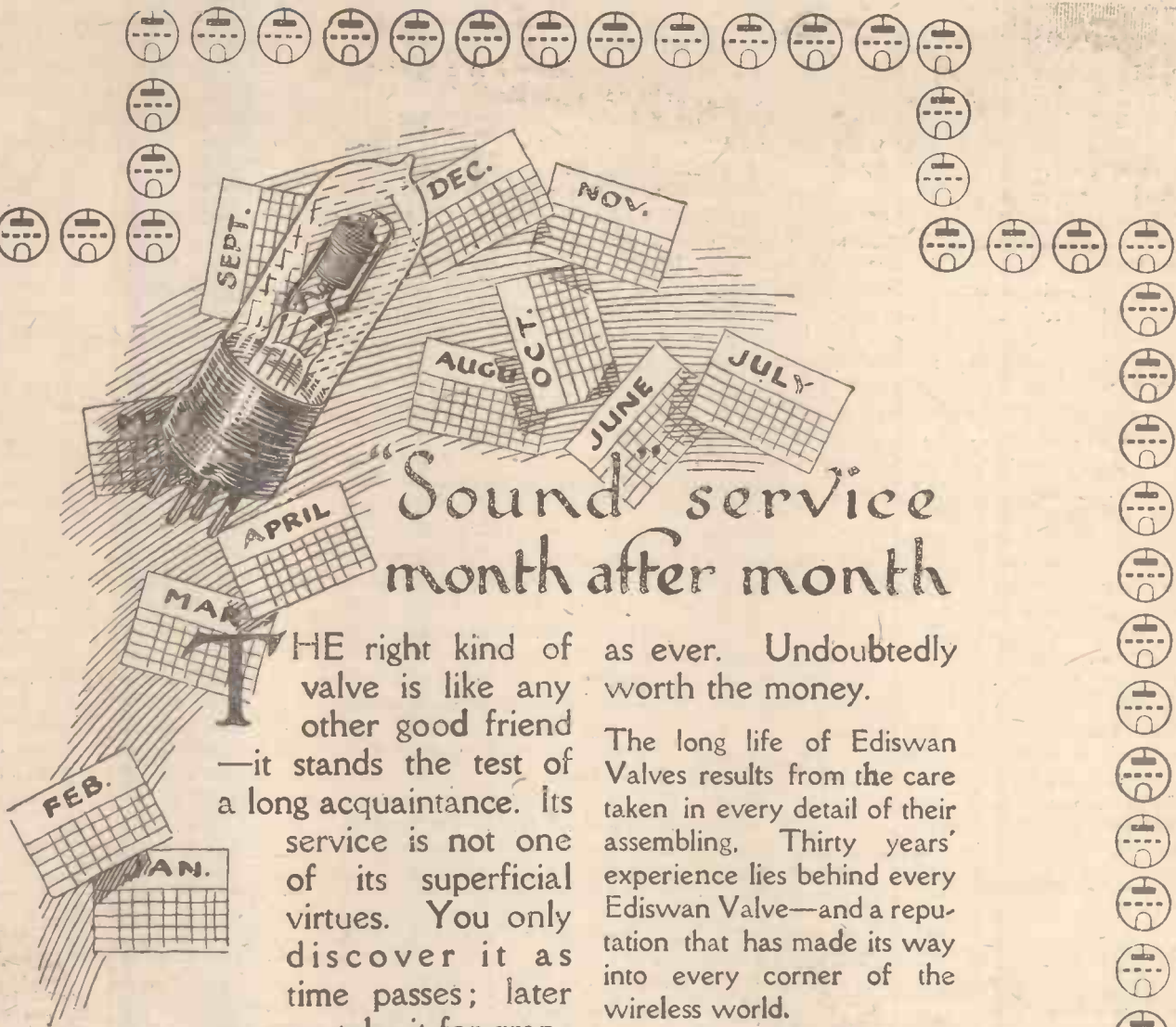
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162-5

EDISWAN VALVES

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 inspected.

CORRESPONDENCE (continued from page 696)

Appreciation

SIR,—I have an Amplion Junior loud-speaker, bought over a year ago, and recently had the misfortune to burn out one of the bobbins. I wrote to Messrs. Graham and Co. asking for a quotation for overhauling the instrument. In reply I received a most courteous letter, saying that if I would send the instrument to the works they would repair it free of all charge. This I did, and have now received the instrument back in perfect order.

I feel I must bring this case of excellent service before your many readers.

I may add I have no connection with Messrs. Graham and Co. other than that of a satisfied user.—T. W. P. (Leytonstone).

Late Transmissions

SIR,—I notice on page 460 of "A.W." a statement to the effect that in order to make the programmes additionally attractive to the possessors of multi-valve sets one provincial station will continue to transmit on each Tuesday and Friday evening for half an hour after the other stations have closed down. Why should this additional attraction be confined to the owners of multi-valve sets?

I have picked up most of the B.B.C. stations on a crystal set with two L.F. amplifiers—of course after London has

closed down—but have invariably found that the amateurs cut in and drown these distant stations.

There must be many like myself who would welcome a regulation preventing amateurs from carrying out their tests whilst any B.B.C. station was operating. It would surely cause very little inconvenience to those amateurs, whilst the additional pleasure to thousands who do not own multi-valve sets would be incalculable.—S. J. R. (London, W.C.).

Other Correspondence Summarised

V. C. B. (King's Cross) found that by putting about 14 ft. of flashlight ribbon, such as is used for photography, 6 in. below the ceiling as an aerial he got wonderful results.

T. L. S. (Bury) informs us that signals received on an aerial situated 30 ft. above the ground, with a lead-in of over 30 ft., are nearly twice the strength of those received on an aerial 20 ft. high with a lead-in of about 15 ft. The former aerial is only about 13 ft. above the roof, whilst the latter was not screened by any intervening objects.

A. J. F. (N. Finchley) wishes to know the identity of the station which transmitted speech, at about 2 a.m., on October 12. It was apparently American and worked on a wavelength of 360 metres approximately. He would also like to know the identity of another station which

transmitted orchestral music and songs the same day at 2.30 a.m., and was working on about the same wavelength.

G. B. (Yorks) received KDKA on October 12, and states that he had no atmospheric troubles.

H. W. (Surrey) states that he obtains greater purity and more signal strength from his crystal receiver made from instructions given in No. 115 than from any other set he has made.

R. F. (London, W.14) wishes to know which American station closed down at 11.15 p.m. on October 16, after an orchestral item, saying, "The next performance will be at 5 p.m. on Sunday. Good night, ladies and gentlemen."

T. R. (Yorks) would like to know the identity of the station which transmitted vocal solos, a quartet, orchestral selections and "Auld Lang Syne" on October 17, between 11.45 p.m. and 12.45 p.m. The wavelength used was about 370 metres.

R. W. T. (London, N.10) is anxious to know if it was an American station he heard transmitting a religious address, followed by a hymn, on October 16, at 12.45 a.m.

H. A. J. (Birmingham) would like to be confirmed in thinking that it was the Nice station which transmitted a song, impersonating noises of farmyard animals, between 6 p.m. and 7 p.m. on October 19. The station operated on a wavelength between 200 and 400 metres.

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ROTORS.—Wood, 2½ in., 1/-; Ebonite, 2½ in., 1/9.
ROTORS AND STATORS.—2 Stators and 1 Rotor, complete set 3/-.
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RESISTANCES (VARIABLE).—Woodhall 100,000 ohms, mounted on Ebonite, 2/9; Allen, 50,000 to 100,000, 1/8; Lissen, 50,000 to 100,000, 2/6; Watmel, 50,000 to 100,000, 3/6.
RUBBER PHONE EAR-CAPS.—"Sorbo," per pair, 1/6.

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SLIDERS AND PLUNGERS, 3d.; G.W. type, very efficient, 8d.
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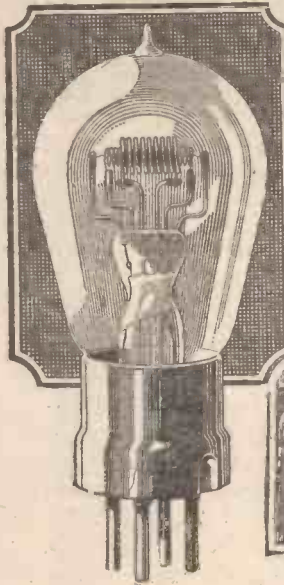
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UNSOLVED PROBLEMS

FOUR problems in wireless which have so far defied solution were dealt with in a lecture delivered by Mr. R. H. Barfield, M.Sc., before the Radio Society of Great Britain on October 22. The lecturer submitted the following questions: (1) Why is long-distance communication possible? (2) Why are signals stronger at night than by day? (3) Why do direction-finding stations experience large errors at night, while daylight errors are practically negligible? (4) Why does "fading" occur?

While propounding no definite theories that would account for any or all of these phenomena, Mr. Barfield advanced the hypothesis that in every case the solution might be found in some unexplored property of the upper atmosphere.

The first problem raised the question of why wireless waves remained on the surface of the earth. A superficial consideration would lead one to suppose that a wave transmitted from London, instead of being received in New York, might either penetrate the earth or be lost in space. The earth offered negligible resistance, and our knowledge of the atmosphere did not suggest that it could hinder an upward tendency of the wave. The more generally accepted theory was refraction from the Heaviside layer. This was only an hypothesis, extremely difficult to refute, but by no means proven.

To the remaining problems the lecturer

ascribed the same possibility, that some unknown property of the upper atmosphere was responsible for these phenomena. In the ensuing discussion Dr. W. H. Eccles, F.R.S., suggested that perhaps too much had been placed on the shoulders of the upper atmosphere! A satisfactory explanation of the daylight effect on short waves was the ionisation of the atmosphere during that period. Its de-ionisation at night furnished the reason for better signals during hours of darkness.

TRADE NOTES AND CATALOGUES

Transfers for Panels

FROM the Eagle Transfer, Ltd., of Finsbury Court, Finsbury Pavement, E.C.2, we have received samples of neat transfers for marking panels.

Catalogues

From Cunningham and Morrison, of Windsor House, Victoria Street, S.W.1, we have received a leaflet in which the Igranic Electric Co., Ltd., recommend their components for use with Myers valves to get perfect reception.

A copy of their trade price list has been sent us by Rose Bros. Electrical Co., Ltd., of 25, Milton Street, E.C.2.

"Wireless Valves" (useful information for the trade) is the title of a brochure sent us by the Electrical Supplies Co.

(E. S. Co., Ltd.), of 233, Tottenham Court Road, W.1.

B.T.H. accessories are described in a leaflet (trade only) received from the British Thomson-Houston Co., Ltd., of 77, Upper Thames Street, E.C.4.

"Radiola" receivers are the subject of leaflets sent us by the British Thomson-Houston Co., Ltd., of Crown House, Aldwych, W.C.2.

Hartmann and Braun measuring instruments are the subject of list K issued by Eck and Brook, Ltd., of 4-12, Palmer Street, Westminster, S.W.1.

Porcelain coil mounts and valve holders are described in leaflets received from the Athol Engineering Co., of Cornet Street, Ht. Broughton, Manchester.

W. and M. components are the subject of a price list and illustrated folder sent us by the Wainwright Manufacturing Co., Ltd., of 531, Forest Road, Walthamstow, E.17.

ASHTON'S PERFECT AERIAL SPREADER (protected) 12/- PER PAIR GETS ALL STATIONS ASHTON'S 8-10 Bull's Head Yard, MANCHESTER.

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Table listing various electronic components and their prices, including Ebonite Transformers, Edson Bell Condensers, Ormond Variable Condensers, Filament Resistances, and Loud Speakers.

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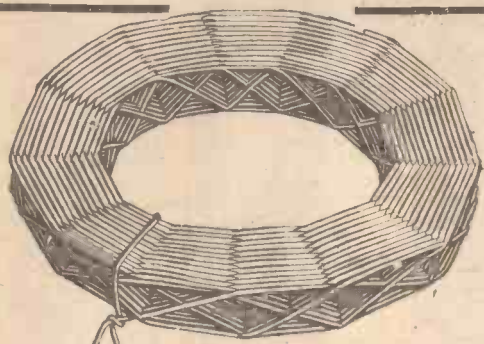
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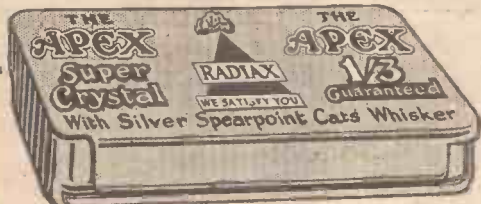
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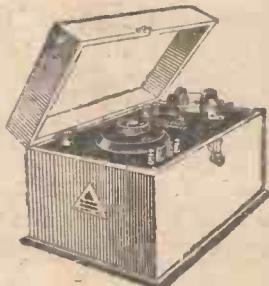
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NOTE.—In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.

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** (5IT), 475 m. **Bournemouth** (6BM), 375 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. **Edinburgh** (2EH), 325 m. **Hull** (6KH), 320 m. **Leeds** (2LS), 346 m. **Liverpool** (6LV), 315 m. **Nottingham** (5NG), 322 m. **Plymouth** (5PY), 335 m. **Sheffield** (6FL), 301 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 (Radio-Wien), 530 m. (1 kw.). 08.00, markets; 10.00, con.; 11.50, time sig.; 12.20, weather; 14.30, Stock Ex., news, con.; 17.20, children (Tues. and Thurs.); 18.15, news; 19.00, con., news, weather.

BELGIUM.

Brussels (SRB), 265 m. (1½ kw.). 17.00, orch., children (Wed. and Thurs.); dance (Tues. and Sat.); 18.00, news; 20.15, 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: 10.30, 12.00, 12.45, 16.00, 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; 17.00, con. (Thurs.); 09.00, con. (Sun.).

DENMARK.

Copenhagen (Radio-Klub), 775 m. 20.00, con.; 16.00, con. (Sun.).

Lyngby (OXE), 2,400 m. (10 kw.). 09.30, 15.50, 20.45, weather; (2,700 m.) 18.20, (2,400 m.) 20.00, news; 11.00 and 19.10, con. (Sun.).

Ryvang, 1,025 m. 19.00, con. (Tues., Fri.); 11.00, con. (Thurs.).

Yorcks Passage, 440 m. New station testing almost daily, 19.00.

Viborg, 1,400 m. 19.00, con. (irr.).

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 11.00, markets (exc. Sun.); 11.15, time sig., weather; 14.45, 15.35, 16.30,* Stock Ex. (exc. Sun. and Mon.); 19.00, weather; 22.10, weather (exc. Sun.).

* From Nov. 1, on 1st and 15th of each month, at 16.45.

Radio-Paris (SFR), 1,780 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).

L'Ecole Sup. des Postes et Télégraphes (PTT), 458 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, 470 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.

Agén, 300 m. New high-power station testing daily.

GERMANY.

Berlin (1), Vox Haus, 430 m. (700 w.); (2), 350 m. (1½ kw.). 09.00, markets; 09.15, news; 10.35, markets*; 11.15, Stock Ex.; 11.55, time sig.; 12.05, news; 13.15, Stock Ex.; 14.00, markets*; 15.00, markets*; 15.30, orch.; 16.00, markets*; 17.30, lec., children (Wed., Sun.); Eng. conv. (Mon.); 18.00, Eng. conv. (Mon.); children (Wed.), lec.; 18.45, lec. (exc. Sun.); 19.30, con., news, time sig.; 21.30, dance (Thurs. and Sat.). Evening lec. and con. from 18.00 relayed by Berlin (2) on 500 m. * On W.L. 500 m. only.

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

Königswusterhausen (LP), 680 m. (4 kw.). 09.40, con. (Sun.). 2,450 m.: 10.20, con. 2,550 m. (5 kw.): Wolff's Büro, 06.30-19.40, news. 2,800 m. (4 kw.): 10.50, con. (Sun.). 3,150 m.: Telegraphen Union, 06.00-20.00.

(Continued on page 704)

EFFICIENCY

THE STRONG LINK OF YOUR SET MUST BE

1/6



1/6

The Wireless Crystal with the Power of a Valve

To obtain music that cheers discard the weak link and substitute

"VALPO"

Enquire of Wireless dealers, or direct, post free 1/6., from **MERTON DAVIS, PARNELL & CO.** 359, Strand, London, W.C.1.

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Richardson's VERTEX AERIAL

Hundreds of users say that the "VERTEX" is the most compact, attractive and efficient aerial on the market. Easily attached to chimney-stack or face of wall, as shown, it increases range, volume and purity. It has one mast only, and can be installed in the most confined space. The "VERTEX" obviates "interference." Complete with 50-ft. downlead, 4 insulated arms and central steel hub £3 15 0 bracket, ready for mounting on mast. Steel wall brackets, with bolts, nuts, Rawlplugs and screws can be supplied.

"VERTEX" INDOOR AERIAL. A most efficient long-range "VERTEX" Indoor Aerial is also made for use where outside aerial is not possible. Can be suspended in loft under roof or in a top room. As illustrated, with 35-feet downlead, insulated cords and ring for suspension £3 15 0

Trade Enquiries Invited
WIRELESS APPARATUS, LTD.,
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FAMA DUTCH VALVES

USUAL TRADE DISCOUNTS

	Retail Prices
Amplifiers, Fil. 4-volt Anode, 60 to 100 volt ..	each 4/8
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Dr. Neper pattern Adjustable Diaphragm 4,000-ohm Headphones ..	pair 11/6

Please remit Postage.

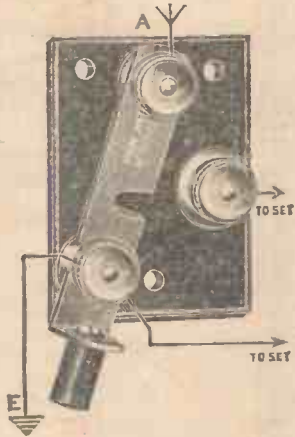
BISHOPSGATE ELECTRIC SUPPLY (1924) CO.,
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Phone: Central 7361.

Small devices which make a big difference

There may be no need to tell you what a difference attention to details makes in wireless, but we would bring to your notice these small Igranitic Devices which *make* that difference.

It is because Igranitic craftsmen—both designers and engineers—devote such care to details in producing Igranitic Components that we say “you will build a *better* set” if you use Igranitic Devices.



**IGRANIC
EARTHING SWITCH**

will protect both your home and set. The terminals are of patented improved type and carry the spring switch contacts which ensure perfect electrical conductivity.

Mounted on solid ebony base with three fixing holes. Price 3/-.



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For fitting to any rotary tuning device in order to obtain fine vernier adjustment. It is designed to fit 3/4" spindles, but with a liner will fit 3/16" spindles.

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SPRING CLIP TERMINALS

In boxes containing 10 terminals with fixing studs and nuts. **SIMPLE, SECURE, STRONG, SAFE.**
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IGRANIC COMPONENTS INCLUDE.

Honeycomb Coils
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All carry a six months' guarantee.

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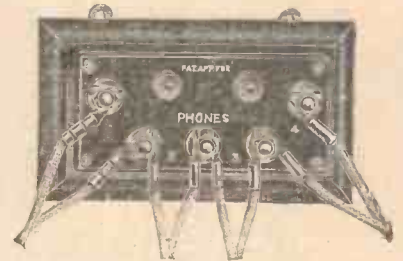
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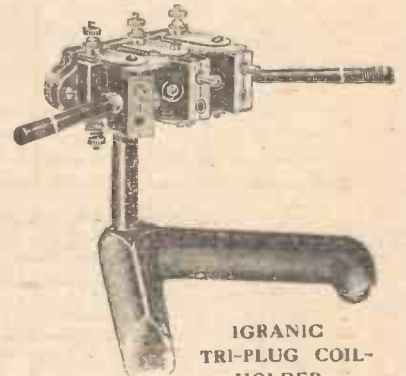
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Glasgow: 50, Wellington Street.
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**IGRANIC
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Designed to provide connections for additional pairs of telephones so that several persons may “listen in” simultaneously, on receivers possessing only two telephone terminals.
Any number of telephones up to four pairs may be connected instantly. Price complete, 8/6.



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TRI-PLUG COIL-
HOLDER**

For use with “Igranitic” Standard Plug Type Honeycomb Coils, it is arranged to take one fixed and two movable coils. Finest nickelled fittings, instrument finished.
Price, with stand and ebonite operating handle 21/-
For Panel Mounting 15/-



**IGRANIC
BI-PLUG COIL-HOLDER**

Similar in construction to the Tri-plug type, but designed for use with two coils.
Price, with stand and ebonite operating handle 16/6.
For Panel Mounting 10/6.

BROADCAST TELEPHONY (continued from page 702)
news, 4.00, (16 kw.); Express news service, 06.00-20.00.

Breslau, 415 m. (1 1/2 kw.). 10.00, sacred con. (Sun.); 10.15, Stock Ex., weather; 11.55, time sig., weather (Sun.); 12.25, time sig., weather, Stock Ex.; 14.00, Berlin news; 15.00, children (Sat. and Sun.); 16.00, orch., lec. (Sun.); 18.30, Esperanto (Mon.); 19.30, con. (Sun.); Eng. conv. (Thurs.); con., lec. (other days).

Frankfort-on-Main, 467 m. (1 1/2 kw.). 07.00, sacred con. (Sun.); 10.10, news; 10.55, time sig. and news; 15.00, children (Sun.); 15.10, markets; 15.30, orch.; 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, fech. lec., women's corner; 21.00, time sig.; con. (exc. Sun., Mon. and Thurs.).

Hamburg, 387 m. (1 1/2 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.; 15.30, children; 16.30, con.; 17.45, English conv.; 19.00, con. or opera; 21.00, on as weekdays.

Königsberg, 460 m. (1 1/2 kw.). 07.10, markets (Wed., Sat.); 10.15, markets; 10.30, sacred con.; sermon (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 (Sat.).

Leipzig, 452 m. (1 1/2 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. (1 1/2 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, 407 m. (1 1/2 kw.). 06.55, time sig., news; 11.15, Stock Ex.; 12.00, time sig.; 14.00, markets, news; 14.45, orch.; 18.15, weather, news; 19.00, con., dance (Sat.); 20.15, news. Sun.: 14.45 and 19.00, con., news, dance.

Nuremberg (relay), 340 m. Programme relayed from Munich (q.v.).

Stuttgart, 437 m. (1 1/2 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 (PTT), 458 m. (500 w.). 16.00, lec. (Tues. and from 06.45, news, Stock Ex.; 16.00, con.; 11.30, news (daily).

ITALY.
Rome (IRO), 422 m. (1 1/2 kw.). 19.30 to 21.30, con.

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.

SPAIN.

Madrid (Radio Iberica), 392 m. (1 1/2 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.

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.). 12.15, lec. No Sun. transmissions.

Lausanne (HB2), 850 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 (Höngg), 650 m. 12.00 and 16.00, weather, news, Stock Ex.; 17.15, children (Mon., Wed., Fri.), women's hour (Thurs.); 18.00, weather, news; 19.15, lec., con.; 21.00, news. Sun.: 11.10 and 19.15, con.; 21.00, news.

PHONE 4857

INGERSOLL WIRELESS Co. Ltd.,

PHONE 4857

MAIL ORDER "A" DEPT.: 24/6 CHANGE ALLEY, SHEFFIELD

BRANCHES at: 2-6, SWINEGATE, LEEDS, and 53, TYRREL ST., BRADFORD

VALVES	
B.T.H. R4.....	12/6
" B3.....	21/-
" B4.....	35/-
" B5.....	25/-
Cosmor P.1: P.2.....	12/6
Mullard H.F.: L.F.....	12/6
Ediswan A.R.....	12/6
" A.R.D.E.....	21/-
" A.R.O.C.....	25/-
Ingersoll R.....	8/-
" D.E.06.....	20/-
All valves are tested before sending, and are at customers risk only.	
LOUD SPEAKERS	
Amplion Junior.....	27/6
" De Luxe.....	50/-
" Dragon Fly.....	25/-
" Standard.....	55/5
Baby Brown.....	50/-
Solent R.E.....	42/-
Brandes Table Talker.....	42/-
Sterling Primax.....	£7 7/1
B.T.H.....	£5
All orders in strict rotation.	
H.T. BATTERIES	
Phoenix 36 volt.....	7/3
" 60.....	11/6
" 90.....	16/3
Siemens 30 volt.....	8/3
" 66.....	14/6
Ediswan 50.....	9/9
Including carriage.	

HART ACCUMULATORS	
4 v 20 act.....	24/11
4 v 30.....	30/2
4 v 40.....	35/8
6 v 20.....	37/-
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Including carriage.	
HEADPHONES	
Brown F.....	25/-
A.....	62/-
B.T.H.....	25/-
Sterling.....	25/-
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Dainty.....	15/-
Brandes.....	25/-
Dr. Petrie Power.....	13/6
L.F. TRANSFORMERS	
Marconi Ideal.....	35/-
R.I. new type.....	25/-
Silvertown.....	21/-
Igranic.....	21/-
Ferranti.....	17/6
Lissen T1.....	30/-
" T2.....	25/-
" T3.....	16/6
Ingersoll King.....	20/-
Eureka 2nd.....	22/6
" Concert grand.....	30/-
Royal.....	20/-
Amplitran.....	18/6
TELEPHONE TRANSFORMERS.	
Igranic 1-1.....	18/6
R.L.....	20/-

IGRANIC COILS	
25 5/- 35 5/- 50 5/2	
75 5/6 100 7/- 150 7/10	
200 8/8 250 9/- 300 9/5	
COIL HOLDERS	
W. & M. 5/- Basket 5/-	
Polar 6 6 B.M. 4/6	
Ingersoll Vernier.....	5/6
" Nickel.....	7/6
Quality Bead Vernier.....	9/-
RHEOSTATS	
Ormond.....	2/-
Ingersoll.....	2/-
Peerless 60 am.....	4/6
" 30 am.....	5/-
Burndept.....	5/-
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Microstat.....	2/9
Lissenstat Minor.....	3/6
" Major.....	7/6
Solent Unique.....	3/6
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Lissen Push Pull.....	2/9
Series Parallel.....	3/9

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Cymosite.....	2/6
Tungstallite Blue.....	1/6
" Red.....	1/-
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Belling Lee.....	4/6
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Lissen variable.....	2/6
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Mullard.....	2/6

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4 foot strip.....	4d.
Lead in Tube 6 inch.....	6d.
15-inch 1/3 9 inch.....	9d.
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" ".....	2/-
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Small Egg.....	11d.
" Shell.....	11d.
" Reel.....	2d.
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Phone.....	2d.
Spade.....	21d.
" Med.....	2d.
" Small.....	11d.
" Red or Black.....	11d.
Contact Studs.....	doz. 6d.
Nuts 2 to 8 B.A.....	2d.
Washers.....	2d.
Screws 2 B.A.....	4d.
" 4 to 8 B.A.....	3d.
Switch arms 1/- and 1/3.....	3d.
Slider Bars.....	3d.
" Knobs G.W.....	1/-
" Ebonite.....	4d.
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Wander Plugs 3d. and 4d.....	3d.
Brass Rod.....	3d.
Earth Clips.....	4d.
Pulleys.....	4d. and 1/-
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Valve Holders 7d., 9d., 1/- 2/-	
Aermonic.....	1/6
Valve Sockets 1d. and 2d.	
Phone Boards.....	2/6
Coil Plugs 1/-, 1/3, 1/6	
Basket Coil Holders.....	1/6
Burndept Detector.....	5/-
Ingersoll.....	1/6 and 2/-
Mic Met.....	6/-
Speartpoint Whisker.....	3d.
Nickel Studs.....	doz. 7d.
Condenser Vanes pair.....	1d.
Valve Pins.....	1d.
Phone Cords 1/9 2/6	
Utility Switches.....	5/-
Spot on Ebonite.....	1/-
S.P.D.T. on Ebonite.....	1/-
D.P.D.T.....	1/6
Tumbler Switch.....	2/3
Ebonite Panels cut to size.	
Ebonite Knobs 21d. 3d.	
ALL GAUGES D.C.C. and Enamelled Wire.	
VARIABLE CONDENSERS	
.001 8/-	.0005 6/-
.0003 5/6	.0002 4/6
With Knob and Dial Square Law	
.001 8/3	.0005 7/-
.0003 6/6	.00025 6/-
No Knob or Dial With Vernier	
.001 13/6	.0005 12-6
.0003 11/6	
Knob and Dial Sterling Stocked.	

THE INGERSOLL CONCERT GRAND TWO-VALVE TRANSATLANTIC RECEIVER With H.T. Battery and L.T. Accumulator, including Marconi Royalty

VALVES EXTRA £9-0-0 PHONES EXTRA

NOTE: ALL GOODS SENT CARRIAGE PAID. ASK FOR CATALOGUE

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Concerts, dramas, news, and the latest syncopated melodies—entertainment every evening. All these you can bring into your home with the aid of the "Brownie." The latest model, incorporating a Loading Bridge, which enables you to adapt it for 5 XX gives even clearer, stronger reception. From your Dealer. **7/6**

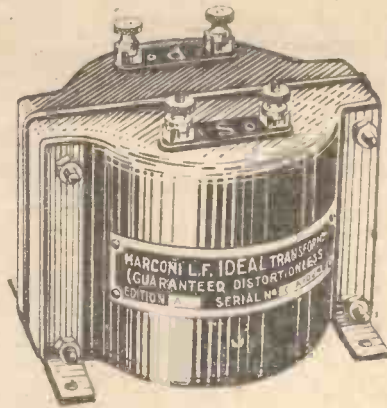
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An Ebonite base, to fit any model, of substantial and attractive design, is now supplied at an extra cost of 1/6. Just slide the "Brownie" into the hole, centre it and fix with the three screws supplied.

A Money-Back Guarantee with Every Outfit



HAILED as a remarkable achievement in highly efficient and distortionless amplification, admired as a piece of masterly workmanship, the Marconiphone "Ideal" Transformer carries a full guarantee for its exceptional claims.

PRODUCED IN THREE RATIOS:—

Price, £1 15s. Each.

LOW RATIO—2.7 to 1. This edition can be successfully used with any type of valve, and is especially recommended where a high impedance valve such as the "R," "D.E.R.," "V.24," "D.E.V.," or "D.E.Q." is used as a rectifier, and where the transformer constitutes the first stage of cascade amplification.

MEDIUM RATIO—4 to 1. This edition of the transformer yields the maximum amplification satisfactorily obtainable from a high impedance valve such as the "R," "D.E.R.," etc. It is also very suitable for low impedance valves of the "L.S.2" or "L.S.5" type used either singly or in cascade.

HIGH RATIO—6 to 1. This edition is intended primarily for use with low impedance valves, and is eminently suitable for the last stages of cascade amplification where a large amount of power is required. It enables full advantage of the properties of the low impedance valve to be taken, and gives a rate of amplification per stage which can be obtained in no other way. The amplification per stage with this ratio transformer and the "L.S.5" valve is approximately 35, a figure which has never previously been reached with any attempt at uniformity over a range of frequencies. This instrument can be used with high impedance valves in cases where perfection of quality is not absolutely essential; employed in this way a very high amplification, approaching 60, will be obtained.

The Marconiphone "Ideal" Transformer is now standard in Marconiphone instruments.

Marconiphone "IDEAL"

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GUARANTEED DISTORTIONLESS

Announcement of

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A number of ships have been fitted with special apparatus for the reception of broadcasting. Experiments are now being carried out with a view to making it possible to receive broadcasting whilst the ship's transmitter is working.

As a result of experiments carried out on the *Elettra*, Senatore Marconi thinks

that he has now solved the problem of direct communication between any two points on the globe without intermediary stations.

There are 550 odd broadcasting stations in America, but at the most only 100 of these can in any way compare in power or programmes with our main stations.

Sterling Dinkie Loud-speaker.—In the advertisement of K. Raymond, of 27, Lisle Street, London, W.C.2, on page 584 of No. 125, the price of Sterling Dinkie loud-speakers is stated as 27s. 6d. This is an error. The correct price is 30s.

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COMPLETE LIST. 1s. 6d. net each; 1s. 8d. post free.

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 Rearing. Induction Coils. Knotting and Splicing Ropes and Cordage. 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.

CASELL & COMPANY, Ltd., La Belle Sauvage, London, E.C.4. AND ALL BOOKSELLERS.

WE REGRET

That, owing to pressure on our space this week, we are compelled to hold over the "Information Bureau" page. All queries addressed to us are answered by post providing a coupon (p. 709) and stamped addressed envelope are sent us.

ANNOUNCEMENTS

"Amateur Wireless and Electrics." 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.

SOLD

OTHER METHODS **MAKES SOLDERING CHILD'S PLAY** **SOLDO METHOD**

An amateur can solder more easily with SOLD than an expert by other methods

1/6 **CLEANS AND TINS AND SOLDERS in one operation. NO ACIDS, NO FLUXES, NO FILING**

From all dealers,
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Dull Emitters Repaired Quick!

10/6

Good News! D.E.'s repaired for **10/6**. With 2 volt '25 amp. filaments. As good as new. Prompt service.

Can't repair "WECO" type or kind having electrodes brought out at opposite ends of tube (i.e., low capacity type). We return your valve equal to new.

RADIONS Ltd., BOLLINGTON, MACCLESFIELD Near

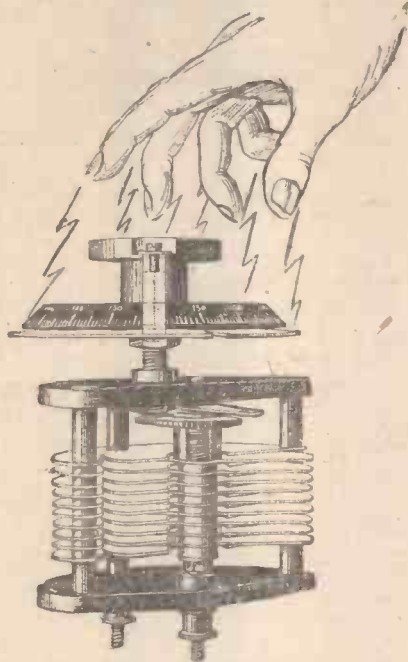
New Radion Cool Valves, 18/6

C1. Fil. 2 volts '25 amp. For general purposes.

C2. Fil. 2 volts '35 amp. For L.F.

C. Fil. 3 volts '06 amp., 21/- each.

Anode 20-8s, & amplification about 9 in each case



FINE TUNING

THERE are three main reasons why the "Fulstop" variable condenser gives fine tuning. First, as it is a square law condenser, the stations are spaced evenly round the dial with wide gaps between each station; second, because the dial is geared two to one to the moving plates and the dial turns completely round to move the plates 180°; and third, because with the "Fulstop" all hand capacity effects are completely eliminated.

The "Fulstop" variable condenser is the only one which actually guarantees the abolition of hand capacity.

Read what "Modern Wireless" says:

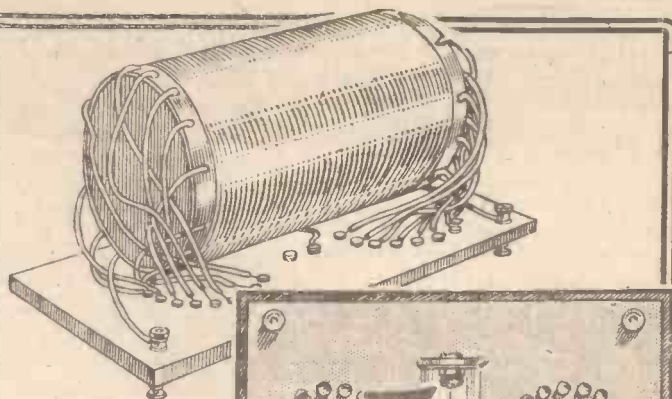
"We can strongly recommend this type of geared condenser for careful tuning and for use in situations where hand capacity effects are troublesome."
October, 1924.

PRICES: { .001 ... 13/6 | .0003 ... 10/3
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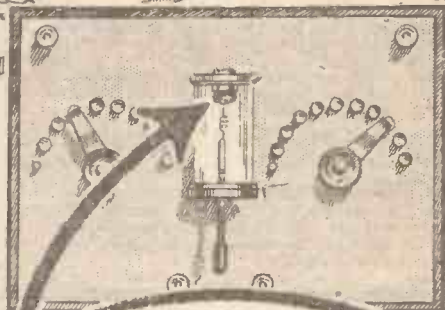
Protected Throughout the World

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

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



See Stand D2, British Wireless Exhibition, W at City, Nov. 15 to 29.



The Heart of a Perfect Set - NEUTRON

The one great essential to perfect Crystal or Crystal-valve reception is a really efficient Crystal. A good aerial, heavy-gauge inductances, low capacity, good phones—all these help, but the one vital point is your Crystal. And the finest Crystal in the world—Neutron—costs you but 1s. 6d.

An indoor Aerial with Neutron equals an outdoor one with ordinary crystals. Neutron will even compensate for poor phones or inefficient coils; but be sure you get Neutron, in the black and yellow airtight tin—the guaranteed and concert-tested wonder-crystal.



The World's Greatest Radio Crystal — Concert Tested and Guaranteed

What Correspondents write:—

"I have tried this Crystal and now I should like to say I am quite satisfied with it. It might interest you to know it is at present in use on an ordinary crystal set and works with good strength five pairs of phones."

G.H.S., S.W.1.

"Received your Crystal this morning. I have never been able to get London so plain. I have tried crystal after crystal, but I have never had such a good result before as I have to-day, when I listened in at the Noon Concert from London."

W.T.T., Harrietsham, Kent.

NEUTRON, Ltd., Sicilian House, Southampton Row, London, W.C.1. Phone—Museum 2677.

Sole Distributors: V. Zeitlin & Sons, 144 Theobalds Road, London, W.C.1. Phones—Museum 2795 and 6841.



Stocked by the Best Radio Dealers. Packed in airtight tin, with silver catwhisker. Insist on Neutron in the Black and Yellow Tin—or send 1/6 and Dealer's name, and this wonderful Crystal will be mailed by return.





Beckenham and District Radio Society

Hon. Sec.—A. WEST, 3, Manor View, Beckenham. On October 23 Mr. Knight gave a lecture entitled "Common Faults in Reflex Circuits," followed by a talk on the best way to learn Morse.

Coventry and District Co-Operative Radio Society

Hon. Sec.—A. CURTIS, West Orchard, Coventry. A LANTERN display was given on October 25, the slides having been loaned by the Marconi Company. This was followed by a demonstration for the benefit of those members inexperienced in wiring up a set from a diagram.

Tottenham Wireless Society

Hon. Sec.—A. G. TUCKER, 42, Drayton Road, Tottenham. On October 22 Mr. Tucker gave the first of a series of lectures entitled "How It Works," in which he proposes to deal, in an elementary way, with certain components used in wireless. This lecture dealt with the valve.

Hackney and District Radio Society

Hon. Sec.—G. E. SANDY, 70, Chisenhale Road, E.3. An interesting afternoon was spent in the wireless section of the National Physical Laboratory at Bushey House, Teddington, on October 17. On October 20 the usual weekly meeting was held.

Radio Association. Sidcup and District

Hon. Sec.—L. N. MARTIN, Pilford, Knoll Road, Sidcup, Kent. The above branch of the Radio Association is being formed, and intending members are asked to communicate with the secretary.

Wimbledon Radio Society

Hon. Sec.—P. G. WEST, 11, Montana Road, S.W.20. The meeting on October 24 was devoted to the first of a series of lectures by Mr. C. E. P. Jones, who aims to give anyone who cares to follow the series a thorough insight into the working and operation of a wireless receiving and transmitting installation.

A FIFTEEN-GUINEA CUP FOR A WIRELESS NOVELTY!

A WIRELESS Exhibition will be held at the White City (Uxbridge Road entrance) from November 15 to November 29, 11 a.m. to 10 p.m., the admission being one shilling, including tax. "Amateur Wireless" will have a stand, and the Exhibition is expected to provide a goodly array of components and materials to delight the heart of the wireless amateur.

"Amateur Wireless" is offering a 15-guinea silver cup for competition, with a view to encouraging the amateur wireless inventor.

Any amateur may send his novelty or invention to the Exhibition, and indeed is invited to do so.

These competition inventions will be on view from November 20 to November 29, and must reach the Exhibition not later than Monday, November 17. They should be sent, carriage paid, to "Amateur Wireless" Inventions, The Wireless Exhibition, White City, Uxbridge Road, London, W.12, and not to our Editorial offices. When the Exhibition is over they will be returned carriage forward, but quite small pieces of apparatus will be returned through the post.

The rules are very few indeed, but should be closely observed.

The inventions must reach the Exhibition not later than Monday, November 17. Each package must be labelled "'Amateur Wireless' Inventions," and must bear the name and address of the sender. Neither "Amateur Wireless" nor the Exhibition authorities will be responsible for any loss or damage to the articles entered for competition, but it is needless to say that every possible care will be taken of them.

The inventions will be judged by the technical staff of "Amateur Wireless," together with any specially qualified experts they may care to invite to assist them. The awards will be announced on Tuesday, November 25, at the Exhibition, and, if possible, will be published in the issue of "Amateur Wireless," on sale on Thursday, November 27; failing that in the issue published one week later.

In addition to the silver cup as first prize, there will be a gold medal as a second prize, and a silver medal as a third.

Let every ingenious reader of "Amateur Wireless" get right down to the job straight away, and see that his invention reaches the Exhibition not later than Monday, Nov. 17.

CHIEF EVENTS OF THE WEEK

SUNDAY (November 9)

London	3.0	Programme of Music by the Oriana Singers and the Chaplin Trio.
Birmingham	3.0	Band of the 2nd Batt. the East Yorkshire Regiment.
Bournemouth	3.0	Band of the 2nd Batt. the Argyll and Sutherland Highlanders.
Aberdeen	9.0	"Requiem" (Mozart). (S.B. to Glasgow and Edinburgh).
Glasgow	3.45	English Song Recital by John Coates.

MONDAY

ALL STATIONS (Except Belfast).	7.25	The Lord Mayors Reception in the Library, Guildhall. "Round and About London on Lord Mayor's Day." Speeches from the Lord Mayor's Banquet, Guildhall.
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TUESDAY

ALL STATIONS	7.30	All Stations have arranged programmes which are suited to the spirit of Armistice Day.
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WEDNESDAY

Dundee	9.0-9.10	Official Opening of the Dundee Relay Station. (S.B. to all Stations.)
London	7.25	Pianoforte and Song Recitals.
Birmingham	7.30	Musical Comedy Night, "Philida."
Bournemouth	7.0	"Winter Gardens Night," The Municipal Orchestra.
Cardiff	7.30	Band of 2nd Batt. the Welsh Regiment.
Manchester	7.30	A Day at Belle Vue.
Newcastle	7.0	Operatic Night.
Aberdeen	7.30	Scottish Community Singing Concert (S.B. to Glasgow and Edinburgh).
Belfast	7.30	Symphony Night.

THURSDAY

ALL STATIONS (Except Belfast).	7.30	Part of Hallé Concert relayed from Manchester.
ALL STATIONS (Except Birmingham and Belfast).	8.15	Part Songs, Humour and a Melodrama.
Birmingham	8.15	Two Plays and a few songs.
Belfast	7.30	Robert Louis Stevenson's Anniversary. Concert.

FRIDAY

ALL STATIONS (Except Belfast).	7.30	B.B.C. Birthday Programme.
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SATURDAY

London	7.30	Philharmonic Concert.
Birmingham	7.30	517's Birthday Programme.
Bournemouth	7.30	"Cherio." A Smoking Concert.
Cardiff	7.30	"The Development of English Song." John Coates.
Newcastle	7.25	Miners' Saturday Night.

"Making a Lady's Work-box" is the title of a well-illustrated article appearing in the current issue of "The Amateur Mechanic and Work" (3d.). The article gives full instructions on making a compendium for containing all that is necessary for a lady's sewing, knitting and other operations. Other articles that appear in this number are: "The Beginner's Microscope"; "An Electric Magnetic Fan"; "Our Small Car Page"; "An Easily-built Crystal Receiving Set"; "The Insulation of Component Parts"; "An Assembled H.T. Battery"; "Notes by the Way"; "How I Built My Bungalow"; "Fixing a Mincing Machine"; "Decorating a Room"; "Winter Photography: Dealing with the Summer's Negatives"; "Motor-cycle Practicalities."

IPSWICH AMATEURS' EXHIBITION

A WIRELESS and scientific exhibition is to be held at Church Institute, Tower Street, Ipswich (next to Poole's Picture Palace), on November 11 and 12 by the Ipswich and District Radio Society. The exhibition will be opened at 3 p.m. by the Mayor. Both trade and amateur apparatus will be on show. There will be demonstrations of broadcast reception.

"Uncle Jack Frost's Wireless Yarns on Good Reception and How to Get It" is the title of an interesting book on wireless matters that is published by the Wireless Press, Ltd., at 2s. It is compiled from broadcast talks.

G.W.I.'s New Address

In order still better to serve their ever-growing circle of customers, the firm of G.W.I., Ltd., are moving to new offices and showrooms at 43, Grafton Street, Tottenham Court Road, W.1.



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STAND K34
White City Exhibition



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**WEMBLEY
LOUD-SPEAKER**
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Write for Lists of other Stella Loud-speakers at 35/- and 70/-.



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These noted light-weights are tested and guaranteed to give perfect and distortionless reception, with maximum comfort. Thousands sold to satisfied customers. Equal to any and cheaper than most other really good phones. Carriage paid, or from local dealers **17/6**
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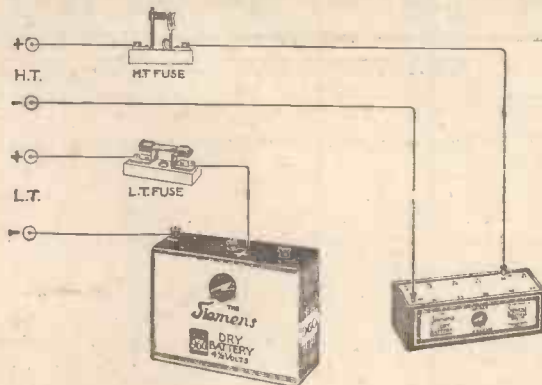
Identical diaphragms to "Stella" Phones, but lighter construction, and so made that only the earpieces touch the head at sides — a boon to lady listeners, as the hair is not disarranged. Carriage paid, or from all good dealers. **14/6**
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BATTERY PROTECTION



"In commercial installations it is the invariable practice to ensure that any electric battery installed is adequately protected by suitable devices which will immediately break the battery circuit in the event of an excessive discharge taking place. Unfortunately, this precaution is one which is seldom observed by the Wireless Amateur and, until he is confronted with a useless battery, the need for such protective devices is not sufficiently realized. The provision of suitable fuses is quite a simple matter and the initial cost of them comparatively small. On pages 19 and 20 of this Catalogue we illustrate and describe our Fuse Q.2875 for protecting the filament (L.T.) battery and Fuse Q.2890 for protecting the anode (H.T.) battery. When ordering the L.T. Fuse Q.2875 it is desirable to specify the maximum current which the fuse will be called upon to carry safely.

"The fuses are mounted on porcelain bases which may be affixed to any convenient woodwork. The fuses should preferably be inserted in the positive connecting lead from the respective batteries to the receiving set; but in cases where separate tapplings are taken from the H.T. battery, the fuse for this battery may be connected in the negative lead.

"A suitable wiring diagram is shown above."

Extract from our Catalogue 595, a copy of which will be sent on application.

Advertisement of Siemens Brothers & Co., Ltd.,
Woolwich, S.E.18.

Amateur Wireless

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Available until Saturday,
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GREAT SUCCESS OF RADIO "STOCKS"

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FIRST-CLASS VARIABLE CONDENSERS

Best British make. Perfect finish. Absolutely Finest value obtainable

	Ordinary.	With Vernier.	Square Law.	With Vernier.
.001 ...	7/3	8/9	9/6	11/-
.0005 ...	5/6	7/-	8/-	10/-
.0003 ...	5/1	6/7	7/6	9/-
.0002 ...	4/5			
.0001 ...	4/2			
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Dials and Knobs Included in all Condensers

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AERIAL WIRE.—7/22; Best H.D. Copper, 1/10 $\frac{1}{2}$; Enamelled, 3/6 per 100 ft.

ANODE RESISTANCES.—Bretwood, variable, 3/-; Watmel, 3/-; Lissen, 2/6; Dublier, and all makes.

BATTERIES.—Best British H.T. Batteries, 36 Volt, 6/-; 63 Volt, 10/6; 100 Volt, 16/6.

CONDENSERS.—(Copper and mica). Fixed; to .001, 9d.; to .005, 1/-; to .01, 1/9; to .1, 3/-; Edison Bell Fixed Condensers, to .001, 1/3; .002 upwards, 2/-; Dublier up to .0005, 2/6; .001 upwards, 3/-.

TRANSFORMERS, L.F.—"Powquip," 12/-; "Bucks," 11/6; "Radstock," 10/6; Royal, 20/- best of all. All makes stocked.

TRANSFORMERS, H.F. ENERCO.—No. 1, 2/3; 2, 2/5; 3, 2/7; 4, 2/9; 5, 3/-; 6, 3/-.

SLEEVEING.—(Insulating), 3 ft. lengths, 3 for 10d., finest quality.

SWITCH ARMS.—First quality, 9d.; Nickel, 1/-; second quality, 6d.

SWITCHES.—S.P.D.T., 1/3; D.P.D.T., 1/8. Panel mounting, S.P.D.T., 10d.; D.P.D.T., 1/-.

VARIOMETERS.—Wonderful value: Special All Ebonite Moulded Ball Rotor Double Silk Wound, extremely close coupling, one-hole fixing. A superior article, only 5s. As above, but Tubular Ebonite Rotor, 4s. All-black Double-cotton Wound, one-hole fixing, 1s. 6d. to 4s. each. All are best value obtainable. Igranite and Edison Bell Variometers, 10s., post paid.

HEADPHONES.—N. & K. pattern, 11s. 6d.; Dr. Nesper adjustable, 12s. 6d.; Brown's F., 25s. All makes in stock at lowest prices possible.

LOUDSPEAKERS.—Our special, 2,000 ohms, full clear tone, suitable for low-power sets, 21; Sterling Dinkie, 30s.; Ampion Junior, 27s. 6d.; Dragonfly, 25s.; Ampion new models and all makes in stock at lowest prices.

MANSBRIDGE CONDENSERS.—Special offer: "Octopus" brand, best quality obtainable; accurate, permanent, noiseless; beautifully cased, two extra fixing lugs; tested at 350 volts direct current for insulation; there are none better.

.05, 3/-; .1, 3/6; .25, 3/6.	1 mf., 3/6.	2 mf., 3/10.
Sizes 2" x 1 $\frac{1}{2}$ " x $\frac{1}{8}$ ".	2" x 1 $\frac{1}{2}$ " x $\frac{1}{8}$ ".	2" x 1 $\frac{1}{2}$ " x 1 $\frac{1}{8}$ ".

COIL HOLDERS.—All Ebonite, really fine, 2-way, 2s. 6d.; better finish 2-way plated, 3s. 6d.; ditto, 3-way, 4s. 6d.; Polar 2-way with Vernier, 6/-. Many other makes in stock. State your wants, we will assist you.

BASKET COIL HOLDERS.—Best quality, plug in, block base, 1s. 2d. each; ditto, no block, 10d.; Universal 2-way, 6s. 6d.; 3-way, 7s. 6d.

VALVE HOLDERS.—Solid hand-polished Ebonite, 10d. each; Special Anti-Capacity Legless Sanken Socket Tops, prevent valves burning out, 1s. each. Murray's Patent, very efficient, with simple fitting showing only $\frac{1}{4}$ in. above panel, 1s. 3d. each. Highly recommended.

COILS.—Finest Duplex Basket, Waxless, most efficient for any circuit and any position. Set of 5—Nos. 25 to 100, 1s. 10d.; ditto, for Chelmsford, No. 150, 1s. 3d.; No. 200, 1s. 6d. As above, but extra large air spaces, coils $\frac{1}{2}$ in. wide, Sets of 5, Nos. 25 to 100, 2s. 9d. Igranite, O'Keefe, Energo, Lissen Coils, etc., all in stock.

VALVES.—Dutch, 4s. 6d.; R. type, 5s.; French R., 6s. 10d.; French dull Emitters, finest on market for efficiency and low consumption, 16s. 6d. All makes in stock: Cossor, Mullard, Marconi, B.T.H., etc. etc. Lowest list prices.

FILAMENT RHEOSTATS.—Microstats, 2s. 6d.; Lissenstats, 3s. 6d.; Ormond, 2s.; our own Extra Special Solid Ebonite of a superior type, 2s.; for Dull Emitters, 2s. 6d.; fully guaranteed. Cheapest type, efficient and strong, 1s. 6d. each.

CONSTRUCTORS.—Sets of Parts: We specialise in quoting for complete sets of parts. No matter how small or how large your requirements, we will be pleased to quote you our best terms and also give you technical advice.

CRYSTAL AND VALVE SETS.—Special prices.

EVERYTHING WIRELESS AT LOWEST PRICES

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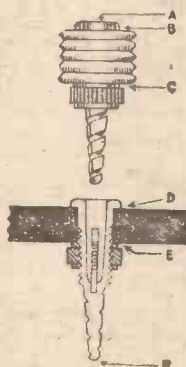
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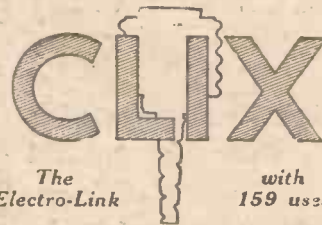
Solder all connections,
Where you can't—use "CLIX"!



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

Retail Prices

CLIX with Locknut, 3d.
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RADIO-PLAN No. 1 contains—

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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. 100 pp. (28 diagrams), 1/3 post free. Satisfaction guaranteed or money returned.

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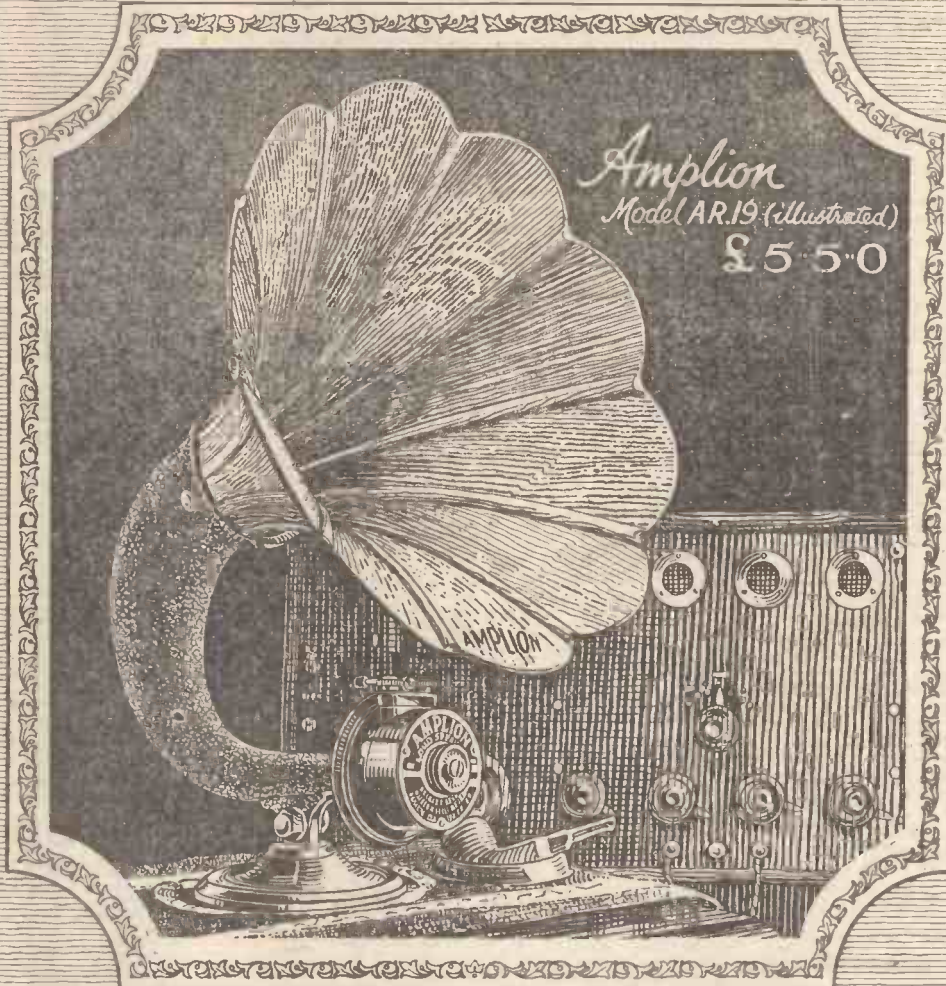
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1V-40a	17/-	6V-40a	25/-
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TELEPHONES RE-WOUND

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THE EXTRAPHONE
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Patents Pending

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You can use as many telephones as you want and they may be of any resistance

WITHOUT WEAKENING THE SIGNAL STRENGTH

Nothing more is needed, simply add one Extraphone to each pair of phones and no matter how many in use, whether low, high or mixed resistances, every phone will be as loud as if all the others were disconnected.

Tested and approved by "Amateur Wireless."
See article, Oct. 15th.

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MONEY RETURNED IF NOT SATISFIED IN 3 DAYS

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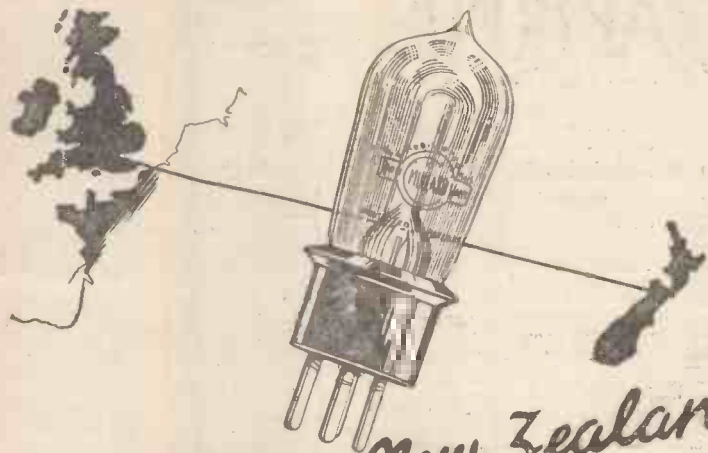
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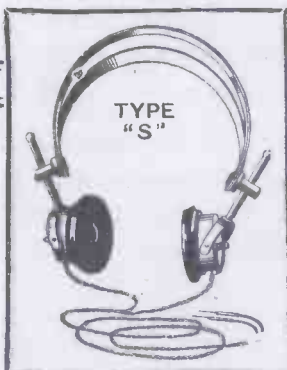
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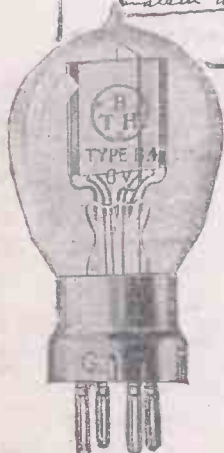
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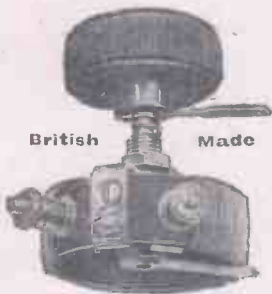
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Amateur Wireless

and Electrics

Vol. V. No. 128

November 15, 1924

EUROPE CALLING!

HOW YOU MAY RECOGNISE THE DIFFERENT STATIONS

MANY evenings are spent by amateurs in their search of long-distance telephony, and from the correspondence received by wireless journals it would appear that some difficulty is experienced in identifying in every instance the station successfully tuned in. It is true that many of the "foreigners" are somewhat lax in the repetition of their calls, but a number of them possess peculiarities which help the listener to establish their identities.

French Stations

There is little doubt that most amateurs recognise both the Eiffel Tower and Radio-Paris by their power and relatively high wavelengths, but for those who are not so sure it may be useful to give the exact wording of their respective calls.

FL, a military station, usually prefaces the opening of the programme by "Allô . . . Allô. Ici la Station Militaire Radio-téléphonique de Paris. Poste de la Tour Eiffel," whereas our friend "Radiola" is more brief and after a couple of cheery "Allôs" merely states: "Ici Radio-Paris. Poste de Clichy." Both L'Ecole Supérieure des Postes et Télégraphes and Le Petit Parisien give their names in *extenso* and repeat them at frequent intervals during the evening.

German Stations

Fewer listeners, probably, understand German, and for this reason rather more details are given.

Königswusterhausen (LP) is very conscientious, and the announcer repeats the name of the station at every opportunity. Phonetically transcribed, it reads thus: "Here Keunigz-voos-stir-housen," and concludes the performance at the end of the transmission with (again phonetically): "Veer mar-hen yetzt schloos. Owf veederheuren" (We are now closing down. To our next hearing). But in any case LP is not difficult to recognise, as, apart from the daily morning concert on 2,450 metres, most of the transmissions take place on Sunday before lunch.

Few of the German stations make use of the breezy "Hullo," most of them broadcasting a more pompous "Achtung" (pronounced Arhtoong) (Look out). It is, as a matter of fact, a similar warning to the one given by the German luggage porter when pushing his trolley through a station crowd. Following this threatening note, the stations usually add the name of their city; thus: "Achtung. Hier Frankfurt-am-Main." There are, however, exceptions. Hamburg, for instance, has a playful way of calling "Hier Norag," the latter word being an abbreviation of the numerous syllabled firm running the "show." Leipzig, for the same

of either giving the call signs in letters or of merely mentioning the name of the town. For the present, however, the useful information imparted by the announcers enables the amateur to establish the identity of the station picked up.

Common Languages

It should be borne in mind that the German language is also used in Austria and part of Switzerland, but the fact that the "Fatherland" stations conclude their evening's entertainment with their National Anthem, "Heil Dir im Siegerkranz," which is played to the same melody as our "God Save the King," clearly denotes that it is a German station.

Vienna's call: "Hallo, Rad-dee-o Veen" (Radio-Wien), stamps it right away.

You cannot expect the poor announcer of either Kbely (pronounced Kee-bell) or Komarov to repeat the word "Czecho-Slovakia" many times during the evening, but the calls are distinctive. Kbely announces that "Prague-Radio" is on the line, and Komarov lets you know that it is run by the "Radio-Journal of Prague." Speeches are made from both stations, not only in Czech but also in German, and on some occasions in Esperanto.

Brussels (SRB) transmits in French, and "Allô. Ici

Bruxelles Radio-Belgique" is regularly heard in this country.

Of the Swiss stations, Zurich only uses the German language, both Lausanne and Geneva lying in the French-speaking portion of the country. Zurich sends a call similar to the German stations and also states its wavelength, as it is still temporary. Lausanne mentions the name of the town, and Geneva styles itself "La Société Romande."

The new station at Madrid is now regularly heard here and the announcer often gives the call "Radio-Iberica, Madrid." Sometimes he gives the items of the programme in Spanish, French and English.

(Concluded in 3rd column of next page)



Which Is It?

raison, announces "Hier Mirag." As a rule, apart from their calls, the stations give their wavelengths. "Achtung. Hier Königsberg auf Welle (wavelength)." Hamburg also possesses the distinctive method of opening the concert with several strokes on a dinner-gong, so many "pongs" later indicating the number of minutes interval between two items. Munich does not, as a rule, mention the city in its call, but styles itself, after the preliminary warning, "Die Deutsche Stunde in Bayern" (the German broadcast in Bavaria). These long-winded calls will be necessarily abbreviated in the near future, and it is more than likely that the Germans may adopt the English method

AMAZING BEAM TRANSMISSION

ALTHOUGH they will not directly affect broadcast listeners, beam transmitters have such amazing possibilities that they are of interest to all wireless enthusiasts. The difference between broadcast and beam transmission is the difference between flood-light apparatus and a searchlight; both may have the same candle-power, but one will diffuse all the light over as large an area as possible, and the other will direct it in a narrow beam.

Broadcast and Beam Transmitters

So with broadcast and beam transmitters; both may use the same power, but the broadcast transmitter will send it out equally in all directions, while the beam transmitter will direct the waves over a comparatively small area. The aerial used with a beam transmitter has placed round it a number of wires that act in a similar way to the reflector in a searchlight, and, in fact, actually reflect the wireless waves and concentrate them in a narrow beam.

Small Power—Low Cost

From a practical point of view the greatest point of interest in beam transmission is the tremendous distances that

bola, whence they travel outwards in the form of a beam. Another type of aerial, which consists of grid placed parallel to one another, is shown by Fig. 2.

Some Results and Possibilities

Huge distances have already been



Fig. 1.—Reflector Aerial.

covered using low-power beam transmitters, as disclosed recently by Senatore Marconi during a lecture before the Royal Society of Arts. During tests between the Marconi station at Poldhu and the

case the power used was less than 250 watts.

Continuous Communication

Results such as these open up great possibilities for communication over long distances in the near future. It is to be hoped that beam transmission will solve the problem of continuous communication (both by night and day) between this country and the Dominions. D. S. R.

"EUROPE CALLING!" (continued from preceding page)

Rome (1 R O) cannot be mistaken. It is a new station anxious to receive reports as to reception, and the call "Stazione di Roma. Unione Radiofonica Italiana" is repeated after every interval.

There are now but few Dutch stations working, but Hilversum (N S F) is readily identified, as the announcements are fairly regularly given in both English and Dutch.

The various pointers given in this article, in conjunction with the fact that the amateur usually has some idea of the wavelength on which he is receiving a

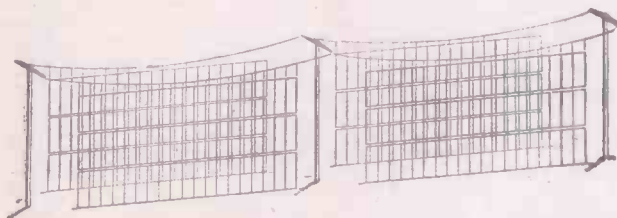


Fig. 2 (left).—Grid-type Aerial.

it is possible to cover with extremely low power. Low power means (as a rule) simpler and less apparatus, with a corresponding decrease in costs, both of maintenance and erection.

Thus for the first time world-wide wireless transmission is made possible at what is comparatively a very low figure. For this wonderful system of beam transmission the wireless world once again owes thanks to Senatore Marconi.

Types of Reflector Aerial

It has already been mentioned that a screen around the aerial reflects the waves and concentrates them in a beam. This is clearer from the diagram, Fig. 1, which shows one form of reflector aerial. The aerial proper consists of two vertical wires (rising from the hut) around which are placed a number of wires in the form of a parabola, the aerial wires being at the focus of the screen.

Wireless waves sent out from the aerial are reflected by the screening wires and concentrated at the opening of the para-

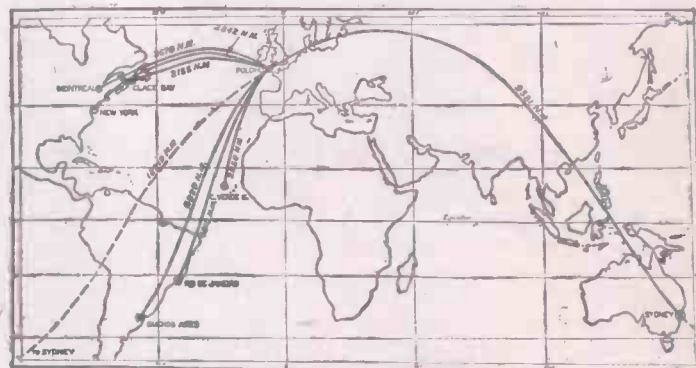


Fig. 3 (right).—Track of Short-wave Signals.

Elettra at Cape Verde (2,300 miles distant, see Fig. 3) strong signals were received without any interference from atmospheric. Poldhu radiated 9 kilowatts on a wavelength of 97 metres, and the reflector concentrated the energy towards Cape Verde. The receiver on the *Elettra* had two stages of H.F. amplification and an auto-heterodyne detecting valve, to which could be coupled two stages of L.F. magnification.

Short-wave Ranges

As far as long-range work is concerned, short waves used without reflector aeri- als have great possibilities. Only a week or so ago three amateurs in this country successfully communicated with New Zealand, a distance of 12,000 miles, on a waveband round about 90 metres. In each

transmission, should enable him to identify accurately the great majority of wireless telephony stations heard. It is only on the lower band of broadcasting wavelengths that some hesitation may occur, but if judgment is used and a record kept a rough glance at the "Broadcast Telephony" page will in every instance settle the matter. J. G. A.

Thinking that music might have a soothing effect on his patients, an Austrian dentist installed a receiver in his operating room. All went well until an ear-splitting crack in the phones caused both dentist and patient to jump, with the result that a drill went through the latter's cheek. After paying damages, the dentist threw the set away!

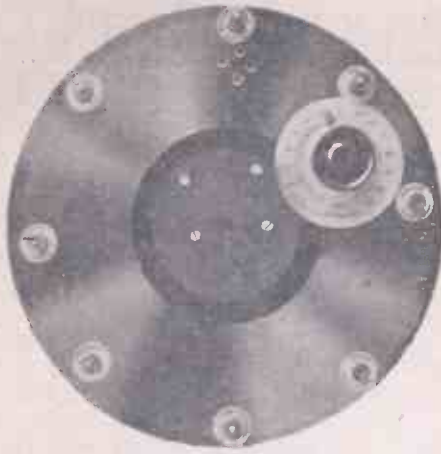


Fig. 1.—Front of L.F. Panel.

CLOCK CIRCUITS.—II

THE LOW-FREQUENCY AMPLIFIER

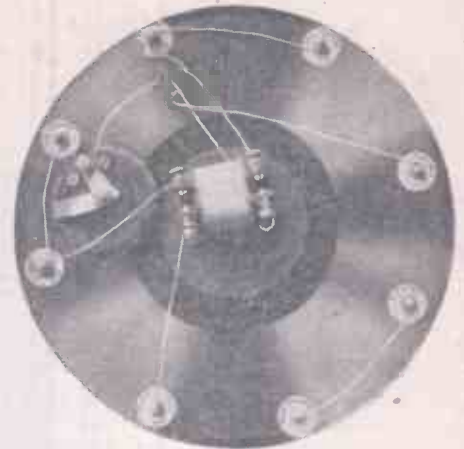


Fig. 2.—Back of L.F. Panel.

THE article in No. 121 described a new and novel system of wiring circuits, which was termed the "Clock Circuits" system. For the information of new readers it may be stated that the underlying principle of the idea is to imagine that the back of the panel—crystal, valve detector, L.F. amplifier or H.F. amplifier—has a clock face on the ebonite, and that the terminals, valves, condensers, etc., are arranged on the panel in positions corresponding to the hour figures of a clock. This gives twelve well-known positions or, with the centre, thirteen positions which could be standardised.

The low-frequency amplifier shown by the photographs Figs. 1 and 2 is so simple

to construct that no one need have the slightest hesitation in attempting the task. It is only necessary to get a 10-in. gramophone record and drill the necessary seventeen holes in the positions shown. The low-frequency transformer occupies the central position and the valve is between the L.T. positive and the transformer, whilst the rheostat is between the transformer and negative low-tension.

Arrange eight terminal tabs round the panel in the following order:

Low-tension positive, high-tension negative, phones, phones, high-tension positive, input, input and low-tension negative. The positions correspond to the hour positions of a clock, thus: Twelve o'clock, L.T. +;

1.30, H.T. -; 3, phones; 4.30, phones; 6, H.T. +; 7.30, input; 9, input; 10.30, L.T. +.

Start wiring from the transformer. First wire, inner primary to input; second wire, outer primary to other input, on to L.T. - and finish at rheostat; third wire, rheostat to filament leg of valve; fourth wire, inner secondary of transformer to valve filament, then to L.T. + and finish at H.T. -; fifth wire, plate leg of valve to phones; sixth wire, phones to H.T. +; seventh wire, outer secondary to grid.

This method of wiring simplifies matters, uses the minimum of wires, and with the exception of the wire from the plate to phones avoids crossing. F. W. E.

A STANDARD OF SIGNAL STRENGTH

THERE are, no doubt, many people who are constantly changing components in their sets or altering the wiring in the endeavour to obtain louder signals. The conditions under which these tests are made may be varied, but to arrive at any definite conclusions as to the relative merits of the new circuit, a factor which must remain absolutely constant is the received signal.

The usual practice for getting this constant seems to be that of tuning in the local broadcasting station. But a difficulty arises. Is this type of signal a constant? The music may be quiet or it may be a band with heavy brass, and last but not least the power may vary slightly. This latter remark also applies to the commercial high-power automatic stations.

The only alternative is to generate the required signals locally. This is a simple matter, the only requirements being a coil, buzzer, battery, switch and variable resistance. These should all be connected in series, as shown in the diagram.

Method of Operation

Close the switch and adjust the buzzer so that it gives a clear, moderately high note, free from irregularities in pitch or spluttering. When this is done, place the coil in relation to the set so that on donning the phones and switching on a faint yet clear signal is heard. Adjust the set to give maximum signal strength, and then increase the resistance in circuit with

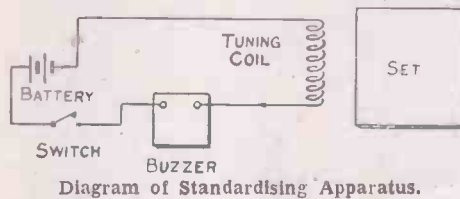


Diagram of Standardising Apparatus.

the buzzer until signals are very faint—in fact just audible. Any alteration to the set which improves the strength of reception is a step in the right direction. Be sure before making any further alterations that you have succeeded in obtaining the

greatest strength possible with the circuit under test.

Notes

On no account should any part of the buzzer circuit be touched during a test or the results will be rendered void.

The battery supplying the buzzer should be of such a type that reasonable runs do not cause any appreciable voltage drop, for this would tend to weaken the signals.

Audibility Tests

The ability of the human ear to detect accurately slight variations of signal strength is very doubtful. If, therefore, serious work is contemplated an audibility meter should be used. A. L. B.

To accommodate the aerial of the G.P.O. station at Rugby it has been found necessary to purchase a piece of land bigger than the total areas of Hyde Park, Kensington Gardens and St. James's Park.

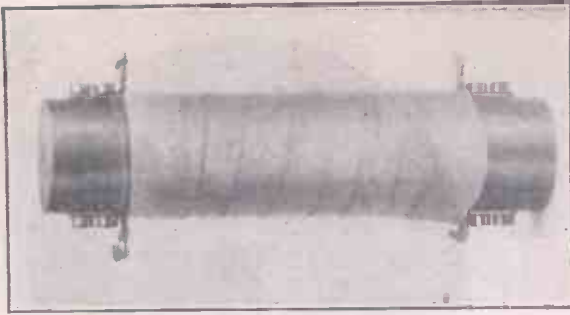


Fig. 26.—Aperiodic Transformer.

THE THOUSAND-CIRCUIT BOARD.—VII

MAKING THE COMPONENTS (continued)

ANOTHER very useful little gadget to make up for the set is a holder for plugging in high-frequency transformers. This is shown in Fig. 25. It consists of a piece of $\frac{1}{4}$ -in. ebonite $2\frac{1}{2}$ in. square, upon which are mounted four correctly-spaced valve legs with a terminal connected to each. The ebonite is raised upon two small battens of wood, which keep the shanks of the terminals and valve legs and the wires connecting them from coming into contact with the surface of the panel when the holder is in use. If two of these holders are made up it becomes at once possible to use tuned transformers for coupling between the high-frequency valves, the .0003-microfarad variable condensers being used for tuning their secondaries. These holders are extremely useful, since they can be used also for valves when required, as well as for the plug-in crystal detector, if it is not convenient to place that in a valve holder.

length. To either end screw on a pair of brass tags to serve as connections for the ends of the windings. In the centre of the rod drill and tap a 4 B.A. hole about 1 in. deep. This enables a piece of studding to be inserted for winding purposes, and it will also serve to take a fixing screw when the finished transformer is attached to a wooden stand about

transformers are untuned. For this reason they do not give the same degree of amplification as those wound with bare copper-wire. At the same time, they are much more stable—it is possible to use three or more stages of aperiodic H.F. amplification—and they do not bring in the same amount of mush as sharply-tuned coupled circuits. The finer the wire used the more aperiodic will the transformer be—that is to say, the wider will be the band of wavelengths covered efficiently by it. Probably the amateur constructor will find that No. 36 Eureka wire is about the finest that he can put on satisfactorily, for when we get above this we are dealing with wire so fragile that winding becomes a matter of the utmost difficulty.

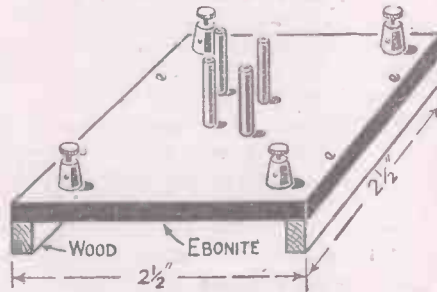


Fig. 25.—H.F. Transformer Holder.

As different makes of mushroom transformer vary in the way in which their pins are connected up to the windings, it is not advisable to mark the terminals IP, OP and so on. It will generally be found that the pins of the transformer are clearly marked, and the connections can thus be made correctly whatever type is in use. Plug-in transformers are not at all expensive to buy, but if it is desired to make them at home this can be done quite easily and cheaply by purchasing simply the formers and winding them with various quantities of No. 36 d.c.c. wire to suit the wavelength range required.

$2\frac{1}{2}$ in. square. When a former 1 in. in diameter is used it is exceedingly easy to make a satisfactory aperiodic transformer, since the rule for winding them is simply one transformer turn per metre of wavelength for both primary and secondary.

It will, of course, be possible to make up other components of the set, such as the fixed condensers, the grid leaks, rheostats and the transformers. I do not recommend, however, that this should be done, for all these things are better purchased and the saving in making them up is not very great. There is far more in the design of a really efficient low-frequency transformer than one might think, and a good bought article will always give clearer and better reception than the best that can be made up in the home workshop.

As their name implies, the aperiodic

(To be continued)

J. H. R.

WIRELESS TRANSMISSION OF POWER

Aperiodic Transformer

Though it is by no means so efficient from the point of view of amplification with tuned transformers, there is very much to recommend the aperiodic transformer as a coupling for high-frequency valves. One of these made for the Thousand-circuit Board is shown in the photograph (Fig. 26). They are very easy to make provided that you are able to wind on thin resistance wire, a task which cannot be accomplished satisfactorily unless a lathe is available or some simple form of winding machine is rigged up. I have made quite a satisfactory job of them on several occasions by using a breast-drill fixed in a vice as a winder, a short piece of studding screwed into the end of the ebonite rod upon which the transformer is wound being fixed into the chuck.

RECENT developments in directional transmission prove that it is now possible to concentrate wireless energy into a comparatively well-defined beam. This revives the much-debated question as to the feasibility of transmitting large powers across space by some similar means. The inherent difficulty lies in the fact that it is at present impossible to radiate any considerable amount of energy except by using low frequencies and correspondingly large wavelengths. On the other hand, it is only with very short waves, of the order of 100 metres and less, that the reflector methods of directional transmission have proved successful. No practical method of concentrating or focusing powerful waves of 20,000 metres and upwards is yet known.

One of the most interesting proposals in connection with this subject is due to the late Dr. Steinmetz. He suggested the use of a huge station transmitting energy of such a wavelength that the waves would encircle the earth, and return in phase with the outgoing energy, thus setting up a "stationary" wave system. If the absorption factor could be reduced to a small fraction of the emitted power, that would represent the only expenditure necessary to maintain the stationary-wave system in operation. Energy tapped off by intermediate receiving stations would, of course, be fed back into the stationary-wave circuit by the main transmitter, in much the same way as the ordinary cable pressure is maintained in a tramway service.

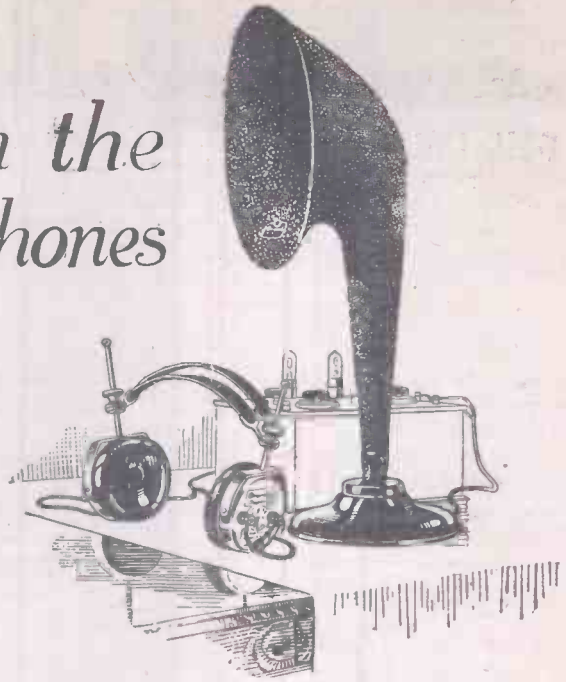
M. A. L.

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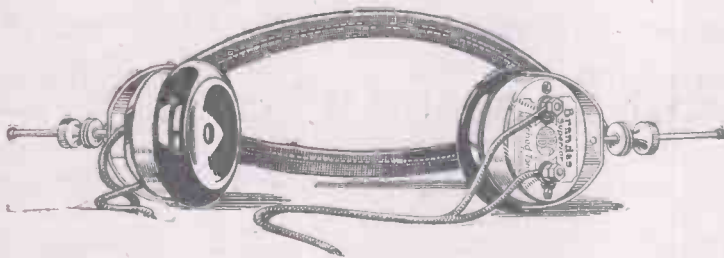


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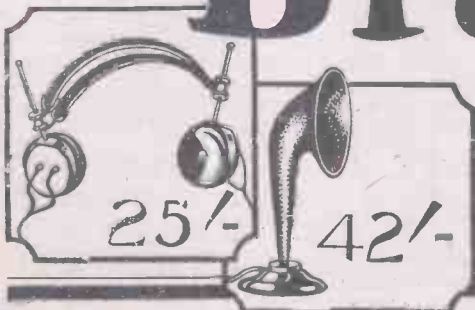
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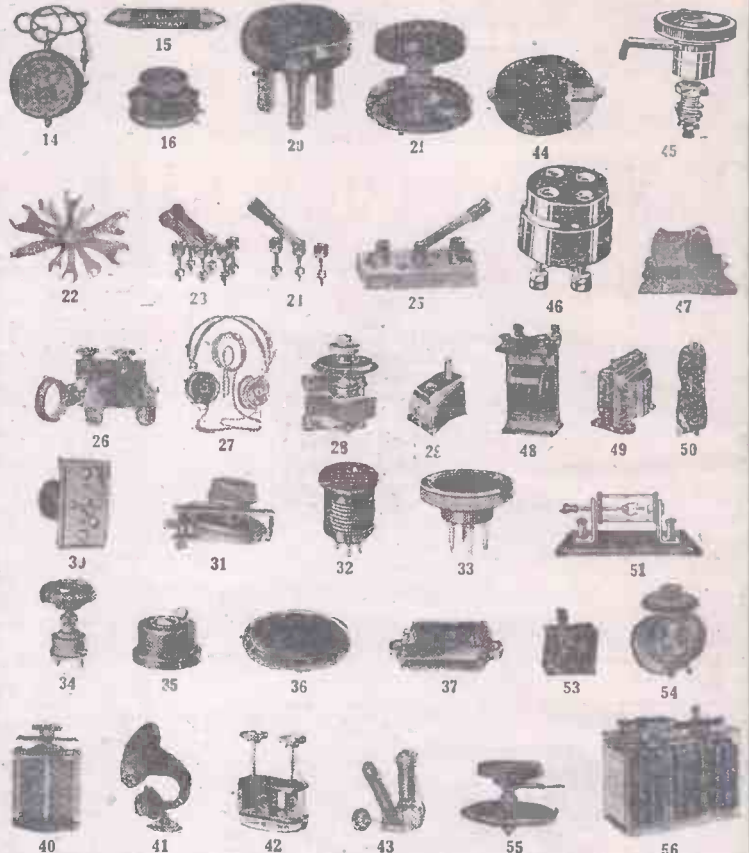
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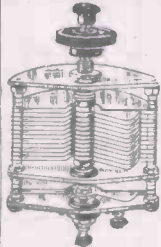
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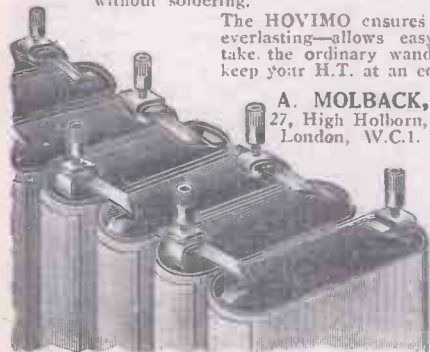
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On Your Wavelength!

Crystal versus Valve

I HAVE been trying some experiments recently with a crystal as rectifier in a multi-valve set. The reason why I did so is that I am not really at all satisfied with valve rectification for the reception of broadcasting. By this I mean the grid-condenser and leak method, which is now almost universally used. It is just the presence of that condenser that is apt to mess things up a bit and to make your reception not so absolutely clear as it ought to be. Of course if you use the older method of detection which works on the plate curve of the valve you will get clearer results, but this seems to be a waste of good material, for when the valve is used in this way without reaction it is not a great deal more sensitive than a crystal. If you stick in reaction and use it a good deal you must get a certain falling off in quality.

The crystal is in theory a much more nearly perfect rectifier than the valve. The only thing about it is that it is not particularly sensitive unless it is dealing with a fairly strong signal. By using one or more stages of H.F. amplification in front of it and getting them well away from oscillation you can deliver a nice fat voltage to the crystal, which then works splendidly. As the result of various trials I have come to the conclusion that if you want to make a multi-valve set give its clearest and most undistorted reproduction of music the best tip is to do away with the rectifier altogether, substituting for it a good crystal detector. Any reader who cares to experiment on these lines will, I am sure, come to the same conclusion, especially if he uses his set to work a loud-speaker and likes to have full volume of sound.

A Problem to be Solved

I was talking only the other day to an enthusiastic friend who is working hard in an attempt to solve the problem of the elimination of atmospherics. He tells me that he is very hopeful of the results, and that already he is able to get rid to a very great extent of the cracklings and splutterings that so frequently make Transatlantic work impossible. If he does manage to achieve his end he ought to be a rich man, and he will jolly well deserve his success. The best tip that I know so far as the amateur is concerned is this: Keep a length of flex or bell wire by you with a couple of small insulators at each end. Rig up attachments on the picture-rail or near the ceiling of the biggest room available and sling the wire from corner to corner. Tune in on the big aerial, and when you have got your tuning

as sharp as you can, turn over to the small one. You will be surprised to find what a difference this makes as regards interference. Your strength, of course, suffers, though not nearly so badly as you would imagine; as atmospherics are suppressed much more than the signal you want, the total effect is that a considerable improvement is effected. I often use this tip for picking up the American stations on bad nights, and it is remarkable how often it succeeds. Personally I much prefer the bell wire to the frame aerial, with which I have never been able to do much good.

Beam Wireless

Senator Marconi announces that as the result of a further long series of experiments he has now been able to overcome one of the great difficulties met with in wireless transmission on the beam system. This was that previously it was found to give really good results only at night time. He is now able to use the beam transmitter almost equally well in the daylight, and he prophesies that within a very short time the first great station using this method will be in operation. There is no doubt, I think, that for commercial purposes the beam method will oust all other systems within a few years. At the present time all commercial messages must be broadcast, which means that about ninety-nine per cent. of the power used is wasted, since you are driving your message out with equal strength in every direction. It means, too, that there can be no secrecy except by the use of codes. But perhaps the most important point is that it leads to a terrible amount of jamming.

I do not know whether you have ever tuned up to the neighbourhood of 12,000 metres, but if you have you will realise what jamming can be. On a fairly wide waveband on that part of the scale you get the impression that every station in the world must be transmitting at once. It is most difficult to pick out a weak signal and to tune it to readable strength to the exclusion of others. How operators ever manage to read accurately and quickly on these wavelengths is something of a mystery to me. Things are far worse up there than they are on the shipping band, and that is pretty bad.

The Licence Question

The P.M.G. states, I see, that there appear to be very few wireless defaulters and that nearly everybody who should have done so has duly renewed his receiving licence. When you consider what we get for the money in the shape of our present broadcasting service you must, I think, agree that ten shillings a year is a

jolly good investment, working out as it does just under a third of a penny a night, or if you use your set for two hours each evening on the average you may calculate that your entertainment costs run to rather more than six hours for a penny. Even if you take into account the cost of battery recharging and of valve replacements you will not find, I think, that you spend much over a penny an hour by listening to broadcasting. Can you find any other form of entertainment which costs so little?

Licences have now very nearly reached the million mark, and it is quite certain that aeriels will run into seven figures in this country before Christmas. This means that there are roughly seven times as many listeners as there were just over a year ago. But the most remarkable thing is that if you take the whole population of the country—men, women and children—one in every forty-five owns a wireless set. But some people I see do not like the idea of licences at all. There is apparently to be a test case, and what the result of it will be no one can say. One thing is quite certain, that if we do not have licences there can be no revenue for the B.B.C., and without a revenue we cannot have any broadcasting. They tried the experiment in America of getting broadcasting done in the form of a private enterprise by many big manufacturing concerns. The result is that, though there are a few really good stations over there, the programmes as a whole cannot compare with our own, and they are pretty well convinced now that some kind of licence will be necessary if things are to continue.

The Amateurs

The New Zealand amateurs seem to have come into prominence with a sudden swoop. Last winter a certain well-known wireless engineer predicted in my hearing that it was impossible for the amateurs of England and New Zealand to exchange two-way communication with the small power that they were likely to use, but this year I think that he will have to admit that nothing is impossible for the amateur transmitter. 2 O D and 2 N M have carried out successful two-way working with Z 4 A G, and several British amateurs report reception of New Zealand stations—notably 6 T M and 2 W J. My Belfast correspondent received 4 A A and 4 A G on two valves in broad daylight!

Why?

There is a general impression that the amateur experimenter contributes no new knowledge to wireless and that all he does is to improve his own knowledge, so that

On Your Wavelength! (continued)

sooner or later he is able to enter wireless professionally. Such a belief is to be deplored, for it is a well-known fact that the amateur has at least opened the eyes of the community to the fact that the use of a power sufficient only to light three ordinary domestic electric lamps enables them to bridge the world!

That he has not contributed to the transmission of music or the like cannot perhaps be denied, but at the time that broadcasting commenced he was discouraged from exploring this field which had already been examined by those who were interested. In any case, it seems a pity to attempt to decry the very useful work of the amateur. Men who love their work for the work's sake are an asset to the community, and the amateur experimenter is surely entitled to the few laurels which come his way.

Another Success

5 Q V reports that he has received Z 4 A K, who was calling a French station, and that on Sunday, November 2, he heard I C M P (America) calling "C Q G U, I C M P will QRX on 100 metres to 125 metres." He replied on 114 metres, and was surprised to get a prompt answer, "QRK? UR sigs QSA. FB louder here than 2 F N—5 Q V GU I C M P." Transmission was carried on for twenty-five minutes, but with the arrival of the sun the test ended. I C M P was received with a two-valve Reinartz receiver on about 90 metres.

Frightfulness

I have a neighbour—of course you have heard that before—but this neighbour has a wireless set. It came into existence by a slow painful process and it has been painful ever since. To be short, I might say that the set is perfectly horrible. He must have raked over all the town for the cheapest transformers he could find, and, combining these with a delightful lack of knowledge, built the monstrosity which now disturbs my slumbers, both daylight and nocturnal. There are four L.F. valves, and of grid bias he has not heard. At times he submits us to Rome on the loud-speaker; going "all out" at 9.30 pip emma and the result—well, the relaying of K D K A last winter was a gem compared to it. I hope that his H.T. will one day find a short cut across his filaments and thus once more give us peace. He has only one redeeming feature: he does not believe in direct action; in other words, he does not use reaction. But possibly this is only because he does not know how.

A Problem

The most pressing wireless problem just now of the majority of listeners is to find some means of separating 5 X X from Radio-Paris. This is a pretty difficult

business in some parts of the country, for both transmissions are powerful and they jam one another effectively.

With a big set, separation can be accomplished, though with a considerable loss of signal strength, by using a frame aerial, but with a small receiver matters are rather more difficult. A double-circuit tuner should be tried, worked with the loosest possible coupling. In single-valve sets one can do a good deal by dispensing with the reaction coil coupled to the A.T.I. or C.C.I. and placing in its stead a variometer in the plate circuit. On the whole, though, I think it is better to employ some kind of wave trap for the purpose. I must admit, though, that no circuit that I have tried so far enables me to get rid completely of 5 X X when Radio-Paris is coming in. The best that one can do is to reduce Chelmsford to something so faint that he does not spoil Radio-Paris.

Aerial Height

I mentioned recently in these notes that the height of an aerial was a factor of the utmost importance in reception. During last week I have had a striking illustration of what height really does mean. A friend who had been complaining that his crystal and two note-magnifier set was giving poor results on 2 L O was advised to try the effect of adding a 15-ft. top mast to the pole which supported the free end of his aerial, thus raising the height from 20 to 35 ft.

The result was absolutely magical. Reception strength is quite double what it was, and other stations besides London can be obtained under favourable conditions. The crystal detector responds very badly to weak impulses, but if you increase their strength the efficiency of the detector goes up as the square. Thus, for example, if you make incoming impulses three times as strong, the detector is not three but nine times as efficient as it was. Always make use of all the height that you can get for your aerial, remembering that in nearly all cases every foot will make an enormous amount of difference.

A New One Bagged

I picked up the other night a station that I have not managed to get hold of before. This was Königsberg, in East Prussia. His strength was not great and he suffered considerably from fading at times. Still I did manage to get him on the loud-speaker with a fair volume of sound. Of the other German stations, Frankfurt and Breslau come in best so far as I am concerned. Hamburg has most annoyingly selected practically the same wavelength as Radio Iberica, with the result that they are apt to jam each other if the two are working at the same time. Luckily the Spanish station goes

on until pretty late and can be picked up on most evenings without interference after Hamburg has closed down. Things are pretty crowded in the neighbourhood of 400 metres during our own broadcast hours, and Hamburg, Newcastle and Radio Iberica take a bit of separating.

French Broadcasting

It seems a great pity that French broadcasting should have concentrated itself mainly in Paris. Crystal users in France, unless they live quite near the capital, have very little to listen to. In fact I have seen it stated in a French paper that in the provinces wireless is a hobby for the rich only, since several valves are necessary in order to obtain results. This applies mainly to the middle of the country, for on the borders there is a fairly good supply of wireless transmissions from foreign stations. Inhabitants of Northern France have the Belgian, Dutch, Danish and German stations to help things out, to say nothing of our own. On the east side Switzerland, Germany and Italy help, whilst in the south there are the Spanish stations to be heard.

A Hearty Laugh

Whatever happens in the way of weather reports or elections, I've had one hour's hearty laugh over the ether. There's hardly much need to ask the cause, because most of us would say the same—"John Henry." From the moment I heard him sawing up that table for the microphone on his studio night I foresaw trouble and the whelk-barrow, and he had both—at least, he didn't get the whelk-barrow because Blossom came along just in time. That orchestra of his ought to have been put on a gramophone record as a test of sobriety. You see the idea: if a man could recognise the tune, dismissed with a caution; if not, forty days and the rest! Anyhow, we would all like another dose, please.

Programme Music

We all like the pieces with a story to them—at least, I'm afraid I do. I love to sit and wait for the part where the broom breaks in two and brings too much water, or the Mephistophelian gentleman in red or black, whichever colour scheme you fancy, sits on the tombstone, etc. The most modern example is Vaughan Williams' Suite "The Wasps." In the play the chorus represent wasps, who give their opinion with the freedom for which they are famed. In the suite there is a march of the old men and a march of the kitchen utensils. According to a well-known critic there is still a lingering tradition that the composer searched all the Cambridge kitchen armed with a tuning-fork to find a frying-pan in E flat.

THERMION.

A COMPACT CRYSTAL SET

A RECEIVER WITH NOVEL TUNING ARRANGEMENTS

VARIOMETER tuning of a somewhat unorthodox type is incorporated in the crystal set described below. From the photographs it will be seen that the Igranite honeycomb coil is mounted to form the stator of the tuning variometer, while the rotor is of the ordinary ball-wound type fixed so as to be rotatable near to the coil; the maximum and minimum wavelengths to which the set can be tuned can therefore be varied at will by changing the plug-in coil—a point of especial value when the set is required for use on different aerials.

The whole set complete with headphones is mounted in a hard-wood box of the dimensions given in Fig. 1. The receiving portion of the set may, however, be constructed separately, as it merely drops into the small compartment on the right-hand side of the case.

A piece of matt-finished ebonite measur-

those who have never previously had experience with this type of winding, but if the following instructions are carefully carried out no difficulty should be found.

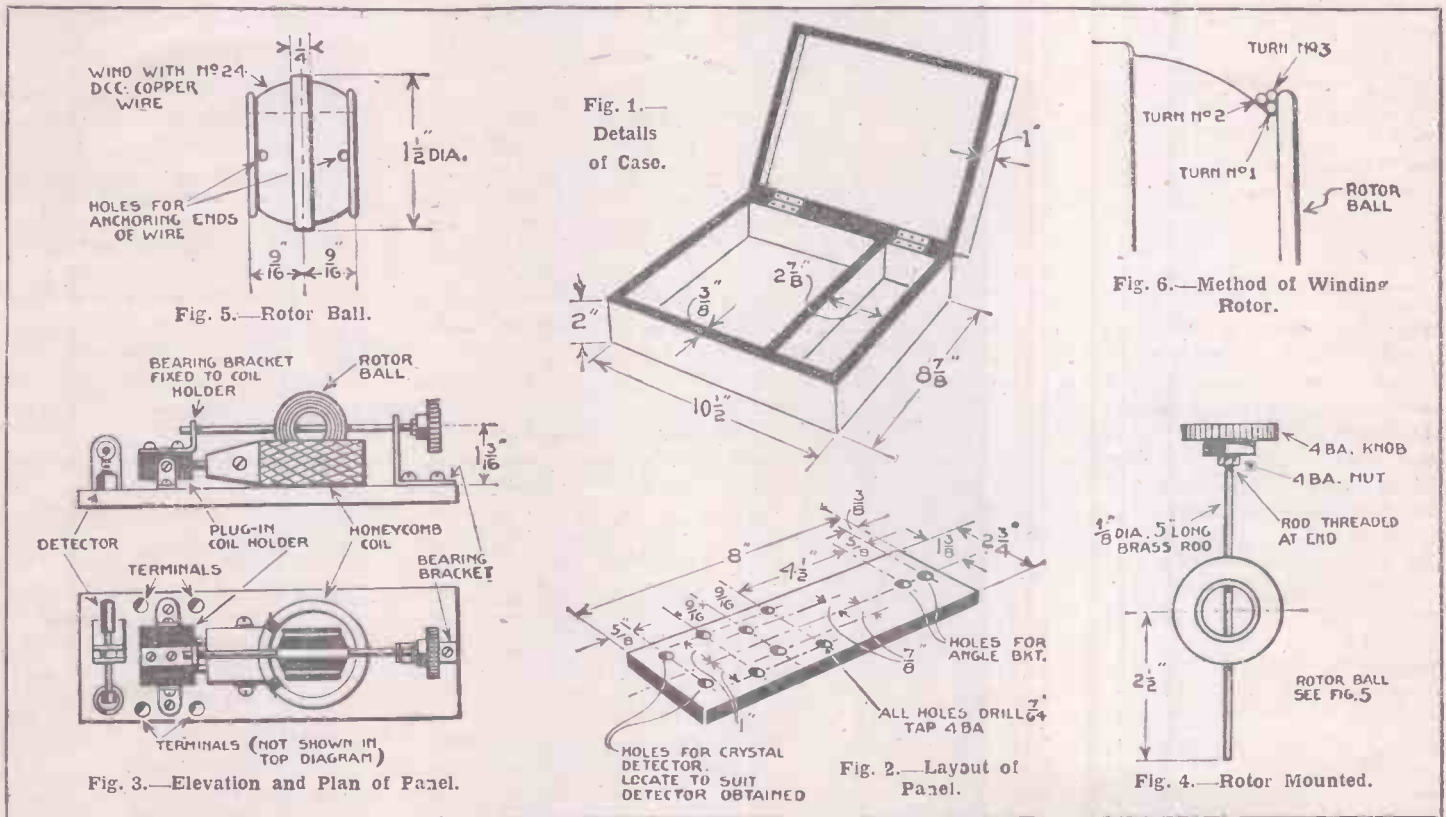
The rotor ball itself, as will be seen from Fig. 5, measures $1\frac{1}{2}$ in. in diameter by $1\frac{1}{8}$ in. deep, and is provided with ridges at each side in order to prevent the wire from slipping off; a small hole should be drilled just on the inner side of each of these ridges as shown in Fig. 5 in order to anchor the beginning and end of the winding. Pass the end of some No. 24 d.c.c. copper wire through one of the anchoring holes in the ball and solder to it a 5-in. length of miniature silk-covered flexible wire, making a small blob of solder at the joint in order to prevent withdrawal of the wire. Now wind on two complete turns of the No. 24 wire and then at the point where the third turn should have started mount the wire up



The Complete Receiver.

Winding the second half of the ball is carried out in an exactly similar fashion to the first; when finished the wire is cut and soldered to the end temporarily held by the drawing-pin, a coat of shellac varnish given in order to hold the wire securely in position.

Excepting the two flexible leads from



ing 8 in. by 3 in. by $\frac{1}{4}$ in. thick and drilled to the particulars shown in Fig. 2 forms the base, to which is attached the detector, plug-in coil holder, terminals and rotor-spindle bearing brackets, as indicated in Fig. 3.

Fig. 4 shows the rotor and rotor spindle assembly. The pile winding of the rotor ball may seem somewhat of a problem to

over the top of the first and second turns as indicated in Fig. 6, making the first "pile wound" turn. The subsequent turns are then put on in the order shown in Fig. 7 until the first half of the rotor is completely filled. At this point the wire should be cut and the winding prevented from coming undone by fixing with a small drawing pin.

the variometer rotor, all connections between parts are made by means of strip brass interposed between the components and the top of the panel; this is in order that no nuts, screw-heads, etc., shall be required underneath; the ebonite when placed in position in the containing box is, of course, in contact with the wood.

(Continued at foot of next page)

MAKING THE MOST OF THE AERIAL

I HAVE received several visits lately from slightly diffident individuals, who have noticed my aerial and wish, as novices, to obtain some practical information on the subject of the stations they have just erected or propose to erect.

The majority of us possess within ourselves a natural inertia that prompts us in all but essentials to take the line of least resistance, and many recent innovations in the world of wireless have seemed to indicate that the outdoor aerial is a luxury rather than a necessity, and that its place can be more conveniently and more readily be taken by frame-aerials or the system of "wired wireless."

Except, however, under the most exceptional circumstances, that may embrace contiguity to a broadcasting station and the possession of a highly sensitive multi-valve set, the results from the adoption of either of these methods are bound to be of a disappointing nature. It is rare, moreover, that the advocates of these substitutes for the aerial proper allude to the inherent disadvantages of the systems they describe.

Utmost Efficiency

For the ordinary individual who desires the utmost efficiency, but whose outlay is determined by financial reasons, there is not at present anything to equal the outside aerial, and yet, oddly enough, the majority of novices hurry over its erection

with but scant ceremony in order to get down to the "really interesting part." This is utterly wrong, and sufficient emphasis cannot be given to the fact that the installation of any receiving station, however modest, should be started, continued and completed with the utmost regard for the aerial.

It is manifestly impossible in widely divergent circumstances to dogmatise on a subject that is liable to limitations of position or to insist on the maintenance of an aerial that shall in all respects come up to the P.M.G. standard, but it is infinitely better to sacrifice length rather than height; a twin aerial is normally more efficient than a single wire only for wavelengths above 600 metres.

If the materials are bought in the cheapest market an efficient twin aerial can be constructed at a very moderate cost. Bamboo spreaders are strong and possess the additional merit of lightness. They should be bought at an upholsterer's shop, and although the price varies, they can be bought for as little as 1s. 6d. each. I find that the best way of mounting the spreader is to bore a hole in each end of the bamboo and pass the aerial wire through, as this method admits of further adjustment.

Get the far end up as high as you possibly can up to the limit of the 100 ft.—and then get it a little bit higher!

Carefully survey every place and position before final decision, because you may be

definitely sure that your enjoyment is to be made or marred largely by the efficiency or otherwise of your aerial. Beware of all short cuts, and sweat at it till you are satisfied, having, as a last resort, constituted yourself a virulently hostile critic.

I know that experts say that your earth lead should be as short as possible, but this dictum should not be construed as in any way restricting the aerial. Get the best possible earth connection; but you can, within limits of great elasticity, ignore the length if you have provided yourself with an efficient aerial.

Relative Earth Efficiencies

It is as well to try, if you are in a position to do so, the relative efficiencies of more than one earth, and this is easily done.

A length of gas-piping sunk about three feet in the ground will, if the ground be kept moist, provide you with a good earth.

Don't forget the value of the soldered joint, and if you can't solder, be bold enough to suggest that an expert member of the Wireless Association or Club you have joined—for, of course, you must join an institution of that kind—give a practical demonstration of soldering in all its forms. You may feel quite sure that you are not the only member who does not know how to do it, although others may not possess the moral courage to admit it.

WALTER MEADE.



View of Panel.]

A COMPACT CRYSTAL SET

(Continued from preceding page)

The circuit diagram of the set is shown by Fig. 8.

Operation

To use the receiver, plug in a No. 35 coil if the aerial connected is of the full 100-ft. length, or a No. 50 coil for a small indoor aerial. The No. 50 coil may, however, be successfully employed for both types by connecting a fixed condenser of .0003-microfarad capacity between the lead-in and the set when using the larger aerial.

R. W. N.

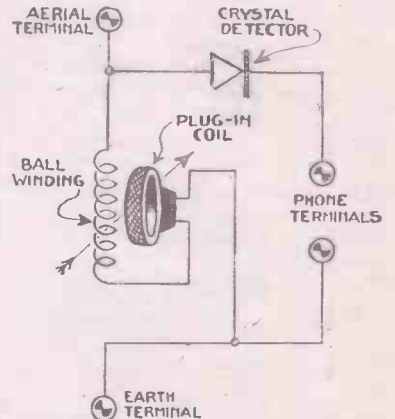


Fig. 8.—Diagram of Connections.

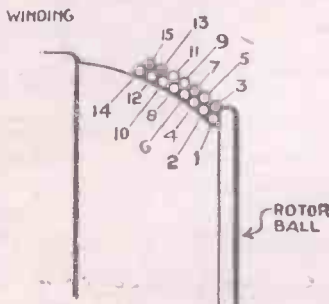
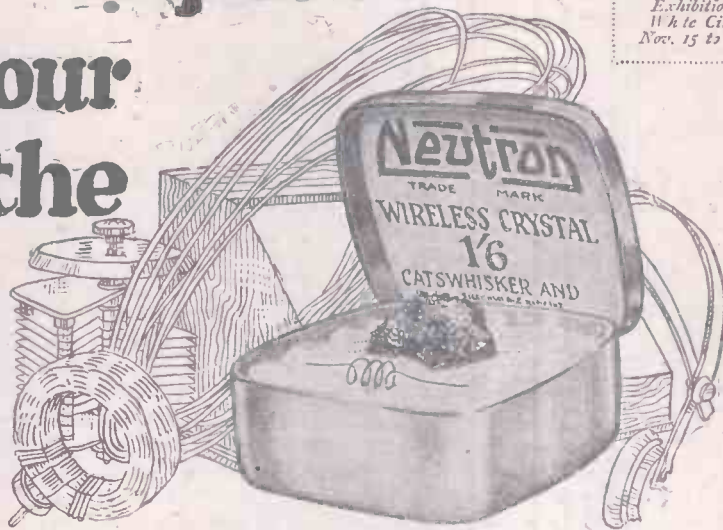


Fig. 7.—Further Details of Rotor Winding.

Figs. 1 to 6 are shown on the preceding page.

The most important item in your outfit is the Crystal

See Stand D2,
British Wireless
Exhibition,
White City,
Nov. 15 to 29.



Upon the choice of a really good crystal depends your success in clear, loud and faithful reception.

A good aerial, heavy-gauge, efficiently wound coils, minimum self-capacity, good phones—all these *count*, but most important of all is your Crystal. . . . There are many efficient Crystals, but you may try *twenty* before you find a *good* one—unless you ask for NEUTRON, in the black-and-yellow tin. *If you take this precaution*, you will undoubtedly secure a crystal that will give you full efficiency first time, requiring no “searching” for sensitive spots, and giving you continued joy in listening.

-and the finest Crystal you could possibly buy costs you just 1/6
In air-tight case, with silver catswhisker.

All the best Radio Dealers sell and recommend Neutron (in the black-and-yellow tin). If you should have difficulty in obtaining it, send crossed P.O. for 1/6, with Dealer's name and address, and this guaranteed Crystal will be mailed by return.

Ask your Wireless Dealer for Neutron

DISTRICT AGENTS:—

Scotland: R. F. Miller & Co., 22, York Place, Edinburgh.

Plymouth: Mumford & Sons, 68, Mutley Plain, Plymouth.

Birmingham: Cooke & Whitfield Wireless Ltd., St. Paul's Buildings, 24, St. Paul's Square, Birmingham.

North-East Yorks: Smith & Jordan, The Arcade, Redcar, Yorks.

Manchester: Garnett's, Islington Grove Works, Salford, Manchester.

Ireland: Pettigrew & Merriman Ltd., 8, Corporation Street, Belfast.

**“5 B T” hears Brussels—
with a Neutron.**

Mr. L. V. Clark, of Experimental Station 5 B T Chiswick, reports receiving clear telephony from Brussels, with a Neutron Crystal, *without the aid of Amplifiers.*

“5 Pairs of 'Phones”

“G. H. S.” London, S.W. writes: “I have tried out this crystal and should like to say I am quite satisfied with it. It is at present in use on an ordinary crystal set, and works with good strength 5 pairs of 'phones.”

“Never so Plain Before”

“W. T. T.” Harrietsham, writes: “I have never been able to get London so plain before. I have tried crystal after crystal but I have never had such a good result as I have to-day with Neutron.”



The World's Greatest Radio Crystal

Sole Distributors:—V. Zeitlin & Sons, 144, Theobald's Road, London, W.C.1. 'Phones: Museum 3795 & 6841.

Produced by:—Neutron Ltd., Sicilian House, Southampton Row, London, W.C.1. 'Phone: Museum 2677.

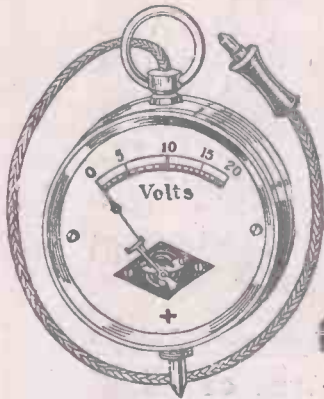
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WIRELESS ON EASY TERMS

GAMAGES have now extended their easy payment system to Wireless, and you may now secure on payment of first deposit Wireless Sets and Apparatus from £5 upwards, balance being payable in monthly instalments. Write for details to Wireless Dept.

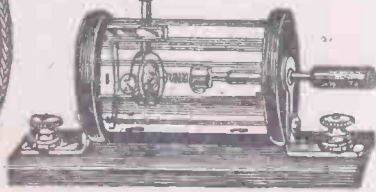
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For Wireless—Always!

Huge Stocks, Skilled Staff and Modern Facilities make an Early Visit to Gamages most desirable. All Orders by Post are guaranteed complete Satisfaction or Money refunded in full.



VOLTMETERS

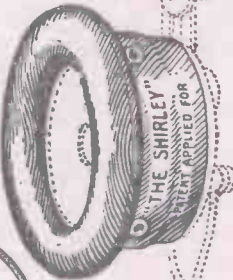
Dead-beat Type. Very reliable. Readings, 0-3, 0-6, 0-12, 0-15, 0-20 volts. Price each **5/-** Post 6d.



"GAMAGE" SUPER Crystal Detector

The striking points about this New Detector are the *Revolving Crystal* and the *Silver Cat's Whisker*. All brass parts lacquered. Complete with a piece of Gamages famous "Permanite" Crystal. Price for Panel Mounting ... **4/6**

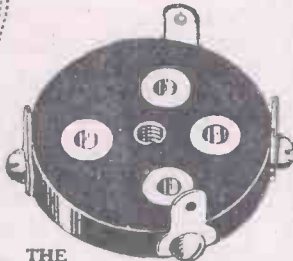
Price for Table Panel Mounting ... **5/6** Post 4d. on each Type.



EAR PADS

(Pneumatic)

Ensure maximum comfort with a pair of these Rubber Ear Pads made to fit all Standard Receivers. Price per Pair ... **4/-** Post 6d.



"Gamage" Under Panel VALVE SOCKET

Striking Points: Anticapacity; positive protection from burning out valves by incorrect fitting. Gamage Price ... **10d.** Post 2d. each.

Watch Type COMBINED DEAD-BEAT Volt-Ammeter

In Nickelled Brass Case. Readings, 0-20 volts; 0-30 amps. In the usual high standard of quality ... Price **7/6** Post 6d.

Write for a Copy of our New Fully Illustrated WIRELESS CATALOGUE

Everything you want for your Set at a Distinct Saving in Price. We will send you a Copy Post Free on Application.

A. W. GAMAGE, Ltd., HOLBORN, LONDON, E.C.1
Also at *Benetfinks, Cheapside, E.C.2.*



INSULATED HOOKS

Well made and nicely finished. Ideal for Indoor Aerials. Size, 2 ins. over all. These hooks come under the usual Gamage Guarantee of Quality. Send for a sample lot to-day. Price per dozen ... **1/6** Post 3d.

Orders by Post receive skilled attention by a **SPECIALLY TRAINED STAFF.**

VALVES repaired Quick!

THE advantage of sending your valve for repair to a valve manufacturer is that only a valve manufacturer can retain the valve characteristics when re-filamenting. Radions Ltd. are the pioneers of valve repairs, and still lead for good work, low price and QUICKNESS. Before sending your valve, consult this.

PRICE LIST.

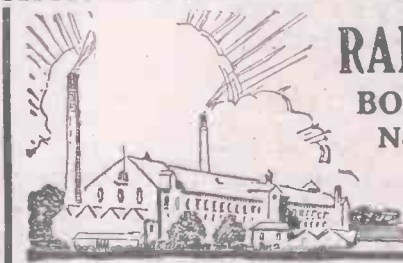
No extra charge for New Glass or New Cap —or for both if needed

Radion Mullard Dutch Marconi Cosser	R type—4 volts—6 amps. Postage on these valves is usually about 3d.	B.T.H. Ediswan French Phillips Moorhead
	Post 6/6 extra.	

Dull Emitters converted into Bright Emitters, with filaments as below:—				
B.T.H. B5	... ..	4 1/2 volts	... .. .25 amps	... .. 15/-
B.T.H. B4	... ..	6 volts	... .. .6 amps	... .. 17/6
B.T.H. B3	... ..	4 1/2 volts	... .. .6 amps	... .. 6/6
Mar D.E.3	... ..	4 1/2 volts	... .. .25 amps	... .. 6/6
Mullard D.F.	... ..	4 1/2 volts	... .. .6 amps	... .. 6/6

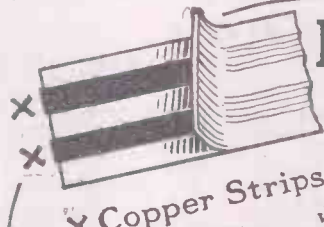
Power Amplifiers				
Mar L.S.2	... ..	6 volts	... .. 1.5 amps	... .. 17/6
" L.S.3	... ..	4 1/2 volts	... .. .65 amps	... .. 11/3
Mullard P.A.2	... ..	5.5 volts	... .. .85 amps	... .. 13/-

Other Types—prices and particulars on application.



RADIONS Ltd.
BOLLINGTON
Near Macclesfield

We make the new **RADION** Low Consumption Valve **Price 10/-** Uses only a third of usual current.



INVISIBLE

Wire for Indoor Aerials and Wireless Extensions

Can be run throughout the house without showing. Consists of TWO COPPER STRIPS held between Two Paper Tapes. Can be run and fixed anywhere by using Glue or Paste. Being Invisible it is very suitable for Secret Wiring. When fixed to four sides of a room it becomes a Directional Aerial, giving excellent results.

PRICE: In 100-ft. Coils, Postage Paid, 5/-

SMITH & HAMMOND
5, Savoy St., Strand, London, W.C.2



A Natural Galena Crystal of special selectivity

Price **1/6** In glass-topped box

Each piece is selected, tested and guaranteed, also contains a good quality non-corrosive spearpoint catswhisker.



L.M. MICHAEL LTD

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

Radiola Receivers

Radiola II
(Two-valve)



BOTH these sets employ a special, easily tuned reflex circuit, which is equivalent, in effect, to an extra valve. Both are fitted with B.T.H. B.5 (0.06 amps.) valves, which consume so little current that standard dry cells can be used quite successfully for filament lighting.

Radiola I (Valve Crystal) Receiver

This is the ideal set for Head Telephone reception over distances up to 100 miles. Two crystals, with change-over switch are provided.

	PRICE	£ s. d.
with enclosed H.T. battery and B.5 valve		9 15 0
B.T.H. Headphones (4,000 ohms.)		1 5 0

Radiola II (2-valve) Receiver

The power of three valves is secured by the use of a dual amplification circuit. Under average conditions this set will receive all B.B.C. Stations.

	PRICE	£ s. d.
with enclosed H.T. and L.T. dry batteries and two B.5 valves		19 15 0
B.T.H. Headphones (4,000 ohms.)		1 5 0

Radiola I
(Valve-crystal)

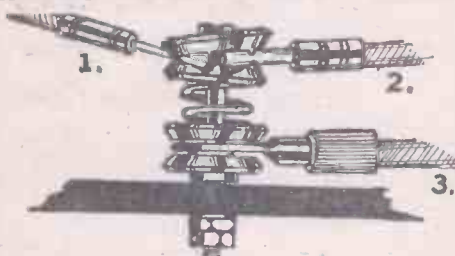


The British Thomson-Houston Co Ltd
Wholesale only
Works: Coventry. Office: Crown House, Aldwych, W.C.2



2224A

HAYES "SAFETY SET" TERMINALS (Pat. App. for)



These terminals take any number of 'phones, automatically disconnect when pulled or jerked and INSURE phones and Set against damage. **ABSOLUTE CONTACT.** Any shape and size pin Nos. 1 and 2 or spade terminal No. 3 can be used. **NO SPECIAL 'PHONE ENDS** required. **DOUBLE** terminals (as illustrated) for 'phone adaptors and panels. **SINGLE** (with top plates only) for all instruments **CONNECTION COMBINATIONS INNUMERABLE**

PRICES: Single, suitable for A. and E., 3d. each. Dozen lots, 2/10½.
" Double, suitable for 'Phones, 4d. each. Dozen lots, 3/10½.
Packing and Postage up to 4—2d. Dozen lots, 4d.

If unable to obtain from your dealer, write enclosing P.O. or stamps to

W. J. HAYES (Dept. C), 29, Manor Lane Terrace, Lee, S.E.13
TRADERS INVITED.

FAMA DUTCH VALVES

USUAL TRADE DISCOUNTS

Amplifiers, Fil. 4-volt Anode, 30 to 100 volt	..	Retail Prices	each 4/8
Detectors, .. 4-volt Anode, 30 to 60 volt	..		each 4/11
Dull Emitters, 0.06 amps. Fil. 1.6-volt Anode, 20 to 100 volt	..		each 12/-
Sidpc (Continental) L.F. Transformers	..		each 9/6
Best Continental Adjustable Diaphragm 4,000-ohm Headphones	..		pair 11/6

Please remit Postage.

BISHOPSGATE ELECTRIC SUPPLY (1924) CO.,
180, Bishopsgate, London, E.C.2.

Phone: Central 7361.

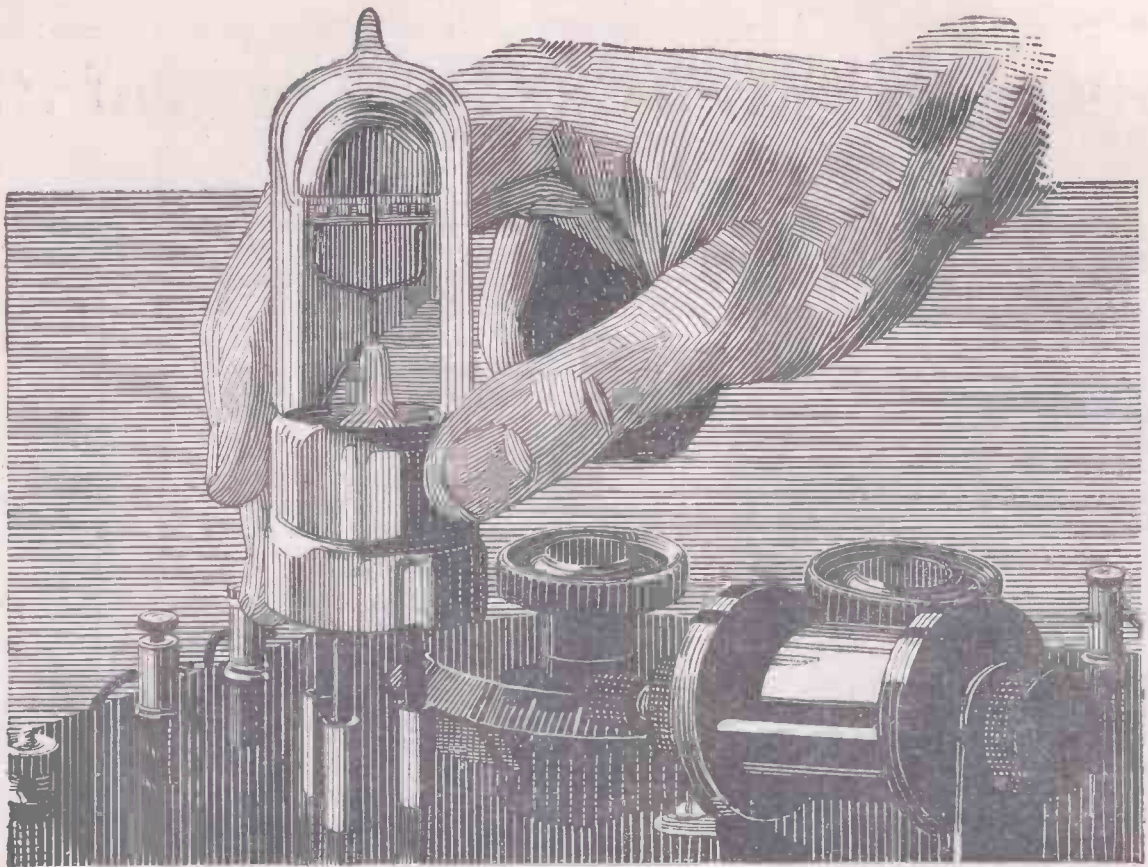
WIRELESS CONSTRUCTORS OF GREAT BRITAIN!

WE INTRODUCE TO YOU OUR 1925 EDITION
50-PAGE ILLUSTRATED CATALOGUE

The most comprehensive retail wireless component catalogue yet published —backed by a smart postal delivery service and a firm whose whole energies are devoted to supplying the Home Constructor.

IT'S YOURS FOR THE ASKING

SEND A P.C. NOW TO
THE BRIGHTON RADIO STORES
163, WESTERN ROAD, BRIGHTON



*The Sovereign Remedy for
a lifeless Set*

NUMBERS of wireless enthusiasts have never experienced the finer delight of logging distant Broadcasting Stations. They still think that it requires some kind of "professional skill." They have not yet realised that the fault probably lies in their Valves and the lack of a little patience in learning the capabilities of the Receiver, and how to tune it.

Both of these points are capable of easy remedy. If your Set is lifeless, it is quite likely that you are using the wrong kind of Valves.

While, obviously, loss of efficiency

in a Valve may not seriously affect the reception from near-by Stations, yet, when you are dealing with the extremely faint oscillations generated by a Station hundreds of miles away, you cannot afford to take chances.

The first and still the only standard Valve for long distance reception is the Cossor P.2—the Valve with the red top. By using one of these as a high frequency amplifier and a P.1 as the Detector, you are assured of a perfect combination of Valves definitely worked out to function on the weakest and most delicate of signals.

COSSOR BRIGHT EMITTERS	
P.1. For Detector and L.F. use	12/6
P.2. (with red top) for H.F. use	12/6
WUNCELL DULL EMITTERS	
W.1. For Detector and L.F. use	21/-
W.2. (with red top) for H.F. use	21/-



SHORT-WAVE WORK IS THE THING!

A second article explaining the operation of the short-wave set described in the last issue.

ON the broadcast wavelength, if the set has been made up and the coil wound as described, there is little danger of getting the valves into a state of self-oscillation. The grid tuning condenser should be advanced a few degrees at a time, and the reaction condenser slowly advanced at the same time until a signal is heard or a slight rushing noise gives warning that the set is oscillating. The reaction condenser should always be turned back to zero before the grid tuning condenser is moved until the operator has become used to the set.

On a good aerial this set should bring in the whole of the B.B.C. stations very well indeed, and a very large number of British and Continental amateurs should also be heard. On the first night the set was tried over twenty amateurs, some of them French and Dutch and one Italian, were heard and logged in an hour and a half. All the B.B.C. stations, including relays, German, French and Spanish stations below 800 metres have been heard.

Low Wavelengths

On the lower wavelengths it may be found difficult to get the set to oscillate for the reception of C.W. signals. In this case completely disconnecting the earth connection should be tried. This may not be very efficient, because signals, though they come in, are faint, and the distance range of the set is seriously affected. In default of a proper counterpoise, which is the ideal earth arrangement to use for short-wave reception on this set, a few feet of wire, insulated like an aerial and fixed beneath the aerial, should be tried. It should be as close to the ground as the convenience of users of the garden will allow. The near end should be brought in, with the usual precautions, to the earth terminal of the set. As an alternative a small condenser could be inserted in the aerial lead. This should be of three plates with an overlap of about $1\frac{3}{8}$ in. The spacing can be made with ordinary condenser spacing washers held together with 4 B.A. screws or rod.

The German station POZ has been heard many times without either aerial or earth.

Calibrating the coils may present some difficulties. The No. 1 coil will be fairly easy, because most of the broadcasting stations can be heard and identified. If a point fairly high up on the condenser scale is fixed and another fairly low down, and the two are plotted on squared paper against condenser degrees along the foot

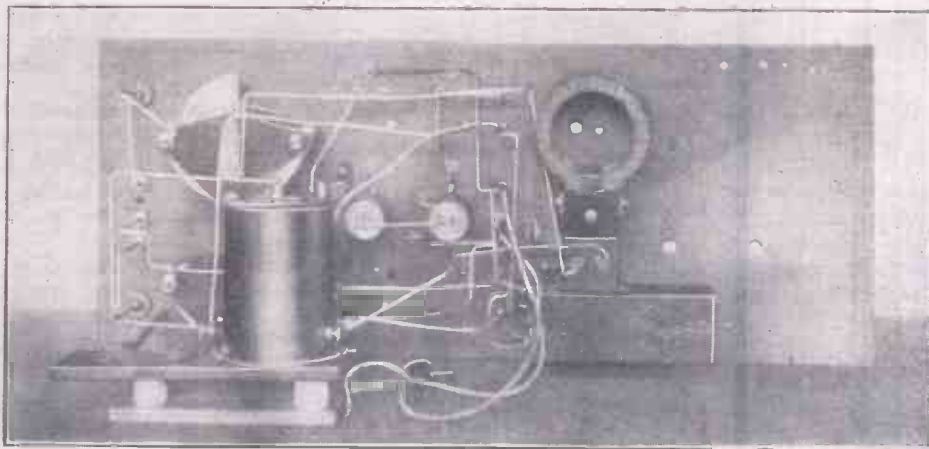
programme on the "harmonics" of at least two stations on No. 2 coil, provided there is an efficient aerial, which may be considered as essential.

All the coils were calibrated, in default of a really reliable heterodyne meter, with quite sufficient accuracy by the simple expedient of plotting all the harmonics of a

powerful station sending high-speed C.W. The station had to be found first of all on its right wavelength on a big set, and the wavelength tested with a buzzer wavemeter. After that it was a simple matter to follow his harmonics down to the sixteenth. Once the grid portion of any coil is calibrated properly it becomes a very reliable wavemeter, for there is no change in wave-

length when reaction coupling is increased, as there is in sets employing magnetic (coil) reaction coupling. Also the wavelength is not affected by using the set on a different aerial.

5 Y M



View of Back of Panel of Short-wave Receiver.

and wavelength up the side, a line joining the two points should give a perfect calibration chart of the coil, provided a square-law tuning condenser is used. It will usually be possible to hear and enjoy the

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

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."

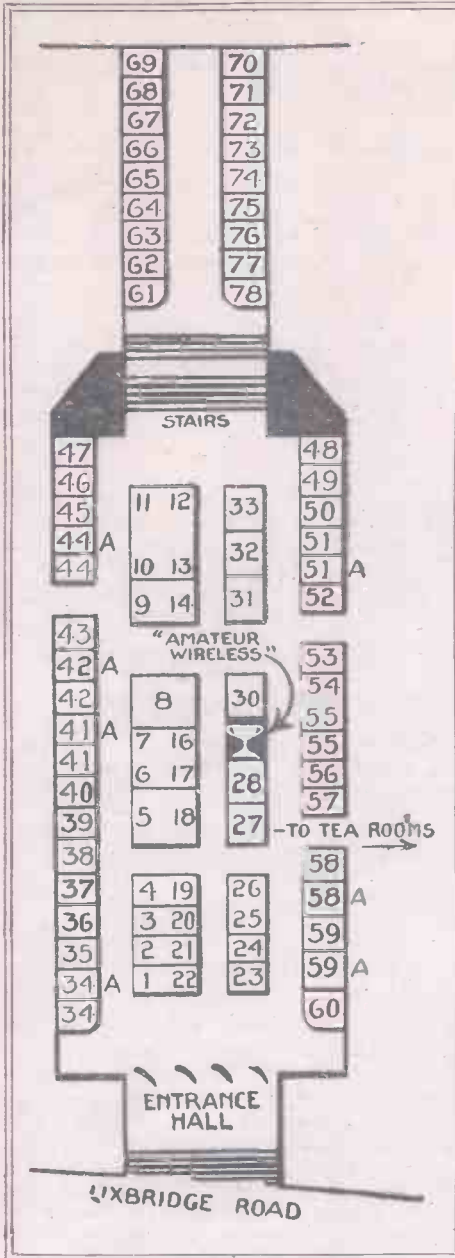
To the writer of the letter adjudged by the Editor to be the most interesting, a prize of Three Guineas will be awarded, and to the writers of any other letters published 10/6 will be paid.

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.

WHITE CITY EXHIBITION

A Guide to the Exhibits at the British Wireless Exhibition and Radio Convention, November 15 to 29.



Stands 1 and 22. Fellows Magneto Co., Ltd., Cumberland Avenue, Park Royal.

Two-, three- and five-valve sets will be on view on these stands, together with coils, crystal sets and the well-known Fellows phones. A new super one-valve set will be exhibited, together with a one-valve amplifier and a new model three-valve Super Grand.

Stand 4. Victoria Electrical Co., Ltd., Chapel Street, Manchester.

Variable condensers of all descriptions and good finish form the exhibits of interest on this stand. Victoria sets and components, including Victoria rheostats and engraved terminals, will also be shown.

Stands 5 and 18. New Times Sales Co., 61, Leather Lane, E.C.

Stands 6, 7, 16 and 17. Oldham and Sons, Ltd., Denton, near Manchester.

Examples of all those types of accumulators that are of service to the wireless enthusiast are on show here. Accumulators in both glass and celluloid cases are shown.

Stand 8. The New London Electron Works, Ltd., E.14.

Electron wire is the chief exhibit on this stand, and by means of a doll's house the simplicity of using this wire is amply demonstrated.

Stands 9 and 14. Igranic Electric Co., Ltd., Queen Victoria Street, E.C.4.

An attractive feature of this stand is the installation of a No. 84 B coil-winding machine, by which honeycomb coils are produced. Coils, high-frequency transformers, variometers and many other components are being shown, as well as two completely-dressed windows, in which are a complete range of components on view.

Stands 10, 11, 12 and 13. Pettigrew and Merri-man, Ltd., 122-124, Tooley Street, S.E.1.

Loud-speakers, phones, square-law condensers, valves, crystals and other components of various makes will be exhibited on this stand. The Newey snap terminal is of special interest, since it allows many components to be connected together in a minimum of time.

Stand 19. Sel-Ezi Wireless Supply Co., 6, Greek Street, W.1.

On this stand will be found an extended range of components, including anti-capacity handles, H.T. batteries, grid leaks, coil plugs and holders, crystal detectors and low-frequency transformers. A feature of special interest is

a range of Erla fixed condensers, in which no moulded ebonite casing material is employed.

Stand 20. The India Rubber, Gutta Percha and Telegraph Works Co., Ltd., Silvertown, E.16.

A large range of wireless accessories will be displayed on this stand, including the well-known Silvertown variable condensers and low-frequency transformers. The new Silvervox loud-speaker will be an exhibit of special interest.



This useful device, made by the Jeb Trading Co., can be used for testing batteries and valve-socket connections.

Stand 21. Tungstalite, Ltd., 47, Farringdon Road, E.C.1.

This firm is showing the well-known Tungstalite crystal (blue label), Airmax coils, Tungstalite high-tension batteries and complete crystal receiving sets.

For All Visitors to Note!

ORGANISERS.—Radio Exhibitions and Wireless Conventions (A.B. Dale and E. Schofield), Wellington Chambers, 46, Cannon St., E.C.4.

DATES.—Saturday, November 15, to Saturday, November 29, inclusive.

TIMES.—11 a.m. to 10 p.m. daily.

ADMISSION.—1s., including tax.

DEMONSTRATIONS.—There will be demonstrations of receiving apparatus at many stands, but loud-speakers will not

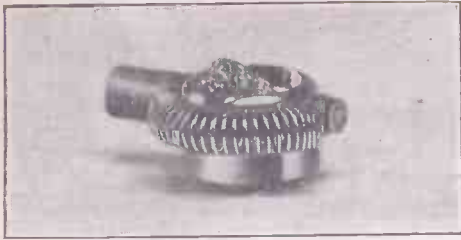
be used for this purpose. A special installation will be created for the reception of broadcasting. "Silent cabinets" will be provided for testing sets.

EXHIBITS.—Only goods of British manufacture will be shown.

NOVELTIES AND INVENTIONS COMPETITION.—"Amateur Wireless" is offering a prize of a 15-guinea silver cup for the best amateur novelty or invention. Full particulars are given on p. 733. The closing date is November

17. Gold and silver medals will also be given for the second and third prizes.

HOW TO GET TO THE WHITE CITY—(Uxbridge Road Entrance). Trains.—Metropolitan and Central London Rlys. to Shepherd's Bush; Metropolitan and L.N.W. Rlys. to Uxbridge Road (the latter from Earl's Court and Willesden). Trams.—L.U.T. from Hanwell, Southall, Hayes and Uxbridge; L.C.C. from Hammersmith, Willesden, Clapham Junction, Tooting, etc. Buses.—Nos. 11, 12, 12b, 17, 17b, 32, 49, 49a and 88.



By using this Perfection holder crystals can be changed easily and quickly.

Stand 23. Seagull, Ltd., 21, Spital Square, Bishopsgate, E.1.

An extended range of complete receivers, loud-speakers and accessories is on view on this stand. A three-valve receiver, complete with batteries, coils, dull-emitter valves and a loud-speaker, should be specially noted.

Stand 24. Wireless Service, 91, New Bond Street, W.1.

Stand 25 and 26. City Accumulator Co., 10, Rangoon Street, E.C.3.

A novel point about this stand will be that it contains a sound-proof demonstration room. Uni-valve, Duo-valve and reflex receivers will be much in evidence, together with the new C.A.C. portable receiver. Components of every description will be shown.

Stand 27. Penton Engineering Co., 15, Cromer Street, Gray's Inn Road, W.C.1.

Ball-and-socket coil holders, filament rheostats, standard coil holders, knife switches and basket coil holders will comprise the chief exhibits on this stand. The Penton low-consumption valve is of special interest, while standard Penton R-type valves will also be shown.

Stand 28. Neutron, Ltd., Sicilian House, Sicilian Avenue, Southampton Row, W.C.2.

Stand 29. "Amateur Wireless" and "The Amateur Mechanic," La. Belle Sauvage, E.C.4.

Entries for the AMATEUR-WIRELESS Novelties and Inventions Competition (for full particulars see panel in next column) will, it is hoped, be the most interesting feature of the Exhibition. There are no restrictions as to the form that entries may take, and everybody, from the newest enthusiast to the experienced experimenter, stands an equal chance of winning the 15-guinea cup offered as first prize—and a prize to be proud of, too!

Be sure to visit the AMATEUR WIRELESS stand and see what amateurs can do!

Stand 30. The Telegraph Condenser Co., Ltd., West Park Works, Mortlake Road, Kew Gardens, Surrey.

On this stand will be shown a complete range of the well-known T.C.C. condensers for reception and for transmission. A large transmitting condenser tested to 30,000 volts will be on view.

Stand 31. A. K. U. Co., 33, Orchard Street, W.

Stand 32. J. V. Mulholland, 4, Blenheim Street, New Bond Street, W.1.

A complete stock of Gambrell Efficiency apparatus, including the well-known neodyne condensers, coils, tuners, wavemeters, valve sets and high-frequency amplifiers, is on show. Valves, loud-speakers and a new type of unit system will be worth notice.

Stand 33. Fuller's United Electric Works, Ltd., Chadwell Heath, Essex.

A comprehensive range of the well-known Sparta wireless accessories will be shown on this stand, including ironclad intervalve and telephone transformers, various types of Sparta filament resistances and potentiometers, coil holders, condensers, chokes, switches, insulators and batteries. The Little Sparta loud-speaker will also be on view, together with samples of ebonite in panel, rod, tube and moulding.

Stand 34. Stella Products, 31-37, Wybert Street, N.W.1.

On this stand will be found the well-known Stella and Wembley phones and loud-speakers. An alternating-current rectifier will also be shown; this enables those who have alternating-current supplies in their homes to charge their own accumulators.

Stand 36. F. Yates and Son, Ltd., 144, Church Street, Kensington, W.8.

Accumulators suitable for wireless work are

A FIFTEEN-GUINEA CUP FOR A WIRELESS NOVELTY!

WITH a view to encouraging the amateur wireless inventor, "Amateur Wireless" is offering a 15-guinea silver cup for competition in connection with the White City Wireless Exhibition. —Any amateur may send his novelty or invention to the Exhibition, and indeed is invited to do so.

The inventions must reach the Exhibition not later than Monday, November 17. Each package must be labelled "Amateur Wireless' Inventions," and should be sent, carriage paid, to "Amateur Wireless" Inventions, The Wireless Exhibition, White City, Uxbridge Road, London, W.12, and not to the Editorial offices. When the Exhibition is over it will be returned carriage forward.

These competition inventions will be on view from November 20 to November 29, and must reach the Exhibition not later than Monday, November 17. Neither "Amateur Wireless" nor the Exhibition authorities will be responsible for any loss or damage, but it is needless to say that every possible care will be taken.

All entries will be judged by the technical staff of "Amateur Wireless," together with any specially qualified experts they may care to invite to assist them. The awards will be announced on Tuesday, November 25, at the Exhibition, and, if possible, will be published in the issue of "Amateur Wireless" on sale on Thursday, November 27; failing that, in the issue published one week later.

In addition to the silver cup as first prize, there will be a gold medal as a second prize, and a silver medal as a third.

Let every ingenious reader of "Amateur Wireless" get right down to the job straight away, and see that his invention reaches the Exhibition not later than Monday, Nov. 17. There is no time to lose!

of special interest on this stand. Wireless components, including the well-known F.Y.S. intervalve transformers and square-law condensers, will also be on view.

Stand 37. F. H. Middleton, 13, Manette Street, Charing Cross Road, W.1.

Midite, the "dependable" crystal, will be the chief exhibit on this stand, but the Perfection

crystal holder is also of special interest. A holder of this type will be given to every purchaser of a tube of Midite.

Stand 39. Harding, Holland and Fry, Ltd., 27, Garlick Hill, E.C.4.

The largest and most uniform natural crystal yet extracted from the earth will be one of the chief exhibits on this stand. This giant crystal weighs over 6 lbs., or approximately 14 lb., and has a sensitivity of at least 99.5 per cent. Phones, loud-speakers, crystals and complete crystal sets are also shown.

Stand 40. The Jeb Trading Co., 49a, Avenue Road, Acton, W.3.

Battery testers, brass spade terminals, wander plugs, Mego catwhiskers and Jebite crystal will be the chief exhibits on this stand. Of special interest is the C.W. battery link for making up high-tension units with ordinary pocket-lamp batteries.

Stand 41. The Formo Co. (Arthur Preen and Co., Ltd.), Crown Works, Cricklewood.

Formo shrouded transformers and Formo-roner variable condensers will be the chief exhibits on this stand. The compact and shrouded transformers and the original condensers shown should attract much attention.

Stand 42A. Burwood Electrical Supplies Co. (1924), 41, Great Queen Street, W.C.2.

Square-law condensers, valve holders, panel switches, valve legs, dull-emitter valves and terminal adaptors are among the chief exhibits. The Jay Gee crystal-valve set, complete with all accessories, is worthy of special notice.

Stand 43. Precision Screw Co., Ltd., Macdonald Works, Walthamstow, E.17.

Variable condensers, vernier condensers, switch arms, coil plugs, crystal detectors and Colpak terminals are shown on this stand. Various brass parts and crystal detectors are also exhibited. The Colvern vernier condenser is of especial interest.

Stand 44. The Portable Utilites Co., Ltd., 8, Fisher Street, W.C.1.

The new Gravity crystal detector will be of special interest. It is claimed that this detector is able to withstand the effect of jars and shakes better than the ordinary catwhisker contact. Frame aeriols and the well-known Eureka L.F. transformers are also shown.

Stand 47. Bullen, 38, Holywell Lane, Great Eastern Street, E.C.2.

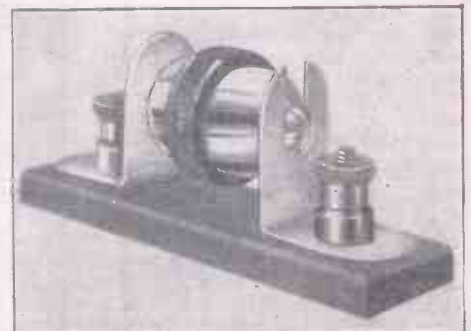
Stand 48. Lighting Supplies Co., 4-5, Finsbury Pavement, E.C., and The Ecco Radio Co., Princess Street, St. John's Wood, N.W.

Finston fixed and square-law condensers and variometers, Sedion basket coils and crystals will be on view on this stand. Well-known makes of phones, components and complete sets will be exhibited by the Ecco Radio Co., of Princess Street, St. John's Wood, N.W., who are sharing the stand.

Stand 49. Hart Collins, Ltd., 38a, Bessborough Street, Westminster, S.W.1.

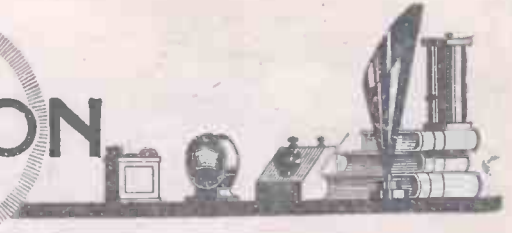
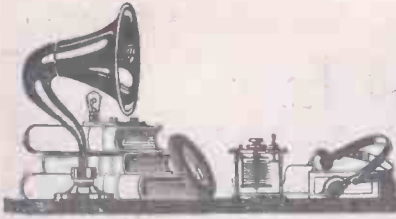
Of special interest on this stand is the Tuninal, a single-valve broadcast receiver hav-

(Continued on page 746)



All the parts of this Gravity detector are totally enclosed and adjustment is made by rotating the knurled ring.

OUR INFORMATION BUREAU

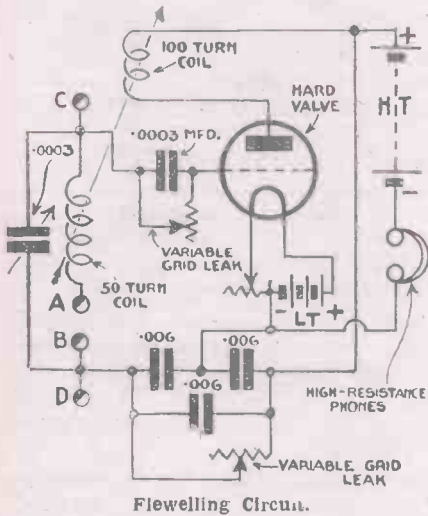


RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, lay-outs, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 759).

Flewelling Circuit

Q.—Please give me a circuit diagram of the Flewelling super-regenerative receiver.—L. C. (Brighton).

A.—The fixed condensers employed in this circuit must be of first-class quality. The grid



leak and the resistance shunting the trio of .006-microfarad condensers should have a resistance varying between .5 and 5 megohms. Either a bright- or a dull-emitter valve may be used. Should the receiver be used in conjunction with a frame aerial, a suitable size of frame is one having sides each 3 ft. in length, forming a square on which eight turns of wire are wound. The two leads from the frame aerial are connected to A and B, shown in the circuit diagram. If an outside aerial and earth system is used, connect the aerial to terminal C, the earth to terminal D, and short circuit the terminals A and B with a piece of copper wire.—D. C. R.

List of Crystals

Q.—An enthusiastic crystal user, I have for some months been using hertzite. Now, for a change, I should like to try some other crystals. Can you give me a list of likely ones?—J. K. D. (Hammersmith).

A.—For experimental purposes we suggest you try the following crystals: Zincite-bornite, carborundum, copper pyrites, galenagraphite, molybdenite, silicon and tellurium. Of these you will probably find the zincite-bornite combination the most interesting with which to carry out experiments.—X.

Condenser Capacities

Q.—I present for your explanation a little problem that I am unable to solve. A .001 microfarad condenser is variable from zero to .001 microfarad. This being so why do you insist on the fact that even a .0003 microfarad variable condenser is of too high a value to tune the anode coil in a high-frequency amplifier?—R. D. (Wick).

A.—You are wrong in supposing that a .001 microfarad variable condenser, or any other condenser for that matter, has zero

capacity when set at the zero mark. With a large variable condenser, such as that you mention, there is quite an appreciable capacity between the edges of each set of plates. The fewer the plates the smaller will be the minimum capacity value of the condenser. A condenser of more than .0001 microfarad is not to be recommended for tuning the anode inductance of a high-frequency amplifier, for the slightest adjustment of a large variable condenser makes a very big change in wavelength with the result that tuning will be very difficult.—D. C. R.

Edison Accumulator

Q.—What are the advantages of the Edison accumulator, one of which I possess?—K. M. I. (Leeds).

A.—The electrolyte used in this type of accumulator is an alkali and the plates are nickel. This accumulator is very suitable for all purposes, especially where a heavy rate of discharge is required. It is almost indestructible and even shorting the terminals does not harm it. The E.M.F. per cell is 1.2 volts, so that two of these cells would be excellent for use with dull-emitter valves of the .06-ampere type.—D. C. R.

Interference from Generator

Q.—I have a two-valve set and am troubled by interference from the generator of a picture theatre 200 yards away. I have tried a capacity earth but with no effect. Is there any other remedy?—F. T. W. (Caerau).

A.—Loose-coupled tuning coils will decrease

generator interference to a considerable extent, and a variable condenser connected in the earth lead often proves beneficial. Tinfoil shields should be provided for variable condensers, iron-cored transformers and rheostats. All leads should be well separated from one another. Small cylinders of tinfoil may be placed over the valves, and these with the other shields connected to a common earth.—H. R.

Condenser Across Reaction Coil

Q.—Would a variable condenser across the reaction coil improve results?—F. C. (Wimbleton).

A.—If the reaction coil and aerial tuning inductance are correctly balanced there is no need for a variable condenser across the former, although the addition of one might make it easier to control the degree of reaction. If, on the other hand, your reaction coil is on the small side, a small variable condenser of about .0002 microfarad will improve results.—D. R.

Altering Accumulators for Dull-emitter Valves

Q.—I possess a 4-volt 60-ampere-hour (actual) accumulator. If possible I wish to convert this into a 2-volt battery, using both cells. Can this be done?—G. R. (Halifax).

A.—At present there is a connecting bar joining the positive terminal of one cell to the negative terminal of the other. This bar should be removed and the two cells joined in parallel. The resultant actual capacity of the battery will be 120 ampere-hours.—D. C. R.

WIRELESS TERMS TRAVESTIED



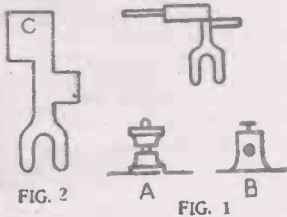
A BROADCAST RECEIVER.



PRACTICAL ODDS AND ENDS

Terminal Tags

TO amateurs who are continually altering the wiring of their sets to test various circuits, the following device will be found to be of great assistance when the



Figs. 1 and 2.—Terminal Tags.

terminals on the panels are of both the types illustrated.

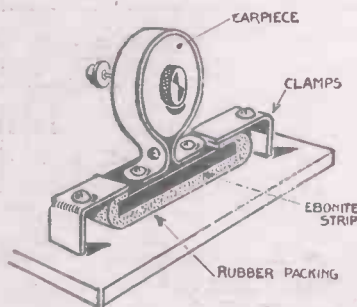
If wires are repeatedly bent to fit terminal A, Fig. 1, and straightened to go through the hole of terminal B, the ends are liable to weaken and will eventually break off. All that is required to prevent this is a sheet of very thin brass, from which several pieces, in the shape shown by Fig. 1 are cut.

The end of the wire is soldered at C and the whole rolled into the shape shown in Fig. 2, when it will be found that wires thus fitted can be easily connected to either type of terminal. F. C. L.

Microphone Vibration

A SIMPLE method of protecting the earpiece and microphone of the "A.W." Crystal Loud-speaker Set from shocks and other outside disturbances is shown by the illustration.

The phone is mounted on a strip of ebonite or hard wood secured to the base-board of the set by two inverted L-shaped



Preventing Microphone Vibration.

clamps, a piece of sponge or other soft rubber being inserted between the clamps and the earpiece mounting strip as shown, thus completely insulating the microphone from external vibrations. R. N. W.

Changing Connections

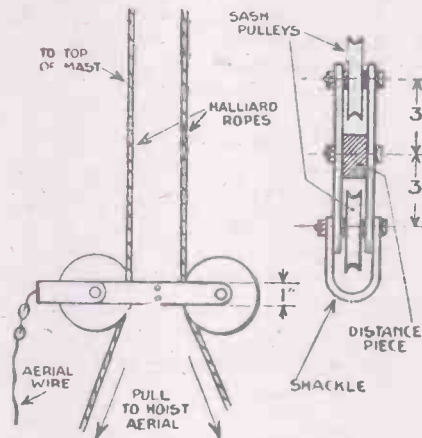
EXPERIMENTERS who often want to make quick changes in connections should use small paper clips, to which permanent leads can be easily soldered.

D.

Hoisting Aerial Wire

IT may happen that the aerial halliards become fast in the pulley block at the top of the mast, thus making it seemingly impossible to hoist the aerial wire. This, however, may be done as follows:

Two strips of flat iron $\frac{1}{4}$ in. by 1 in. by 6 in. are drilled $\frac{1}{8}$ in. (right). A distance piece, slightly thicker than a sash pulley, is bolted between the strips. A sash pulley was mounted in each end of the fork and bolted in position. A shackle



Method of Hoisting Wire.

is mounted on one spindle bolt in order to attach the aerial wire. The actual hoisting is easy. One halliard is threaded through each pulley and the ropes pulled at an angle to each other. Surprisingly little effort is needed to make the wire ascend. A. E. M.

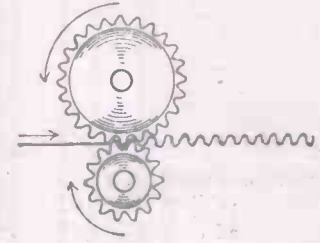
Soldering Earth Plates

MANY amateurs make use of old zinc or galvanised-iron baths for earth plates. When these have been in other service previously great difficulty is usually experienced in clearing the surface sufficiently well to enable tinning and soldering the earth wire to be accomplished.

An excellent tip is to dab a quantity of raw spirits of salt on the place to be soldered and in a minute or so wash off with clean cold water. It will be found that the spirit has eaten away the surface, leaving a perfectly clean surface. C. W.

Copper-tape Aerial

READERS who use copper-tape in place of the ordinary stranded wire for aerials will find that an extra 50 ft. or 50



Corrugated Aerial Tape.

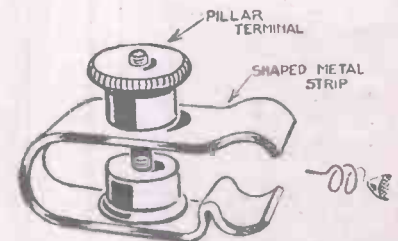
can be suspended between the two masts if it is first corrugated in the manner outlined in the accompanying sketch. The tape is simply passed between two suitable gear wheels which are preferably a little worn, so that the clearance between the teeth is at least equal to the thickness of the tape.

If one possesses a selection of various gear combinations a corrugating "machine" may easily be rigged up. The writer used the gears of an old miniature mangle arrangement used for glazing photographic prints. O. J. R.

Crystal Holder

CRYSTAL experimenters will find the simple clamping device shown in the illustration of special convenience when crystals are to be quickly changed, such as is likely to be the case when comparing different makes of crystal during a broadcast item. The arrangement can also be used in the construction of a simple crystal detector for ordinary use.

A small-sized pillar terminal is used,



Simple Crystal Holder.

which clamps the crystal tongue to the base of the detector, the head of the terminal providing the means for clamping the crystal in position or releasing it as required. R. N. W.

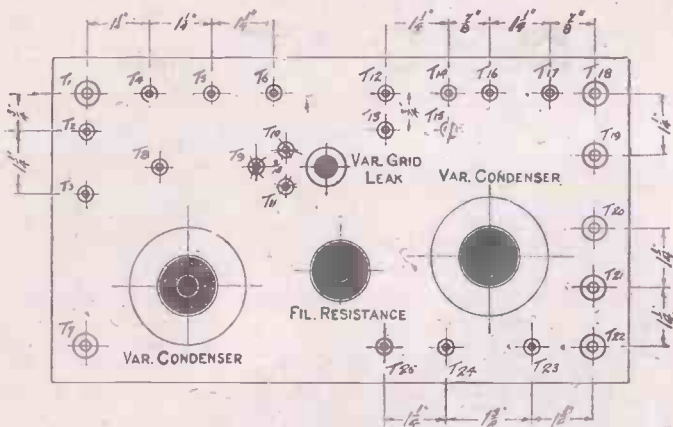


Fig. 2.—Layout of Panel.

EVERY amateur at some time or other during his experiments must have gazed with dismay at his spidery, tangled bench hook-ups, and sighed for some decent-looking instrument that would present a good outward appearance to the eye and yet retain its flexibility and capacity for experiments.

The receiver shown by Fig. 1 and about to be described is the result of several attempts to solve this problem for the experimenter with one-valve circuits. As most of these can be readily and efficiently tried out, it enables the advantages and disadvantages of each circuit to be compared and useful data compiled. Withal it is compact, neat in appearance, portable and, last but not least, dustproof. It also makes an ideal instrument for the beginner.

The sizes of cabinet, ebonite panel, etc., are given, but these can, of course, be modified to suit the components used, provided the general scheme of layout is adhered to. The wiring should be kept well spaced. One of the points that should be noticed is that the terminals are kept at a uniform distance apart ($1\frac{1}{4}$ -in. centres in this case) wherever possible. This admits of using one size of connecting link for most of the connections, making for ease and rapidity when wiring up, which would not be the case if the terminals were at any odd centres.

Components

The components required are as follows: One two-coil holder; two .0005 variable condensers (Polar were used in the writer's set, but any good make of condenser will do, although the depth of case may have to be modified. Condensers with a vernier adjustment incorporated would probably be an advantage for real fine tuning); one grid condenser .0003 microfarad; one variable grid leak; one .006 fixed condenser; one .002 ditto; one rheostat (preferably one that can be used either with bright- or dull-emitters); one pair H.R. phones; low-capacity tuning coils, Nos. 35, 50, 75, etc.

If the coils are home-made the writer recommends the lattice-wound type on 2-in. formers, using No. 22 d.c.c. wire with well-spaced windings for the sizes mentioned.

Also (at a later date if preferred) a good crystal detector, an intervalve transformer and a general-purpose valve (say a ".06" dull-emitter).

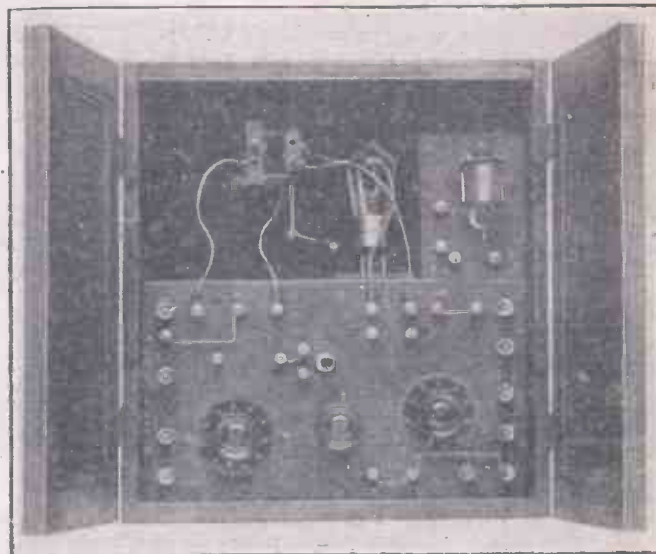
The advantage of using a dull-emitter is that it makes the set portable if required. Although more expensive at first cost, it will repay itself in the long run. In addition there will be required a 60-volt H.T. battery, four valve legs, seven 2 B.A. screw-down terminals; eighteen 5 B.A. ditto, and some spade tags.

The cabinet is of stained and polished mahogany; the internal dimensions are 13 in. by $12\frac{1}{4}$ in. by $4\frac{1}{2}$ in. A bead $\frac{1}{8}$ in. wide is fastened at a depth of $1\frac{1}{2}$ in. along the bottom and for $6\frac{1}{4}$ in. up each side, to which the ebonite panel is screwed.

The ebonite panel measures $12\frac{1}{4}$ in. by 7 in., and has the surface removed with fine emery-cloth as usual. Oil should be used as a lubricant to save the ebonite from being scratched during the process.

Fig. 2 shows the relative positions of the components and terminals. The valve legs are screwed into a piece of ebonite (this component can be bought ready-made), which is screwed to a wooden shelf, which is in turn fastened to the main panel by means of a

A SELF-CONTAINED THE EXPERIMENTAL



strip of the $\frac{1}{2}$ -in. square heading and small wood screws.

The components should then be mounted and the whole wired up. No. 18 bare tinned-copper wire is suitable for connections, all joints being soldered. Fig. 3 shows the wiring, and it is also apparent in the photograph, Fig. 4.

The coil holder should be fastened in position at some convenient height. In the instrument described Meccano strips suitably bent were used. Connections between terminals on the front of the panel are made with wire links bent as shown in Fig. 5. The same wire as was used for wiring up will do nicely for these.

Holes should be drilled in the case opposite those terminals which take external leads, and rubber rings pushed on to the

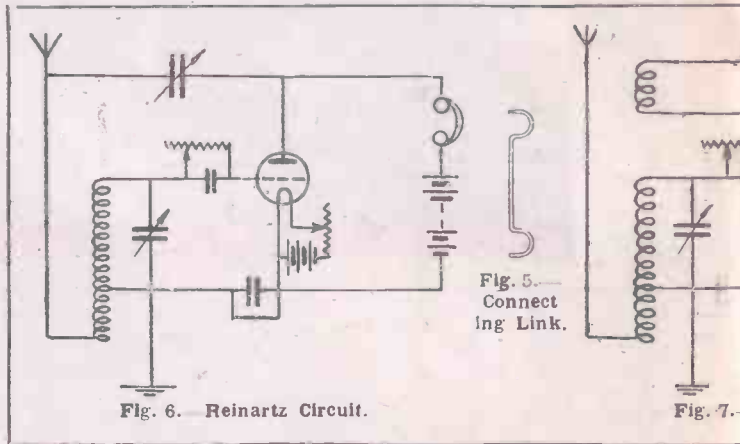


Fig. 6.—Reinartz Circuit.

Fig. 5.—Connecting Link.

Fig. 7.

AINED SET FOR RIMENTER

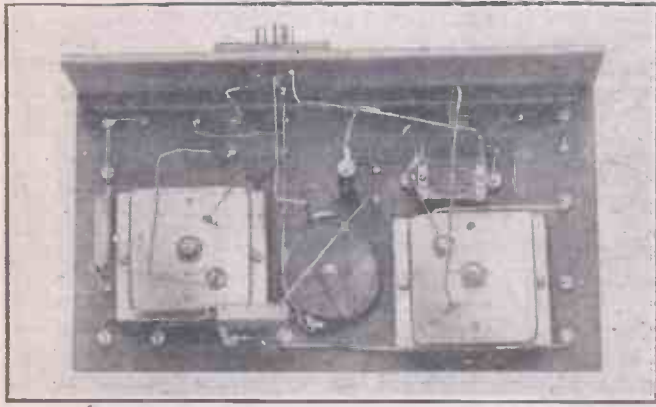


Fig. 1 (photograph on the left).—The Complete Receiver.

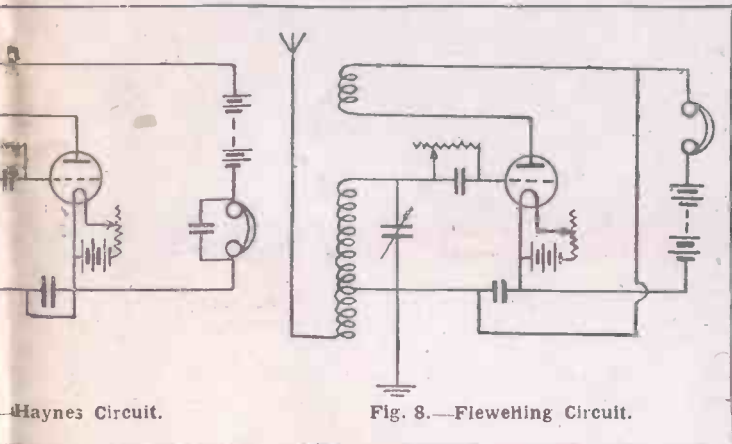
Fig. 4 (photograph above).—View of Back of Panel.

leads to fill up the holes when in position. This enables the doors to be left closed with everything in position, whilst the rings shut out the dust.

Some Circuits

No. 1.—Single-valve detector, series-tuning condenser, with or without reaction.

Aerial T1, earth T7, A.T.I. coil holder leads T6 and T4, reaction if used (otherwise terminals shorted), (T12, -T14), H.T. + T18, H.T. - T19, telephones T20, T21, L.T. + T22, L.T. - T23, (T2, T5) (this will require a special link), (T9, T10), (T16, T17), (T21, T22), (T25, T24), (T24, T22) (this requires a special-shaped link bent to miss T23, otherwise L.T. would be shorted) (see photograph). Coils in respective holders.



Haynes Circuit.

Fig. 8.—Flewelling Circuit.

detector, with or without reaction. Aerial, earth, phones, H.T. and L.T., and reaction (if used) as before.

A.T.I. coil holder leads T2, T6, (T4, T5), (T8, T9), (T10, T11), (T21, T22), (T16, T17), (T25, T24), (T24, T22), suitable coils.

No. 4. Reinartz (Fig. 6).—For this circuit a special coil is required, and for convenience the writer has adopted the following method of winding this. Compared with the more usual basket windings, it does not seem to suffer in efficiency. The coil was wound in the usual lattice fashion on a 2-in. diameter former, with well spaced turns, but with the following modifications: No. 22 d.c.c. wire was used, sufficient being cut off for about 26 turns.

This we will call wire A, the rest of the wire being left on the reel B. A zigzag turn and then a layer of spaced turns, and again the usual zigzag turn was wound on from reel B and the wire temporarily fastened to prevent it unwinding.

Next a layer of turns was wound on immediately above the first layer, using the lengths of wire A, and finishing with the zigzag turn.

No. 2.—Single-valve detector, parallel-tuning condenser, with or without reaction.

As No. 1, but delete connection (T2, T5) and substitute (T2, T3), (T4, T5).

Special Coils

No. 3.— Short-wave single-valve

This was also temporarily fastened. The wire used for the first layer, wire B, was then "unslacked" and a further layer put on, finishing with the zigzag-turn and again fastened. Then another layer of the wire A was wound on in the same manner, until there were about 16 turns in each of the separate windings of wire. The winding with wire B was then continued until a resultant coil of about 50 turns was formed, not counting the 16 turns of A.

All this sounds complicated, but actually is quite easy to carry out. The coil was then dipped in hot wax, carefully drained, and when cool the pins were removed, the first zigzag turn pulled out, and the coil slipped off the former. The great advantage of winding this way is that the coil can be tapped or mounted on the usual coil plug (although this is not connected up), and the same coil will do for several other circuits.

A piece of ebonite with three equally spaced small terminals was fastened across the face of the coil, and connections made in the following manner. The beginning of the coil wire A was taken to the one outside terminal T26. The beginning of coil wire B and the other end of coil A were joined together and taken to the middle terminal T27. The remaining wire was taken to the remaining terminal T28.

Connections for the Reinartz Circuit

Aerial T1, earth T7. H.T. + T20, H.T. - T21. Telephones T18, T19. The special coil can be either placed in the coil holder or laid on the left-hand side of the shelf. (T26, T1 or T2), (T27, T4), (T28, T6), (T9, T10), (T12, T14), (T16, T17), (T14, T15), (T13, T2) (a special straight length of wire necessary for this last connection). Right-hand condenser now controls reaction. (T25, T24), (T24, T22) special link, (T21, T22).

No. 5.—Haynes DX (Fig. 7).—Special coil must, of course, be put in the holder for this circuit. The connections are as for Reinartz, but delete (T12, T14), (T14, T15), (T2, T13); connecting suitable coil in

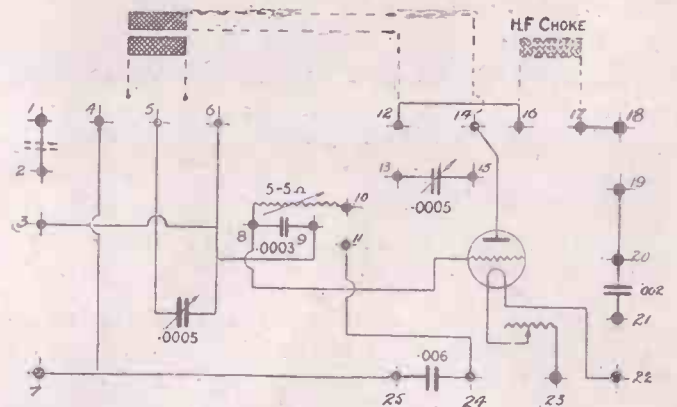


Fig. 3.—Wiring Diagram.

reaction coil holder leads to T12, T14; reverse position of phones and H.T.—that is, H.T. + T18, H.T. - T19; phones T20, T21.

No. 6.—Flewelling (Fig. 8).—Connections as No. 2, but T25, T24; reverse phones and H.T.; phones T18, T19, H.T. + T20, H.T. - T21. Connections T12, T25 (special length link required).

The Haynes DX circuit may also be used as a modified form of Flewelling by deleting connection T24, T25, and adding the feed-back connection T12, T25.

Note.—The Flewelling works best on a small indoor aerial or frame, but it is very tricky to handle, although it is a very interesting circuit to experiment with. If a frame aerial is used connections would be as follows: Frame-connection leads to T1, T7, A.T.I.; coil-holder leads to T2, T6, also connection T4, T5; reaction-coil holder, etc., as before.

The above circuits give a good idea of the adaptability of the receiver and the methods of connection, etc. Most one-valve circuits which have appeared in this and various periodicals can be tried out in this way. A study of the wiring diagram of the set and the diagram of the circuit to be tried out will soon show what connections are required.

Terminals T16 and T17 are for connection to a choke coil should one be required in any particular circuit. (This is the case in some American circuits. It is also sometimes an advantage to use one in the Reinartz or Flewelling, although the

writer has never found it necessary.) Any good low-capacity lattice or duolateral coil of about 250 turns will do.

Adding a Crystal Detector

A crystal detector unit has been added, as this enables the valve to be used as an H.F. amplifier when greater range is required, with only a slight additional cost.

This consists of a box 3 3/8 in. by 4 1/2 in. with an ebonite front, four terminals and detector. It stands on the right-hand side of the shelf and is best held in position by a small brass clip. When the valve is used as an H.F. amplifier T8, T9 are shorted.

If a further similar unit containing an intervalve transformer with necessary terminals, etc., is added an interesting field in dual amplification is opened up. This transformer unit is best placed at the left-hand end of the shelf and can be retained in position by a similar clip.

Various positions for putting the secondary winding in circuit can be tried, as (1) in series with the A.T.I. (earth side), (2) in parallel (using choke in series with secondary winding of transformer, using T8, T11, or (3) across the grid condenser T8, T9.

Grid Bias

Experiments in grid bias can be tried by connecting the grid cells across T25, T24.

No notes as regards performance of the various circuits have been given, as of

course, these vary with different aeriels and operators, but on the writer's indoor aerial excellent results have been obtained from all B.B.C. and Continental broadcasting stations with any of the circuits mentioned. One refinement, however, might be added, namely, a suitable base to hold necessary batteries, etc., or a compartment with separate door built into the case itself.

A large capacity condenser of about 1 microfarad should also be placed across the H.T. battery. As the positions of the battery connections to set varies, this cannot be placed across any two terminals in the set itself, so it is best incorporated in the H.T. unit. F. W. O.

THE NEW HIGH-POWER STATION

ALTHOUGH no site for the new high-power station in the Northampton district has yet been decided upon, B.B.C. engineers are planning many improvements based on experience gained at Chelmsford.

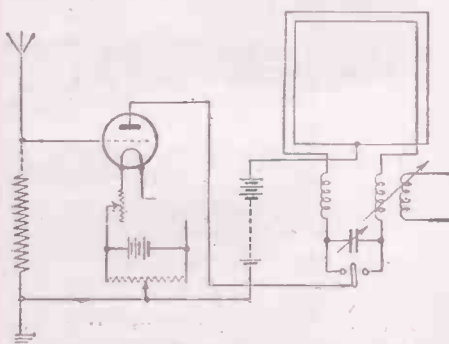
Captain Eckersley has mentioned one such improvement, which is the movement of a single spot of light in a darkened room to show if there is any distortion in the signals being transmitted. The device will be kept in a special copper-shielded room.

It is understood that two aerial masts are proposed, each 500 ft. high.

PROGRESS AND INVENTION

Directional Reception

BOTH an untuned open aerial and a tuned frame aerial are used in a method of directional reception outlined in Patent No. 222,210/24 (N. P. Hinton, of Golders Green, and Metropolitan-Vickers Electrical Co., Ltd., of Westminster).



Directional Reception (222,210/24).

The principle on which the arrangement works is briefly as follows: Both the desired signal and any interfering signal are received on the open aerial in the ordinary way. The frame aerial is tuned

to the wavelength of the undesired signal. By altering the position of the switch and the magnification factor of the valve, the currents produced in both open and frame aerial circuits can be balanced out. It should be noted that only one tuned circuit is used.

If the switch connecting the frame aerial to the valve anode is in the open position, plain frame reception is obtained, the open aerial being entirely cut out. The switch may be moved to one of its operative positions, the brilliancy of the valve filament of the potential of the grid or the resistance in circuit with the open aerial being varied until the signals received by the frame are completely balanced by those received from the open aerial.

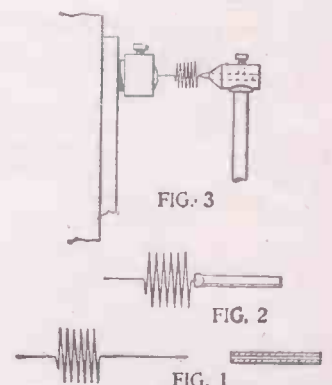
Catwhisker Improvement

ALL crystal users will agree that the average catwhisker is far from being substantial. This fact becomes of particular moment when attempting to clamp a fine wire catwhisker into a holder.

In order to facilitate this operation it is proposed in Patent No. 222,334/24 (W. J. Bowyer, of London, N.W.5) to strengthen

one end of the catwhisker by a metal sleeve. The arrangement is clear from the diagrams. Fig. 1 shows the catwhisker and sleeve separated and Fig. 2 assembled.

It is a simple matter to clamp the com-



Figs. 1 to 3.—Catwhisker Improvement (222,334/24).

paratively thick sleeve in a holder (Fig. 3) and there is practically no limit to the fineness of the catwhisker itself. The sleeve is fixed to the catwhisker by being pinched at each end.



ACCORDING to Captain Eckersley, there is a distinct difference between the view points of British and American listeners. The American looks on wireless as a hobby, but the British listener aims at getting tone and clarity of reception and regards wireless as an entertainment.

It is suggested that it would be beneficial to install loud-speakers in a hall at Bradford for the reception of church services broadcast from London.

Mr. J. K. A. Nicholson, the engineer in charge of 5PY, who has been promoted engineer-in-charge of the Newcastle main station, was recently presented with a suitably inscribed silver cigarette-case by the entire staff.

Chamber music, provided by the Kutcher String Quartet, will be broadcast on November 19.

The third National Radio Exposition at New York was opened through the medium of wireless by Senatore Marconi from London on November 3.

Mrs. Kendal, the great Victorian actress, has arranged to broadcast next month. She has chosen *Granny's Juliet*, by Mr. Herbert Swears, and in this bright one-act play she will "speak" with Lady Trece.

An appeal is being made for funds to supply a set to the Blind and Deaf School, Stoke-on-Trent.

Next month General Ferric (chief of the French Army Wireless Department), in conjunction with other foreign experts, will begin a series of operations for determining the exact size of the earth by wireless. It is stated that the scientists will make numerous measurements, and then wait for several years before making them again in order to determine accurately whether the earth's dimensions have altered during the interval.

A jolly birthday programme is to be broadcast on November 14, at which various members of the B.B.C. staff will have an opportunity of displaying their talents.

Some of the youngsters at a Sheffield elementary school take their own phones to listen-in after lessons or when it is too wet for games.

Much valuable data with regard to long-distance broadcasting is expected to be obtained as the result of the voyage to the Antipodes of the ss. *Orama*. It is expected that on the outward voyage Chelmsford will be received as far as Port Said.

Lord Gainford, chairman of the B.B.C., was at one time Postmaster-General.

Those who were pleased with the recent solo night given from 2LO will be interested to hear that a similar programme will be broadcast on November 20. Mr. George Bernard Shaw will read from his own play, *O'Flasherty, V.C.* This will be S.B. from all stations.

Free to readers of
"Amateur
Wireless"
A Copy of
"The Amateur Mechanic"

Edited by Bernard E. Jones. The contents of this money-saving weekly for handy men are always Practical, Reliable and Straightforward. Week by week it gives just the kind of advice on the thousand and one domestic jobs and hobbies which every handy man or woman needs to ensure the best results from his or her work. Whether you own only a few simple tools or a fully equipped workshop, "The Amateur Mechanic's" weekly help will make all the difference to your pleasure and your success, and will show you how to make and save money by using your spare time profitably.

Send a postcard with your name and address to the Editor, "Amateur Mechanic," Room 97, Cassell's, La Belle Sauvage, E.C.4, and a free copy of this practical weekly will be forwarded to you post free.

By "listening-in" to a total eclipse of the sun, American wireless amateurs are to aid astronomers early in the new year. It is desired to learn whether the shadow path acts as a reflecting mirror to wireless waves.

A bright orchestral programme will be broadcast on the afternoon of November 16. Miss Sybil Maden and Mr. Glyn Eastman, both well known for their concert work, will sing.

Twenty-five pounds has been offered to the Nottingham General Hospital Board for the provision of a valve set for use in the children's section of the institution. An appeal is also being made for funds to provide a four-valve set for the patients in the Whiteabbey Sanatorium.

A Shakespearean night will be given on November 18, and delightful music associated in some way or other with Shakespeare and his plays will be broadcast.

Work has started in the West End of Berlin on the construction of an "Eiffel Tower" for wireless transmission work. The tower will be over 430 ft. high.

Heterodyning, owing to the coincident wavelengths of 2LS and a French station, was the cause of an annoying whistle in the Leeds transmissions recently.

It is interesting to know that there is a possibility of further American transmissions, but so many amateurs can get America fairly well that it is not worth while the B.B.C. relaying the programmes unless they are particularly good.

An amateur at Buenos Aires has succeeded in communicating with Nice on a wavelength of 87 metres and over a distance of 8,750 miles.

Hearing that the world's largest crystal, weighing 137 grams, has been purchased by the British Museum, a correspondent wants to know what kind of catwhisker they will use with it.

The ss. *Plum Branch* reports that on a voyage from South America, and while still in mid-Atlantic, two-way communication was established with Valencia. The daily evening weather reports were received from the Air Ministry for over a week prior to the ship's arrival at Liverpool. Coast stations were read comfortably from 3,000 miles.

A "super-howler" is at work in the London area, who jams all wavelengths up to 450 metres with powerful howls.

Senatore Marconi has returned to London after an absence of about three months, during which time he has been further developing his new beam system. He states that this system will be soon effective for signalling over any distance by day as well as by night.

By the time these lines appear in print the Dundee station will be open.

Despite some objection, the Liverpool Licensing Committee decided to grant a temporary permit for the installation of wireless sets in six licensed premises.

The Post Office authorities are satisfied that nearly everyone using a wireless set has taken out a licence. In September, 1923, 180,000 wireless licences had been issued, and last September the number had increased to 970,000.

It is extraordinary the number of people who do not seem to know that it is possible to get 5XX every night. Chelmsford is still going very strong and can be picked up easily all over the country.

A high-power transmitting station is to be installed at the Sûreté Général (French Scotland Yard), and receivers will be established at all important police stations throughout the country.

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

The B.B.C. announces that American Presidential election results were picked up by them at 2 L.O. Many results conveying specific figures were received via K D K A.

Wireless enthusiasts at Belfast are up in arms against the closing of the broadcasting station on Sundays. It is asserted that local "killjoys" are responsible for the ban.

The value of direction-finding apparatus to ships was conclusively demonstrated during the voyage of the ss. *Arca* to the Kara Sea. Wireless bearings showed that unknown currents had set the vessel twenty miles to the northward of her expected position.

The Saturday night travelogue, or "radio-photologue," as it might best be called, has apparently come to stay in the United States, and station WMAQ broadcasts the talk of some noted lecturer or traveller from 8.40 to 9 p.m. every Saturday night. The illustrations for the lectures are printed on the picture page of the *Chicago Daily News* on Saturday morning, so that amateurs can listen to a description of places or events while looking at the pictures of them.

A United States Army aeroplane recently succeeded in broadcasting the voices of the observer and pilot to a land-receiving station while flying at top speed through a heavy rainstorm. The land set

was supplied with a microphone and re-broadcast the message to amateurs all over the country. The two aviators who conducted the experiment flew over Chicago, where the W.G.N. broadcasting station picked up and relayed their messages. The voices could be heard quite clearly above the roar of the motor. The aeroplane sending set had a radius of ninety miles.

The period of fine weather enjoyed throughout most of Europe for the two middle weeks of October are taken as conclusive proofs by expert meteorologists that wireless does not cause bad weather and rain.

MODERN SHIPS' WIRELESS

GONE are the days when ships were fitted with little ¼-kilowatt induction-coil transmitters that could only "cough" hoarsely over ranges of 100 miles or less. Nowadays even the smallest cargo boat is fitted with powerful apparatus that enables its operator to keep in touch with stations hundreds of miles distant.

A cargo vessel being built at Barrow will be equipped with the most modern devices for safety at sea, including Marconi direction-finding equipment and lifeboat apparatus.

The main transmitter is a Marconi 1½-

kilowatt quenched-spark set capable of long-distance working, similar to that carried by the largest vessels afloat. The receiving apparatus, which comprises a valve amplifier with crystal detector, is capable of adjustment for any wavelength now in commercial use up to 2,500 metres.

In addition to the ordinary navigating instruments, the ship will be fitted with Marconi direction-finding equipment, which will enable its position to be plotted reliably in thick fog or under adverse weather conditions which may prevent visual observations.

The vessel being built will be one of the first cargo boats to carry a lifeboat wireless set, which has a quenched-spark transmitter with a range under normal conditions of at least 50 miles. As the receiving apparatus combines the "all-round" and directional principles, the lifeboat, having transmitted its circumstances to all stations in range, can first listen for replies from all directions, and then employ the directional apparatus to concentrate attention on one station only. The lifeboat can thus take a bearing on the answering ship or land station and set her course towards it.

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We are able to announce something new in wireless aeri-als, viz.:

SILVER BRAIDED COPPER WIRE, 144 STRANDS, IN TAPE FORM

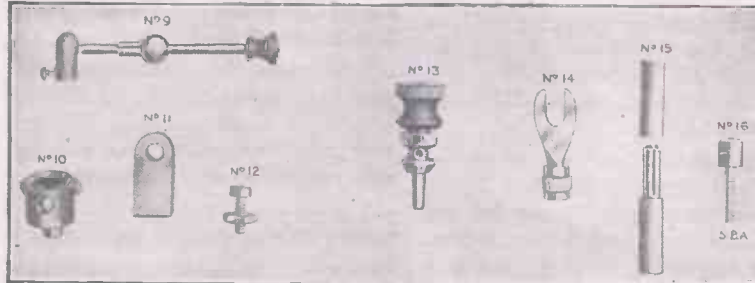
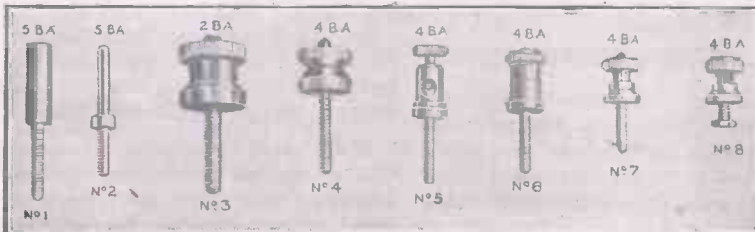
STUDY THESE FACTS: TOTAL SURFACE: 1.17 ins. WEIGHT: (100 ft.) 5½ ozs. BREAKING STRAIN: (100 ft.) 60 lbs.

The total surface of ordinary 7/22 copper wire is .567 in., therefore this has practically double the surface.

EASILY HANDLED, SMART IN APPEARANCE. FLEXIBLE. DURABLE.

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| No. 2. Valve Pin without Collar ... 4d. " | No. 11. Holder for Ball Joint ... 1d. " |
| No. 3. Terminals Heavy Pattern, 2 B.A. ... 2/2 " | No. 12. Screw Nut for above ... ½d. " |
| No. 4. Terminals W.O., 4 B.A. ... 1/- " | No. 13. Wander Plugs, complete red and black ... 4½d. " |
| No. 5. Telephone Terminals, 4 B.A. 1/- " | No. 14. Spade Terminals ... 1/- doz. |
| No. 6. Telephone Terminals, Small Barrel (special 4 B.A.) ... 1/- " | No. 15. Plug and Socket ... 1d. each |
| No. 7. Fancy Terminals, 4 B.A. ... 10d. " | No. 16. Contact Studs 5 B.A. ... 4d. doz. |
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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** (5IT), 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), 301 m. **Stoke-on-Trent** (6ST), 306 m. Programmes relayed.

CONTINENT

The times are according to the Continental system; for example, 10-30 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 (Tue. and Thu.); 18-30, news, weather; 19-00, time sig., con., news; 21-00, dance (Wed.).

BELGIUM.

Brussels (SRB), 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.).

Häeren (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 Radiofonistation), 750 m. 19-00, con. (Sun. and Wed.).

Lynby (ONE), 2,400 m. Week-days: 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. (Tue. 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; 19-00, weather; 22-10, weather (exc. Sun.).

* From Nov. 1, on 1st and 15th of each month, at 16-45.

Radio-Paris (SFR), 1,780 m. (10 kw.). Sun-days: 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).

L'Ecole Sup. des Postes et Télégraphes (PTT), 458 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), 500 m. (1½ kw.). 09-00, educat. lec. (Sun.); markets; 09-15, news; 10-35, markets*; 11-15, Stock Ex.; 11-55, time sig.; 12-05, news; 13-15, Stock Ex.; 14-00, markets*; 15-00, markets*; 15-30, orch.; 16-00, markets*; 17-45, lec., children (Wed., Sun.); Eng. conv. (Mon.); 18-00, Eng. conv. (Mon.), children (Wed.), lec.; 18-45, lec.; 19-30, con., news, time sig.; 21-30, dance (Thurs. and Sat.). Evening lec. and con. from 18-00 relayed by Berlin (2) on 500 m. * On W.L. 500 m. only.

Berlin (Telefunken Co.), 750 m. (1 kw.). 10-30, con. (almost daily); 19-00, con., tests (irr.).

06-30, 19-40. 2,800 m. (4 kw.): 10-50, con. (Sun.). 3,150 m.: Telegraphen Union, 06-00, 20-00, news. 4,000 m. (10 kw.), Express News

Königswusterhausen (LP), 680 m. (4 kw.). 09-40, con. (Sun.). 2,450 m.: 10-20, con. (irr.). 2,550 m. (5 kw.). Wolff's Buro. Press Service: Service, 06-00, 20-00.

(Continued on page 744)

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IF "ELECTRON WIRE" IS THE WIRE YOU WANT BE CAREFUL THAT YOU GET IT.

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Ask for and insist upon "Electron Wire" in our distinctive white box printed in blue. Refuse any wire which may look like "Electron Wire," and may even be boxed under a similar name.

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Try It—then you will know why it is so popular. Ask your dealer for "ELECTRON WIRE." But you must agree to return it if it does not "prove up" to every claim made for it. If your dealer does not sell "ELECTRON WIRE" yet, he can get it for you, or we will send it direct to you upon receipt of P.O. or cheque. Do not send stamps, PLEASE.

The CHEAPEST AERIAL 1/8 and the Best in the World. Postage 6d.

Also laid double for extending	Two 150 feet lengths twisted. 300 ft.	Two 250 feet lengths-twisted. 500 ft.	Two 500 feet lengths twisted. 1,000 ft.
'Phones, Loud Speakers, etc.	5/-	8/-	15/-

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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

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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.

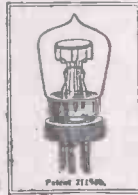
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From all Wireless Dealers and Electricians.



BROADCAST TELEPHONY (continued from page 742)

Breslau, 415 m. (1½ kw.). 11.00, sacred con. (Sun.); 10.15, Stock Ex., weather; 11.55, 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, 467 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, 387 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, 460 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, 452 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, 407 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), 340 m. Programme relayed from Munich (q.v.).

Stuttgart, 437 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 (P.A.S.), 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 (PTT), 458 m. (500 w.). 16.00, lec. (Tues. and from 06.45, news, Stock Ex.; 10.00, con.; 11.30, news (daily)).

ITALY.

Rome (iRO), 422 m. (1½ kw.). 19.30 to 21.30, con.

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.

SPAIN.

Madrid (Radio Iberica), 392 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.

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.). 12.15, lec. No Sun. transmissions.

Lausanne (HB2), 850 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 (Höngg), 650 m. (500 w.). 12.00 and 16.00, weather, news, Stock Ex.; 17.15, children (Mon., Wed., Fri.), women's hour (Thurs.); 18.00, weather, news; 19.15, lec., con.; 21.00, news. Sun.: 11.10 and 19.15, con.; 21.00, news.

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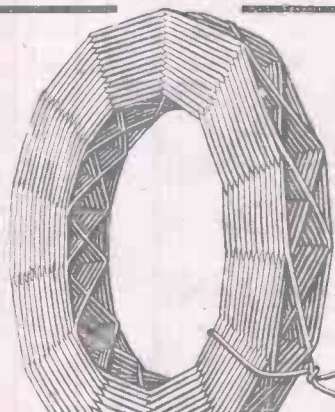
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Phones: Museum 3795, 6841.

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WHITE CITY EXHIBITION (continued from p. 733) ing an exceptionally wide wavelength range. Other sets from simple crystal receivers to four-valve cabinet receivers are on view.

Stand 50. Sydney Jones and Co. (London), Ltd., 28, Endell Street, W.C.2.

This firm (wholesale) is exhibiting an extended range of loud-speakers, ebonite, brass work and component parts that will prove worthy of attention.

Stand 51. Refty Electrical Appliances, Ltd., 2, Featherstone Buildings, High Holborn, W.C.1.

The well-known Refty terminals and crystal cups are the chief exhibits on this stand. Sets making use of these time-saving devices will also be on show.

Stand 51A. Radio Improvements, 12-18, London Mews, Maple Street, W.C.

On this stand will be found a full range of Bretwood specialities, grid leaks and anode resistances, and the new Trolite anti-capacity valve holders and switches. An interesting feature is the testing of the efficiency of Bretwood grid leaks by means of a megger and a neon-lamp tester.

Stand 52. M. W. Woods, 15-16, Railway Approach, London Bridge, S.E.1.

Battery chargers for all supply voltages and secondary outputs will be on view on this stand, and all who are not satisfied with their present system of accumulator charging should see these D.C. rotary transformers.

Stand 53. Gran-Goldman Service, 71, Fleet Street, E.C.4.

Of special interest on this stand is the Ulinkin D.C. home battery charger for charging accumulators off existing direct-current supply. Tapped inductances, high- and low-frequency transformers, coil holders and numerous other components are shown.

Stands 54 and 55. Read and Morris, 31, East Castle Street, Oxford Street, W.1.

A comprehensive range of complete sets and accessories will be found on this stand. The Panelstat, a filament rheostat that has been so designed that the space taken up behind the panel is practically nil, is of special interest. Many interesting multi-valve sets will be shown.

Stand 56. Peronet, Ltd., 38, Bloomsbury Square, W.C.1.

One-, two-, three-, four- and five-valve sets will be displayed on this stand. These are worthy of detailed attention, as they embody many refinements.

Stand 57. Abgar Electrics, 39-40, St. Andrew Street, Plymouth.

A comprehensive range of Red-spot sets and components will be on view.

Stand 60. Superlamp, Ltd., 197, Old Street, E.C.2.

Superadio crystals, lightweight phones and the new Songster loud-speaker will be the chief exhibits on this stand. An interesting exhibit is the Superadio experimenter's set of wireless crystals—a selection of detectors that will appeal to every crystal enthusiast.

Stand 61. Energo Products, 2, Oliver's Yard, City Road, E.C.1.

Low-frequency transformers, low-capacity tuning coils and plug-in H.F. transformers are the chief exhibits on this stand. The Energo one-valve low-frequency amplifier, embodying the well-known Energo L.F. transformer, is of special interest.

Stands 76 and 77. Peter Curtis and Co., 75, Camden Road, N.W.1.

A feature of special interest on this stand will be the new Duodyne receiver of long-distance efficiency, and having the ability to cut out local stations. Paragon ebonite, sheet, rod, tube, and components will also be shown.

Stand 78. Watergate Press, Ltd., 19, Surrey Street, W.C.2.

THE B.B.C. AND WOUNDED SOLDIERS

ON November 23 the B.B.C. aunts and uncles will show their real worth as entertainers, for on that day they will act as hosts (but not by wireless) to over 600 wounded soldiers at a matinee at the Palladium. Each of the fourteen private boxes available will accommodate a party of soldiers under the "charge" of an aunt or uncle.

This entertainment is run by the Adair Wounded Fund, which is urgently in need of money to meet expenses incurred in connection with such Sunday afternoon concerts and teas. Twice a year (November 23 on this occasion) it is possible to admit the public to these entertainments, and seats can be booked at 5s. 9d., 3s. 6d., 2s. 4d. and 1s. 10d. Further particulars can be obtained from the hon. secretary of the Fund, Mr. Basil F. Leakey, at Somerset House, New Barnet.

The occasion is one of interest to all wireless enthusiasts, and it is to be hoped that many readers of AMATEUR WIRELESS will give it their support. Wireless sets are needed by many hospitals, and here again is a chance for the amateur to help.

An important broadcasting station is being built in Kowno, Lithuania, equipped with continuous-wave generators. The station will operate on 1,200 metres.



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LOUD SPEAKER

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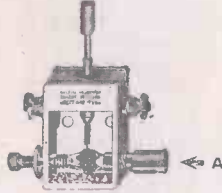
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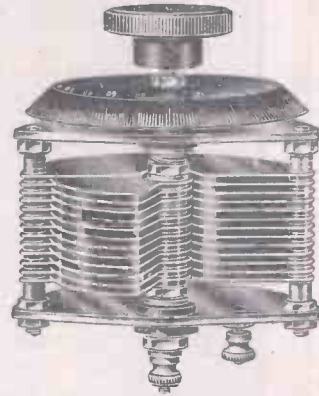
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The gauge of wire used is such that a current of 20 milli-amps can be safely carried continuously. The LISTOLEON Transformer is therefore eminently suitable for use in conjunction with the biggest types of Power Valves used for broadcast reception.
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Pleated-paper Loud-speaker

SIR,—Referring to the article with the above title in No. 125, I have just completed making a loud-speaker and am more than pleased with the results it gives.

There is no "noisy background," and it is audible all over the house, which is quite an ordinary seven-roomed one. I found it quite easy to make, and the only part where particular attention is required is in folding the diaphragm.—A. G. A. (London, S.E.).

Heterodyne Wavemeter

SIR,—I was interested to read the article on making a heterodyne wavemeter in No. 126, as I made a somewhat similar meter some eighteen months ago which I have found invaluable.

I should like to warn your readers that the graphs obtained will be approximately straight lines only if a Polar condenser or a "square-law" condenser is used for tuning, though even with an ordinary tun-

ing condenser straight-line graphs will be obtained if logarithmic paper be used instead of ordinary "squared" paper.

I should like to suggest that it is not very satisfactory to calibrate by using broadcasting stations as standards, as very few of them actually operate on their nominal wavelengths. For instance, 2 LO is, or was, actually 357½ metres instead of 365. It is far better to use the harmonic method recently described by Thermion and use one of the standard calibration signals sent out daily by the Air Ministry.—V. G. P. W. (High Wycombe).

Accumulator Trouble

SIR,—Our attention has been drawn to the reply given on your "Information Bureau" page of No. 124 to the query re "trouble with accumulators."

We very much appreciate the practical manner in which the queries are dealt with in this section, and it is with no desire

to criticise that we write to point out a slight inaccuracy in the reply. It is stated that the specific gravity of the electrolyte "when fully charged should be 1.22 (sometimes written 1.20)"; in most portable cells the acid has a specific gravity of 1.250.

Unless it can be seen that the sediment is short-circuiting the plates, we would hesitate to recommend that the acid be drawn off and replaced with fresh acid, because the cause of the trouble might be sulphation of the plates, and changing the acid would only aggravate the trouble.—THE CHLORIDE ELECTRICAL STORAGE CO., LTD. (Manchester).

Reception of New Zealand

SIR,—With reference to recent announcements of the reception of New Zealand amateurs, the following information of G 5 N N's work may be of interest to you.

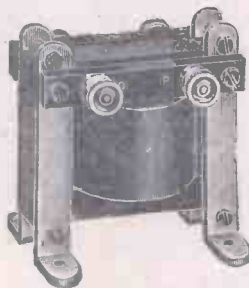
Z 4 A A, Z 4 A G, Z 4 A K were first heard at 5 N N on Monday, October 20, at 6.42 a.m. Constant reception, often with phones on the table, has been carried out on each succeeding morning to date. On Sunday, October 26, Z 4 A A reported G 5 N N QSA. Two-way working was not established owing to sunrise. On Thursday, October 30, Z 4 A Q called G 5 N N and reported signals very QSA with slight QSS. Signals readable all the period that they were audible.

Transmitter at G 5 N N consists of

(Continued on page 750)

Blame your Transformer—if it isn't a Woodhall

If your Loud Speaker says "Burragurrumph!" don't blame the announcer or the loud-speaker—if the soprano shrieks, don't blame the singer or wireless. Think first of your Transformer.



Cheap Transformers may amplify, but they will not reproduce. "One-to-Five" implies nothing except a doubtful "step-up."

In the "Woodhall No. 4" you have, with only a 1.2:8 ratio, a wonderfully faithful "tone," that is due to correct proportioning of impedance, uniform

amplification, plenty of wire, heavy core, and a unique method of winding.

That method is the use of SILK, simultaneously wound with the wire—a method used in no other Transformer. It is costly, but remarkably efficient.

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The Woodhall-Wireless Manfg. Co., Ltd.



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Signals unheard
with TEN other
headphones—
perfectly audible
with this super
head-set



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"Headphones that Amplify"

This is a notable result of tests carried out on a one-valve reaction set with no amplification.

American Stations WGY and KDKA, also Canadian amateurs and most European Stations, have been consistently received with a singular absence of distortion.

Bechsteins are almost the equivalent of a valve amplifier when used in conjunction with a crystal set, the range of which is increased by roughly ten miles.

With a one-valve set, employing no amplification, the range covers

a vastly increased radius over which formerly no signals have been logged.

Get what you are missing—and improve what you are getting in wireless, by insisting on the "Headphones that Amplify." Bechsteins are the last word in comfort, and every pair is guaranteed.

Further particulars are given in an illustrated folder on request.

If your local dealer does not stock Bechsteins, write direct giving his name and address to:—



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WHOLESALE DISTRIBUTORS:—Liverpool: H. Kniveton, Norman Road, Runcorn, Chesh. London: Penton Engineering Co., 15, Cromer Street, King's Cross, W.C.1. Manchester: Accelero Co., 7, Liverpool Road. Leeds: Radio Productions, Ltd., 107, Portland Crescent. Sheffield: Sheffield Wholesale Motor Supplies, 43, Carver Street. Glasgow: London Radio Stores, 11, Bath Street. Nottingham: Super Radio Co., 32, Parliament Street.

CORRESPONDENCE (continued from page 748)

Meissner circuit; full-wave rectification with MT₁ valves; oscillator, two T₂₅₀ valves in parallel; input, 200 watts; radiation 1.85 amps. on 97 m.; aerial, 56 ft. high, six-wire cage; six-wire counterpoise 12 ft. above ground; receiver, Burndept Ultra III. using detector (DEQ) and one L.F. (DE₅) only. Reception when working New Zealand amateurs always carried out without aerial to avoid atmospheric. — J. H. D. R. (London, S.E.).

Other Correspondence Summarised

P. B. R. (Scarborough) has received Hull, Newcastle, Leeds, Bournemouth, Chelmsford, Aberdeen, Radio-Paris, Eiffel Tower and many German stations on his one-valve ultra-audio set, built from instructions given in No. 120.

H. F. (Leicestershire), referring to his letter in No. 124, states that the station, amongst others, which he received was KGO and not KGI.

C. V. B. (Fenton) wishes to know the identity of the foreign station which transmitted *Il Bacio* about midnight on October 21.

E. C. W. (London) would like to know which Continental station transmitted music which sounded like a combination of guitars or string instruments, followed by, presumably, a news bulletin and items by a tenor and soprano, between 10.40 p.m. and 12.15 p.m. on October 14. The station

was working on a wavelength between 400 and 425 metres.

E. C. T. O. (Shepperton-on-Thames) wishes to know the identities of four stations, particulars of which are here given. On October 19, at 8.2 p.m., a foreign station broadcast string orchestral music on a wavelength of 425 metres, and at 11 p.m. gramophone records, on a wavelength of 490 metres, were received, presumably from a French amateur. On October 20, at 7.45 p.m., the "Soldiers' Chorus" from *Faust* was broadcast on a wavelength of 545 metres, and at 8.50 p.m. a lady's song, presumably from Copenhagen, was received on a wavelength of 508 metres.

T. B. (London, N.W.10) states that he has received all the B.B.C. stations at good phone strength, five French stations and WGY on his one-valve Flewelling receiver made from instructions given in No. 113.

G. G. L. (Cambridge) has received six American stations, ten Continental stations and all the English stations, except Plymouth and Edinburgh, on his four-valve set.

D. T. F. (London, W.14) would like to know the identity of the foreign station which transmitted on a wavelength of 420 metres on October 20. The word "Antonio" was repeated several times.

W. S. H. (Cheshire) has received seven B.B.C. stations, two French ones and

Radio Iberica on his ultra-audio one-valve set made from instructions given in No. 120.

T. B. G. (Liverpool), referring to the article "A Great Evening with WGY" in No. 126, states that he received that station until it closed at 5 a.m., English time, on October 18.

AMERICAN ELECTION RESULTS

FOR some weeks B.B.C. engineers have been making Transatlantic tests, and on November 4 and 5 picked up the American election results, which were broadcast from KDKA, while they were experimenting on short waves.

KDKA started tuning-up at 11 p.m. and transmitted its normal programme from 11.30 p.m. until 12.45 a.m.

They started to give election results at 12.55 a.m., and during the intervals, while waiting for further results to come in, they transmitted musical items which were of a standard higher than those in their usual programmes.

All the election results, after being given in English, were repeated in Spanish for the benefit of South American listeners.

Reception was very distorted and unsatisfactory until 1.30 a.m. Atmospherics were also severe before that time, but reception became very clear later.

PHONE 4857

INGERSOLL WIRELESS Co. Ltd.,

PHONE 4857

MAIL ORDER "A" DEPT.: 24/6 CHANGE ALLEY, SHEFFIELD

BRANCHES at: 2-6, SWINEGATE, LEEDS, and 53, TYRREL ST., BRADFORD

<p>VALVES</p> <p>B.T.H. R4 12/6 " B3 21/- " B4 35/- " B5 25/- Cossor P.1: P.2 12/6 Mullard H.F.: L.F. 12/6 Ediswan A.R. 12/6 " A.R.D.E. 21/- " A.R.O.C. 25/- Ingersoll R. 9/- D.E.06 20/-</p> <p>All valves are tested before sending, and are at customers risk only.</p> <p>LOUD SPEAKERS</p> <p>Amplion Junior 27/6 " De Luxe 50/- " Dragon Fly 25/- " Standard 25/- Dragon 55/5 Baby Brown 50/- Solent R.E. 42/- Brandes Table Talker 42/- Sterling Primax 27/7 B.T.H. 25</p> <p>All orders in strict rotation.</p> <p>H.T. BATTERIES</p> <p>Phoenix 36 volt 7/3 " 60 " 11/6 " 90 " 16/3 Siemens 30 volt 8/3 " 66 " 14/6 Ediswan 50 " 9/9</p> <p>Including carriage.</p>	<p>HART ACCUMULATORS</p> <p>4 v 20 act 24/11 4 v 30 " 30/2 4 v 40 " 35/8 6 v 20 " 37/- 6 v 30 " 45/11 6 v 40 " 55/1</p> <p>Including carriage.</p> <p>HEADPHONES</p> <p>Brown F. 25/- B.T.H. A. 62/- B.T.H. 25/- Sterling 25/- Western Electric 25/- Dainty 15/- Brandes 25/- Dr. Petrie Power 13/6</p> <p>L.F. TRANSFORMERS</p> <p>Marconi Ideal 35/- R.I. new type 25/- Silvertown 21/- Igranic 21/- Ferranti 17/6 Lissen T1 30/- " T2 25/- " T3 16/6 Ingersoll King 20/- Eureka 2nd 22/6 " Concert grand 30/- Royal 20/- Amplitran 18/6</p> <p>TELEPHONE TRANSFORMERS.</p> <p>Igranic 18/6 R.I. 20/-</p>	<p>IGRANIC COILS</p> <p>25 5/- 35 5/- 50 5/2 75 5/6 100 7/- 150 7/10 200 8/8 250 9/- 300 9/5</p> <p>COIL HOLDERS</p> <p>W. & M. 5/- Basket 5/- Polar 6/6 B.M. 4/6 Ingersoll Vernier 5/6 Aeronomic Nickel 7/6 Toowai 3/6</p> <p>RHEOSTATS</p> <p>Ormond 2/- Ingersoll 2/- Peerless 6 ohm 4/6 " 30 ohm 5/- Burndept 5/- " Dual 7/6 Microstat 2/9 Lissenstat Minor 3/6 " Major 7/6 Solent Unique 3/6 One-Hole Fixing 1/6 Lissen Push Pull 2/9 Series Parallel 3/9</p> <p>SATURNIUM, THE CRYSTAL .. 2 3</p>	<p>CRYSTALS</p> <p>Cymosite 2/6 Tungstelite Blue 1/6 " Red 1/- Neutron 3/6 B.T.H. in Cup 1/3 Saturnium for results 2 3</p> <p>VARIOMETERS</p> <p>Solent 2/6 Igranic 10/- Belling Lee 4/6 W. and W. aerial 8/-</p> <p>Anode with Reactance 10/- and 12/6 Ingersoll 2/6 Ebonite rotor 4/6</p> <p>GRID LEAKS</p> <p>Dubilier 2/6 Lissen variable 2/6 Watmel variable 2/6</p> <p>ANODE RESISTANCES</p> <p>Lissen 2/6 Watmel 3/6 Dubilier 5/6 Mullard 2/6</p>	<p>Copper Aerial 2/6 Electron 1/8 Ribbon 3/6 Square Tinned Wire 4 foot strip 4d. Lead in Tube 6 inch 6d. 15-inch 1/3 9 inch 9d. 18-inch 1/6 12-inch 1/- Patent 3/6 5/6 Lightning Switch 1/6 " " 2/-</p> <p>INSULATORS</p> <p>Small Egg 1 1/2d. " Shell 1 1/2d. " Reel 2d. Large Shell 6d. Barrel 4d. Solder Irons 1/6 2/6 3/6 W.O. Terminals 2d. Phone " 2d. Spade " Large 2 1/2d. " " Med. 2d. " " Small 1 1/2d. " Red or Black 1 1/2d. Contact Studs doz. 6d. Nuts 2 to 8 B.A. " 2d. Washers " 2d. Screws 2 B.A. 4d. " 4 to 8 B.A. 3d. Switch arms 1/- and 1/3 Slider Bars 3d. " Knobs G.W. 1/- " " Ebonite 4d. Crystal Cups 3d. and 4d. Wander Plugs 3d. and 4d. Brass Rod 3d. Earth Clips 4d. Pulleys 4d. and 1/- Cleats 4d.</p> <p>Valve Holders 7d., 9d., 1/-, 2/- Aeronomic 1/6 Valve Sockets 1d. and 2d. Phone Boards 2/6 Coil Plugs 1/-, 1/3, 1/6 Basket Coil Holders 1/6 Burndept Detector 5/- Ingersoll 1/6 and 2/- Mic Met. 6/- Spearpoint Whisker 3d. Nickel Studs doz. 7d. Condenser Vanes pair 1d. Valve Pins 1d. Phone Cords 1/9 2/6 Utility Switches 5/- Spot on Ebonite 1/- S.P.D.T. on Ebonite 1/- D.P.D.T. 1/6 Tumbler Switch 2/3 Ebonite Panels cut to size. Ebonite Knobs 2 1/2d. 3d.</p> <p>ALL GAUGES D.C.C. and Enamelled Wire.</p> <p>VARIABLE CONDENSERS</p> <p>.001 8/-0005 6/- .0003 5/60002 4/6</p> <p>With Knob and Dial Square Law</p> <p>.001 8/30005 7/- .0003 6/600025 6/-</p> <p>No Knob or Dial With Vernier</p> <p>.001 13/60005 12-6 .0003 11/6</p> <p>Knob and Dial Sterling Stocked.</p>
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12/13, Henrietta Street, Strand, London, W.C.2.

TRADE NOTES

Pleated-paper Loud-speaker

Great interest has been taken in the article "Making a Pleated-paper Loud-speaker" that appeared in AMATEUR WIRELESS, No. 125. The greatest difficulty in constructing one of these is to get just the right kind of paper, but the vegetable parchment made by J. Halden and Co., Limited, of 8, Albert Square, Manchester, seems to be the ideal substance.

I understand that this firm is willing to supply parchment paper in sheets of a suitable size from their London branch at 15 and 17, Broadway, Westminster, S.W.1.

Reactone Tuning Coils

WOUND by a special process under constant tension, Reactone inductance coils are of special interest to every amateur. By an oversight, however, these coils were called Selectone in the advertisement that appeared on p. 701 of our last issue; for this Reactone should be read in every case.

The distributors of Reactone coils are V. Zeitlin and Sons, of 144, Theobalds Road, W.C.1. A set of five coils costs only 4s. 6d.

Neat Crystal Set

IN an early issue I hope to give the results of a test of the neat crystal set made by Belling and Lee, Limited, of

Queensway Works, Ponders End, Middlesex, which is sold at 25s. The detector is particularly ingenious, being totally enclosed yet easily accessible. Provision is made for rotating the crystal without disturbing the cover of the detector.

VANGUARD.

SOMETHING TO WRITE FOR

A REVISED accessory list and folder dealing with the Sparta crystal set have been sent us by Fuller's United Electrical Works, Ltd., of Chadwell Heath, Essex.

Particulars of the Phillips rectifier for charging accumulators are given in a folder issued by A. de Jong, of 58, Southwark Street, S.E.1.

Two publications received from Siemens Brothers and Co., Ltd., of Woolwich, S.E.18, deal with ebonite products and wireless component parts.

Copies of their home-edition and transmitting catalogues have been received from Burndep, Ltd., of Aldine House, Bedford Street, Strand, W.C.2.

An illustrated catalogue and brochure describing Atlas specialities have been sent by H. Clarke and Co. (Manchester), Ltd., of Eastnor Street, Old Trafford, Manchester.

Useful hints on the choice and upkeep of Exide batteries are given in a new list issued by the Chloride Electrical Storage

Co., Ltd., of Clifton Junction, nr. Manchester. A study of this booklet will well repay users of accumulators and readers of "A.W." are advised to send for one, mentioning "A.W."

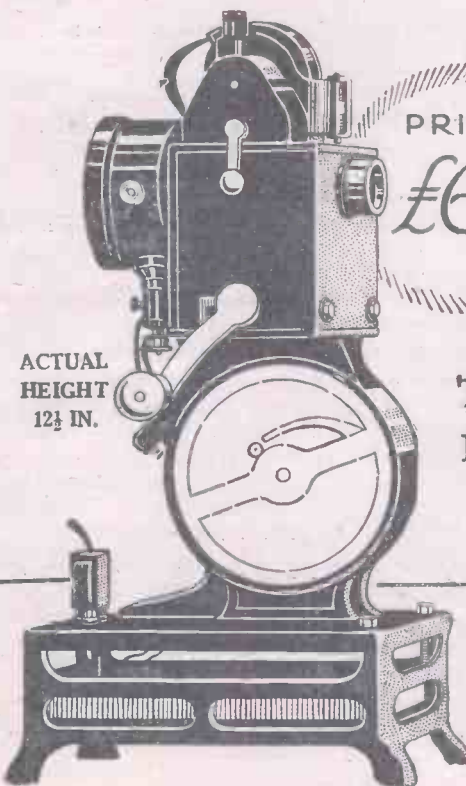
LISTENING TO CANADA BEFORE BREAKFAST

A MATEURS will be interested to learn that the *Daily Express* has made arrangements with the broadcasting station CKAC, of the *La Presse* newspaper of Montreal, to transmit a special concert on November 19.

The powerful transmitting apparatus at the *La Presse* station will be trebled in power in order that listeners on even small valve sets may be able to pick up the programme. Transmission will be timed for reception this side of the Atlantic at about 5.30 a.m., an hour which it is estimated will be more convenient to the majority of listeners than the ordinary American "three o'clock in the morning" signal.

This concert will mark a memorable event in the wireless history of the Empire, as never before has a special transmission been arranged between an overseas Dominion and the home country.

"Experimental Transmission."—Owing to the demands upon our space we regret that we have been obliged to hold over this week's instalment of the series of articles on experimental transmission.



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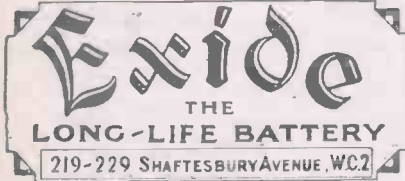
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6/6 Ediswan Valves, R.A.F. "C" Type. The finest all-round English Valve. Osram "C.R." with 4 legs (as illustrated).
 Alternators, 200 watts, 70/-; 500 watts, 25/10. Accumulators from 4/6. Hydrometers, 2/-. Milliammeters, 6 m/a, 30/-; 50 m/a, 35/-. Wire, all types, ton stocked. Amplifiers, 3-valve, 23; 5-valve, 26; 6-valve, 27; 7-valve, 28. Buzzers, 1/6, 3/6. Valve Boxes and Coil Boxes, 1/6. Cabinets, 10/-. Condensers up to 24 mfd., all types, 90/-; 6d. Dynamos, 6V. and 12V., 6-amp., 60/-; H.T. 1,000-V. Hand, 28. S.I.G. 12 to 1,200-V., 222. Earth Clips, 6d. Mats, 15/-. Spikes, 1/2. Ebonite Panels, 3/6 lb. Meter, fine selection, all sizes from millivolts to 2,400-V., low prices. R.A.F. Insulators, 11d. Loud Speaker Units, 7/6. Microphones, 1/-. Phones, 2/- to 32/6. Plugs, 3d. Potentiometers, 2/6. Receivers: Crystal, 5/-; 17/6; 19/6; 37/6; 2-valve, 22; 3-valve, 23/15; 5-valve, 25/5. Switches, Dewar to 200-amps. Special: 2-valve C.W. Transmitters, 23/10. Ammeter Panel for do., 17/6. 1-Valve Trench Transmitters, 25. Spark Sets, 100/600 metres, 15/8. Large 32B 100 watts do., 35/-. Telephony Sets, No. 34, 25. Tuners, R.A.F., 8/- to 40/-. Valves, all types: Dull Emit., 17/6; Maxon Round, 3/6. Variometers, 3/-; 3d. Panel Wire, 2d. per 24-inch rod. Wire, Rubber Flex, 1d. per yard. Thunderstorm Arresters, 3/-. Prompt delivery by mail all over the world. Send 4d. stamps for Illustrated Catalogue of Radio Bargains.

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If good trading consists in getting the utmost return for one's outlay, then buying a Louden Valve is excellent business.

The outlay required is only ten shillings.

In return you will get a valve which we consider represents by far the best value yet offered.

Only one of its good qualities is the saving which it will effect in your accumulator bill.

The current consumption of the Louden Valve is exceptionally low (0.4 ampere), whereas that of the ordinary bright filament valve is almost double this figure.

Satisfied users of Louden Valves report that "their accumulators now last twice as long," that the journeys to the charging station are now halved, as also is the accumulator bill.

If this were the only advantage which the Louden Valve possessed over others it would alone be sufficient to recommend it, but when you consider that in addition it gives a reproduction startling in its silver clarity, that it gives the same volume as valves costing considerably more, and that the life of the filament is greatly prolonged by the absence of "bombardment" you will agree that in fairness to your purse you should fit your set with Louden Valves at the earliest possible date.

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. 20-25.

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

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

LESLIE DIXON & CO., 9, Colonial Avenue, Minories, E.1.
 Phone: Avenue 4163. Telegrams: Electradix, Ald., London N.A.1.

CKAC

THE well-known Montreal broadcasting station, owned by the newspaper *La Presse*, is now transmitting regular concert programmes on 425 metres with an energy of 7½ kilowatts. Following are the times of transmission:

Daily, 21.00 G.M.T., Stock Exchange, weather; 18.45 G.M.T., orchestra (Monday, Wednesday, Friday); 24.00, children's corner (in both English and French) (Tuesday, Thursday, Saturday); 00.30, orchestra (Wednesday, Friday); 01.30, orchestra (Sunday); 03.30, dance (Sunday). On first and third Thursdays of each month, concert at 05.00 G.M.T.

J. G. A.

A NEW FRENCH STATION

SENATOR PAUL DUPUY, whose newspaper *Le Petit Parisien* broadcasts a programme on a wavelength of 340 metres each evening which is listened to with pleasure in England and in France, has just opened another broadcasting station. It is the first station erected on a high mountain, being at the Pyrenean Observatory at the top of the Pic du Midi.

The station will be used principally for helping agriculturists by broadcasting weather forecasts. Reports that the new station was heard in Central France on a crystal set indicate its success. In his inaugural address M. Dupuy said that as the station was the highest in the world,

the investigation of many wireless phenomena, such as fading and the effect of rarefied atmosphere on the propagation of sound, would be possible. A temporary aerial is at present in use, the permanent aerial not having yet been hauled up the mountain top, which is 9,350 ft. above sea level.

"House Repairs" is the title of a series of articles beginning in the current issue of "The Amateur Mechanic and Work" (3d.), and the subject dealt with is "Renewing Sash Lines." Another useful article gives instructions on carving a device on linoleum in such a manner that when this is inked and impressed on paper, a print or impression of the design is left. Other articles appearing in the same number are "Renovating a Bath"; "How I Built My Bungalow"; "Motor-cycling Practicalities"; "A Winder for Basket and Honeycomb Coils"; "The Insulation of Component Parts"; "Notes by the Way"; "Working in Vulcanite"; "An Easily-made Electric Torch"; "Sharpening a Razor"; "Brass and Where It Should Be Used"; "Our Small Car Page"; "Fishing for Grayling: The Tackle and Lines"; "Don'ts for the Amateur Mechanic."

Mention "A.W." please when you write to advertisers.

AMERICAN AND CANADIAN BROADCASTING STATIONS

- K G O, 312 metres.—General Electric Co., Ltd., Oakland, California.
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- W B Z, 339 metres.—Westinghouse Electric and Manufacturing Co., Ltd., East Pittsburgh, Pennsylvania.
- W G Y, 380 metres.—General Electric Co., Ltd., Schenectady, New York.
- W J Y, 405 metres.—Radio Corporation of America, New York City.
- W J Z, 455 metres.—Radio Corporation of America, New York City.
- W E A F, 492 metres.—American Telegraphy and Telephony Co., New York City.
- CKAC, 425 metres.—*La Presse*, Montreal.

* Also transmits on 66 and 100 metres.

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EFESCA ANTI-CAPACITY SWITCH
(Patent applied for).
Double pole, double throw switch specially designed to minimise the capacity which exists in most change over switches. The contact brushes are of phosphor bronze and present only their edges to each other with a comparatively wide air gap—thus practically eliminating all capacity effects. Price 8s. each.



EFESCA "DEVOSTAT"
(Patent applied for).
A specially designed R. costat for Dull Emitter Valves consuming 66 amps. The contact carrier rotates concentrically with the resistance former and is fitted with a ball pointed brush making contact with the resistance wire. A spring plunger maintains the fall at even pressure at every turn of the wire thereby ensuring fine adjustment, smooth and noiseless contact throughout its action. Wound on Ebonite former. Resistance 30 ohms. Complete as illustration, 4s. 6d.



EFESCA WIRELESS HEADPHONES.
A popular priced headphone maintaining the usual Efesca standard of quality. They are exceptionally clear and evenly matched in tone and produce full volume. The magnets are of cobalt steel, ground perfectly true. Diaphragms of Stalloy. Headbands of polished Duralumin. 4,000 ohms, with 6 ft. flexible cord, 21s. Ditto, 120 ohms, 21s.

SIMPLICITY

Efesca components enable the finest wireless results to be obtained by the home constructor without intricate wiring, or parts which complicate tuning arrangements. We have produced a series of components which give unequalled results because their design is based on sound wireless theory adapted on novel lines to suit the home constructor.



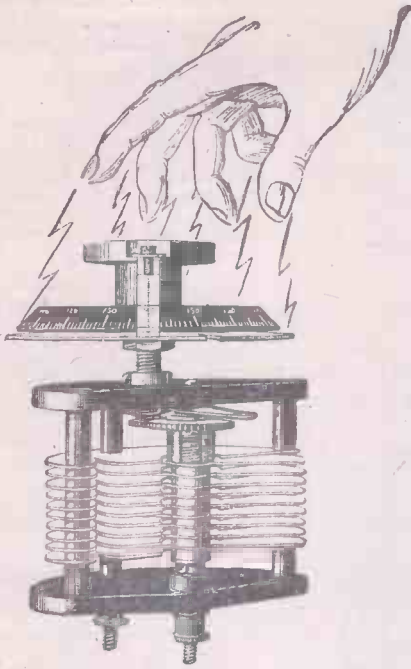
ONE-HOLE FIXING COMPONENTS

are manufactured with instrument precision, and every component is tested to definite standards of performance before leaving our works. Use EFESCA components in your new set or replace the inefficient parts in your old set with EFESCA parts—you know that you'll get pure reproduction, fine volume, a greater range, and freedom from distortion.

Catalogue No. 522 is yours for the asking—it tells you all about EFESCA components and EFESCAPHONE Receiving Sets. Write for YOUR copy to-day.

Sold by all Wireless Dealers, Ironmongers and Electricians.

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FALK, STADELMANN & Co., Ltd.,
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 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.

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PRICES: { .001 ... 13/6 | .0003 ... 10/3
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Stocked by most Wireless Dealers, but if you have any difficulty write to:

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



Hello Everybody!



Here I am at the Exhibition waiting to welcome you all. We've got here the finest and most representative wireless show you have yet seen. Everything from super-receiving sets with more valves than you'd care to contemplate to little crystal sets costing a few shillings apiece. Loud speakers, headphones, components, valves, in fact, everything that could possibly be required for broadcasting or experimental work; and you needn't go beyond the first stand in the show to find them. We're right at the entrance, you can't miss us; you wouldn't want to, either, as you know perfectly well that from our new Super-One to our Super-Five we provide first-class apparatus at really economical prices. In fact, just what I always say:

Quality Apparatus at Low Cost.

Muller Fellows

FELLOWS WIRELESS

Advt. of the Fellows Magneto Co., Ltd., Park Royal, London, N.W.10. E.P.S. 93

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

Stands 1 and 22
British Wireless
Exhibition,
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Brown



Factory Series.
No. 6.

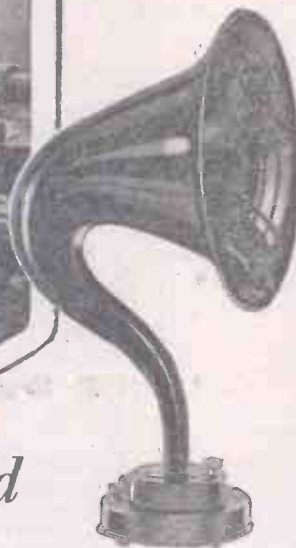


Illustration shows aluminium cases for the H2 type Loud Speaker being machined

Expert knowledge and Superb machinery

THE high reputation enjoyed by all Brown Wireless products—not only in this Country but throughout Europe and the Colonies—was not built up in a day. It is the result of an increasing effort to produce apparatus as near electrical and mechanical perfection as possible.

Take for example the Brown Loud Speaker. Few can realise the immense number of processes necessary before the Instrument reaches its final tests. Even when the Loud Speaker arrives at the Testing Department it is by no means certain that its tonal purity and volume will reach the high standard of efficiency which has been so deliberately set.

No Loud Speaker is ever released for issue until S. G. Brown, Ltd., are satisfied that it

will uphold their reputation as builders of the finest Loud Speakers on the market.

Naturally, to produce such instruments requires sensitive and accurate machinery and workers possessing experience above the ordinary. Although there is such a tremendous demand for Brown Loud Speakers because the wireless public has realised that its exclusive tuned reed principle must give more faithful reproduction, yet the policy of S. G. Brown, Ltd., is such that every instrument receives individual care from commencement to finish.

It is worth remembering that the very first Loud Speaker for Wireless use was manufactured by S. G. Brown, Ltd.—even the words "Loud Speaker" were evolved by them—obviously such greater experience must have its effect upon ultimate results.

Prices:

Type H.1	Type H.2	Type Q
120 ohms £5 5 0	120 ohms £2 5 0	£15 15 0
2000 ohms £5 8 0	2000 ohms £2 8 0	in all
4000 ohms £5 10 0	4000 ohms £2 10 0	resistances

S. G. BROWN, LTD. — Victoria Road, N. Acton, London, W.3.

From all Dealers or can be demonstrated at the following Showrooms:

- 19, Mortimer St., W.1.
- 15, Moorfields, Liverpool.
- 67, High Street, Southampton.

Gilbert Ad, 1744.

CHIEF EVENTS OF THE WEEK

SUNDAY (November 16)

London	2.30	"Noises" from the Zoo. (S.B. to all Stations).
	8.15	Service relayed from the Royal Albert Hall.
Birmingham	9.0	Chamber Music and Songs.
Bournemouth	3.0	Squire's Celeste Octet.
Glasgow	3.0	Organ Recital.
Glasgow	9.0	Cedric Sharp (violinello) and Herbert Thorpe (tenor).

MONDAY

ALL STATIONS	7.30	"Song, Story and Episode," including "Gipsy Life."
(Except Bournemouth and Belfast.)		
Bournemouth	8.0	Municipal Orchestra Night.
Belfast	7.30	"Mainly Mendelssohn."

TUESDAY

London	7.30	Shakespearean Night, including Songs by John Coates.
Bournemouth	7.30	Dramatic Night.
Cardiff	7.30	An Evening with Mozart.
Manchester	7.30	Novelties and a Play.
Newcastle	7.30	Mozart Concert.
Newcastle	9.40	A Drama.
Glasgow	9.0	The Scottish Orchestra. (S.B. to Aberdeen, Edinburgh, and Dundee).
Belfast	7.30	Irish Night.

WEDNESDAY

London	7.30	Chamber Music Evening.
Birmingham	7.30	Operatic Night—Cavalleria Rusticana.
Bournemouth	7.30	"Other Nations—No. 5." Bournemouth calling Scandinavia.
Cardiff	7.30	Musical Comedy Night.
Manchester	7.30	A Musical Bouquet.
Newcastle	7.30	William Murdoch (solo pianoforte).
Glasgow	8.0	Bach Chamber Concert. (S.B. to Aberdeen.)

THURSDAY

London	7.30	Orchestral Solo Night. (S.B. to other stations.)
	8.30	George Bernard Shaw. (S.B. to all stations except Belfast.)
Manchester	7.35	An Hour of Humour and Song.

FRIDAY

London	7.30	Comic Opera and Musical Comedy.
Bournemouth	8.15	Rotary Dinner—Ladies' Night. Relayed from Grand Hotel.
Manchester	7.30	A Night with Russian Composers. William Murdoch (solo pianoforte).
Newcastle	7.30	Dido and Aeneas (Henry Purcell).
Glasgow	7.30	Clan Night. No. 1—Clan MacLean.
Belfast	7.30	Grand Opera and some British Music.

SATURDAY

Birmingham	7.30	David Garrick (comedy).
Bournemouth	7.30	Musical Comedy Favourites—Old and New.
Cardiff	7.30	An Hour of Instrumental Music.
Aberdeen	7.30	Grand Opera in Miniature—Tannhauser.

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.



Clapham Park Wireless and Scientific Society
Hon. Sec.—MR. H. C. EXELL, 41, Cautley Avenue, S.W.4.
 ON October 22 Prof. W. Wilson gave a lecture on "The Scientific Work of Clerk Maxwell." On October 29 Messrs. McWilliam and Shirley, representing the British Ebonite Co., gave an account of the manufacture and properties of ebonite.

Lewisham and Catford Radio Society
Hon. Sec.—MR. C. E. TYNAN, 62, Ringstead Road, Catford, S.E.6.
 A MEETING was held on October 30 when a lecture and demonstration were given.

Algburth Amateur Radio Association
Hon. Sec.—MR. R. A. MATTHEWS, 35, Lyttelton Road, Algburth, Liverpool.
 THE opening meeting of the above society was held at the above address on October 29, when the secretary demonstrated his "Superation" single-valve receiver. All communications should be addressed to the secretary, excepting applications for membership, which should be addressed to R. McMeakin, 14, Rimmington Road, Algburth, Liverpool.

North Middlesex Wireless Club
Hon. Sec.—MR. H. A. GREEN, 100, Pellatt Grove, Wood Green, N.22.
 AN informal meeting was held on October 29 at Shaftesbury Hall, Bowes Park, N., when there was a good attendance of members.

Coventry and District Co-operative Radio Society
Hon. Sec.—MR. A. CURTIS, West Orchard, Coventry.
 ON October 29 the society held a "junk" sale, when a good assortment of components and other useful materials were offered to buyers. Tickets may now be obtained for the society's first social event—a dinner and concert on December 17.

Caterham and District Wireless Society
Hon. Sec.—MR. J. W. DAVIES, Doddington, Caterham Valley, Surrey.
 It is proposed to form a wireless society in the above district, and a preliminary meeting will be held in the Parish Hall, Caterham Valley, on November 18 at 8 p.m.

Tottenham Wireless Society
Hon. Sec.—MR. A. G. TUCKER, 42, Drayton Road, Tottenham.
 ON October 29 Mr. Usher gave the first of his series of elementary lectures on "Magnetism and Electricity." An interesting discussion followed.

Economic Electric Extension.—A large extension of the works of the Economic Electric, Ltd., 10, Fitzroy Square, W.1, has been the cause of a slight delay in the delivery of Dextraudion valves. We are sure our readers will not mind the temporary slight inconvenience. It should be noted that the firm is still in a position to execute all orders for the "Xtraudion" general-purpose and H.F. valves.

When Your Phones are Fitted with

THE EXTRAPHONE

WONDER-DETECTOR

Patents Pending
 Designed and manufactured by the inventor of "Amateur Wireless" system, John W. Miller

You can use as many telephones as you want and they may be of any resistance

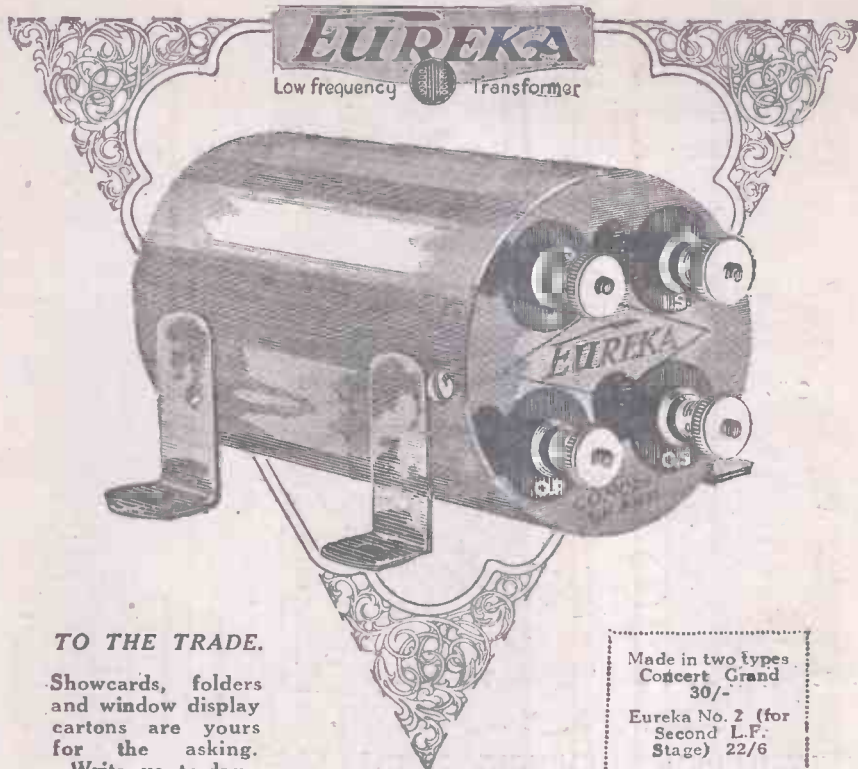
WITHOUT WEAKENING THE SIGNAL STRENGTH
 Nothing more is needed, simply add one Extraphone to each pair of phones and no matter how many in use, whether low, high or mixed resistances, every phone will be as loud as if all the others were disconnected.

Tested and approved by "Amateur Wireless."
 See article, Oct. 18th.

"MANY PHONES ON ONE CRYSTAL SET."

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 Or samples direct from—
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Made in two types
 Concert Grand 30/-
 Eureka No. 2 (for Second L.F. Stage) 22/6

Penny wise and pound foolish

IS thirty shillings a lot of money for a Transformer? The tens of thousands of enthusiastic Eureka users do not think so, but we know that there are still a large number of home constructors who—before building their Sets—carefully go through their list of components and see where they can save money. And it is right that they should do, no doubt; but are they wise in stinting money on their L.F. Transformer—the one component on their Receiver that can make or mar its quality of reproduction.

After all, most multi-valve Receivers are operated in rooms of moderate size—sufficient amplification for which is readily obtained by the use of one Eureka Concert Grand. The difference in cost between a Eureka and a cheap and inferior Transformer cannot possibly exceed 15/-. For fifteen shillings, therefore, would you prejudice the hours of work you have spent on your Set or the money you have invested in it?

Again, supposing you choose a cheaper Transformer, and find that you are not getting sufficient volume, your only alternative would be to add another stage of low frequency amplification—meaning another Transformer and another valve.

No! Think it over again and you'll want a Eureka—Britain's Transformer de-luxe. Guaranteed indefinitely against breakdown and recognised by experts as producing the purest tone—a Transformer you'll be proud to instal in your Set.

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Gilbert Ad. 1756

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100', 3/6, 2/6, 1/1	
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Shell, 2 1/2" x 2 1/2" 4d.	
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As good as a stage of H.F.

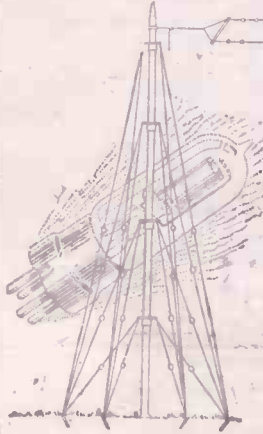
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Abbey Steel Masts are made in 10 ft. sections, light strong and easily erected, and are made in the following sizes. 10 ft., 25/-; 20 ft., 37/-; 30 ft., 50/-; 40 ft., 66/-; 50 ft., 90/-; 60 ft., 105/-; 70 ft., 137/-.

Complete with all accessories. All prices carriage paid.

Send a card for illustrated list.

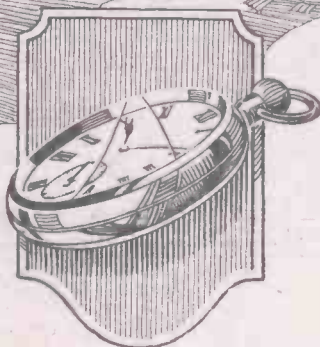
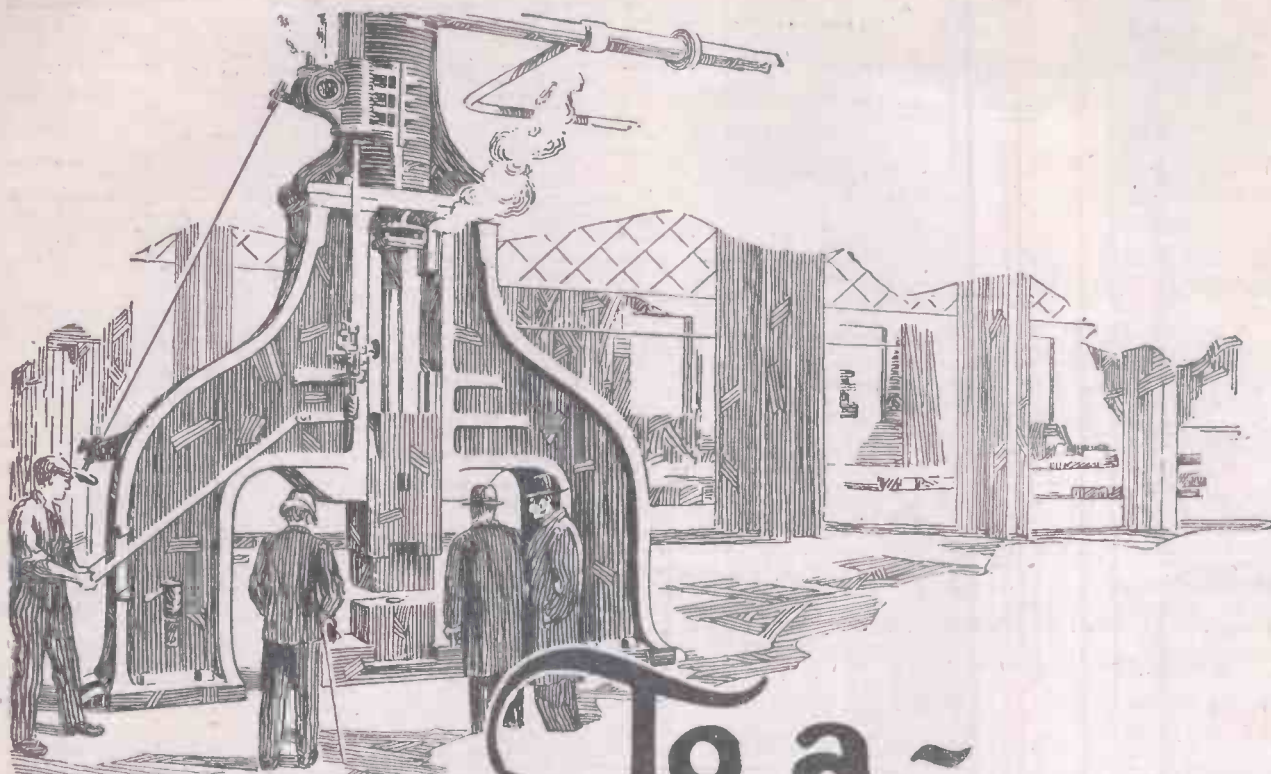
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THE Smith demands the highest degree of accuracy from his steam hammer.

It must respond instantly, and deliver a giant blow of twelve tons or a light tap barely sufficient to crack a watch-glass, and it must never make a mistake.

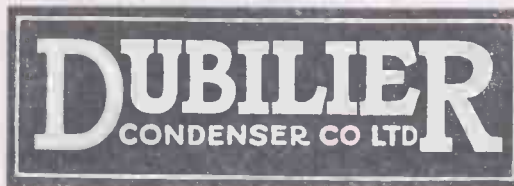
The Smith gets the best out of his hammer because the best workmanship and materials have been put into it.

You should see that no component finds its way into your wireless set unless you can feel entire confidence in it.

Eighty per cent. of the complete set manufacturers in Britain as well as thousands of experimenters employ Dubilier Condensers and Resistances in their sets.

They know that a product bearing the name Dubilier can be trusted implicitly to do what is expected of it, and they count the few extra pence spent on it a sound insurance against disappointment.

YOU should specify Dubilier.

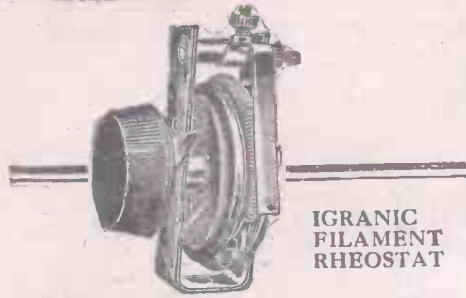


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Amateur Wireless

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AN IMPROVEMENT ON THE SQUARE LAW CONDENSER?



A SQUARE law condenser is a condenser which for a given movement along its scale always gives the same alteration of wavelength with a given inductance. That is to say, if one movement of the pointer or dial of a square law condenser through, say, 10 degrees gives an alteration in wavelength of, say, 100 metres, every other movement along the scale will give a *pro rata* alteration.

Although for laboratory work a square law condenser is necessary, for ordinary tuning work it has its disadvantages. For instance, it would be impossible satisfactorily to use a .001 square law condenser in a short wave receiver for broadcasting, as such a receiver would be most difficult to tune—it would be far too critical. On the higher wavelengths the .001 square law condenser could be used without difficulty, because tuning on the higher wavelengths is much less critical than on the lower band, and much easier.

If a square law condenser is used for short wave work it should not exceed .0002 capacity. It would be found critical enough even with this capacity. But .0002 capacity is not nearly high enough for an ordinary receiver, as it does not provide sufficient capacity for working on the higher wavelengths.

It can be said, therefore, that a .0002 square law condenser cannot be used at all on the higher wavelength range, and that a .0005 or .001 square law condenser cannot properly be used on short wave work—certainly not .001.

If, therefore, a condenser can be obtained which has almost the accurate characteristics of a square law condenser but is easier to tune with, provides a negligible minimum capacity at one extreme of the scale while at the other end it provides a high

maximum capacity, a condenser has been found which for ordinary tuning work (outside a laboratory) is a great improvement on any square law condenser.

There is now such a condenser available. On short wavelengths its characteristics make tuning much nicer and easier than even a .0002 square law condenser—it has a more open scale. The effect of this is to make tuning, especially long distance tuning, much easier on short wave work than any square law condenser possibly can be, and incomparably better than a square law condenser of higher than .0002 capacity. This condenser also possesses the advantage that despite its negligible minimum capacity it also possesses a high maximum capacity, which is always necessary for tuning on the higher wavelengths. With this condenser a receiver is equipped for much nicer tuning, better long distance tuning, much more flexible tuning than is possible with any square law condenser. Its pointer makes two revolutions—when small changes of capacity are required, you work on the first revolution, and on the second revolution when more critical changes of capacity are necessary—**WITH ONE KNOB CONTROL.**

This condenser is the new **LISSEN MARK 2 MICA VARIABLE CONDENSER**—and it is worth its price of 17s. 6d

Negligible min. capacity.

Maximum rated at .001 (actually much higher). Lissen One-hole Fixing, of course.

With this condenser and **LISSENAGON** coils, a receiver is fitted with the best tuning combination it is possible to have. Ask for them if you are out for ease and distance.

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THE NEWEST OF LOUD-SPEAKERS

Amateur Wireless

And Electrics

Vol. V. No. 129.

SATURDAY, NOVEMBER 22, 1924

Price 3d

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THE COMMUNAL
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THE MOON AND
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DISPENSING WITH
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THE ART OF TUNING
USING THE
THOUSAND-CIRCUIT
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5 QV

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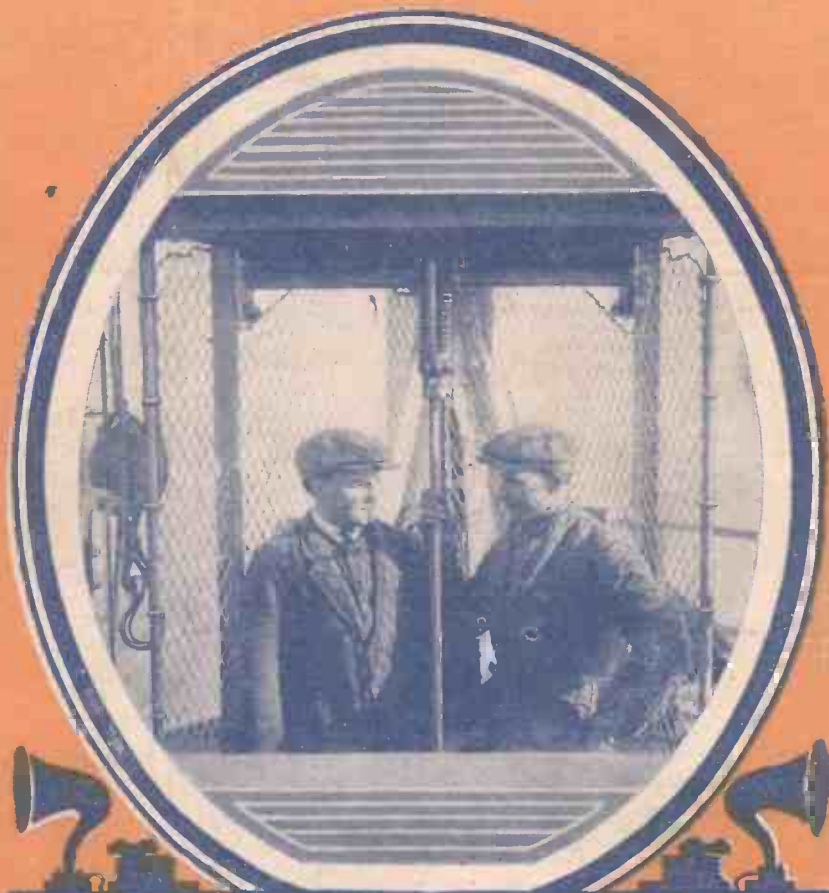
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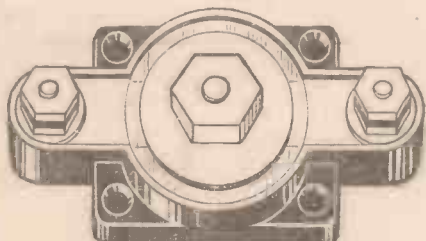
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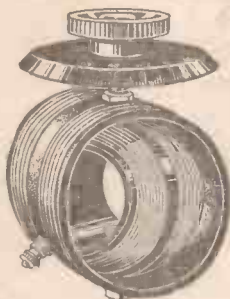


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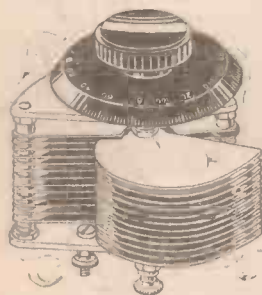
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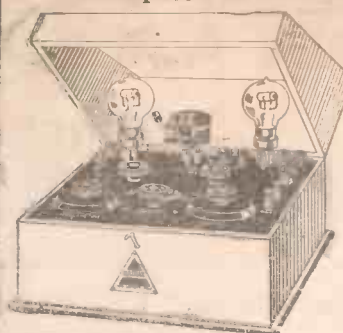
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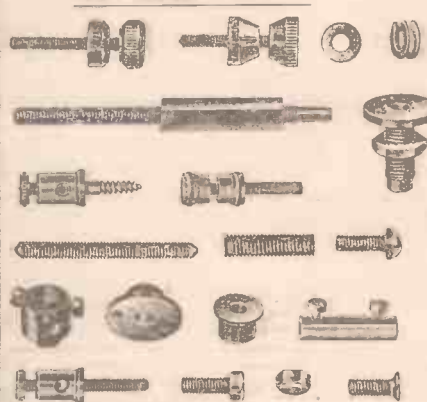


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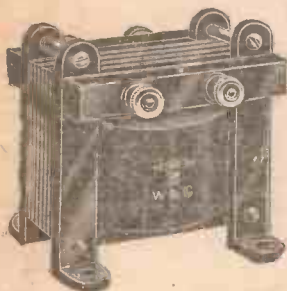


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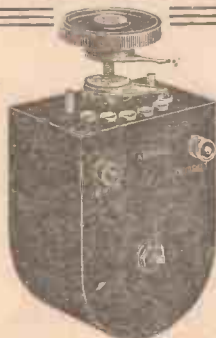
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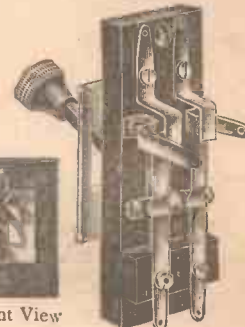


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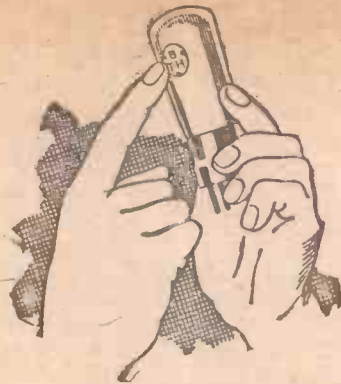


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Amateur Wireless

and Electrics

Vol. V. No. 129

November 22, 1924

THE MOON AND LONG-DISTANCE RECEPTION

NOW that so many amateurs are interested in long-distance reception, the old question of the moon and its relation to wireless is undergoing a fresh examination. In many cases the results of this examination do not accord with expressed expert opinion. I think I am right in saying that the accepted theory is that the moon has nothing to do with signal strength or, indeed, has any effect upon wireless at all. This is rather difficult to believe, as many amateurs are discovering for themselves.

Being especially interested in long-distance work, I was led some time ago to attempt the compilation of a systematic chart showing signal strength in relation to changes of the moon. This chart was compiled from the reception of several American broadcasting stations and covers a period from August to the present date. KDKA has been used for short-wave work and WBZ for long-wave work, with occasional reference to WGY and WFY.

I have not been able to find that there is any reduction of signal strength when the moon is full. But several other interesting points have arisen out of my experiments.

Fading on American stations is a curious phenomenon. Very often a certain effect is obtained which is, in my opinion, erroneously called fading. Most people with powerful sets will have noticed the marked "wave" effect on an American transmission, the signals appearing to come in waves of standard duration, say about three minutes between the apices of strength.

A listener with a set which is only just capable of tuning in this station will imagine the "wave" effect to be fading, for he will only hear the signals when they are at their loudest. But the signals are not fading. Actually they are increasing every now and then to an entirely fictitious value above an average mean strength.

But for all that American stations are

subject to a certain amount of real fading. And there is always a greater tendency to fade when the moon is full. I have quite established this to my own satisfaction.

It is a curious fact, for there appears to be no theoretical reason why the moon should influence fading, especially if, as I personally think, that unpleasant bugbear is not so much a natural phenomenon as is generally supposed.

Another point which systematic observation will establish beyond a doubt is that the moon does affect static.

I have found without exception that the nights just preceding and just following a full moon are the worst possible for

tinuity of the reception into a sort of jagged series of dots and dashes.

During this phase of the moon there is also a great tendency for a perfectly stable set tuned to a point well off the oscillation mark to tip over and howl at periodic intervals. If it is left alone, which, of course, is not possible on account of the interference caused with other listeners, it will, after a few moments, subside again.

And when the shorter waves are subject to this static interference during the full-moon period the higher wave band is usually an absolute impossibility. I have very rarely been able to tune in a 300-metre wave station during the full-moon period, and then it has required an effort of will to keep the phones on one's head.

At most times it is possible to tune in a station like WGY even when there is static interference by detuning the aerial condenser and adjusting the reaction, but on a full-moon night this does no good, the ratio of static and signal strength remaining the same however much one detunes.

There are technical questions which arise, of course, but I do not propose to discuss them at this stage in my experiments. There is undoubtedly considerable

field for intensive and systematic research into the relation of the moon to wireless and, more especially, to static. It is not a subject which we can afford to dismiss or regard casually if we wish to perfect long-distance reception.

And there is work for the absolutely untechnical enthusiast here, for he is able to compile data. In order to be able to ascertain anything of real value it would be necessary to have information from all parts of the country comparing signal strength and static with the phases of the moon, and these could be compiled by anyone using a standard receiver who was prepared to give the time to the task. Personally I think that concentration upon the shorter wavelengths would be beneficial.

E. C. D.



DISPENSING WITH THE H.F. VALVE

THE following notes will be appreciated by many who employ one or more stages of H.F. amplification.

Undoubtedly increased selectivity can be

obtained by the addition of the tuned circuits as shown at A and B (Fig. 1). If a station can be heard with a strength which apparently does not require the extra amplification of an H.F. valve, it is usually a tedious operation to alter the reaction coupling to a different circuit, consequently the H.F. valves are used whether they are required or not.

A simple yet effective means of retaining the selectivity of the original reaction circuit and still using the same reaction coupling, although dispensing with the valve, is to plug into the valve holder a small con-

denser across the grid and plate terminals. This can be easily made up from a broken valve cap in a similar manner to the recognised "plug-in" transformers. The best

valves will give in some instances clearer and stronger reception.) If signals are unnecessarily strong the valve A can be taken out and be replaced by the new plug-in

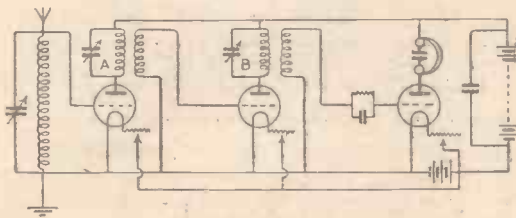
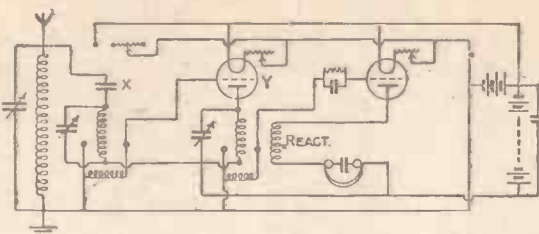
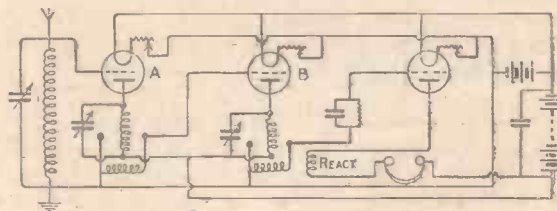


Fig. 1 (left).—Diagram showing Tuned Circuits.

Fig. 2 (right).—Ordinary H.F. Transformer Coupling

Fig. 3 (below).—Circuit with Added Condenser.



value the writer has found in use is .0003 microfarad.

Fig. 2 shows the ordinary method of H.F. transformer amplification. (No doubt changing the grid potentials on different

condenser across the grid and plate. A condenser with good insulation is necessary, as the shorting of this condenser will mean a consequent shorting of the H.T. battery, as will be seen in Fig. 3.

The plug-in condenser is shown in Fig. 3 at X. In this diagram one valve only is dispensed with, but a similar condenser can be put in place of the valve Y. This method of valve saving can undoubtedly be applied to the popular tuned-anode circuit, but as the writer has not actually tried this he refrains from giving details. E. W. S.

THE ART OF TUNING

EVEN to-day there are many real enthusiasts who find it a matter of no little difficulty to manipulate their sets in tuning-in distant stations, the picking up of which should not be particularly difficult with the apparatus they have available. Too often the receiver is blamed for its non-success, when the cause of poor results lies in the clumsiness of the human element. This is a point of greater importance than is generally recognised, for to a very large degree the man in control makes or mars reception. The forceful "twirler" will never achieve anything notable in the way of long-distance work. It is the man with the sensitive touch who brings in America on a single valve.

There is an art in tuning. For those who can learn that art the only necessities are practice and a thorough understanding of what they are doing when they make the various adjustments. In the commoner types of apparatus the fine tuning is done by means of condenser and reaction, but some preliminaries must be gone through before the stage is reached at which these are brought into service. First of all, it is a good plan, for the

preservation of the valves, to connect up the accumulator or other source of filament supply to what are believed to be the appropriate terminals on the panel. Then the valve rheostats should be turned on a little. If the filaments show illumination the connections have been made correctly, and the H.T. battery can safely be put in circuit. The other connections—aerial, earth and telephone—should also be gone over to see that all are O.K.

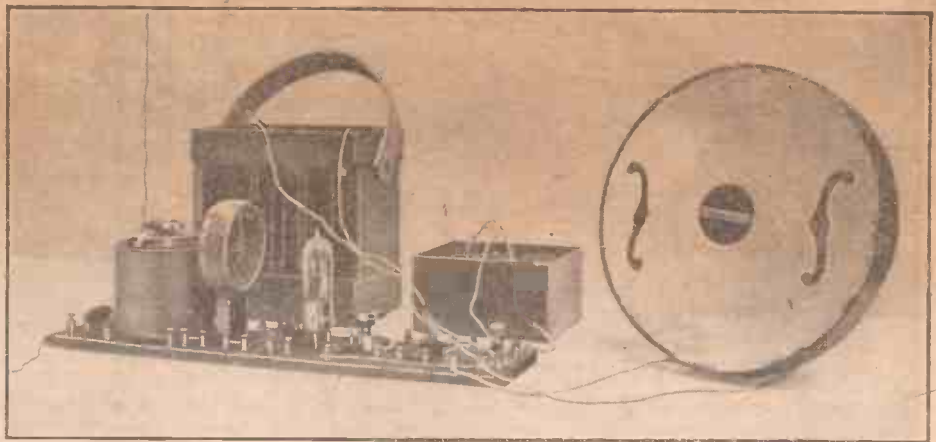
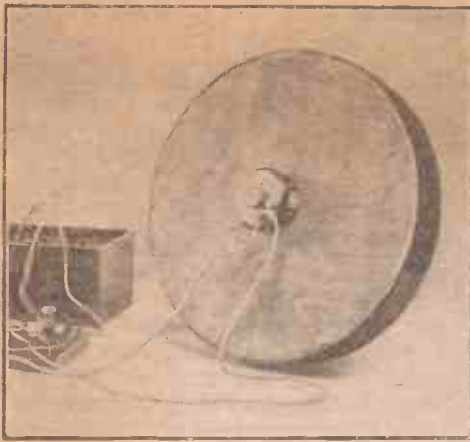
Then the valves can be lighted, always bearing in mind that in doing so the knobs of the resistances should be moved round gradually and that there is no advantage to be gained by having the valves too bright. The best point is frequently reached before the current allowed to pass to the filaments is the maximum possible. Too much voltage on the filaments, though it may not always bring instant disaster, assuredly means a big slice off the life of a valve.

Now for the tuning. Amongst persistent searchers-out of far-off transmitters the following method is in common use. The reaction coil, an instrument of torture in the hands of the inexpert and the most sensitive part of a valve outfit, is brought

back to zero. The condenser knobs are steadily and carefully shifted backwards and forwards along the whole extent of the scale, and in a series of the slightest possible movements reaction is gradually introduced.

When faint signals are heard at any particular stage the movement of the condenser should be stopped immediately and the coil brought up until the signals lose their original clear-cut sound and a hiss is perceptible in the phones. The hiss is a warning and shows that any further increase of reaction will cause howling, which is to be studiously avoided. To keep the signals "in" it will be now found necessary to make slight readjustments of the condensers while the reaction coil is being moved. This is essential because of small variations in the tuning which are so caused. Signals are at their best and strongest when the hissing is just noticeable but not too loudly prominent.

If listeners do their tuning on some such system as this they will discover that it brings more success and enjoyment to them in their own efforts, while they can also have the satisfying reflection that they are not causing interference. G. A. F.



THE NEWEST OF LOUD-SPEAKERS

THE loud-speaker shown by the photographs is of German origin, the inventor being Herr Ibach, the well-known piano manufacturer. The principle involved is similar to that of the pleated-paper loud-speaker, which has been already described in "A.W." In this case, however, the entire construction is of wood, with the exception, of course, of the reed earphone which it is essential to use. It will be recognised by those who have some knowledge of sound reproduction that the device is nothing more or less than a sounding-board.

The only tools required for building the instrument are a fretsaw and a screw-driver.

Fig. 1 shows the loud-speaker in section and it will be obvious that its construction is simplicity itself.

The diameter of the instrument is 10½ in. The diaphragm (Fig. 2) should be cut from ⅛-in. pine wood if this is available. The author, however, was unable to obtain pine and had to be content with sycamore ⅜ in. thick. Wood of this thickness is rather tricky to work, but it gives excellent reproduction. All the necessary wood may be obtained from Hobbies, Ltd., the well-known fret-work dealers.

The ideal construction would be for the front and back boards to be glued direct to the side, but the average amateur will

probably find this beyond his capabilities. In the present case eight oak blocks measuring 1¼ in. by ¾ in. by ⅜ in. were cut to support the front. The back board is shown by Fig. 3 and the blocks were arranged as shown in Fig. 4. They were secured by glue and one small screw in each block.

The Front Board

The front board, prepared as shown by Fig. 2, is attached in the same manner. In cutting this the centre circular hole should be cut first and the scroll-shaped holes afterwards. In order to ensure that both of the latter are the same, the desired shape may be first cut from a piece of cardboard and this used as a template, the shape being reversed for the opposite hole. A small bridge piece (Fig. 5) is attached at the back across the centre hole as shown in Fig. 1.

After the front board is glued and screwed in position, a piece of very thin three-ply wood is glued and screwed to the blocks to form the sides.

Finishing

The next step is to varnish the case. The writer endeavoured to obtain violin varnish for this purpose, but as the price of this was prohibitive, artist's varnish was used instead.

The operating mechanism consists of a Brown reed-type phone with a piece of brass wire threaded the whole of its length (No. 10 B.A. thread) screwed into the hole previously occupied by the screw which ordinarily holds the diaphragm in place. The ebonite cap of the phone with the centre hole enlarged is secured to the back of the instrument by means of two screws.

The body of the earpiece is screwed into the cap when the latter is in position and the No. 10 B.A. rod passed through the hole in the centre of the small oak cross-piece. Two nuts placed on the rod are so adjusted, back and front, that the relative positions of cross-piece and phone are correct.

A. J. C.

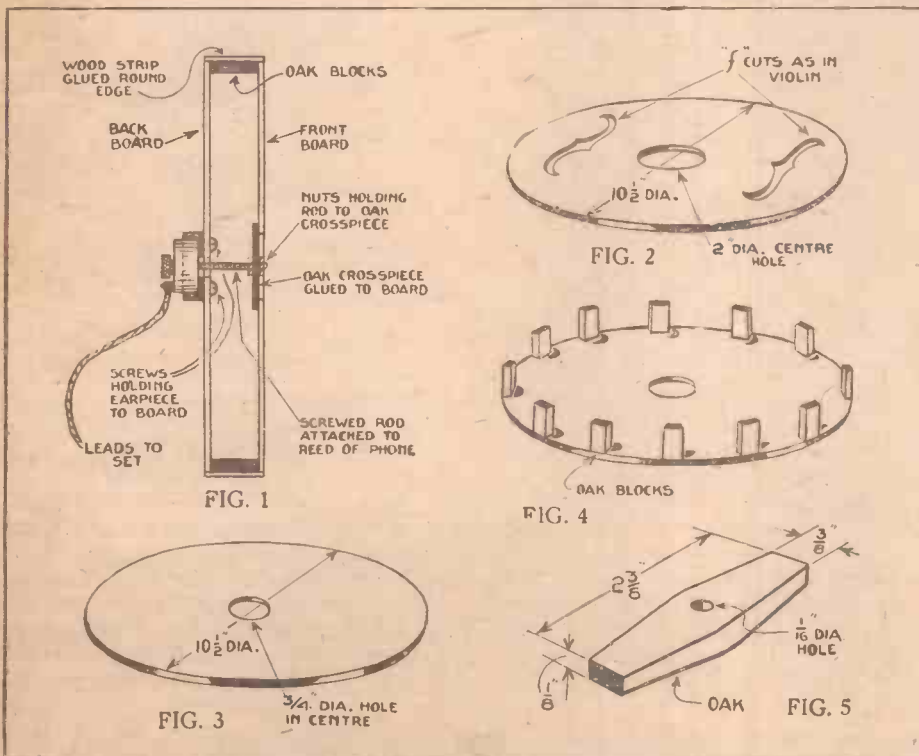


Fig. 1.—Section of Loud-speaker. Fig. 2.—Front Board. Fig. 3.—Back Board. Fig. 4.—Arrangement of Side Blocks. Fig. 5.—Oak Cross Piece.

EXPERIMENTAL TRANSMISSION.—IV

EARTH SYSTEMS

WE are now faced with the problem of the lower capacity, but here we have only two alternatives to consider, the counterpoise and direct earth.

The Counterpoise

The counterpoise is essentially a second aerial, preferably of the flat-topped fan-shaped type, supported at a height of about 8 ft. from the ground immediately underneath the aerial and just as carefully insulated as the latter.

It is obvious that here we have many distinct advantages over the direct earth. The actual ohmic resistance may be reduced from the colossal resistance of the usual water-pipe earth to the small figure of about 3 ohms. Unlike the buried-plate earth, the value for R_g is nearly constant and does not vary very much with atmospheric conditions. It has, however, two disadvantages, in that the actual construction is a little more difficult and that the fundamental of the aerial system is slightly altered. These, however, do not counteract the great improvements gained in the reduction of R_g .

The counterpoise, as already stated,

wire or copper strip must again be employed.

It may appear that the use of a counterpoise introduces many unnecessary complications and extra expense, but such a decidedly greater value of aerial current is obtained that the use of a counterpoise is always to be strongly recommended.

Direct Earths

A direct earth, if used, should consist of buried metallic bodies, plates or good lengths of wire which present large surfaces to the ground. Copper netting or old army earth mats may be used. They should be well packed with coke to ensure that the surrounding earth may be easily kept moist.

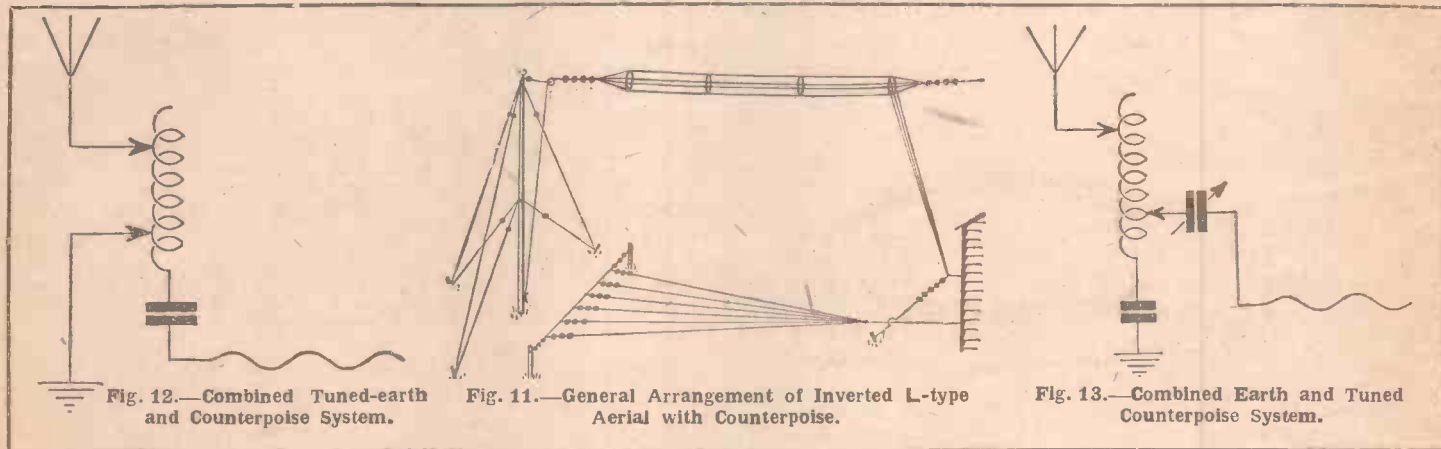
The essential points about direct earths are: (1) An extremely large surface must be presented to the ground if a large value for the aerial current is desired; (2) the surrounding soil must be kept very moist to ensure good contact; (3) all joints must be soldered and the lead-in from the earth should be as short and thick as possible.

Where a really good direct earth is

total resistance of a number of parallel resistances. If, however, any one of the earths would by itself be sufficient, and this earth is put in parallel with others less efficient than itself, then a fall of aerial current will most certainly result owing to lack of balance, the antenna currents being unequally divided. Only in very special cases where each individual earth is poor is the system of multiple earths to be recommended.

Provided that the experimenter does not mind the slight extra trouble involved in extra tuning, a tuned counterpoise or tuned earth may be used in combination with every chance of a resulting increase in it; this scheme is shown by Figs. 12 and 13.

The essential point to be noticed, of course, is that both earth and counterpoise are exactly in tune. In practice maximum results have to be obtained on the counterpoise alone, and the earth tapping is then adjusted until no diminution of aerial current results and until the wavelength of transmission is not changed by connecting or disconnecting the direct earth. The latter and the counterpoise are then in tune.



should preferably be of the flat-topped fan type (Fig. 11), the wires converging from a position about 100 ft. away to a spread of about 24 ft. It is absolutely essential that the counterpoise should have at least as high a capacity to earth as the aerial possesses, and therefore should consist of approximately the same number of wires as the aerial itself.

The wires should be supported at a convenient height above ground (about 6 to 8 ft.) on well-insulated wooden posts. The insulation of the whole system must be just as carefully attended to as in the upper capacity, especially at the lead-in end. Fig. 5 (No. 126, p. 639) shows that it is greatest in the earth lead. Stranded

available, it is advisable to insulate carefully the earth lead up to the point of actual contact with the ground, as the earth connection will then more nearly represent a counterpoise in action and will have less resistance.

It is common practice in many stations, especially where a good direct earth is not available, to connect all adjacent metalwork, gas- and water-pipes, etc., together and employ these as the lower capacity. Many curious effects may result by so doing. If each individual earth is inefficient by itself, an increase of aerial current may result owing to the larger surface presented for contact with the ground and also possibly due to the lower

If desired, the process may be reversed. The set must then be adjusted for maximum results on the direct earth, and the counterpoise is then brought into tune. The former method, however, will most likely prove to be the easier.

Special Types of Antennæ

Up to the present types of antennæ have been dealt with that will prove most useful for general work. There are still three other classes of antenna to consider:

- (1) Directional aeriæls.
- (2) Aeriæls for duplex work.
- (3) Artificial, phantom or dummy aeriæls.

KENNETH ULLYET.

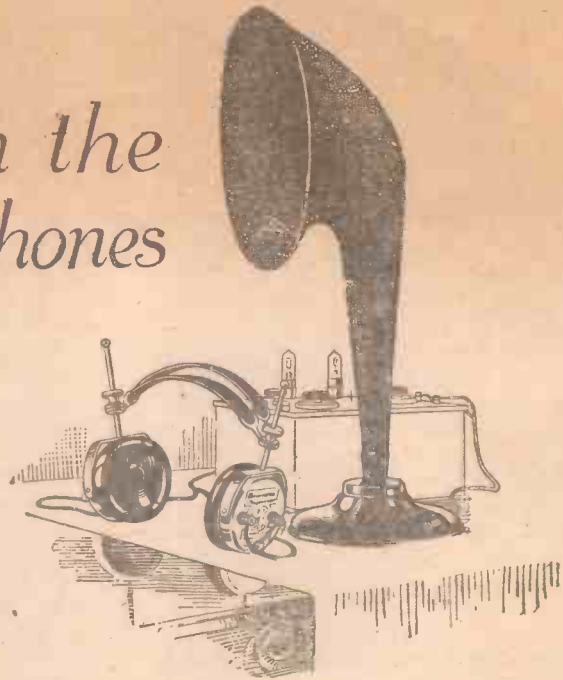
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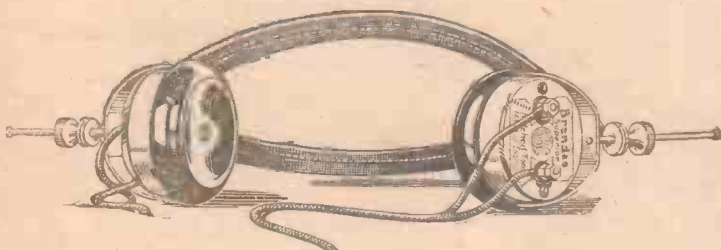
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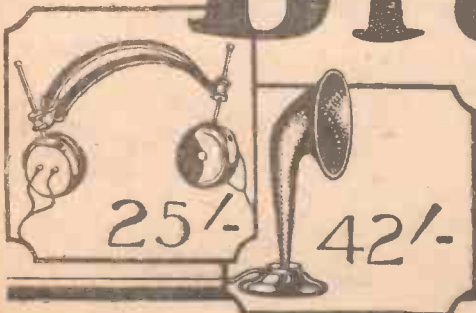
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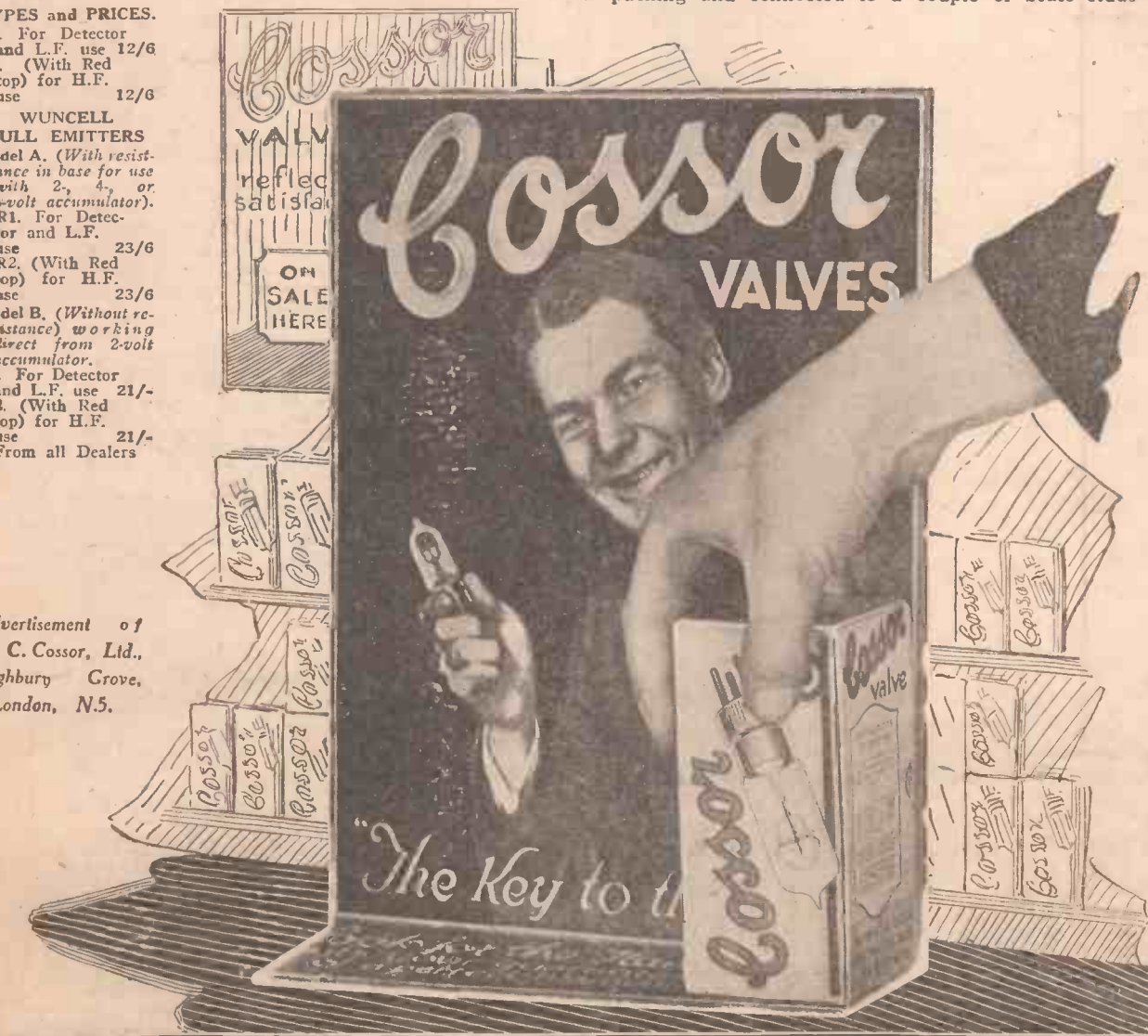
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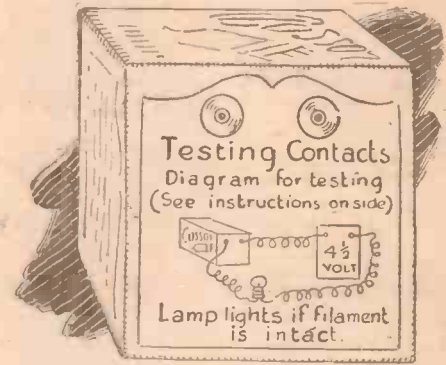
Valves

sealed cartons

exterior of the carton. It will be obvious that if these two studs are placed in circuit with a flash lamp and battery the current will pass through the filament and—completing the circuit—cause the flash lamp to light. If, on the other hand, the filament is broken, the current cannot pass, and the lamp will not light.

This idea is incorporated in an electrical Showcard supplied to all Dealers. All that he has to do is to pick up the Cossor sealed Carton containing the Valve, and place its studs in contact with two metal strips on the Showcard. If the Valve is in order the miniature lamp behind the showcard lights up—he need not break the seal at all.

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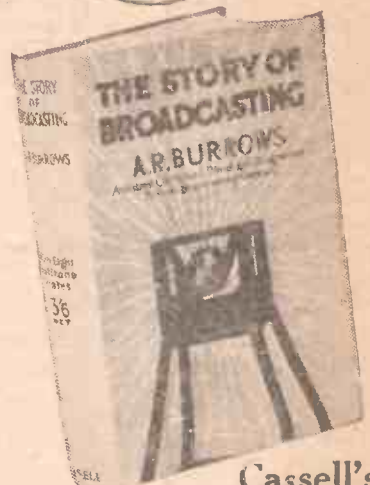
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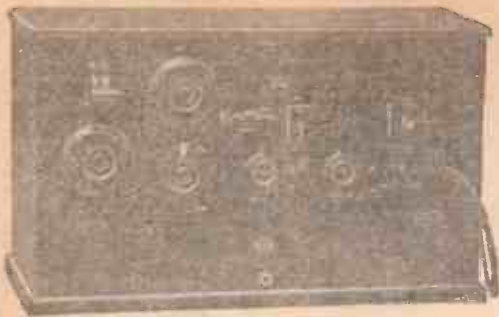
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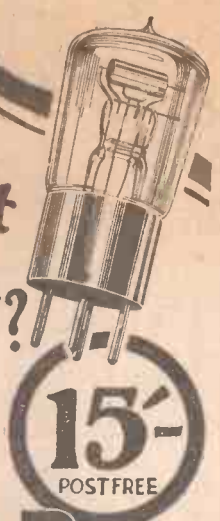
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On Your Wavelength!

The Jamming Question

I HAVE had an interesting letter from a correspondent who takes exception to my remarks on the difficulty of separating 5 XX from Radio-Paris. I said, if you remember, that though I could tune in 2 ZY on 375 metres so that there was no interference from 2 LO on 365, I could not get rid absolutely of 5 XX on 1,600 when tuning in Radio-Paris on 1,780. He points out, quite correctly, that if one takes the frequencies, and not the wavelengths, there is an even greater gap between 2 ZY and 2 LO than between 5 XX and Radio-Paris. The actual difference is 21,918 cycles between the short-wave stations and 18,961 between those which work on the high wavelengths. This being so, he argues that it should be easier to separate 2 LO from 2 ZY than 5 XX from Radio-Paris.

This is all right so far as it goes, but what the practical wireless man has to deal with is not so much wavelengths and frequencies as actual degrees on his condenser scale. Now taking the readings of my A.T.C. I find that its setting at 365 metres is 31 degrees, whilst for 375 metres it is 38½, the difference being 7½ degrees. Using an appropriate set of coils for the higher-wave stations the A.T.C. scale readings are 72 for 1,600 and 104 for 1,780, the difference in this case being 32 degrees. This means that in separating London from Manchester you have only a tiny amount of condenser scale to work with, while between Chelmsford's tuning and that of Radio-Paris you have nearly one-fifth of your scale.

Even if square-law condensers are used the movement required to raise the wavelength from 1,000 to 1,780 is rather more than five times as great as that needed to tune from 365 to 375 metres.

Large or Small?

One of the great difficulties of obtaining selective tuning on the short wavelengths is that the smallest movement of the condenser makes a very big difference to the frequency. Those who make use of the large A.T.C.s that used to be fashionable always find it difficult to do anything like fine tuning on the shorter waves. Unless you have a vernier condenser in parallel, anything larger than about .0004 microfarad makes selective tuning a matter of considerable difficulty. In a set that is to be used for both long and short waves the best way, I think, is to fit an A.T.C. of about this value and to mount a couple of clips so that fixed condensers of various values can be placed in parallel with the variable condenser for use on the longer waves.

The only advantage of having a big aerial tuning condenser is that with it one inductance can be used to cover a wide band of wavelengths. However, if you obtain a really well made inductance whose self-capacity has been reduced by good design to something very small, and use with it a first-rate variable condenser with a very small minimum capacity, you will find that you can cover quite a wide range with the combination. In fact with a good *small* condenser and an efficient inductance the wavelength limits are usually greater than with a poor coil and a badly-made condenser of large size.

Variable Condensers

The variable condenser question is one which is receiving a great deal of attention from manufacturers, and I think that in this connection "A.W." may consider itself patted on the back as being one of the first papers to take up the question of condenser efficiency and to devote a large amount of space to pointing out the virtues of the square-law condenser. There are now on the market large numbers of really good condensers at reasonable prices, whilst many makers are turning out excellent square-law condensers quite cheaply.

2 LO's Birthday

By the time that these notes are in print 2 LO will have celebrated its second birthday. I wonder how many people remember now the curious time we went through two years ago. In the spring it was suddenly announced that the wireless restrictions made necessary by the war were to be relaxed and that anyone would shortly be able to obtain a receiving permit without any trouble. It was stated, too, that broadcasting as done in America would soon be an established fact in this country. Everyone rejoiced and thousands dashed off to buy wireless sets.

Then for several months we were kept upon tenterhooks by announcements of all kinds, by rumours, by statements and by contradictions. Broadcasting was to begin at once. Broadcasting was not to take place at all. It would begin next week. It would not begin for three years. And so on and so on. Then with almost startling suddenness the B.B.C. came into being and stations began to blossom everywhere. Almost before we knew where we were things were in full swing, and when you wanted to get into a wireless shop you had to place yourself in a queue in the street outside and possess your soul in patience for some little time.

It was a wonderful period, as all old hands will remember. If it had not been for Writtle to stabilise our spirits, which were

inclined to rise and fall like the potentials on a grid, I do not know what would have happened. The early programmes from 2 LO were not of very long duration. There were no transmissions during the daytime and the evening broadcasting lasted, if I remember right, for about two hours. For quite a long time the entire work of running these stations, apart from the engineering side, was in the hands of Mr. Burrows and Captain Lewis, with Mr. Stanton Jefferies to assist them as O.C. music. However they managed to get through the work of arranging programmes, announcing, answering letters and doing a very solid day's work in the office I really do not know, but they did it and did it jolly well.

Early Days

In its infancy the B.B.C. was housed in one enormous room in Magnet House. I remember going to see Mr. Burrows one day when they were in those cramped quarters. There was a kind of little barrier just inside the door, forming a sort of pen into which about a dozen people all eagerly desiring to ask questions were crammed. When your turn came you passed from the pen into the main office. At the right-hand side of the room was a big table, at one side of which sat Mr. Burrows, whilst opposite him was Captain Lewis.

The whole of the office seemed to be filled with big tables, most of them surrounded by typists who were whacking away for all they were worth at their machines. On the left side of the door sat Captain Eckersley, complete with pipe and smile, also up to the eyes and also answering conundrums. It must have been a pretty hectic time, and I expect that when the original B.B.C. men look back on it from their present comfortable quarters they wonder how they ever contrived to survive.

The Old Studio

2 LO's original studio was situated at the very top of Marconi House. There was a lift, but it generally happened when I went there either that it had gone on strike or that the lift man was off duty for the moment. I do not know how many steps there were to be climbed, but I can recall on several occasions the wireless uncles arriving for the Children's Hour, the opening of which appeared to coincide with the lift man's tea-time, so short of breath that it took them some minutes to get into their proper stride.

The first evening I spent there was at quite an early date in the history of broadcasting in this country, and I remember hearing and seeing the first performance

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On Your Wavelength! (continued)

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before the microphone given by one who is now amongst the most popular of wireless turns. This was Mr. Ronald Gourlay, the blind pianist and whistler whose delightful mixtures of tunes, so apparently far apart as "Three Blind Mice," Rachmaninoff's "Prelude," and "Last Night in the Back Porch," are now familiar to all of us.

The microphone then was not the elaborate arrangement that it is to-day. It was simply a perfectly ordinary microphone provided with a little handle rather like that of a lady's lozgette so that the speaker or the singer could hold it in his hand. In the ordinary way it was placed in a clip attached to a stand in the middle of the studio. Wires ran to this from all over the place, and people fell over them at intervals. When a singer went to the piano somebody had to hold the microphone in the right place during the performance. One little source of trouble was the switch which brought it into action. Sometimes it was left on when it ought not to have been, so that conversations in the studio were broadcast far and wide, and sometimes again it was not turned over while a genuine item was in progress. Yes, these were great days.

Spoonerisms

The microphone appears to produce a peculiar kind of nervousness in many speakers, probably because it is so utterly unresponsive. I have often wondered for this reason that it has not produced more spoonerisms. One does get them occasionally, as, for instance, when a few weeks ago at a certain historic ceremony the chief speaker congratulated the B.B.C. on opening the Belfast broadcasting station. But this is one of the very few gems that one has been able to collect. Once in a shop I heard an enthusiast demanding to be served with a Greek lid. The assistant rushed him off to the hat department before he was able to explain. There is also the story of the lecturer who turned kilovolts into vilokolts and kolovolts and volokilts, until finally he got so tied up that he had to give up the attempt and refer thereafter to thousands of volts.

The Ship's Chronometer

I wonder if it has ever occurred to my readers, when listening to the official time signals, what an immense boon wireless has conferred on those who go down to the sea in ships. In the old days a ship's captain had to have a time-keeper which he could absolutely trust, and the chronometer became perhaps the most important instrument aboard. To obtain a really dependable timepiece he did not hesitate over the expenditure of a good many golden sovereigns, and if disaster came and the ship had to be abandoned, the chronometer went with the captain, carefully guarded

by hand, so as not to suffer the slightest jar. An error of a few seconds in his chronometer might cause a considerable defect in his dead reckoning, which would throw the captain right off his course and maybe pile the ship upon the rocks.

Nowadays this is unnecessary. A ship can be navigated, if need be, by a good watch costing perhaps only a pound or two. The reason for the change is the prevalence of daily time signals, such as are now sent out by scores of stations all over the world. Ships on every ocean can pick them up daily and correct the chronometer by which, together with observations of the stars or the sun, their position at sea is determined.

Wireless as a Home-maker

There is still another aspect of wireless, often stressed but always worthy of stressing, which may have a far-reaching sociological effect on present-day history. This is the often-mentioned advantage of wireless in keeping the younger members of the family within the home at nights instead of on the streets. In Sweden, at any rate, this effect has been so pronounced as to have won Government recognition. In a decree announcing some additional encouragement to wireless development, the Swedish Government speaks of the assistance of wireless to "the renaissance of family life." Home-making proper is contingent upon the interest taken in home life by the family and in the cohesion of the family circle.

In some quarters we have heard or read of wireless as a home-breaker, and the wives of enthusiastic amateurs have been pathetically referred to as "wireless widows." But in a far larger number of cases—in my experience, at least—where the younger members have been attracted to it, wireless has proved the means of keeping them within the home and away from many of the more questionable sources of amusement outside. I would say, then, "Hail to wireless—the home-maker!"

"06" Valves

I have been delighted recently with the performances of a couple of "06" valves which I rigged up on a small set. One imagines somehow that these little fellows, using only about one-tenth of the juice required by the bright-emitter, cannot possibly deliver the goods. I confess that I was distinctly prejudiced against them before I gave them a fair trial.

As a matter of fact, if you use them carefully and don't run them too brightly they perform nearly as well as the best bright-emitters and they are quite as easy to work with. It does seem absurd, though, to have to use a milliammeter to discover the filament consumption of your valves. But that is what you have to do

for the ordinary 0 to 10 ammeter is quite useless, its needle making so slight a movement when you switch on that you have to watch very carefully to see that anything at all is happening.

Nor do I find these expensive little things particularly fragile. I don't mean to say that you can throw them about the room as you can the Myers valve, which simply refuses to break even if you bounce it, as I have done, on a stone floor; but the "06" valves do stand up well to their work, and when I dropped one accidentally the other day several inches on to the bare top of the table it came up smiling after the bump.

Uncle Bernard

I rather wonder if a new uncle will be made at 2LO after to-night when Mr. George Bernard Shaw reads one of his own plays, *O'Flaherty, V.C.* I do not see, though, why it should be S.B. to all stations except Belfast, because that is either going to give the Free State cause for another political grievance or rejoicing. I do not foresee any special run on the other works of G. B. S. either, for he is like caviars or olives, an acquired taste, and one which he himself gained very early in life. It is interesting to note that he commenced his early dramatic career as playwright for the Salvation Army with *Major Barbara*.

A Unique Show

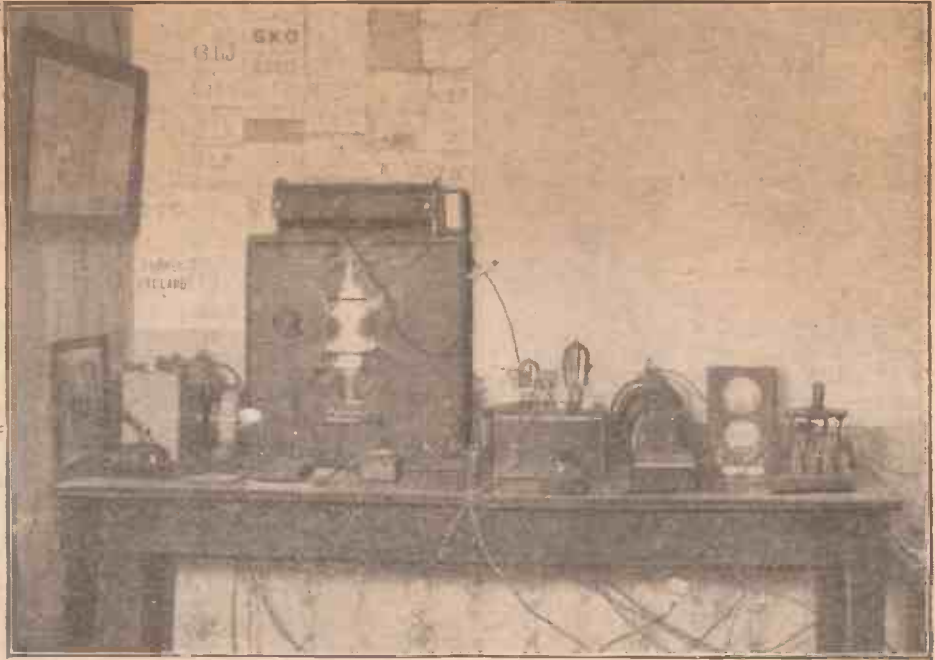
I have endured many public processions in my time, but this year, thanks to wireless, I actually enjoyed one! And no less than the Lord Mayor's Show at that. By hearing it first and seeing it later (yes, on the pictures!). I had all the excitement and thrill of the noise and blair, without the physical discomfort, while with those two inimitable artistes John Henry and Helena Millais I could vividly recall other shows when I, too, was part of the "heterogeneous mass" which usually forms the approving "chorus" of these affairs. Still, I would have liked to have heard what became of John Henry's friend.

That Love of "Cold Shivers"

The dear old British public, it does like to "get that cold feeling," sometimes called "the shivers," doesn't it? I think we inherit it from the time of the first relation to our progenitors of Bluebeard's Chamber of Horrors. Since then we have progressed steadily through Shakespeare's *Hamlet* and *Macbeth* to Grand Guignol and Madame Tussauds, and now "over the ether." Between being "Down in the Coal Mine," "Hunt the Tiger," and now "Congo Night"—well, frankly I prefer "Charley's Aunt." Tom-toms and the wailing of the native war chants from the last straw after you have put up that fight to get a seat in the tube. THERMION.

WELL-KNOWN AMATEUR STATIONS.—I

5 Q V



Mr. F. H. Stollery's Transmitting Station 5 Q V.

STATION 5 Q V is known throughout the length and breadth of Great Britain—at least at all those amateur receiving stations which make any pretence at D.X. reception.

It is owned and operated by Mr. F. H. Stollery (Member R.S.G.B.), and is situated on the East Cliff at Clacton-on-Sea. It serves as a control station of the T. and R. Section and O.R.S. of the A.R.R.L. The aerial of Mr. Stollery was the first amateur aerial in Clacton; it was hooked up to a piece of carborundum at a time when the few possessing aërials for reception were anything from twenty to forty miles distant from each other. Many lasting friendships resulted from those days.

Having investigated the "ether slashing" propensities of spark transmission with the patient help of 2 Q N (Margate), attention was next given to valve transmission, and quite interesting experiments (for those days) were conducted with absorption modulation on 440 metres, two T15 valves in parallel being used, the radiation being .35 ampere with H.T. from the D.C. mains. Later a more vigorous transmitter was installed with one T30 valve as an oscillator, using grid control for telephony. This set gave excellent results on low-power telephony. Next a 2,000-volt D.C. generator with remote control came into commission, and using H.T. from one half of this generator with a counterpoise and tuned earth, speech was put through to Italy on 185 metres at dusk one evening. It was audible there with two valves (one detector, one L.F.). Speech from this set is QSO in daylight in Scotland and Northern Ireland.

The set has now been supplemented with a straight Hartley circuit with a tuned grid circuit and parallel feed. A 50-watt valve is used as an oscillator, radiation being over 6 amperes on 160 metres with full load, using the counterpoise and no earth connection! Signals have been reported by

8 P A (Bouches du Rhone, France) as R8. Two separate aërials are used at present, one a single enamelled wire for reception and an eight-strand cage aerial with a six-strand cage down lead for transmission. The height is approximately 45 ft. All the leads-in from the two aërials and counterpoise pass to heavy earthing switches near the point of entrance. One mast is of galvanised-iron barrel, and the other of fir.

The length of the aerial is 70 ft. overall, and it is somewhat screened by the house on one side though open to the sea

8 ft. The earth consists of copper wires laid under the cemented path and connected to earth plates at the foot of the farther mast. A 44-ft. roll of fine wire-gauze netting connected to the earth terminal is laid on the surface of the path during speech transmission, as this is found to increase radiation by about .1 ampere. Keying is effected in the grid, as with the voltage used no risks must be run of a "hug" from the high tension. Speech control is effected on the set by means of a valve of high impedance, such as an M.O. R5v.

Three separate receiving sets are available, any of which can be switched in with a loud-speaker and micro-amplifier for boosting up phone reception. The receivers comprise a crystal set for Chelmsford, a two-valve Reinartz (80 to 500 metres) for experimental reception, and an old three-valve Marconi panel for 26,000 metres. The efficiency test for this last antiquity is the weekly recording on Sunday mornings (09.55 to 10.00 G.M.T.) of the time signals from NBA, Panama (about 6,000 miles).

5 Q V has been described as the "star of the East," and judging by the number of callers during the summer months it must be at least as attractive to the "brass pounders" as is the ozone of Clacton. When the visitor enters the station he is at once struck by the tidy and neat appearance of the apparatus. The careful attention that has been given to every

(Concluded in third column of next page)



Mr. Stollery (Centre) Takes an Active Interest in the Sea Scouts.

on the other. The receiving aerial is directional N.W., and excellent D.X. reception is obtained on this.

The counterpoise has eight strands, arranged slightly fan shape; it extends the length of the aerial at a height of

USING THE THOUSAND-CIRCUIT BOARD

The first of two articles detailing the many uses of the experimental receiver described in the seven preceding issues.

THOSE who make up the set will find that it is the easiest thing to use because its general lines are so very much like those of a wiring diagram and because so few connections have to be made even when wiring up a big set. Examination of the diagram below will show all that has to be done when turning the board into a five-valve set with double-circuit tuner, two stages of high-frequency amplification, tuned-anode

microfarad variable condenser, and this completes the change.

Suppose, again, that after using the circuit shown in the drawing for short-wave work we desire to receive say the Eiffel Tower on 2,600 metres. The best thing to use here is resistance-capacity H.F. coupling. The changes needed are very few indeed. Remove the inductances from the holders opposite valves 1 and 2, replacing them with plug-in anode resist-

all at will. If none is required, switch off the L.F. valves, disconnect the extra H.T. battery and short-circuit the terminals. Disconnect the grid of the rectifier from IP of the first transformer and join it to the lower telephone terminal. That is all. Should it be desired to use extra high-tension voltage only for the last valve when two L.F. stages are in use, then OP of the second low-frequency transformer comes to H.T. plus instead of to extra H.T. plus, and IS of the first transformer is taken to L.T. minus instead of to the grid-battery terminal.

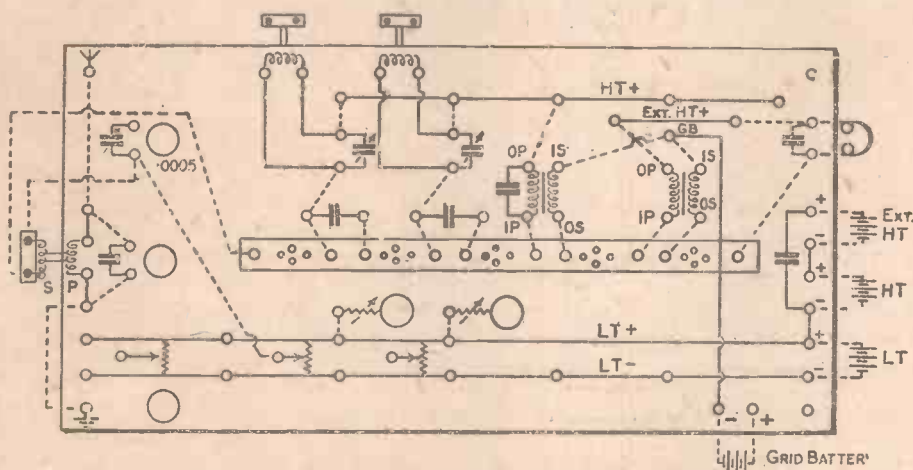


Diagram showing the Board as a Five-valve Receiver.

coupled, a rectifier and two stages of low-frequency amplification, both extra high-tension potential and grid bias being used for each of the last two valves.

The permanent wiring of the board, exclusive of the filament connections, is shown in thick lines, whilst the connections that have to be made are shown by broken lines. It will be seen that there are only twenty-eight of them all told.

Quick Work

To alter this set by, say, doing away with the secondary circuit and using reaction coupled to the second tuned-anode inductance is the work of a few moments. The secondary coil of the tuner is disconnected from the .0005-microfarad variable condenser, the latter being also disconnected from the grid of the first valve and from the potentiometer. A lead is run from the upper terminal of the primary of the tuner to the grid of the first valve and from the lower terminal to the potentiometer. Next the wire between the plate of the rectifying valve and IP of the first transformer is removed and wires are taken from the plate of the rectifier, and from IP of the first transformer to the terminals of the moving-coil holder opposite the second H.F. valve. This coil holder is also connected to the .0005-

ances, the making of which has already been described. Turn both the anode condensers to zero and the set is ready as soon as a larger A.T.I. and secondary have been placed in the coil holders of the tuner.

Let us take another case. We will suppose that we find two tuned-anodes rather difficult to handle and that we decide to try instead tuned-transformer high-frequency coupling. We remove the two anode inductances and disconnect the first grid condenser and grid leak. Remove also the connection between H.T. plus and the tuned circuits. Above valve No. 1 we place the transformer holder, connecting IP to plate and OP to H.T. positive; IS we connect to grid and to the upper terminal of the first .0003-microfarad variable condenser. The lower terminal of this condenser we connect to potentiometer and OS. The wiring between the second and third valves is precisely the same, except that as No. 3 is the rectifier we leave the grid condenser and grid leak in place, connecting one of the former to the upper terminal of the second .0003-microfarad variable condenser.

L.F. Amplification

Of low-frequency amplification we can use either one or two stages or none at

Aperiodic Transformers

Aperiodic H.F. transformers are connected in the same way as those which are tuned, except that the .0003-microfarad variable condensers are omitted from their secondary circuits. It will usually be found that if two stages of sharply-tuned H.F. coupling are used it is not necessary to use a double-circuit tuner in order to obtain perfect selectivity; in fact it is actually inadvisable to do so, for the set is much more liable to oscillate with the loosely-coupled tuner.

Loose-coupled Transformers

For broadcast and other medium-wave reception I am rather inclined to recommend yet another form of tuned H.F. transformer coupling, which can be made up with the greatest ease on this board. This is the *loose-coupled* H.F. transformer. For this pairs of inductances of suitable values are mounted in the two double-coil holders above valves 1 and 2. These are wired up exactly like tuned transformers, the moving coil being the primary in each case and the fixed coil, tuned by a .0003-microfarad variable condenser, the secondary. With this type of intervalve loose-coupling great selectivity is obtainable and there is very little tendency on the part of the set to fall into self-oscillation.

J. H. R.

(To be continued)

"WELL-KNOWN AMATEUR STATIONS" (continued from preceding page)

detail of the outlay and arrangement of the gear is apparent in the photograph, 5 Q V is mindful of the very helpful assistance rendered by 2 L Z, 2 M C, 2 M D, 2 T O, 6 B T and others who send so many useful reports.

The decorations on the wall of the den are a great economy of wallpaper and testify to 5 Q V being QSO in seven European countries.

A. J. C.



How does it magnify?

AS a matter of fact, which are audible in it *doesn't* although your loud speaker most people think of it in that way. The wireless valve is a valve in the truest sense of the word; just as much as the throttle on an engine. It is there to regulate the supply of energy from your H.T. battery in obedience to impulses from the aerial. The energy so regulated transforms the feeble current picked up from the ether into sounds

Ediswan valves perform the delicate function of current control with a notable absence of distortion, a complete silence of operation and a marked economy in filament consumption and length of service.

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Goswell 2-way Panel Mounting	3/-
Franco Cam Vernier 2-way (geared)	12/6
Franco 3-way	17/6
Goswell 3-way Cam Vernier... ..	12/6

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No. 1	2 for 2/-
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Coil Stand 2-way for Basket Coils	5/6
Universal 2-way for Basket Coils	5/11

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Post Free.

2-way on base	3/-
3-way on base (brass fittings) ..	4/9
2-way ex handles	4/6
3-way do. (nickel fittings) ..	5/6
2-way Cam Vernier (high class) ..	5/9

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No. 14. Voltmeter	4/6
No. 15. Grid Leak	1/-, 1/3, 2/6
No. 16. Rheostat and Dial	2/3
No. 20. Murray Valve Holder ...	1/3
No. 21. Rheostat (one hole fixing) ..	1/6
No. 22. Set of Spanners	1/9
No. 23. D.P.D.T. Panel Switch ...	1/5
No. 24. S.P.D.T. Panel Switch ...	1/2 (cheaper to callers)
No. 25. S.P.D.T. china base	1/9
No. 25a. D.P.D.T. china base	2/3
No. 26. 2-way "Baby" Coil stand (coils extra)	3/-
No. 27. Dr. Nesper Phones	13/-
No. 28. Square Law Condensers (Please see lists)	
No. 29. Shaped coil plug	1/-
No. 30. On and off switch	1/6
No. 31. Igranite Rheostat	4/6
No. 32. McMichael H.F. (List) ...	
No. 33. Ergo or Raymond (List) ..	
No. 35. Tumbler Switch	1/6
No. 36. Real Ebonite Dial	1/-
No. 37. Fixed Condensers	1/- (cheap quality all capacities)
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No. 41. BABY AMPLION (Dragon Fly)	25/-
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No. 51. Crystal Detector 1/3, 1/6, 1/9 Nickel	1/9, 2/-
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Anode Resistance 50,000, 70,000, 80,000, 100,000, on stand complete	5/6

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Coils: 25, 5/-; 35, 5/-; 50, 5/2; 75, 5/6; 100, 7/-; 150, 7/10; 200, 8/8; 250, 9/-; 300, 9/5; 400, 10/3; 500, 10/6	
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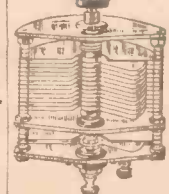
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- 30 g... 1/6. Etc., etc.
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- Panels Drilled
- Radio Press Envelopes
- Raymond Fixed Condensers .001, .0001 to .0005, 10d.
- .002, .003, .004 1/-
- .006 1/3 ; .01 1/9 ; .02 1/9
- Polar Micrometer Condenser 5/6
- W.O. or Pillar Terminals 1d.
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- Spring Pillar Terminals 2 1/2d.
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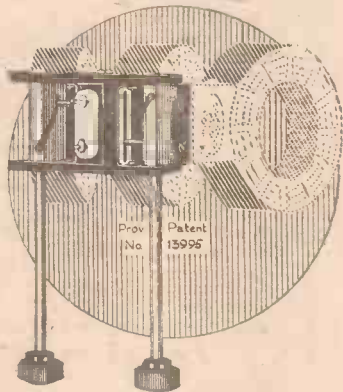
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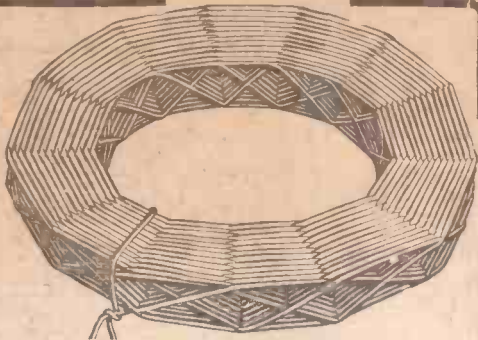
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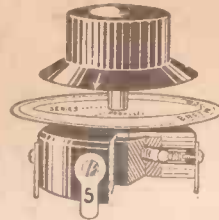
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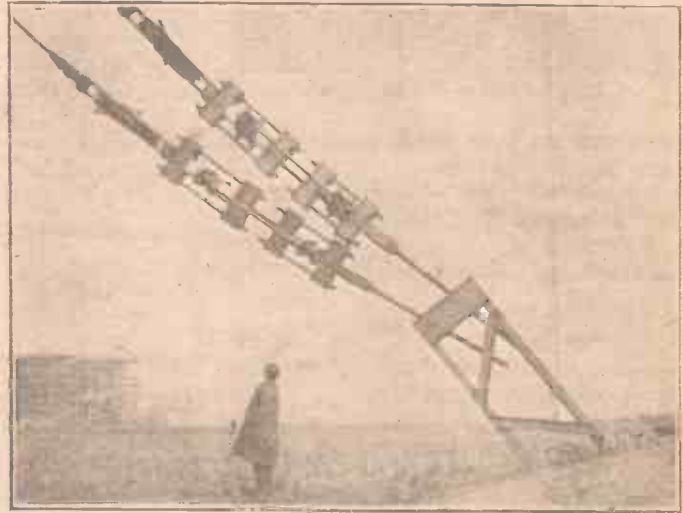
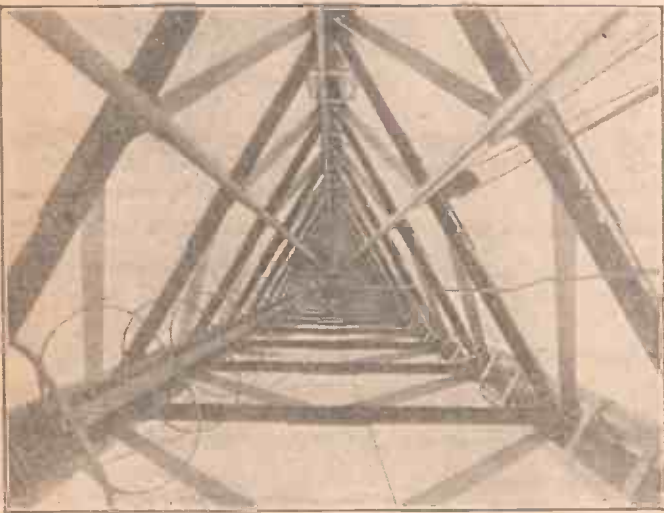
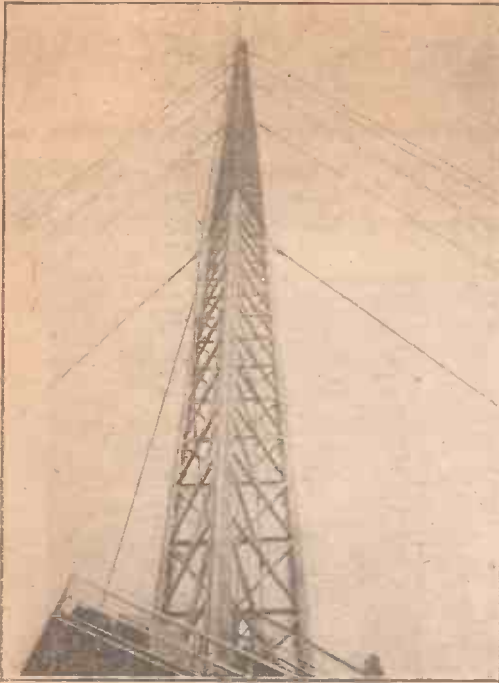
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AT Millmorton, near Rugby, the most powerful wireless station in the world is now being erected. There are eight giant masts for the aerial, covering 800 acres, and each mast is 820 ft. high, or nearly six times as high as Nelson's column. The masts are triangular and each weighs 200 tons. The pictures in their order show respectively: One of the masts nearing completion, a view looking up one of the steel standards, a view looking up one of the masts and two of the insulated stays.



COLLOID RECTIFIERS

PROGRESS has recently been made in the direction of using colloidal substances as a substitute for the thermionic valve. Colloids are jelly-like substances of large molecular mass. They are in the nature of, but are not, true solutions. In one type of colloid the liquid molecules are absorbed by the solid molecules. In the other type the solid molecules are held in a peculiar state of suspension throughout the liquid. Microscopic examination of the latter variety reveals a peculiar agitation taking place amongst the suspended particles. This is known as the "Brownian movement," and is due to unbalanced electronic charges. Under the influence of an applied E.M.F. these intermittent movements can be converted into a one way electron flow similar to that existing between the filament and plate of a valve.

D. H.

TESTING H.T. BATTERIES

HIGH-TENSION batteries should preferably be tested cell by cell with a small-reading voltmeter after the battery has been in use for some time. This method will indicate a dead cell if one is present. Any cell giving a reading of less than one volt comes under this category. The test should not be made after the H.T. battery has been off load for some time, as the polarised cell then has time to recuperate and will probably show a residual E.M.F. of more than one volt. Dead cells offer a very high resistance and should be promptly shorted. In addition they are a frequent source of "noise" or crackle in the set owing to irregular fluctuations in the effective E.M.F. due to the effects of progressive polarisation.

M. A. L.

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

PLACING THE PHONES

IN an ordinary crystal set the phones should always be inserted in the circuit on the "earth" side of the crystal, otherwise they open up a leakage path across the crystal through the body of the listener to earth. Unrectified H.F. currents passed in this way represent so much lost energy. In a single-valve circuit the proper place for the phones is on the negative side of the H.T. battery. If they are inserted between the H.T. positive and the plate, they are at a high positive potential and may be the cause of leakage to earth. This applies particularly when the set is wired up to phones in different rooms.

In the case of multi-valve sets, the telephones are generally inserted on the H.T. positive side owing to the fact that all the valves are fed from the same battery, and any other arrangement consequently becomes impracticable.

A. M.

AROUND THE SHOWROOMS

Shipton Resistance

BY making the fuse an integral part of their new strip filament resistance, E. Shipton and Co., Ltd., have accomplished something that should be appreciated by all amateurs who use valves.



Shipton Filament Resistance.

At present too little use is made of such protective devices.

A spare fuse is included in each carton, the whole costing only 3s. for a filament resistance of 7, 30 or 60 ohms. The address is 37, Tothill Street, Westminster,

Vernier Condenser

FOR some time there has been felt the need for a small vernier condenser that can be fitted to a panel without taking up a lot of valuable space. That such a compact condenser exists is evidenced by the photograph, which shows a Trix vernier condenser.



Trix Condenser.

Faraday House reports that the maximum and minimum values of this are respectively .0001 and .0000245 microfarad. Trix products are made by Eric J. Lever, of 33, Clerkenwell Green, E.C.1. The vernier condensers are sold at 3s. 6d. each.

"Book of MOV"

TADPOLES and frogs and fairies seem to have little connection with the technicalities of wireless, but in "The Book of MOV"

they are used in an interesting analogy of the working of the valve.

A copy of this 40-page book, which contains useful data concerning Marconi-Osram valves, as well as an interesting analogy on the working of the valve for the non-technical reader, can be obtained post free from the M.O. Valve Co., Ltd., of Brook Green, W.6, if AMATEUR WIRELESS is mentioned.

H.F. Xtraudion

IT is well known that the Xtraudion valve functions best as a low-frequency amplifier, and in order to meet the demands of those who want efficient high-frequency amplification a special H.F. Xtraudion is now being made.

This takes slightly more filament current than an ordinary Xtraudion (.5 ampere) and works with an anode voltage of between 30 and 80 volts. The price is 12s. 6d.

Original Valve Holder

WHEN building sets on the American principle—that is, with a vertical panel and with the valves enclosed—it has been necessary up to the present to build shelves on which to mount the valve holders. This difficulty is overcome by an original type of valve holder, one of which is shown by the photograph.

It will be seen that the holder can be easily fixed to a vertical panel and a window provided for inspecting the bright-



Panel-mounting Valve Holder.

ness (or otherwise!) of the filament. These holders are made by V. R. Pleasance, of 60, Fargate, Sheffield. VANGUARD.

PROGRESS AND INVENTION

Single-valve Circuit

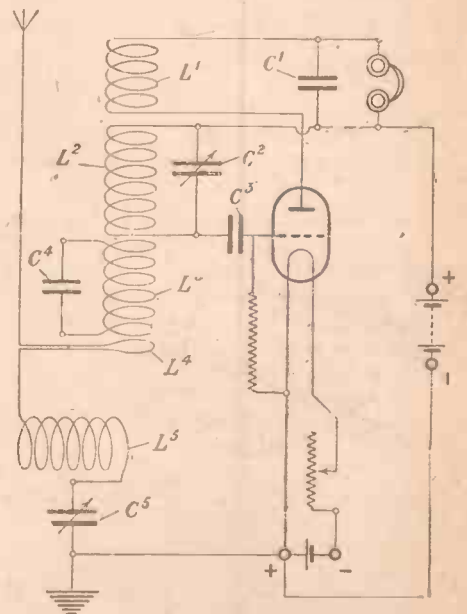
THAT it results in the maximum clarity and tone in reception with the minimum number of valves and is free from the complexity of couplings usually used in arrangements of a compound type is the claim made for a new circuit that is the subject of Patent No. 221,951/24 (Cooke and Whitfield Wireless, Ltd., and H. H. Whitfield, both of Birmingham).

In the aerial circuit is included a single-turn coil L_4 (see circuit diagram) which is wound about the lower end of a periodic coil L_3 . The aerial tuning coil L_5 is placed with its plane at right angles to the plane of the coil L_3 . Coil L_3 is wound on the same former and side by side with L_2 , these being spaced apart. Coil L_3 is not tuned to the incoming wavelength.

Wire of relatively large gauge and hence of low resistance is used for winding coils L_4 , L_3 and L_5 , but fine wire can be used for the reaction coil L_1 . This is wound over the top of L_2 , but is insulated from the latter. The whole circuit is shunted by a relatively large capacity C_1 .

The periodic coil L_3 is inserted for the purpose of obtaining oscillation in the oscillatory circuit and to compensate for

the phase difference between the currents in the aerial and subsidiary circuits. It is found that with a circuit constructed in



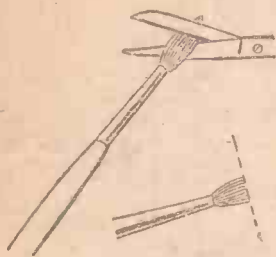
Single-valve Circuit (221,951/24).

this way, with the use of one valve, excellent results are obtained.

PRACTICAL ODDS AND ENDS

Cleaning Crystals

BLOWING on a crystal detector to remove particles of dust, etc., should never be resorted to, as oxidation of the catwhisker and surface of the crystal is facilitated by so doing.



Brush for Cleaning Crystals.

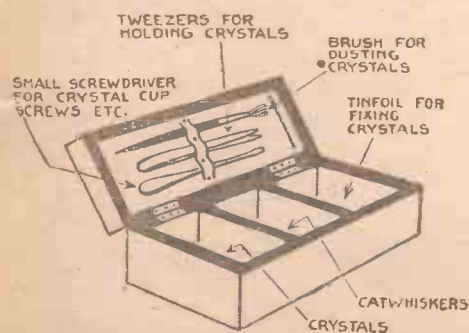
An ordinary painting brush, such as can be obtained for a few pence, can be made into a good crystal-cleaning brush by cutting off the pointed end (as shown in the illustration), a pair of domestic scissors being used for the purpose. R. N. W.

Terminal Tags

BRASS and copper tags soon tarnish and then offer a greater resistance to current passing. If they are "tinned" over with solder, the act of tightening down terminal nuts on tags, removing a minute shaving of solder, will always give a clean and good contact. C. W.

Overhauling Kit

EVERY set needs overhauling at some time or another, and the illustration shows a handy crystal-maintenance kit which is contained in a small gramophone needle-box. A brush, tweezers and small



Overhauling Kit.

screwdriver are held by a strip of cloth fixed in the lid in tool-roll fashion, while spare crystals, catwhiskers and tinfoil or Wood's metal are placed in the compartments. W. N.

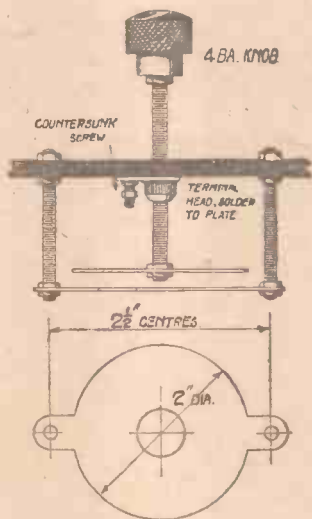
Loud-speaker Distortion

A GREAT number of home-made loud-speakers suffer from the fault of distortion caused by the resonance of the horn used. In the case of papier-mâché horns this distortion is practically non-existent, but with the tin or copper horns the fault is very apparent, particularly in the reproduction of a piano selection.

This can be remedied by painting the inside of the horn with ordinary black enamel or a lacquer and pouring down the horn a quantity of powdered cork over the enamel, which will stick to the metal quite firmly as the enamel dries. This, it will be found, will completely deaden "the tinny effect." A. H.

Vernier Condenser

AN easily constructed and efficient vernier condenser is often a necessity, and can be made to the following details: The sketch shows the method of assembly, with suggested sizes. The plates



Details of Vernier Condenser.

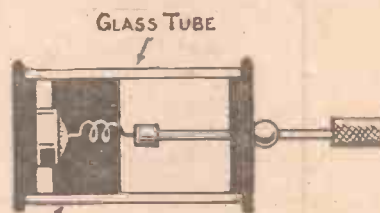
should preferably be of zinc, though aluminium, copper or brass will serve equally well. One must be circular, while the other should have lugs, as is shown in the lower sketch.

4 B.A. studding is used, and the guide for the moving spindle may be a terminal head soldered to a brass plate. A 5 B.A. screw holds this plate in position, serving also as a terminal for the moving vane. The holes through the panel must be clear. H. W.

Please mention "AW" when you write to Advertisers.

Crystal-detector Tip

TO facilitate a quick and visible adjustment of the catwhisker in a glass-enclosed detector, the following hint may be useful. Under the catwhisker and on the inside of the glass tube paint with



BLACK BAND
Making the Catwhisker Visible.

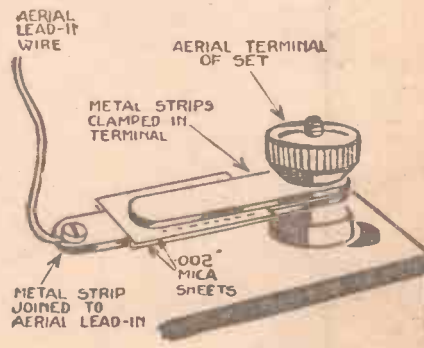
indian ink a band on half of the tube or gum on a piece of black passé-partout paper. This will make the catwhisker more visible owing to the contrasting colours of the catwhisker and black band. P. B. O.

Simple Series Condenser

AN increase in signal strength can, in the case of many crystal sets, be obtained by connecting a small series condenser in the aerial lead. The illustration shows a very simple method of introducing such a condenser.

Two metal strips about 3/4 in. wide by 2 in. long are drilled at one end and held by the aerial terminal of the set as shown, a washer of approximately the same thickness as the strip metal being placed between the strips.

A third strip of similar size to the first two, and also with a hole in one end,



Arrangement of Series Condenser.

is then pushed in between the clamped strips with a sheet of .002-in. mica on each side in order to prevent electrical contact. Connection between the aerial lead-in wire and the third strip is then made. N. R.

THE COMMUNAL AERIAL

A SYSTEM that permits of the operation of more than one receiver upon the one aerial has been in practical use for a considerable time, but very few details have been available for the amateur. No claim is made, therefore, in the following description of the system of any novelty. Practically speaking, the efficiency of the system depends upon correct tuning, and as it is almost impossible to emphasise this point too strongly, a resumé of the principles of aerial tuning will not be out of place.

Aerial Tuning

The natural wavelength of a standard P.M.G. aerial hardly ever exceeds about 130 metres. In order to receive present-day telephony additional apparatus in the form of inductances and condensers are employed to load-up or tune the aerial system. Fig. 1 is a theoretical diagram of an aerial system joined directly to earth. In effect the aerial and earth form the two plates of a condenser. The inductance NL is the natural inductance of the aerial wires. Fig. 2 illustrates the same aerial but with an artificial inductance and capacity added in parallel. It will be seen

that the introduction of these components has given the aerial system an additional circuit.

Omitting for the present the subject of loose-coupled circuits, it will be realised that for the best results circuit AC-AL must be tuned to the wavelength of the desired signal. Now if we are tuning for the broadcast concerts, the natural wavelength of the aerial itself NC-NL will be much lower than that of the desired signal. The only practical method of correcting the tuning of the aerial is to add an adjustable aerial-tuning loading inductance as shown in Fig. 3. This inductance is invariably omitted in amateur receivers, with a consequent loss in efficiency and general damping of the whole aerial tuning system.

A Simple Arrangement

Fig. 3 illustrates what may be termed the simplest arrangement permitting of correct aerial tuning. Fig. 4 shows an alternative circuit with the "artificial" condenser in series (instead of in parallel) with the coil. The circuit with the series condenser is called an "acceptor," whilst that with the parallel condenser is known as a "rejector" circuit.

Each circuit has its individual duty to perform, a matter which does not at present greatly concern us. It should be realised that, provided each individual circuit is correctly tuned, any number of circuits may be added to an existing aerial system with very little detriment. Fig. 5 (see p. 790) shows this clearly. If A, B and C have equal values, then the combined value or wavelength is equal to any one of the individual circuit values. A simple illustration will prove the accuracy of this statement. Condensers joined in series give a total capacity equal to

$$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}, \text{ etc. ; or}$$

$$C = \frac{C_1 \times C_2}{C_1 + C_2}$$

where only two condensers are concerned,

Condensers wired in parallel give a total capacity of $C_1 + C_2$, etc. Inductances in series gives a total inductance equal to $L_1 + L_2$, whilst in-

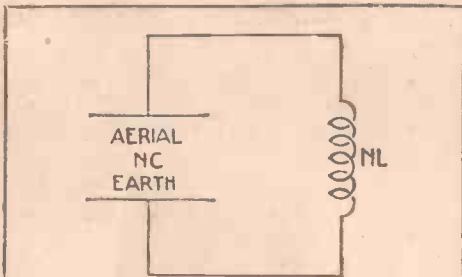


Fig. 1.—Circuit of Plain Aerial.

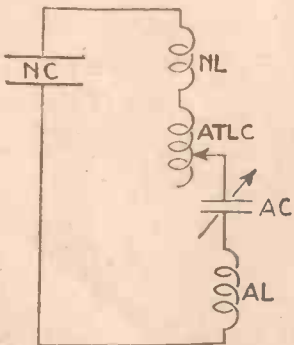


Fig. 4.—Alternative Circuit for Correct Tuning of Aerial.



Two Receivers

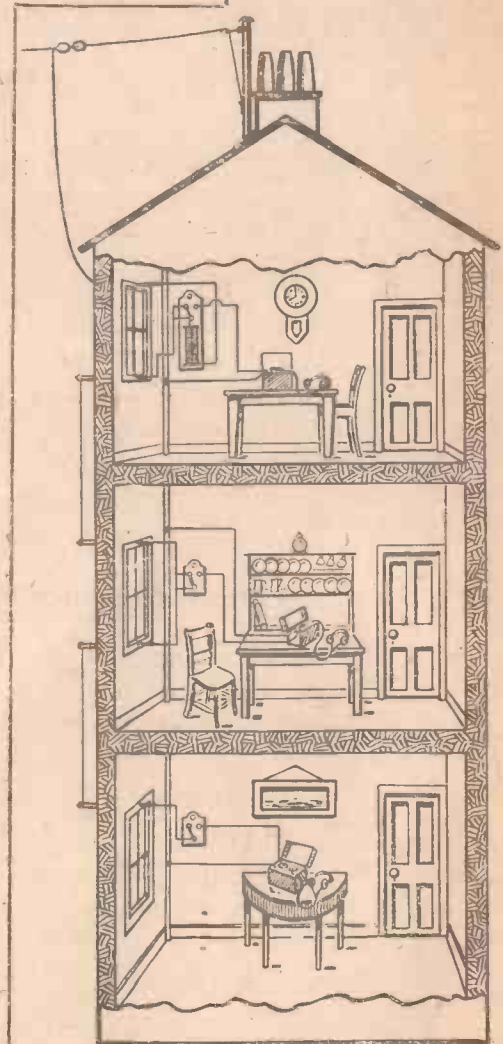
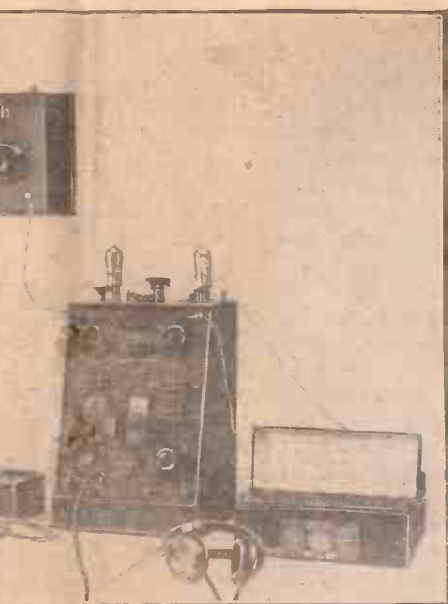


Fig. 6.—House Wired for Three Sets on One Aerial.

Many persons are limited in their wireless activities on account of the difficulty of erecting a suitable aerial. Particularly is this the case with those who dwell in flats, and it is to them that the idea of the communal aerial will make a special appeal. The system described in this article has been in use in the Navy for some time, but it should be understood that as outlined below it is only a suggestion for a novel field of experiment.



sets in Use on the Same Aerial.

ductances in parallel equal $\frac{1}{L} = \frac{1}{L_1} + \frac{1}{L_2} + \frac{1}{L_3}$.

Referring to Fig. 5, the condenser and inductance values of each circuit are represented by round figures, the value of each circuit being 6 LC. Condensers B and C are joined in parallel with each other, consequently the combined capacity equals $2 + 1 = 3$. Now this combined capacity B and C is joined in series with condenser A so that the total capacity of the whole system equals $\frac{3 \times 3}{3 + 3} = \frac{9}{6} = 1.5$ units.

There are also two inductances B and C in parallel, and the combined inductance is equal to $\frac{1}{L} = \frac{1}{3} + \frac{1}{6} = \frac{1}{2}$; therefore $L = 2$.

In addition to this, the inductances B and C are wired in series with A, so that the total inductance of the whole system is $2 + 2 = 4$.
Total $L = 4$
Total $C = 1.5$

$$\text{Total LC} = 4 \times 1.5 = 6 \text{ LC}$$

It is hoped that this simple explanation will dispel any doubts which may have been felt concerning the effect of adding many tuned circuits to one system. Provided that all circuits are tuned to receive the one wavelength, no serious losses will be experienced in any one of the circuits. Obviously the introduction of more tuners results in an increase of H.F. resistance, but this is not of great consequence. The obvious remedy is to design all tuners so that they have the least possible resistance to H.F. currents.

Systematic Tuning

Figs. 6, 6a and 7 illustrate alternative methods of using multiple reception in a three-storey house. The circuit shown by Fig. 7 will permit greater selectivity of reception than will that shown by Fig. 6a, but the former will probably cause a slight loss in signal strength due to increased H.F. resistance.

It must be remembered that when once the individual receivers are tuned, any alteration in the tuning of one will

affect the tuning of the others. Users of the system should therefore remember the correct setting or adjustments of their particular tuners and not readjust them during a transmission or chaos will result. The sets must be tuned in order, the adjustments being kept fixed when once found.

Set No. 1 should be tuned whilst 2 and 3 are switched off at A and B. Set No. 1 may then be left on or switched off as required and set No. 2 switched on and tuned. Finally No. 3 may be tuned.

After the tuning is completed it will be found that on switching off any one set no effect will be apparent in the phones of the other receivers. In order to ensure uniformity of earth connections, a common connection or water-pipe should be used.

One point of great importance which has not yet been dealt with is the earthing of the aerial system in case of lightning. This may be accomplished (see Fig. 8) by inserting an earthing switch between the aerial lead-in and aerial-loading tuner at C, Fig. 6a, or, on the other hand, shunting between aerial and earth a coil of high resistance and inductance and a micrometer

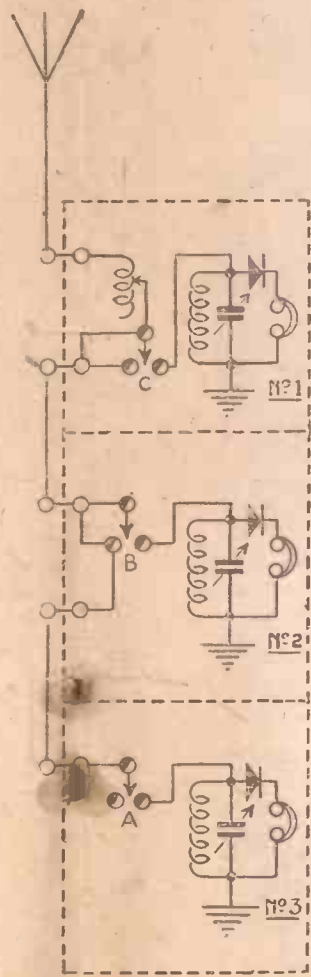


Fig. 6a.—Circuit Diagram of Arrangement Shown by Fig. 6.

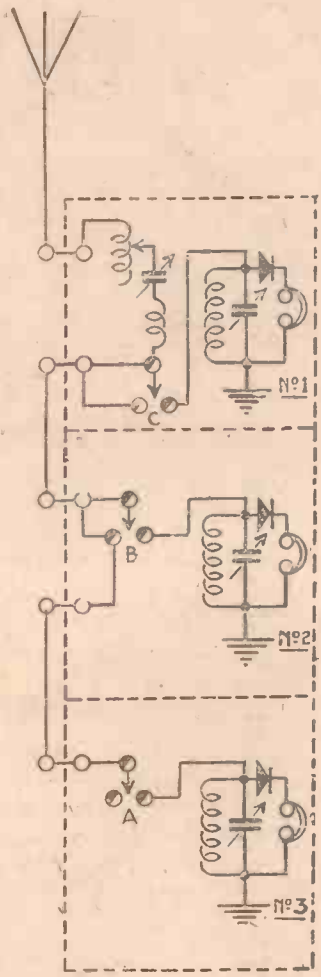


Fig. 7.—Arrangement of Additional Acceptor Circuit.

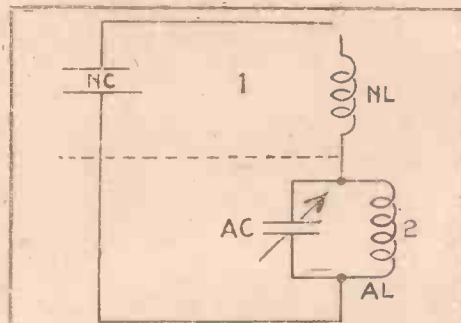


Fig. 2.—Artificial Tuner Added to Plain Aerial.

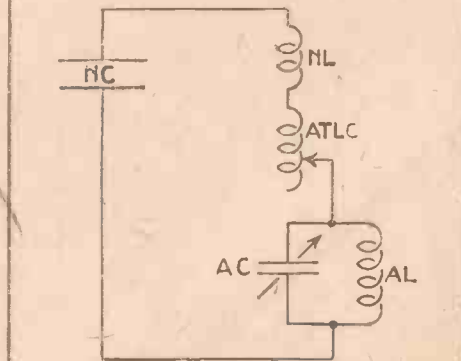


Fig. 3.—Diagram showing Method of Correctly Tuning the Aerial.

spark gap SG (Fig. 8). The resistance coil is an "aerial discharge coil." It permits static charges to leak away to earth, whilst its high impedance blocks the passage of tuned H.F. currents.

Broadcast Reception

For ordinary broadcast reception the aerial-tuning loading coil may consist of 80 turns of No. 18 enamelled copper wire wound on a cardboard tube which is 3 in. in diameter and 5 in. long. A bar and sliding contact may be fitted in the usual manner, or the coil may be tapped in tens and units for fine tuning purposes.

So far the system has only been considered in connection with crystal sets, but it may be similarly employed with valve receivers. In this case direct-coupled aerial reaction must not be used, even though loose-coupled aerial tuners with plug-in coils be employed.

If reaction is used it should be taken to the H.F. valve coupling, and in addition to this loose-coupled aerial tuning should be employed. In order to avoid too complicated a circuit it is best to confine oneself to a system where two receivers only are used. It should be borne in mind, however, that the restrictions and rules governing these two sets hold good for every receiver or circuit which may be added. Fig. 9 illustrates the arrangement for coupling two separate receivers to one aerial. It will be seen that the primary circuit in each case has now been converted into an acceptor, whilst the secondary forms a rejector circuit.

Assuming that the natural capacity of the aerial is 2, the aerial loading coil C in Fig. 10 must have a value of 3 in order to make the aerial tune to 6 LC. The remaining values for circuit A are

14 LC. It is only necessary to include the correct inductance and condenser values throughout circuit B in order to ensure correct tuning.

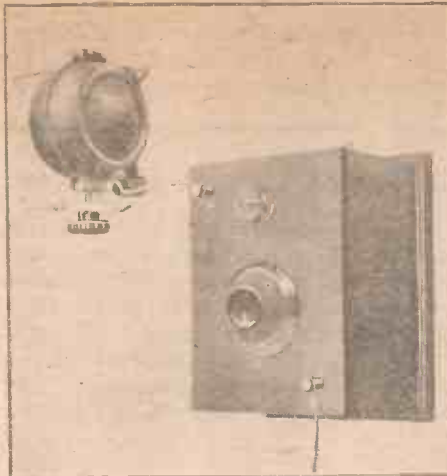
In actual practice a switch may be inserted at X in order to allow of cutting out in turn each circuit to tune the other. After once having tuned each receiver on the one aerial, further adjustments when listening-in should not be attempted.

Altering Tuning

If the operator of one set makes a practice of going the round of the various stations during the course of an evening, it will be advisable for him to provide himself with a list of adjustments for the different stations. Such a list will facilitate quick retuning and obviate much trouble. As soon as the desired station is tuned-in the operators of the other sets will again hear their own particular stations, but whilst the first operator is altering his tuning the "stay-at-home" operators will probably have their reception cut off or badly jammed. Should reception fail owing to an alteration in tuning on one of the other receivers, the listener should wait until the alteration has been effected, when signals previously received should again be heard; a slight drop in signal strength may be noticed, but by altering the adjustment of one or more of the tuning condensers about one degree signals should again be heard at normal strength.

Value of Components

Nothing has been said with regard to



View of Aerial and Acceptor Tuners.

then adjusted as required. Turning to circuit B, it will be seen that the original aerial system cannot be tuned to 14 LC without some addition. This is because capacity 2 and inductance 3 equal 6 LC. However, there is a simple remedy. By inserting an additional aerial tuning inductance (shown dotted) having a value of 4, the aerial itself is tuned to 14 LC for circuit B. Proof of this may be had by adding inductance 4 to inductance 3 and multiplying by capacity 2. Result,

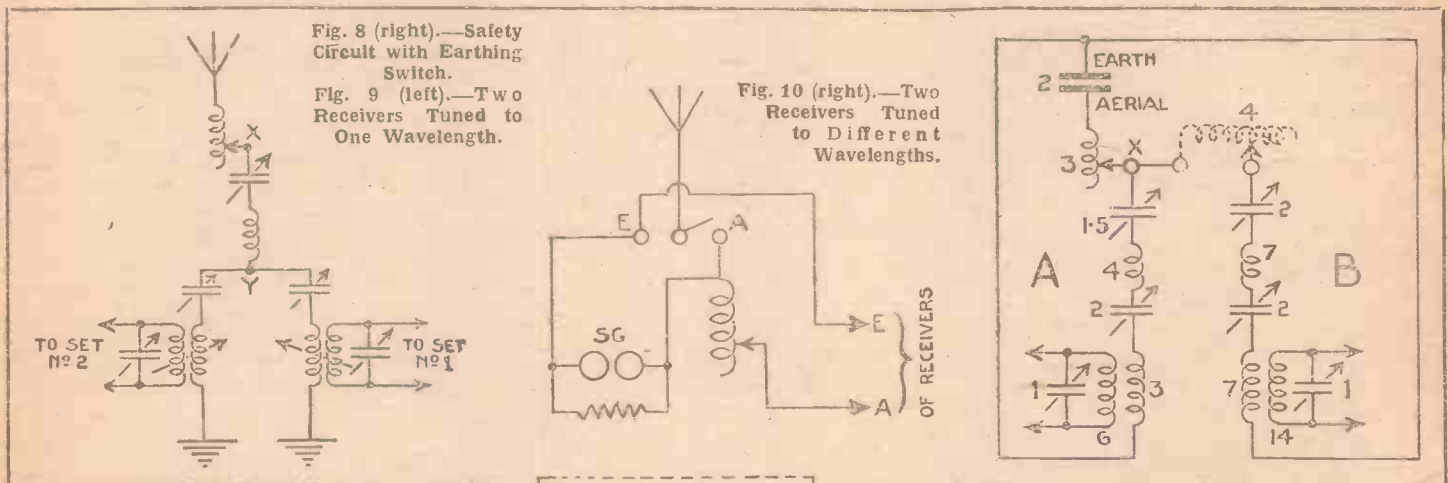


Fig. 8 (right).—Safety Circuit with Earthing Switch.

Fig. 9 (left).—Two Receivers Tuned to One Wavelength.

Fig. 10 (right).—Two Receivers Tuned to Different Wavelengths.

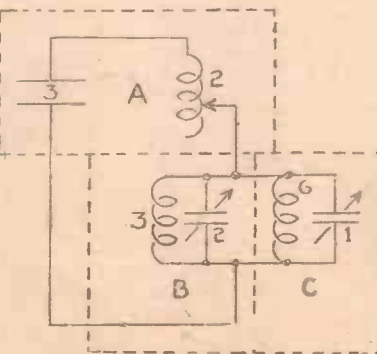


Fig. 5.—Simple Three-circuit Tuner.

Receiving on Different Wavelengths

Whilst on the subject of multiple reception it is necessary to include some remarks on receiving on entirely different wavelengths.

Referring now to Fig. 10, assume that circuit A has to be tuned to 6 LC, whilst circuit B is tuned to 14 LC. The tapping point of the long-wave receiver B is moved from point Y to point X (Fig. 9). The reason for this will be clear if simple numbers are given for the various inductances and capacities and the whole system is analysed.

the actual sizes of the coils and condensers for the reception of different wavelengths, as many of the more advanced experimenters can ascertain the values by calculation. Also manufacturers of plug-in tuning coils issue tables denoting the true inductance in microhenries and the wavelength range when used with condensers of certain capacities.

Much experimenting will be required before the system can be expected to give entire satisfaction, and readers must not be disappointed should results be poor at first.

L. A. CHAPMAN.

5 YM'S SINGLE-VALVER

THE publication of the article "An Evening with a Single Valver" in No. 122 has caused a good deal of comment. There seems to be a large number of wireless enthusiasts who cannot get such results, even on two valves, as I can get on one. Naturally they want to know why.

I may say right at the start that though I can get all the B.B.C. stations, and the Continental stations as well, on my standard two-valve set, I cannot get them with the ease and certainty which characterises work with the one-valver. The reason is that two circuits have to be tuned in the two valver, and the tuning of the anode circuit of the radio-frequency-amplifying valve is apt to be critical. It is very easy to miss a station if the two circuits are not in resonance.

Wonderful Efficiency

I put down some of the efficiency of the single valver to my excellent aerial, but I have since tried it out on an aerial that is very inefficient indeed. It consists of a 40-ft. strip of phosphor-bronze ribbon not 20 ft. above the ground and practically on a level with the set. On this aerial London, Bournemouth and several more distant stations have been heard, the distant stations faintly but still readable. Chelmsford, sixty miles away, is very loud.

As I explained in the original article, the set was originally built up as a portable Flewelling. But a switch is incorporated to allow it to be used as a

"straight" single-valve circuit, and it was as a straight single-valve circuit that I used it. Fig. 1 shows the circuit as it actually is, including the Flewelling connections. When the switch is in position 1 the circuit is an ordinary single valver, with no features that distinguish it from any other ordinary single-valve circuit, with the exception of the provision of a variable grid leak, which is a Watmel with a range of from 0.5 to 5.0 megohms.

In position 2 the switch turns the circuit into a simple Flewelling by connecting the plate circuit straight through to earth and putting a blocking condenser of .006 microfarad in the negative side of the high-tension supply. It is important that the switch be so arranged that the arm cannot make contact with both studs at once. If it does the H.T. battery will be shorted through the telephones. C₂, the grid condenser, has a value of .0003 microfarad. C₁ is a three-plate vernier condenser. In actual working another tuning condenser, an old ex-W.D. Marconi, is shunted across earth and aerial or put in series with the aerial, as circumstances require. This variable condenser has a maximum capacity of .001 microfarad. It could equally well have been put in position C₁, but in this case the inclusion of a vernier would have been a convenience.

The panel is of ebonite 5½ in. by 8 in. A wiring diagram is shown by Fig. 2. The

valve is mounted on the under side of the panel. The mount is actually one of the blocks that come off old army one-valve receivers or transmitters. These blocks have most excellent valve sockets with very little capacity between them. They are in the form of an L, as shown in Fig. 3. A coil holder is mounted close to the panel, inside the box which carries the whole outfit, and leads are taken from the aerial and earth terminals and from the reaction terminals to the holder.

As a Flewelling

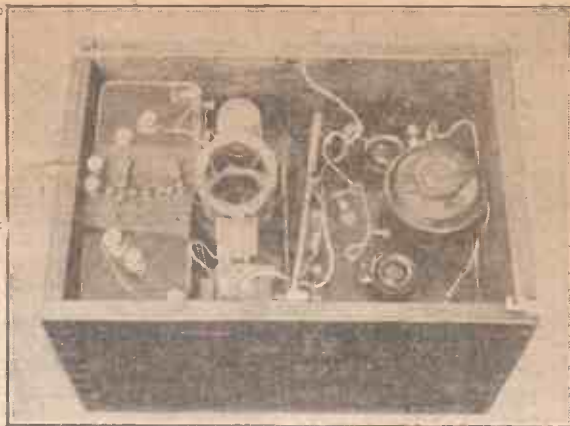
When the circuit is operated with the Flewelling switch in on an ordinary outdoor aerial, with the customary earth connection, it behaves excellently.

There is no whistle and telephony is very loud and clear. It seems to be almost exactly the same as the single-valve straight circuit, except that the reaction coupling has to be much looser. The set can be used in either way, and I can detect no difference either in signal strength or in distant reception.

Since I wrote the original article a big change has been made in this set. It has had a note-magnifier valve added to it. This is to enable it to work a loud-speaker.

I find myself quite at a loss to account for the excellent performance of this little set. The wiring and components of the main panel are well spaced, but there are any number of exterior leads wandering all over the place. For broadcast reception Lissen coils are used, and for the

(Concluded in third column of next page)



Interior of Single-valve Set.

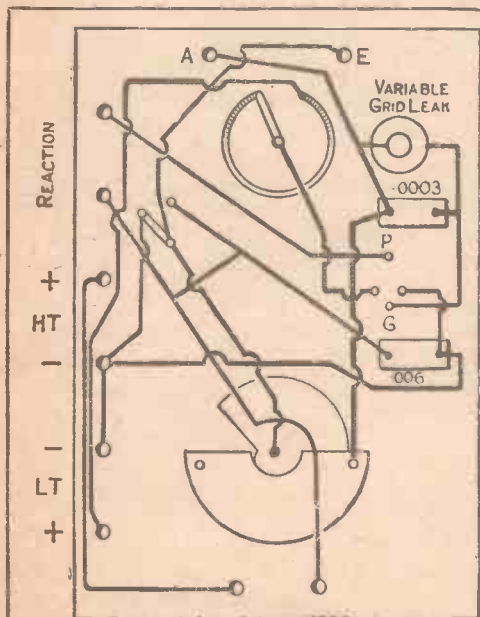


Fig. 2.—Wiring Diagram.

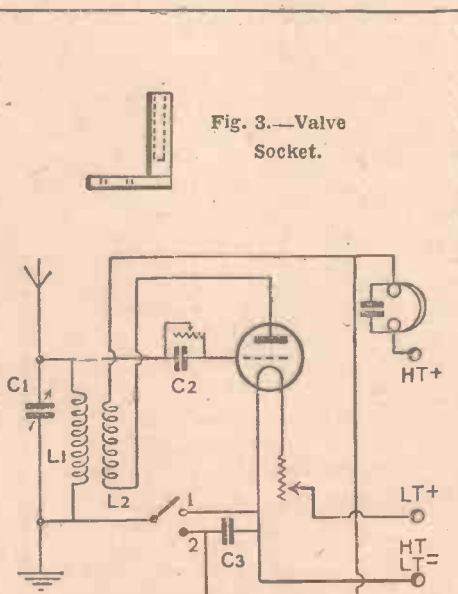


Fig. 1.—Circuit Diagram.

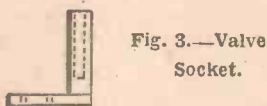


Fig. 3.—Valve Socket.

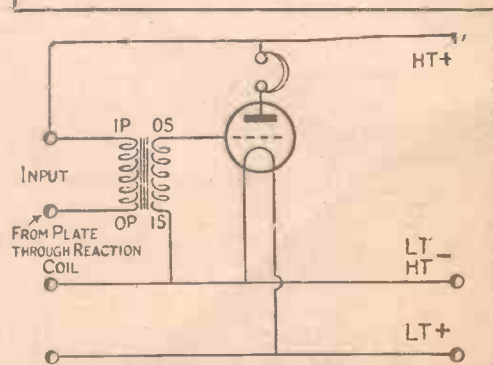


Fig. 4.—Connections of Note Magnifier.

CRYSTAL TALKS.—IV

METHODS OF CONNECTING COILS.

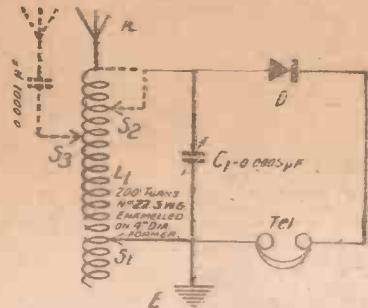


Fig. 1.—Connections for Slider Coils.

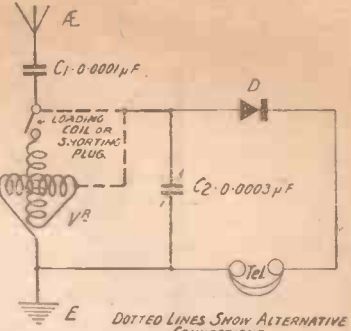


Fig. 3.—Variometer Connections.

THE methods of connecting coils in the circuit are varied and plentiful. Some examples are given in Fig. 1 of different ways of connecting single, double or triple

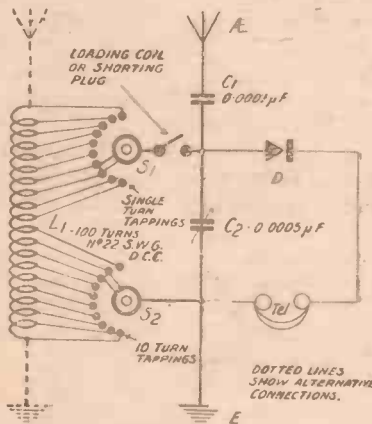


Fig. 2.—Tapped-coil Connections.

slider. Sliders as a rule are inefficient, especially those of the plunger type. Tapped inductances may be connected as shown in Fig. 2. Variometers may be connected as shown in Fig. 3. A variable

condenser is shown in parallel with the inductance in Figs. 1, 2 and 3. While not entirely necessary for local reception, this arrangement affords extra fine tuning facilities. Where connection is made to the rotor of the variometer in Fig. 3, the variable condenser tunes the rotor only, the stator acting as an aerial tuning coil. This is, in fact, an excellent method of obtaining independent rotor-tuning, as this portion of a variometer is not easily tapped.

Plug-in coils may be connected in almost any convenient manner, and a receiver equipped in the following manner will be found to be a source of continued interest. First equip your receiver with a three-way tuner (see Fig. 3, p. 677). Connections are then made to terminals as shown in Fig. 4. This arrangement enables the experimenter to use them as follows: (1) He may use a single plug-in coil for the aerial-tuning inductance (A.T.I.) in a simple crystal circuit. (2) Two coils may be employed for a loose-coupled arrangement. (3) Two or three coils may be connected in series for the A.T.I. giving a variometer tuning effect. (4) Coil No. 3 may be utilised for reaction when a valve unit is employed. (5) Aperiodic tuning may be effected by connecting the aerial midway or part way

down the total inductance represented by two or three coils in series. (6) A coil may be placed in series with the aerial in addition to the A.T.I. (7) A fixed condenser of .0001 microfarad may be placed

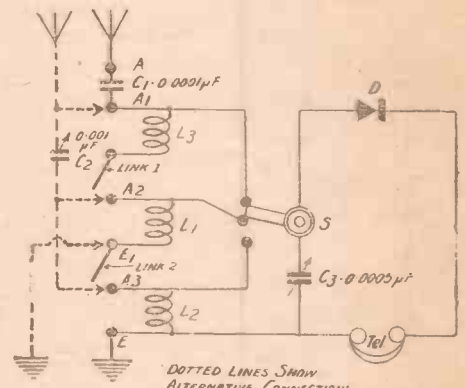


Fig. 4.—Connections for Plug-in Coils.

in series with the aerial or a variable aerial-tuning condenser (A.T.C.). (8) Separate variable condenser units may be placed in parallel with any of the coils used.

RADIO.

GETTING DOWN TO 100 METRES

PERHAPS the loudest American station to be heard in Great Britain is KDKA, of East Pittsburg, which until recently worked on 100 metres. Its power is 25 kilowatts, and KDKA's transmission can sometimes be picked up on a modest indoor aerial.

On such a short wave as 100 metres we have to overcome difficulties which do not exist on the broadcast wavelength, the tuning is excessively sharp, and if we are not careful there is a good deal of leakage by capacity. For this reason it is a good idea to use an anti-capacity valve, such as the well-known V24 manufactured by the Marconi-Osram Co.

Since the natural wavelength of most aerials is in the neighbourhood of 150 metres, we must have some special means of getting down to low wavelengths. A most efficient way of doing this is to sling

a counterpoise earth directly beneath the aerial. A suitable counterpoise consists of a wire equal in length to the aerial and carefully insulated from the ground. A well-spaced basket coil with a .0002-microfarad variable condenser in parallel will give excellent results if good thick wire is used. A very efficient coil can be made of a thin cardboard former and twelve turns of No. 14 d.c.c. wire tapped at the sixth, ninth and twelfth turns respectively. Valve legs and sockets should be used instead of the more usual selection switch.

Alternatively a .0002 fixed condenser can be placed in series with the aerial and a direct earth used; special care must be taken to ensure a really short and effective earth lead.

KDKA (now testing on 68 metres) can be heard on one valve (with reaction) almost any night after 11 p.m. (G.M.T.)

provided that the aerial is up to the mark. The transmissions begin at 11 p.m., but there is a marked improvement in signal strength after midnight, and the volume reaches a maximum intensity towards 3 a.m.

G. J. M.

"5 Y M's SINGLE VALVER" (continued from preceding page)

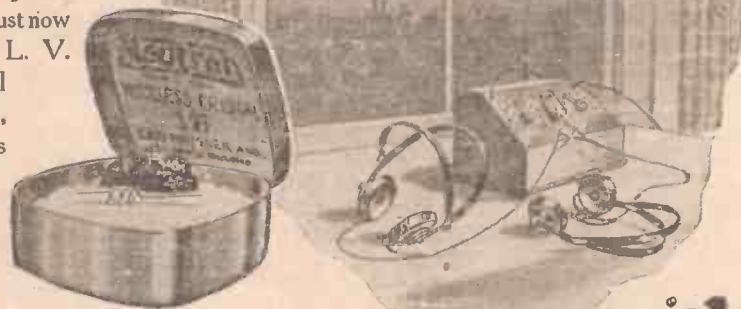
higher wavelengths Igranic coils. The valve is a Marconi DE3.

The valve used in the note magnifier is a French Mikro. A DE3 would serve equally as well with the same low current consumption. Fig. 4 shows the connections for adding a note magnifier to the set. Here again the circuit is perfectly straight. As only 3 volts are used for filament heating, no filament resistance is used.

5 Y M.

and now, Brussels...

To the wonderful record of long-distance reception with Neutron Crystal must now be added that of Mr. L. V. Clark, of Experimental Station 5BT Chiswick, London, who reports receiving clear telephony from BRUSSELS on a Neutron Crystal, without the aid of Amplifiers.



—with Neutron, the Crystal that is doubling the range of the Crystal Receiver

Sooner or later, you will use Neutron, and then stop searching for better results. You may secure a good crystal by just asking for "a crystal"; but you may also try twenty or thirty first. On the other hand, if you ask for Neutron, in the black-and-yellow tin,

you will inevitably secure optimum results *at once*—and save the expense of further tests. This was the experience of "W. T. T." Harrietsham, Kent, who writes:—"I have tried crystal after crystal, but I have never had such a good result before as I have to-day

with a Neutron." The reason why you can depend upon Neutron is that each Neutron is carefully tested and selected, and before ever it reaches your crystal-cup it has been proved at maximum efficiency, for loudness, clearness, and complete sensitiveness.

NEUTRON

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The Concert-Tested and Guaranteed Radio Crystal

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Ltd., St. Pauls Buildings, 24, St.
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All the best Radio Dealers sell and recommend Neutron (in the black-and-yellow tin). If you should have any difficulty in obtaining it, send 1/6 with Dealer's name and address and this guaranteed Crystal will be mailed by return. **1/6**

See Stand D2, British Wireless Exhibition, White City, Nov. 15 to 29

THE NEW GLASGOW STATION

THE new headquarters of the B.B.C. in Glasgow are a vast improvement on the original premises, which latterly became most cramped and inconvenient as the work of the station increased. The official opening by the Lord Provost of Glasgow on November 6 provided a most successful broadcast, and in the musical programme a special feature was the augmented orchestra under Sir Landon Ronald.

Three flats of a large building in Blythswood Square are now occupied by the B.B.C., and in addition to the usual station offices there are also situated here the headquarters of the assistant controller for Scotland, Mr. Millar Craig, and the superintending engineer for the north, Mr. J. M. Cameron.

The dimensions of the new studio at 5 S.C. are approximately 40 ft. by 25 ft.; two large microphones of the latest type are installed. There is also a small "talks" studio in another part of the building. The general arrangements of the studios, such as draping, etc., are of the usual character. The main studio is on the first floor, and close by is the primary amplifier.

It is no longer necessary to have the artist who is broadcasting visible to the operator of the control, and so the latter are placed in the basement for reasons of

convenience. Here also is the secondary amplifier, which receives the telephony after it has been dealt with by the primary. It is then passed on to the transmitting station at Port Dundas over a mile away.

The amplifying gear is a great advance on what was used at the old station, and a complete stand-by set is in constant readiness in case of a breakdown. A change over can be effected with practically no interruption of the programme. On the S.B. board are private lines to London, Aberdeen, Edinburgh and Dundee.

"An Electric Lamp for the Dressing-table" is illustrated and described in the current issue of "The Amateur Mechanic and Work" (3d.). Other articles appearing in this number are: "A Condenser-tuned Crystal Set"; "Working in Vulcanite"; "A Book and Magazine Stand"; "Tinning Cast-iron Utensils"; "Motor-cycle Practicalities"; "Cutting Glass Tubes for Crystal Detectors"; "Notes by the Way"; "A Lean-to Greenhouse"; "Glasspaper or Emery Polishing Cones"; "Three Puzzle Joints for the Woodworker"; "A Chat on Lantern Slides"; "Our Small Car Page"; "The Beginner's Microscope"; and "Fishing for Grayling: The Tackle and Lines."

We want programmes with some punch in them, says a critic. Wasn't the Firpo-Wills fight good enough for him?

SOMETHING TO WRITE FOR

THE current issue of the *Wireless Bulletin* has been received from G. Davenport (Wireless), Ltd., of 69 and 70, Dean Street, Oxford Street, W.1.

W. H. Tant and Co., of 107, Dolman Street, Vauxhall, Birmingham, state that they now supply ebonite and erinoid moulded and turned parts, panels, etc., for the wireless trade.

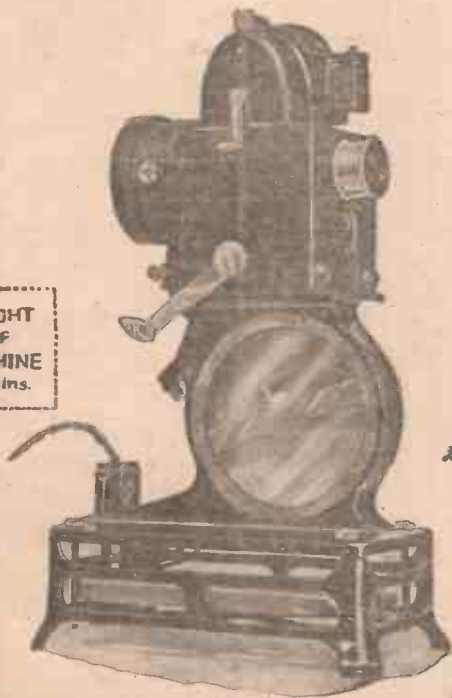
We have received from L. McMichael, Ltd., of Radio Corner, 179, Strand, W.C.2, a very interesting catalogue of a large array of wireless sets and components. A handy reference system has been adopted that enables the particulars of any part or set to be ascertained in a moment.

A showcard, together with literature on the Mars aerial wire, has been sent us by E. and W. G. Makinson, Ltd., of Preston.

The name of Mr. Baldwin should be added to the catalogue of Cabinet set-makers.

We learn that the chatter of the Zoo parrots is to be broadcast. A good many of us had enough of that during the election.

HEIGHT
OF
MACHINE
12½ ins.



Pathé of France Ltd



Go to the "Movies" in your own Home

The "Baby" Ciné Projector is a Cinema for the Home, complete and perfect in every detail. Compact, simple and safe, a child can operate it with ease, exactness and safety. The films are absolutely non-inflammable.

The "Baby" Ciné Projector is not a toy, but will give years of service. It is a product of Pathé the famous French pioneers of the Cinematograph Industry.

PRICE
£6-15-0

Mirrors the World in Your Home

It can be switched on to any electric light circuit and is adaptable to any voltage.

A large Catalogue of all classes of film subjects is available, to which constant additions are being made, and which will include the majority of the world's leading stars. FILMS, Price 3/- each.

THE
"Baby" Ciné
PROJECTOR
THE REAL HOME CINEMA

5, LISLE STREET, LEICESTER SQ. LONDON, W.1.

DUTCH VALVES

TRADE DISCOUNTS



0.06 DULL EMITTER

Will take from 20 to 100 volts on the anode, thus enabling fullest volume of sound and no extortion.

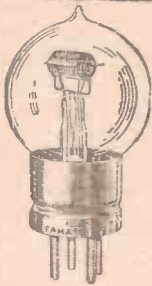
Filament volts	Anode	Amps.
1.6 to 2.0	20-100	0.06

Price Retail **12/-** each.

"R" TYPE DETECTOR

Fil. volts.	Anode.	Amps.
3.8-4.0	30 to 60	0.5

Price Retail **4/11** each.



TUBULAR TYPE AMPLIFYING

Fil. volts.	Anode.	Amps.
3.8 to 4.0	30 to 60	0.5

Price Retail **4/8**



"Powquip" Transformers Ratio, 5 to 1 guaranteed heavy wound, each **12/6** retail.

Every valve exchanged if same lights but does not function.

Buy direct from—

BISHOPSGATE ELECTRIC SUPPLY (1924) CO.,
180, Bishopsgate, London, E.C. 2

Phone: Central 7361.

Kindly remit postage

VERTEX AERIAL

Hundreds of users say that the "VERTEX" is the most compact, attractive and efficient aerial on the market. Easily attached to chimney-stack or face of wall, as shown, it increases range, volume and purity. It has one mast only, and can be installed in the most confined space. The "VERTEX" obviates "interference." Complete with 50-ft. downlead, 4 insulated arms and central steel hub **£3 15 0** bracket, ready for mounting on mast. Steel wall brackets, with bolts, nuts, Rawlplugs and screws can be supplied.

"VERTEX" INDOOR AERIAL
A most efficient long-range "VERTEX" Indoor Aerial is also made for use where outside aerial is not possible. Can be suspended in loft under roof or in a top room. With 35-foot down-lead, insulated cords and ring for suspension. **£3 15 0**

Trade Enquiries Invited
WIRELESS APPARATUS LTD.,
36 Pantom Street, Haymarket, S.W.1.



REGD.

VARIABLE GRID LEAK ... 2/6 ANODE RESISTANCE ... 3/6

Continuously variable, silent in operation, dust and damp-proof. The resistance elements are made by a special process and are perfectly dry. Every Grid Leak and R-resistance is tested and guaranteed.

Beware of imitations. See the Watmel Trade Mark on every Grid Leak. Note the new address.

WATMEL WIRELESS CO.
332a Goswell Road, London, E.C.4
Telephone: 7970 Clerkenwell.



See P.C. for Descriptive Folder.

Patent No. 21687

"MURRIS" 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 1/2 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 carr. pd.

M. VERSTRAETEN

(Dept. 10), Melville Chambers, 50a, Lord Street, Liverpool



THE MAKER'S REMINDER



The little tongues of metal you see on your new component are there as a reminder to you from the makers that this instrument is best soldered into your circuit. You may say to yourself—"Why should I bother to solder when I can easily screw or twist a wire into position—besides, do, and messy as well."

Make no mistake about it. If you want the best out of your set you must give it of your best—solder every connection—spare not one, and you will be delighted with the great improvement of the receptive qualities. Soldering is made simple by the use of the famous FLUXITE, and thousands of wireless enthusiasts will testify to the wonderful aid FLUXITE gives them when they go a-soldering.

Ask your Ironmonger or Hardware Dealer to show you the real little

FLUXITE SOLDERING SET

It is perfectly simple to use, and will last for years in constant use. It contains a special "small-space" Soldering Iron with non-heating metal handle, a Pocket Blow-lamp, FLUXITE, Solder, etc., and full instructions. Price 7/6. Write to us should you be unable to obtain it.

PRICE 7/6



FLUXITE SIMPLIFIES SOLDERING

All Hardware and Ironmongery Stores sell FLUXITE in tins, price 3d., 1/4, and 2s.

Buy a Tin Today.
FLUXITE, Ltd., 32, Baviaton Street, Bermondsey, E. 1 and 4.

ANOTHER USE FOR FLUXITE
Hardening Tools and Case Hardening
of KEYS, LEAFES, etc. on surplus metal

FORGET THE REST AND BUY THE BEST

PORTLAND

LOW FREQUENCY

TRANSFORMER

FOR CLARITY AND STRENGTH OF TONE.

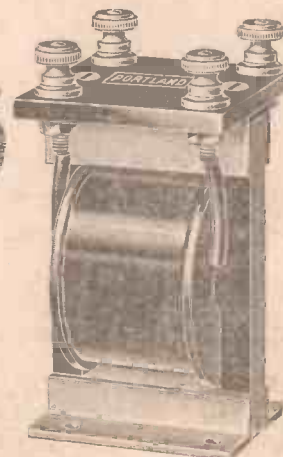
PRICE

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EACH

THE SECRET'S
IN
THE WINDING.

British Made.



FREE FROM NOISES

Every Transformer tested and inspected before despatch.

Surprisingly better than others at higher price.

Manufactured by very latest methods ensuring uniform results.

Suitable for every stage of valve or crystal amplification.

Thoroughly insulated between windings.

Adopted by many manufacturers of first-class sets and amplifiers.

UNCONDITIONALLY GUARANTEED

Thousands in use giving absolute satisfaction. Not one returned to us during the last six months.

OBTAINABLE FROM ALL HIGH-CLASS DEALERS.

Manufactured by:

PORTLAND WORKS, 84, HIGH ST., MARYLEBONE, W.1

BETTER THAN THE BEST OF THE REST

ARMISTICE DAY IN SCHOOL

ARMISTICE Day this year found me in a large school in the north of England, and it was my good fortune to be able to hear the reception of the Armistice commemoration service broadcast from one of our main broadcasting stations.

On most previous occasions I had observed the two minutes' silence as one of the great crowd of business men who collect round about Whitehall in London within earshot of Big Ben. On another occasion I had taken part in the same simple service of homage out in British

Columbia. But I can safely say that on no previous occasion was I impressed so much as I was this year.

Nearly a hundred girls and boys stood in the large school hall. Some of them were only ten years old, some were even younger. The oldest amongst them could not have been more than fourteen. Their recollections of the war must have been very slight.

The set used was a three-valve receiver (one detector and two low-frequency amplifying valves). Only the loud-speaker was new to me—a Puravox.

Promptly at 10.45 a.m. the little folk lined up for the ceremony. By accident

the operator, one of the teachers, got on to a relay station—Nottingham—and the beautiful music of Elgar's "Land of Hope and Glory," played by a band, was heard. Following this the voice of a bishop reading prayers came through clearly.

At five minutes to eleven the tuning was altered to Manchester. Three minutes before the hour the bugle call, the "Last Post," came through with wonderful clearness. I could not help noticing the marked effect on two ex-army officers amongst the teachers. Their shoulders squared up, they stood at attention, and their faces took on that steady immobile look so familiar to those with experience of army ceremonial parades.

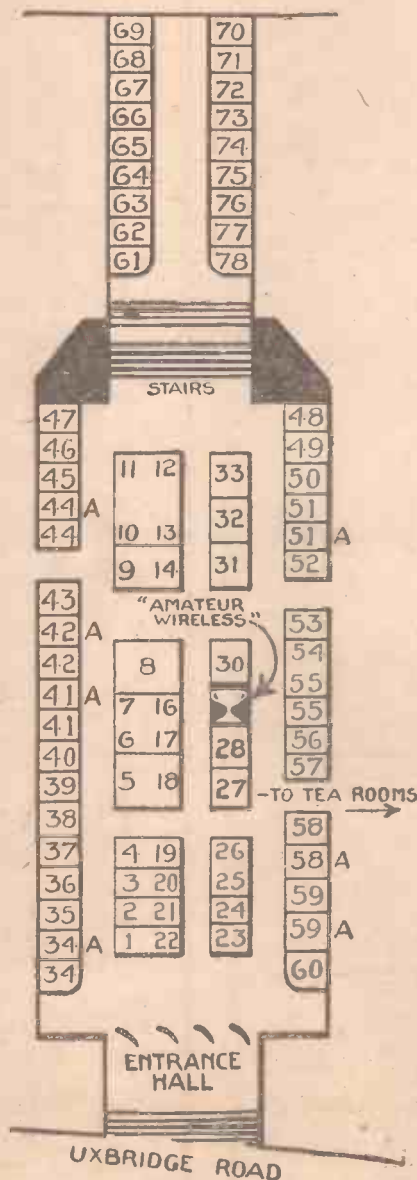
During the two minutes' silence one or two local oscillators could be heard faintly, but no one took the slightest notice nor was the effect spoiled by these wireless irrepressibles. The "Réveillé" came through as clearly as if the bugle had been in the room. After one verse of that grand hymn, "O God, our Help in Ages Past," the set was switched off and the children sang the hymn through themselves.

There are still people to be found who maintain that wireless reception is soulless and that the various items broadcast fail to "get over." I wish such people could have been with me on Armistice Day. They would have seen that a simple commemoration service received by wireless as I saw it received could be as impressive, perhaps more impressive, than any other type of Armistice commemoration service. B. P.

WHITE CITY EXHIBITION

For the convenience of our readers we reproduce a plan of the Exhibition, together with a list of exhibitors. Details of individual exhibits were given in our last issue. "Amateur Wireless" is offering a very handsome silver cup as first prize in a competition for wireless novelties.

- | Stand Number. | Name of Exhibitor. |
|---|--|
| 1, 22. | Fellows Magneto Co., Ltd. |
| 2, 3. | J. W. B. Wireless Co. |
| 4. | Victoria Electric Co., Ltd. |
| 5, 18. | New Times Sales Co. |
| 6, 7, 16, 17. | Oldham & Sons, Ltd. |
| 8. | New London Electron Works, Ltd. |
| 9, 14. | Igranic Electric Co., Ltd. |
| 10, 11, 12, 13. | Pettigrew & Merriman, Ltd. |
| 19. | Sel-Ezi Wireless Supply Co. |
| 20. | India Rubber, Gutta Percha and Telegraph Works Co., Ltd. |
| 21. | Tungstallite, Ltd. |
| 23. | Seagull, Ltd. |
| 24. | Wireless Service. |
| 25, 26. | City Accumulator Co. |
| 27. | Penton Engineering Co. |
| 28. | Neutron, Ltd. |
| 29. | AMATEUR WIRELESS. |
| 30. | Telegraph Condenser Co., Ltd. |
| 31. | A. K. U. Co. |
| 32. | J. V. Mulholland. |
| 33. | Fuller's United Electric Works, Ltd. |
| 34. | Stella Products. |
| 35. | Henry Joseph & Co. |
| 36. | F. Yates & Son, Ltd. |
| 37. | F. H. Middleton. |
| 38. | A. W. Knight. |
| 39. | Harding, Holland & Fry, Ltd. |
| 40. | Jeb Trading Co. |
| 41. | Formo Co. |
| 42A. | Burwood Electrical Supplies Co. |
| 43. | Precision Screw Co., Ltd. |
| 44. | Portable Utilities Co., Ltd. |
| 45. | Wireless Retailers Association. |
| 46. | Morch Bros., Ltd. |
| 47. | Bullen. |
| 48. | Lighting Supplies Co., and Ecco Radio Co. |
| 49. | Hart Collins, Ltd. |
| 50. | Sydney Jones & Co. (London), Ltd. |
| 51. | Refty Electrical Appliances, Ltd. |
| 51A. | Radio Improvements. |
| 52. | M. W. Woods. |
| 53. | Gran-Goldman Service. |
| 54, 55. | Read & Morris. |
| 56. | Peronet, Ltd. |
| 57. | Abgar Electrics. |
| 58. | Klein Bros. |
| 59. | A. R. Avent. |
| 59A. | American Hard Rubber Co. |
| 60. | Superlamp, Ltd. |
| 61. | Energo Products, Ltd. |
| 63, 64. | Competition Entries. |
| 65, 66, 67, 68, 69, 70, 71, 72, 73, 74. | Demonstration Hall. |
| 75. | Entries for AMATEUR WIRELESS Inventions and Novelties Competition. |



BROADCASTING FROM A PIT BOTTOM

THAT the ingenuity of the B.B.C. programme compilers has by no means come near its end is evidenced by the broadcasting of a pit-bottom concert that is to take place on November 28.

The pit is at Normanton, and the experiment is being carried out by the courtesy of Henry Briggs, Son and Co., Ltd., who own the Whitwood Colliery.

A talk on coal mines will be given by Prof. James Riton, B.Sc. Mr. George R. Lister will tell of his experiences at the pit bottom. These items will be followed by selections by the silver prize band run in connection with the colliery.

"Europe Calling."—In the article published in No. 128 under the foregoing title it was inadvertently stated that the German stations terminated their programmes with the playing of "Heil Dir im Siegekranz" to the melody of "God Save the King." This should read: "Deutschland, Deutschland ueber Alles," the tune of which is known in this country as "Austria." This was dropped by Germany as the national anthem when the republic came into being, the former being used by the Monarchist party now only.

Mr. E. Conomy says:



STAND 27
White City
Exhibition.

**“ELECT PENTON
AND REDUCE CURRENT
TAXATION.”**

The cost of a valve to you is not the price you pay for it—but what you ultimately pay to feed it with current.

To discover whether or not a valve is economical—add to its first cost all costs of accumulator charges over a set period—then compare with the costs of the same period using a:—

**PENTON
LOW CONSUMPTION
VALVE**

Take a twelve-week period, using your set, say, 4 hours each day with an ordinary “R” Type valve. During that period your accumulator will require recharging ten times at 2/- per charge, or 20/- in all.

With a Penton Low Consumption Valve, the accumulator will require charging only twice in twelve weeks—costing you 4/- only!

You therefore save 16/- current taxation in twelve weeks and the

PENTON LOW CONSUMPTION VALVE

**COSTS
ONLY**

15/-

Saving more than
its own cost!

Type H.E.4 for 6-volt accumulator. Plate voltage 40. Filament Current .15 amp. Filament volts 5. 15/-. Postage 9d.

From all good dealers or direct from
PENTON ENGINEERING CO.,
15, Cromer Street, King’s Cross, W.C.1.
Telephone: Museum 4861. Telegrams: Erpentobal, Kinross.



**Give life to your
SET!**

Increase your range and get more
volume with the—

**NATIONAL SUPER
CRYSTAL COMBINATION**

Another glowing tribute (unsolicited) from an astounded user:—

Chipping Norton.

“Dear Sirs,

May I express to you my great satisfaction at the way your Crystal performs. I am roughly 50 miles from Birmingham, and receive that Station nightly, and can frequently hear London, Cardiff and Manchester. After my experience with the so-called Crystals in the R.E. Wireless Section during the late War, I am astounded at the strength and clearness of the signals your Set receives.”

Signed.....

**Scrap the “duds”
—buy the “goods”**

We claim that the National Super Crystal combination is the world’s best—that there is nothing to equal it for life and sensitivity. Users know this already—and if you do not find it so, we will at once refund your money. Buy the National to-day—prove it to-night.

From all Wireless Stores, or direct for

1/9

Refuse substitutes—they are inferior.

postage, 2d.

IMPORTANT NOTICE

Owing to the enormous expansion of our business, we have been compelled to seek new premises offering more room for factory extensions, therefore kindly note our

CHANGE OF ADDRESS

At these new works (to which all letters should be addressed) we have equipped a complete General Service Department, Repair and Accessory Department, and Accumulator Charging Station.

ALL RADIO COMPONENTS ALWAYS IN STOCK.

**NATIONAL WIRELESS
AND ELECTRIC CO.,**
42, Gray’s Inn Road, London, W.C.1.

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

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 10/6 will be paid.

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.

AMATEUR RECEPTION OF AUSTRALIA

MR. FREDERICK WALKER, of Walton-on-Thames, has succeeded in picking up wireless signals from Australia on a home-made two-valve set. On Wednesday, November 12, he was trying to get New Zealand on a wavelength of 90 metres when he heard faint Morse signals from A 2 M E, Victoria.

On Thursday, November 13, at 6.50 a.m. he picked up signals on 93 metres from 3 P Q, Box Hill, Victoria, which continued readable until 7.15 the following morning.

IPSWICH AMATEURS' EXHIBITION

THE two days' exhibition organised by the Ipswich and District Radio Society, and held on November 11 and 12, was a great success. All who paid a visit to the Church Institute Hall were much impressed by the exhibits.

In all letters to advertisers please mention "Amateur Wireless." :: ::

TRADE **Grelco** MARK

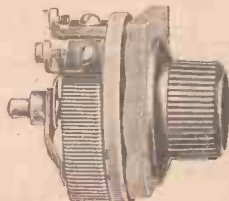
THE GRELCO LOUD SPEAKER HAS

attained extraordinary popularity purely on its outstanding merits. We ask you to come and hear it.

The technical staff of *Wireless Weekly* report (Sept. 10th.)—
"The tone of the instrument was a matter of favourable comment."



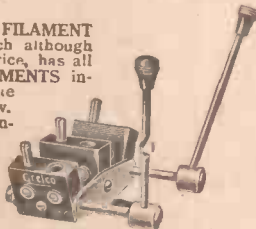
LAMINATED POLES
Adjustable Air Cap
Height 22". Flare 1" dia.
Base 6 1/2" dia., £2-10-0
Special packing and post, 2/.



PORCELAIN BASE FILAMENT RESISTANCE, which although very moderate in price, has all **LATEST IMPROVEMENTS** incorporated. Ebonite shown in shadow. Porcelain is non-hygroscopic. Wire wound on special former.
6 ohm, 2,3 post 3d.
25 " 2,3 " "



TUNED ANODE ADAPTOR for connecting H.F. Transformer to Tuned Anode. 2/- each, post 2d.



The **NEATEST COIL HOLDER YET PRODUCED** for panel mounting. Delightful to use and "tension" adjustable. Finished in polished N. P.
2 coil ... 3/6 ... post 4d.
3 coil ... 5/- ... "



Polished ALUMINIUM Adjustable Headband
2/- each. Post 3d.

Telephone: MUSEUM 751

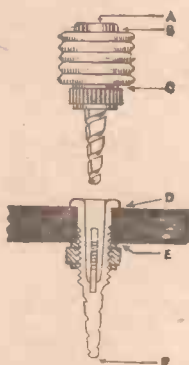
Works: SLOUGH

ELECTRIC GRAFTON COMPANY

54, GRAFTON STREET, LONDON

TOTTENHAM COURT ROAD.

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.

Clix Popularity—the Secret!

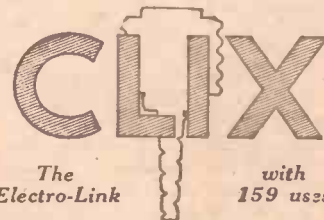
You can't have efficiency in Radio anywhere unless you have efficient contact everywhere.

You can't use solder everywhere—but you can use CLIX.

By virtue of the tapered threaded design of its plugsocket, CLIX ensures perfect contact—an obvious improvement on various forms of split-pin plugs, which, however accurately machined, can only permit of a "two-point" contact. Think it out!

Retail Prices

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



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

AUTOVEYORS LTD

Radio Engineers and Contractors

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

ELECTRADIX The Government Surplus Wireless Depot

New Bulk Deliveries from
R.A.F. Depots and Cable Stations

Absolutely the Finest Show of High Grade Radio Instruments
in London. Many New Bargains! Prices a fraction of Cost!



Another 2,000 "C" EDI3WAF VALVES offered at 6/3 (by post at buyer's risk). Clips, 6d. Adaptors, 4-leg, 1/-. The cheapest high frequency, low capacity detector-amplifier ever offered. Detects, amplifies. Ask your local dealer for one.

6/6 each

D.C. DYNAMOS. The R.A.F. charging sets, enclosed type, ball bearings, etc., costing £15 and quite new, are offered at £3 D.C. high tension machines. Marconi 1,500 v. 12 ma, £8. M. G. Mortley, 1,200 v. 90 ma, £22. M.G. B.I.H. 750 v. 80 ma, £10. 2,000 volts, 2 kw. £35. 10,000 Electric Canole Lamps, 220 volts, 10/- per doz.

RECORDING OF WIRELESS SIGNALS. The great demand for R.A.F. Morse Ticker Recorders indicates the great interest taken in recording distant wireless signals. Cost £40. Few left at £6 10/-.

Put a .02 mfd. CONDENSER across your H.T. battery. Neat and effective, 1/6 each. Mica condenser squares, 2,000 thick 2 1/2" x 2 1/2", 6d. per doz. R.A.F. Watershed insulators, 1/6 per doz. Loud speaker or 'phone extension wire for indoors, insulated with enamel and double cotton, 100 yds., 2/-. Heavy twin battery flex, rubber and glass cotton, 3d. per yd., 5,000 yds. in stock, 18-gauge varth wire, 1/3 doz. yds. Earth spikes, 1/3. Copper gauze counterpoise earth. Lay under carpet when no earth convenient, 15/-. REMOTE CONTROL Switches, 15/-.

AERIAL WIRE. 7/23 copper, 50', 100', 100', 1/3; 110' cartridge aerial, 1/3. Morse practice outfits, 5/6. 25,000 pairs zincite-borite crystals in Pericon cups, 6d. pair. Folding frame aerials, 21/6.

RECEIVERS. Here are the Bargains. A complete outfit for 10/-, comprising 30 C. tuner and enclosed detector, 50' aerial wire and insulators, with single headphone. Guaranteed 20 miles. Other crystal sets, 30 Ct, with lid, 17/6. Large roll top B.W.G., 37/6. Mark III* short, medium or long wave. The finest Government set ever made. £5. Marconi ship receivers, £4 10/- Crystal and 1-valve. B.W.G., toll-top, £3. 2-Valve Mk. III, for 200-1,800 metres, in mahogany case with lid, absolutely complete and tested O.K. Works loud-speaker 30 miles. Thoroughly recommended. £4. R.A.F. 3-valve portable Mk. III aircraft, 75/- R.A.F. No. 10 aircraft, 3-valve, £5 5s. (Prices less valves.)

AMPLIFIERS. See bargain above. T.B. 2-valve for crystal sets, £2. Gen. Radio Co's 2-valve £3 10/-, 6-Valve H.F. and L.F. Mk. IV, £5 10/-, 7-Valve Marconi 55, £8. Brown's micro. amp. less reed and button, 25/-.

We could fill all the advertisement pages of this journal and then not exhaust our stock list, so please send 4d. in stamps for our 68 pages of illustrated catalogue and list.

It will save you pounds and a lot of time. Call if you are in London, as we are close to Aldgate Metropolitan Railway Station, to which trains run from everywhere. Buses pass the entrance.

LESLIE DIXON & Co., 9, COLONIAL AVENUE, MINORIES, E.1.

On Bus Route. Near Aldgate Met. Rly. Station
Telep one—Avenue 4166. CALL AND SEE STO K Telegrams—Electradix Ltd.

Barclays N.A.Z.

10,000 New R.A.F. STEEL TUBE MASTS, at 15', 7/3; 20', 10/-; 25', 12/8; 30', 14/-. Scrap your feeble wood pole at once!

This week's SPECIAL BARGAIN is R.A.F. 3-Valve, Mk. IV Amplifier and a True-Tone Loud Speaker for £3 15s. Equally good for crystal or valve set. 100 sets only.

ALTERNATORS selling fast. You should secure one at the bargain price before it is too late.

200 WATT MIDGET ALTERNATORS, 52A

The most perfectly made little Generator used on aircraft, gives 500 cycles 10 volts 20 amps, weighs 7 1/2 lbs., in aluminium cover. The Generator of unlimited possibilities. The machines are unused and fully guaranteed. With quite a small transformer, any H.T. voltage from 100 volts up to 3,000 volts may be obtained, smoothed and rectified for plate H.T. The wonderful little machines cost £30, and are given away at 70/- each.

PHONE BARGAINS. Single L.R. Receivers, by Siemens, Western, etc., 1/6 and 2/- each. 2,000 ohms, 4/-. New Sullivan L.R. head sets, 5/5, 2,000 in stock. Fr. Thomson-Houston, brand new, 25/- Head sets for 14/6. 750 in stock. W.D. Western head sets, 4,000 ohms, 12/6 pair. Brown's micro-amplifiers, less reed and button, 27/6. "True-Tone" Loud Speakers, large adj. lam magnet, 4,000 ohms, polished wood base, rubber feet, ebonite horn, etc., 35/-, reduced to 20/- Best british.

INSTRUMENTS. First-class high grade Instruments. No Hun stuff! We have the finest stock in London of ex-W.D. precision instruments of accuracy by Elliott, Naiders, Weston, Paul, B. and E., etc., in all ranges from microamps up to 1,000 amps. A.W.C. 375 mounted in a crystal panel will indicate the signal strength exactly. Price 65/- and guaranteed perfect. Megger insulation sets from £12. Wheatstone bridges, 45/- 500 Resistance boxes by Sullivan, Gambrill, Muirhead, etc., in all ranges. Fitted ebonite panel with plug top or switch. Prices 10/- to £3. Alarm for special list or state requirements. Large stock of laboratory condensers by same makers, with plug or switch for ranges from 1/2 mfd. to 8 mfd. Beautifully made in polished mahogany cabinets. Cheap to callers. Vertical galvanos., 17/6. Horizontal, 20/- G.P.O. detectors, 15/-.

TRANSMITTERS. All types in stock. Spark 1" sets, with tuner, condenser and key, 15/- 2" Spark, 52 B., 35/- One-valve Wilson tuner, 20/-, 1,000 volt generator, for ditto, £3. One-valve French M.I.I. transmitter, with telephony accessories and H.T. unit, £7 10s. 2-Valve aircraft transmitter, with remote-control. £3 10s. (Prices less valves).

WAVEMETERS. Surely you have a wavemeter! No? Then no wonder you oscillate! We have the finest of the Government types in stock by Paul and other instrument leading makers. Broadcast Townsend, £2 10s. Long range, 120/4,000 metres, £8. Station wave-testers, 120/3,000, £5. Famous Forward, 80/9,000 metres, £7 10s. Special for American stations, 40/1,000 metres, £4. All to N.P.L. standard. Accuracy guaranteed. Order a wavemeter without delay. G.R.C. variometers, half price, 9/6. Vario couplers, 12/6. 10" spark certs, Marconi, £4.

Build your own set.



and
USE ONLY



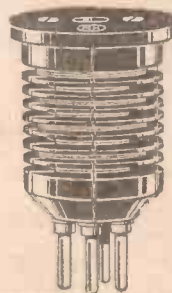
COMPONENTS

H.F. TRANSFORMERS

A series of H.F. plug-in transformers in six ranges of wavelength. They are made of our highly polished non-loss ebonite. The windings are carried in staggered slots, well protected, ensuring low self-capacity and high efficiency. Each transformer is tested to a standard oscillator and any not coming within very narrow limits are rejected. Perfect matching is thus ensured.

No. 00.	80 to 150 metres	...	10/-
No. 0.	150 to 300 metres	...	10/-
No. 1.	300 to 600 metres	...	10/-
No. 2.	550 to 1,200 metres	...	10/-
No. 3.	1,100 to 3,000 metres	...	10/-
No. 4.	2,500 to 7,000 metres	...	10/-
The Complete Set			55/-

Any number of each transformer can be supplied matched at NO extra charge if specified at time of ordering.



L.F. TRANSFORMER

A high-grade and efficient Transformer of pleasing design for all intervalve purposes, possessing the best possible electrical characteristics. A point to observe in the design is that the fixing down lugs can easily be got at. The screwdriver when screwing in the holding down screws is not fouled by any portion of the transformer. Each transformer tested to 1,000 volts.

Price in carton ... 21/-

FIXED CONDENSERS

Each supplied with two Clips.

PRICES:
0.001 μF to 0.0001 μF 1/9 each
0.01 μF to 0.002 μC 2/3 each

We introduced, and have adopted as our standard, the flat type fixed condenser which slips into two clips. They are made of high-grade ruby mica and tinfoil. Connection is made by their solid metal ends to two spring clips which go directly under the terminal nuts, thus avoiding at least two connections. This type is a distinct advance in the design of the fixed value condenser; its utility and adaptability are at once obvious and appeal to all users.

The Best results can only be secured through buying and building into your set the best components possible. To achieve this end, insist on having M.H. components; unimpeachable quality and manufacture throughout.



L.M. MICHAEL LTD

IN CONJUNCTION WITH B. HESKETH LTD

WIRELESS ENGINEERS

RADIO CORNER, 179 Strand, W.C.2

Barclays, 320.



WITH the completion of the relay station at Dundee, which was opened on November 12, the number of B.B.C. installations in Scotland is increased to four. Glasgow and Aberdeen are main stations, while Edinburgh and Dundee normally draw their programmes from elsewhere.

Several complaints have been made that it was distinctly incongruous to broadcast election results to the accompaniment of the Savoy bands.

John Henry will again broadcast at 7.30 p.m. on Tuesday, November 25. Joe Murgatroyd is to be introduced to the microphone on this occasion.

Mr. F. G. Kellaway, who once was Postmaster-General, has been appointed the managing director of the Marconi Co. He succeeds Mr. Godfrey Isaacs, who has been obliged, under doctor's orders, to resign his position.

Scottish amateurs have struck an indifferent patch in the matter of Trans-

atlantic reception. There are now, however, signs of recovery. After a week or two of excellent reports many experimenters suddenly found themselves almost unable to raise a single American broadcaster.

The evening service from St. Martin-in-the-Fields will be relayed from 2 LO on November 23.

A miscellaneous light programme will be broadcast from 2 LO on Wednesday, November 26. The programme will include songs by Miss Nellie Walker, violin solos by Miss Edith Kelly-Lange, and solos by Miss Toni Farrell, the speciality pianist.

Experiments in transmitting time signals will shortly take place at FL, Paris. By means of photo-electric cells the light of stars passing across the eye-piece of a telescope will actuate a wireless transmitter.

A query programme will be given at the

London station on Saturday, November 22. The three most successful competitors will be awarded prizes of five guineas, three guineas and one guinea respectively. In addition these competitors and the next two will be invited to spend an evening in the studio.

Mr. Charles Kilcour Parsons is to be the director of the new Swansea station. He has had a varied and successful career, and for four months recently was assistant station director at Cardiff.

Signals sent out from the wireless exhibition at New York circled the globe eastward in five seconds and westward in six seconds.

Mr. Richard Hughes, whose short play "A Comedy of Danger" was so widely appreciated by all B.B.C. listeners, has written another play entitled "Congo Night," which will be broadcast on November 20.

A "ship's orchestra repeater," designed to enable music played in a saloon to be heard in other parts of the ship, has been developed by the Marconi Co. The liner *Montclare* has been fitted with this apparatus.

Mr. George Bernard Shaw will broadcast from 2 LO his own play *O'Flaherty, V.C.*, at 8.30 p.m. on November 20.

A London amateur, 6 QZ, Mr. Emery, has been successful in re-transmitting the
(Continued on page 802)

—Announcing our "SUPRATONE"

HEADPHONES.

"FOR LIFELIKE REPRODUCTION"



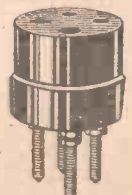
After considerable experiment we are placing on the market headphones we can genuinely recommend to our numerous customers, and which will be found to conform to our reputation and "value-for-money" policy. The SUPRATONE headphones have a resistance of 4,000 ohms and are constructed of the finest material throughout.

The Duralunic™ headbands are adjustable and permit the raising or lowering of the earpieces, ensuring perfect comfort for any wearer. Only the finest insulated wire is used for the magnet windings.

VALVE HOLDER.

Of best quality throughout ... 9d.

All types of Terminals and Brass Parts supplied at Keenest Prices.



Send for our interesting 1924/5 Catalogue To-day.

WATES BROS., Ltd.,

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

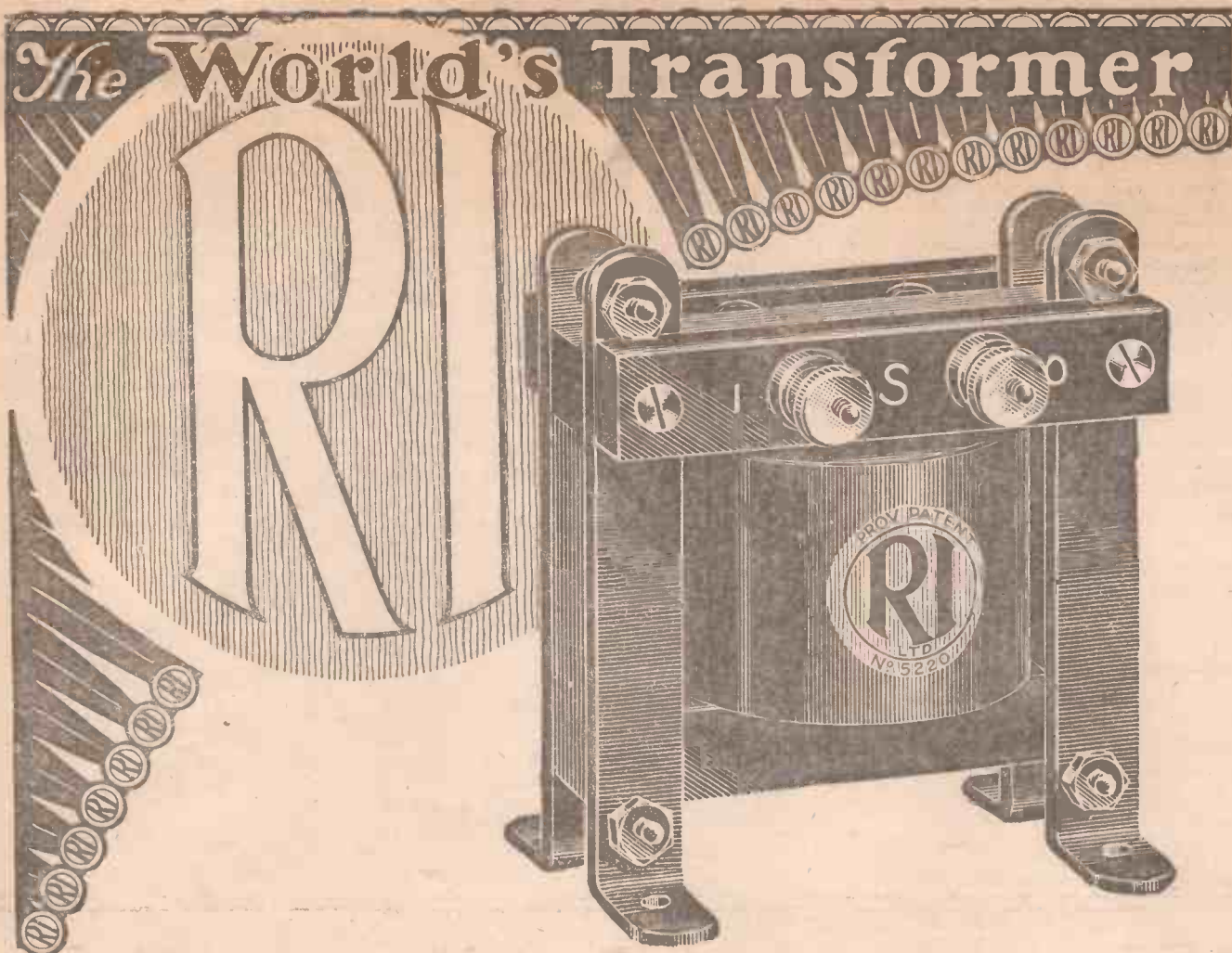
Phone: Gerrard 575 and 576.

Grams: Zywateseng, Westcent.

WORKS: LONDON, BIRMINGHAM, AND WESTCLIFFE.

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Factors and dealers, get our special trade terms.



Lack of Distortion—Abundance of Volume.

These are the points that are nearest the heart of every amateur when he buys a transformer. Ill can he afford to continue to purchase transformer after transformer till he finds the one that suits his particular circuit ; he should learn now that the R.I. suits every circuit. R.I. engineers, differing from all others, specialised in making a

GENERAL PURPOSE TRANSFORMER,

but in the production of the universal type, they never lost sight of the ultimate.

Lack of Distortion—Abundance of Volume.

It is therefore not remarkable that the brains and experience that have been in such demand for over a quarter of a century, coupled with precise and careful manufacture, should produce

THE MASTER TRANSFORMER.

RADIO INSTRUMENTS LTD.

12, Hyde Street, Oxford Street, W.C.1.

Telephone: Regent 6214-5-6. Telegrams: "Instralio, London."



RADIOGRAMS (continued from page 800)

KDKA concerts by means of a seven-valve supersonic heterodyne receiver and a special duplex-working transmitter.

Mr. R. E. Jeffery, the dramatic producer of the B.B.C., is producing plays for blind people because it is felt that if a play can be produced that pleases the blind it will be good for broadcasting purposes.

It is now definitely announced that the Swansea relay station will be erected at Town Hill near the reservoir. Contracts for some of the work have been put out.

An up-to-date polar installation is being fixed in the R.M.S. *Aorangi*, which is being built for the Union Steamship Co. The installation will consist of a 1½-kilowatt spark transmitter with emergency gear, a C.W. transmitter, an automatic call device, a special long-distance receiver, and a broadcasting receiver with seventeen loud-speakers.

The Liverpool station (6LV) has moved from Smithdown Lane to St. Domingo Road. The studio in Lord Street is not affected by the removal.

"Clear, sweet, sonorous, spoken without effort, and giving the audience an impression of friendship" is how the ideal broadcasting voice has been described.

Whaling ships plying the North Sea are now fitted with Marconi direction-finders in order to locate each other and avert collisions in fogs or darkness.

The Newcastle Chamber of Commerce has issued a protest against the French order that all vessels between 500 and 2,000 tons gross are to carry wireless receivers.

Sunday broadcasting has commenced at Belfast and the usual regular programmes will be provided.

The French transmitting station 8DGI reports excellent progress in tests recently made with only 4 watts on a 132-metre wavelength; research in that field is continuing.

Signor Fiamma, an Italian inventor, has made a submarine perform all sorts of evolutions, far from the shore, by simply pressing the buttons of a wireless transmitter. Transmissions from a near-by broadcasting station did not interfere with the experiment.

By a coincidence the wavelength of the longest-wavelength European broadcasting station is ten times that of the shortest-wavelength station—Eiffel Tower works on 2,650 metres and Brussels on 265 metres.

The Radio-Iberica Co. of Spain has recently inaugurated a broadcasting station at Seville, and concerts and news will be broadcast from 7 to 9 p.m. daily.

In order that Germany may possess at least one station fit to compare with Chelmsford and Radio-Paris the power of Königswusterhausen will be increased to 10 kilowatts.

A new high-power station is to be erected at Bolinas with the object of improving wireless communication between South America and China.

There are now 530 broadcasting stations in the United States, and Mr. Hoover (Secretary of Commerce) estimates the number of wireless users at 20,000,000.

After being temporarily closed for repairs, the Lausanne broadcasting station was reopened on November 2.

The Radio Club des Pyrénées states that its members have devised a special method by means of which parasitic noises from near-by motors can be eliminated.

A large broadcasting station is being planned for Agen (in France), operating on a wavelength of 200 metres.

The broadcasting station at Bremen is now completely installed and ready for service. Early tests have been entirely satisfactory to the engineers in charge.

From a New York paper: "For sale: Nine-roomed house, fruit trees, excellent wireless reception, all stations being heard clearly. Price, etc."

The latest development of wireless is the penny-in-the-slot wireless-concert apparatus, installed in an old-fashioned inn near Westminster Abbey. The patron who ventures a penny gets five minutes of whatever fare the B.B.C. is broadcasting at the time.



The new wireless invention
**NO MORE HEADPHONE
-ACHES**

**NO PAINFUL
HEAD BANDS.**

At last the highest science of Acoustics has been applied to Wireless Earphones and the outcome is the "MIC."

A perfect pair of earphones, the "MIC" phones are negligible in weight and have no headbands. Consequently there is no uncomfortable pressure on the head nor unpleasant and dangerous perspiration in the ears.

The reception with "MIC" phones is clearer than with the now obsolete headphone and the volume of sound is adjustable. Yet the "MIC" phones are so tiny that they fit easily into a corner of the waistcoat pocket.

Full particulars from:—

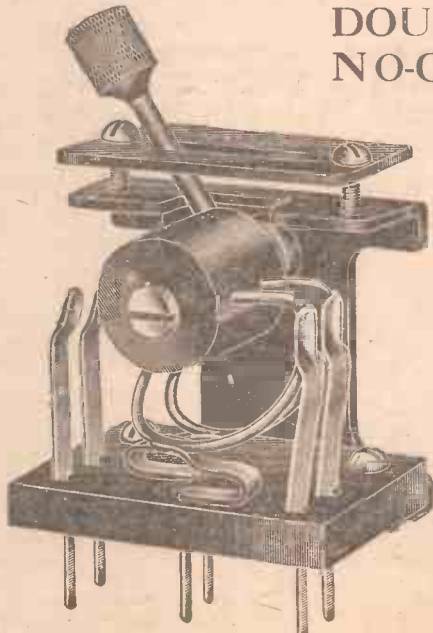
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The "MIC"
actual size
25!
THE PAIR
COMPLETE
In leather pouch
3½ x 2"

UTILITY



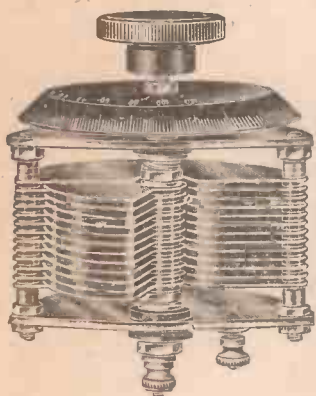
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NO-CAPACITY**

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BIRMINGHAM

SWITCHES

TWO EFFICIENT LISTOLEON COMPONENTS



Variable Condensers

Carefully constructed to give the maximum of efficiency, but as low-priced as is compatible with the finest workmanship. Fit one of these condensers to your set—it will greatly improve delicate tuning.

Prices:—

Capacity	Price	With Vernier	Price	Capacity	Price
.001	8/-	9/6	5/-	.0002	5/-
.00075	7/-	8/9	4/6	.0001	4/6
.0005	6/-	7/6	4/-	.00005	4/-
.0003	5/6	7/-			
.00025	5/-	6/6			

L.F. Transformers

The LISTOLEON Transformer is so well constructed that we are able to guarantee it for a period of two years. The coil is wound by specialists of 25 years' experience, and contains almost twice as much wire as any other competitive transformer sold at 25/-.

The gauge of wire used is such that a current of 20 milliamps can be safely carried continuously. The LISTOLEON Transformer is therefore eminently suitable for use in conjunction with the biggest types of power valves used for broadcast reception. The LISTOLEON Transformer measures 3 3/4 in. long by 2 1/2 in. over terminals, is 3 in. high and weighs 2 lbs. The stampings are best Stalloy, dull blacked; straps and nickel-plated terminals are fitted.

The LISTOLEON Transformer will free your reception from all harshness, whistling noises and that raucous metallic medley of sound usually associated with loud-speaker reproduction.



PRICE:

30/-

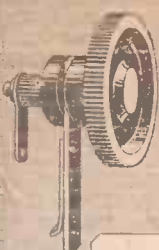
RADIOPHONES LTD.

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Telephone: Regent 4592.

Telegrams: "Radiophon, Rand, London."


Fellows Coils. For all purposes. Standard non-ferrous pin contacts 4/3 to 10/-



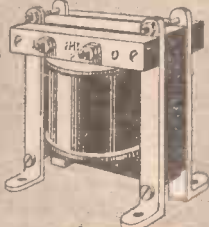
Switch Arms—
As illustrated
2/6 each.



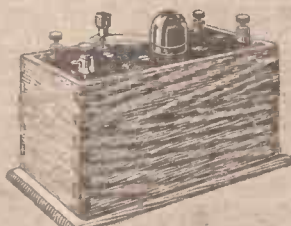
Filament Resistances.
5 ohms for Panel or Cabinet Mounting
3/-



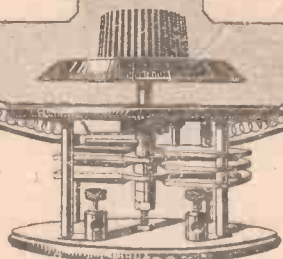
Fellows' components



Low Frequency Inter-Valve Transformer.
Accurate and distortionless 20/- each.



The Fellotone.
For varying and improving the tone of a Loud Speaker, 15/- complete for 2,000 and 4,000 ohms Speakers on y.



Variable Condensers for Panel Mounting. Highly finished with bronze bevelled dial as illustrated.

Variable Condensers: Capacities 0.0006 to 0.001 mfd. Prices 6/3 to 20/-

Whether you are constructing a set to last you five years, or just wiring up a "freak" experimental circuit for the evening you cannot afford to use anything but the best and most reliable components.

In many cases the best is also the cheapest and you are sure to find that the wide range of Fellows components will suit both your set and your purse.

The Fellotone condenser will improve Loud Speaker reproduction considerably and the Inter-Valve transformer is really distortionless. In fact, switch arms, filament resistances or variable condensers, they are one and all true examples of the well-known Fellows policy of

Quality Apparatus at low Cost.

Stands 1 and 22, British Wireless Exhibition, White City.

FELLOWS WIRELESS



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 (5IT), 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), 301 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 (Tue. and Thu.); 18.30, news, weather; 19.00, time sig., con., news; 21.00, dance (Wed. and Sat.).

BELGIUM.

Brussels (SRB), 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 (Kjopenhavros Radiofonistation), 750 m. 19.00, con. (Sun. and Wed.).

Lynghy (OXE), 2,400 m. Week-days: 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.).

* From Nov. 1, on 1st and 15th of each month, a 16.45.

Radio-Paris (SFR), 1,780 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).

L'Ecole Sup. des Postes et Télégraphes (PTT), 458 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-Doña, 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), 500 m. (1½ kw.). 09.00, educat. lec. (Sun.); markets; 09.15, news; 10.35, markets*; 11.15, Stock Ex.; 11.55, time sig.; 12.05, news; 13.15, Stock Ex.; 14.00, markets*; 14.30, children (Sun.); 15.00, markets*; 15.30, orch.; 16.00, markets*; 17.45, lec., children (Wed., Sun.); Eng. conv. (Mon.); 18.00, Eng. conv. (Mon.), children (Wed.), lec.; 18.45, lec.; 19.30, con., news, time sig.; 21.30, dance (Thurs. and Sat.). Evening lec. and con. from 18.00 relayed by Berlin (2) on 500 m. * On W.L. 500 m. only.

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

06.30, 19.40. 2,800 m. (4 kw.): 10.50, con. (Sun.). 3,150 m.: Telegraphen Union, 06.00, 20.00, news. 4,000 m. (10 kw.), Express News

Königswusterhausen (LP), 680 m. (4 kw.). 09.40, con. (Sun.). 2,450 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,

(Continued on page 806)

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Wireless EXHIBITION
AT THE **WHITE CITY**

NOVEMBER 15th to 29th
DAILY 11 AM - 7 PM

THE SHOW FOR ALL CONSTRUCTORS

Magic Music from the Skies
- the GIL-RAY brings it out in all its Purity of Tone

Dear Sirs,
It may interest you to know that I have recently scientifically tested your "GIL-RAY" crystal. Its performance was truly extraordinary when tested both electrically and on a Crystal Set.
From its characteristic curves it would appear to be particularly useful in Reflex circuits.

Yours truly,
L. C., D.I.C., A.I.C., etc.

Price 1/6 of dealers everywhere. If unobtainable, please forward 1/6 and name and address of dealer. Sole Distributors for U.K. and Ireland:

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WIRELESS CRYSTAL GUARANTEED 1/6 GIL-RAY CRYSTAL. INSTRUCTIONS ENCLOSED

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friends and
friends to be—
AN INVITATION

To the hundreds into whose homes I have already introduced better and less costly Wireless entertainment—

To the thousands who know me by name and have read my weekly messages in these pages—

I extend a cordial invitation to
COME AND SEE STELLA
AT THE WHITE CITY.

You have been asked to compare Stella's prices—you have been asked to believe in Stella quality when buying Loud Speakers and 'Phones.

Seeing IS Believing—come to Stand K.34 and have it proved that it is unnecessary to pay more, because it is impossible to get more than Stella Products can give.

From those who cannot come and see me at the White City I invite enquiries, and will be glad to send illustrated leaflets of Stella Loud Speakers and 'Phones.

Yours very sincerely,

Stella

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K 34, WIRELESS EXHIBITION
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are made in the same factory and of identically the same design and quality as the parts used in the world-famous GECOPHONE receiving sets.

They are tested and guaranteed to give complete satisfaction and positively ensure uniformly reliable results.

There is a GECOPHONE component for every requirement—from a simple crystal set to the most elaborate multi-valve receiver.

Build your set entirely with
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and Ensure Complete Satisfaction.

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55 ohms Vari-
35.0 Filament
Resistance 1/6

GECOPHONE
Double
Headphone, with 6 ft.
flexible cord and tag—
120 ohms 22/6
2,000 " 24/-
4,000 " 25/-
6,000 " 25/-
Lorgnette type
Single Headphone
also supplied. Prices
from 15/6

GECOPHONE
Filament Resist-
ance 4.45 ohms
(for one valve) 4/6
2.5-2.75 ohms (or
two valves) 4/6

GECOPHONE Intervalve
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4 to 1 Ratio - - 25/-
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FREE. 20 pages of illustrations, technical descriptions and prices.

GECOPHONE COMPONENTS are sold by all leading Electrical Wireless Dealers and Stores.

BROADCAST TELEPHONY (continued from page 804)
 con. (Sun.). 3.150 m., Telegraphen Union, 06.00-20.00, news (week-days). 4.000 m. (10 kw.): Express News Service, 06.00-20.00 (daily).

Breslau, 415 m. (1½ kw.). 11.00, sacred con. (Sun.); 10.15, Stock Ex., weather; 11.55, 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, 467 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, 387 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, 460 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.).

Lelpzig, 452 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, 407 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), 340 m. Programme relayed from Munich (q.v.).

Stuttgart, 437 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 (NSP), 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 (PTT), 458 m. (500 w.). 16.00, lec. (Tues.) and from 06.45, news, Stock Ex.; 10.00, con.; 11.30, news (daily).

ITALY.

Rome (IRO), 422 m. (1½ kw.). 19.30 to 21.30, 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.

SPAIN.

Madrid (Radio Iberica), 392 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.

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.). 12.15, lec. No Sun. transmissions.

Lausanne (HB2), 850 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 (Höngg), 650 m. (500 w.). 12.00 and 16.00, weather, news, Stock Ex.; 17.15, children (Mon., Wed., Fri.), women's hour (Thurs.); 18.00, weather, news; 19.15, lec., con.; 21.00, news. Sun.: 11.10 and 19.15, con.; 21.00, news.

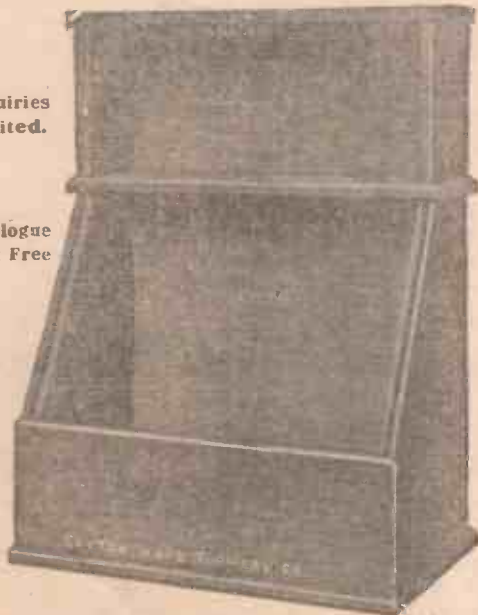
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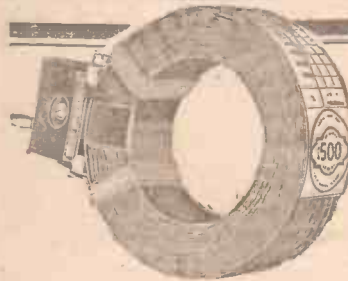


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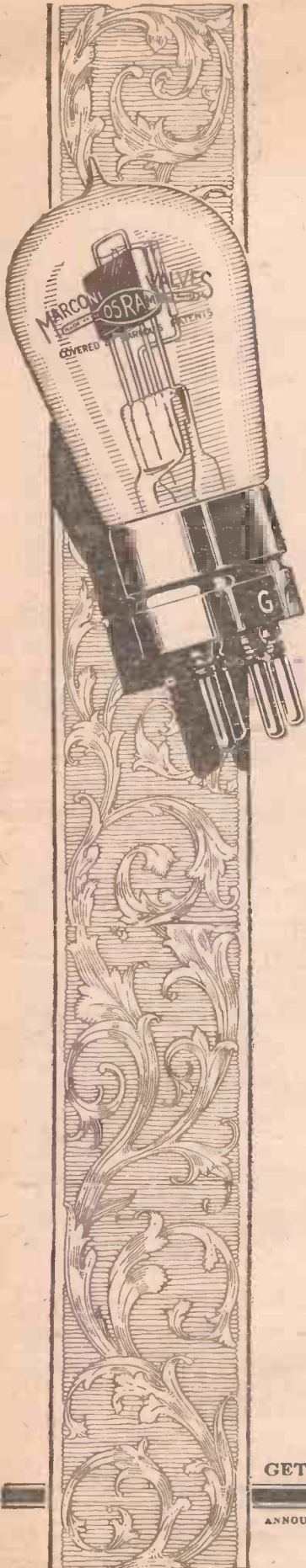
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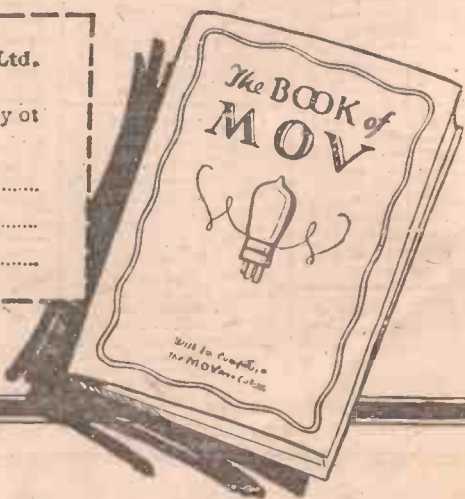
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Amplification

SIR,—The respective merits of H.F. and L.F. amplification depend upon the circumstances of the case. Receiver, aerial, earth, location, distance are all factors which vary to so large an extent that only experiment can show the best results.

To condemn H.F. amplification altogether, as some writers have done, is not sound reasoning. Signals of all amplitudes are on our aerials, but detectors are not efficient below a certain point, and that is precisely why H.F. amplification is desirable for D.X. work.—G. C. C. (London, N.W.).

Dull-emitter Valves

SIR,—We notice in your issue of October 25 a signed paragraph regarding the "Peanut" valve, in which a comparison is drawn between it and the Wecovalve and ARDE types. We would point out that this is hardly a fair comparison, as it is stated that the voltage of the Peanut is higher than that used in the Wecovalve and ARDE, whilst the current consumption is much lower. We would submit that this valve should not be compared with the ARDE type at all, but rather with the AR06, the filament volts and

amperes of which are exactly the figures which your contributor claims for the Peanut.—THE EDISON SWAN ELECTRIC CO., LTD. (London).

Late Transmissions

SIR,—Your correspondent S. J. R. would probably welcome a new restriction on amateur transmitters. If he had to wait up night after night until eleven o'clock before he could start up he would doubtless alter his mind. He may wonder why some of us do not use the low band of wavelengths (150 to 200 metres) and work during broadcasting hours, as we are allowed. I do not do this because many listeners near my station have unselective sets and could not tune out the offending wave. If S. J. R. spent some time altering the tuning of his set he would not be troubled with interference.—M. E. (Shelf).

Radio-Paris and 5XX

SIR,—I notice that many readers of "A.W." have difficulty in tuning-in Radio-Paris to the exclusion of Chelmsford. Loose-couplers have apparently failed to separate the two transmissions.

My own experience is that nothing but a well-designed wave-trap will cut out 5XX within a thirty-mile radius of the high-power station. My wave-trap consists of the following apparatus: A two-way coil holder, a .0005 variable condenser and a couple of honeycomb coils of 200 and 300 turns respectively. The No. 200 serves as

the A.T.I. and the No. 300 as the wave-trap, which is tuned by the variable condenser. The A.T.I. is connected to the set in the usual way.

After Radio-Paris has been tuned in, the wave-trap is brought into play by revolving the knob of the condenser slowly and carefully; a critical point will be reached when the interference from 5XX either fades away or becomes very much weaker; on tightening the coupling between the two coils the jamming will disappear entirely. The A.T.I. is then re-tuned and the Paris station brought up to maximum strength.—G. J. M. (Sutton).

Other Correspondence Summarised

R. E. R. (Cardiff), referring to the article "Musings by Magnet" in No. 126, writes us that his Mullard Wecovalve is the equal of any bright valve in volume and range and is economical in consumption.

F. M. (Ealing) writes us that he receives the B.B.C. stations, most of the French, German and other Continental stations, and a number of American stations on his two-valve Flewelling set.

B. W. (Nottingham) states that the results he obtains from his crystal set, made from instructions given in No. 115, are as loud as any he has heard on a one-valve set. He only uses an indoor aerial.

K. G. (Ashton-under-Lyne) regularly receives American stations, at loud signal strength, on his four-valve set.

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PHONE 4857

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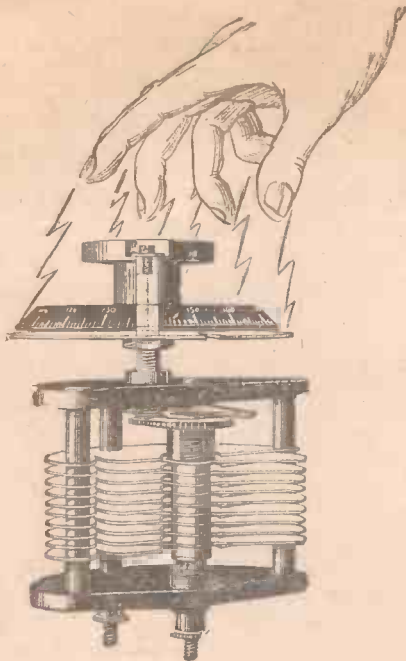
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CHIEF EVENTS OF THE WEEK

SUNDAY (November 23)

London	9.0	J. H. Squire Celeste Octet.
Birmingham	8.30	William Murdoch (solo piano-forte).
Bournemouth	3.0	Band of 2nd Batt. Hampshire Regiment.
Bournemouth	8.50	Mendelssohn Concert.
Cardiff	9.0	"Hymns throughout the Ages."
Newcastle	9.0	Astra Desmond (contralto) and Walter Giesecking (solo piano-forte).

MONDAY

ALL STATIONS	7.30	Comedy and Romance (from London).
Bournemouth	8.0	Bournemouth Municipal Orchestra.

TUESDAY

Birmingham	8.30	City of Birmingham Symphony Orchestra (S.B. to London, Bournemouth and Cardiff).
Manchester	7.30	"Under Italian Skies."
Newcastle	7.40	Russian Opera and Ballet.
Aberdeen	7.30	Concert Programme.
Glasgow	8.0	Scottish Orchestra (S.B. to Aberdeen and Edinburgh).
Belfast	7.30	Irish Night.

WEDNESDAY

Birmingham	7.30	"A Tale of Old Japan."
Bournemouth	7.30	"Pictures."
Cardiff	7.30	Another Bunch of Sweet Laverder.
Manchester	7.30	A Butterfly on the Wheel.
Newcastle	7.30	Selections from Opera.
Belfast	7.30	Russian Music.

THURSDAY

ALL STATIONS (Except Belfast.)	7.30	Part of the Hallé Concert.
ALL STATIONS (Except Belfast.)	8.15	Willie Rouse will introduce a few "Bohemians."
Belfast	7.35	Elgar and other Music.

FRIDAY

Birmingham	7.30	An Evening of Musical Comedy.
Bournemouth	7.30	Operatic and Instrumental Night
Cardiff	7.30	Music and Drama.
Manchester	7.30	Symphony Concert.
Newcastle	7.30	Irish Melodies and Songs of Many Lands.
Aberdeen	7.30	Music—Humour—Drama.
Glasgow	7.45	Scots Play Night.
Leeds-Bradford	7.45	A Concert from the Pit Bottom (1,500 feet deep).

SATURDAY

London	7.30	Band of H.M. Scots Guards <i>Elijah</i> .
Birmingham	8.30	The Famous "All Blacks" (New Zealand Rugby Football Team) (S.B. to all Stations except Birmingham).
Cardiff	7.30	Scottish Night.
Manchester	7.30	Vocal Night.
Aberdeen	7.30	Band of 1st Batt. Lincolnshire Regiment.
Belfast		

A new broadcasting station, working on 1,200 metres, will shortly be opened at Kowno (Lithuania).

WE REGRET

That, owing to pressure on our space this week, we are compelled to hold over the "Information Bureau" page. All queries addressed to us are answered by post providing a coupon (p. 815) and stamped addressed envelope are sent us.

Free to readers of "Amateur Wireless"

A Copy of

"The Amateur Mechanic"

Send a postcard with your name and address to the Editor, "Amateur Mechanic," Room 97, Cassell's, La Belle Sauvage, E.C.4, and a free copy of this practical weekly will be forwarded to you post free.

A woman at a London police court informed the magistrate that "she could not sleep at night as the wireless next door got red hot and sizzled when it rained." Most amateurs are of the opinion that when any "sizzling" takes place in the receiver it's the language which gets red-hot!

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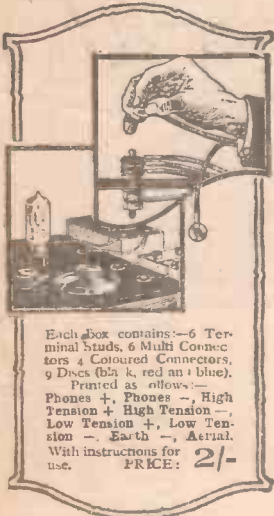
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CLUB DOINGS

Sidecup and District Radio Association
 Hon. Sec.—MR. L. N. MARTUS, Pilford, Knoll Rd., Sidecup, Kent.
 The above branch of the Radio Association has now been formed, and intending members are asked to communicate with the secretary.

Beckenham and District Radio Society
 Hon. Sec.—MR. A. WEST, 8, Manor View, Beckenham.
 On October 30 Mr. Huggett gave a lecture on "How to Make a Wireless Cabinet."

Stoke-on-Trent Wireless and Experimental Society
 Hon. Sec.—MR. E. A. HALIBURTON, 73, Stafford St., Longton, Stoke-on-Trent.
 At a meeting held on November 6 a two-reel film was shown entitled "An Englishman's Home." It was loaned by the General Electric Co., and showed the advantages of wireless in the home.

ANNOUNCEMENTS

"Amateur Wireless and Electrics." Edited by Bernard E. Jones. Price Three pence. 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.

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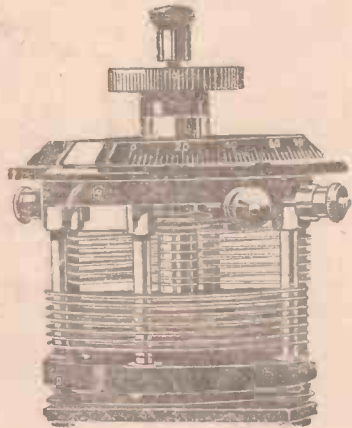
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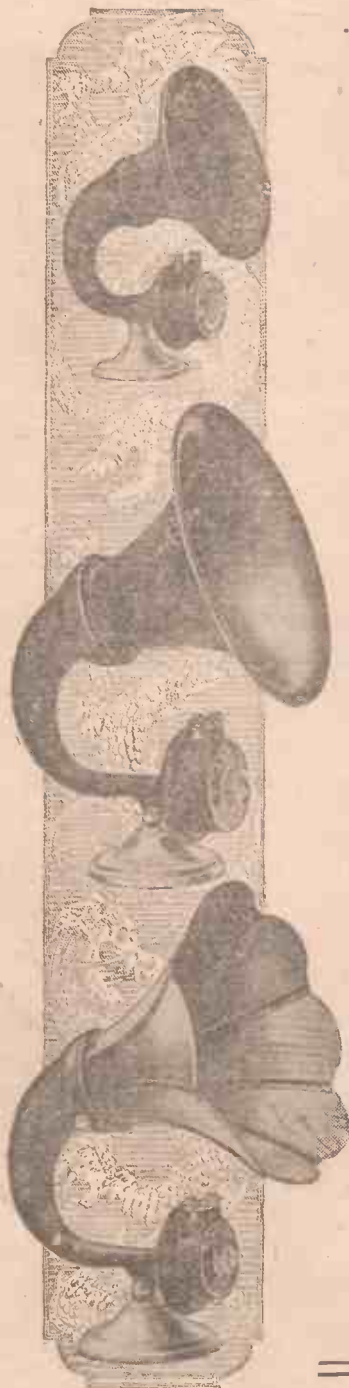
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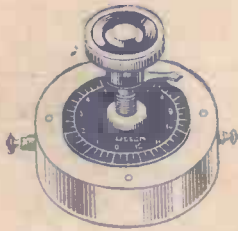
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Amateur Wireless And Electrics

Vol. V. No. 130.

SATURDAY, NOVEMBER 29, 1924

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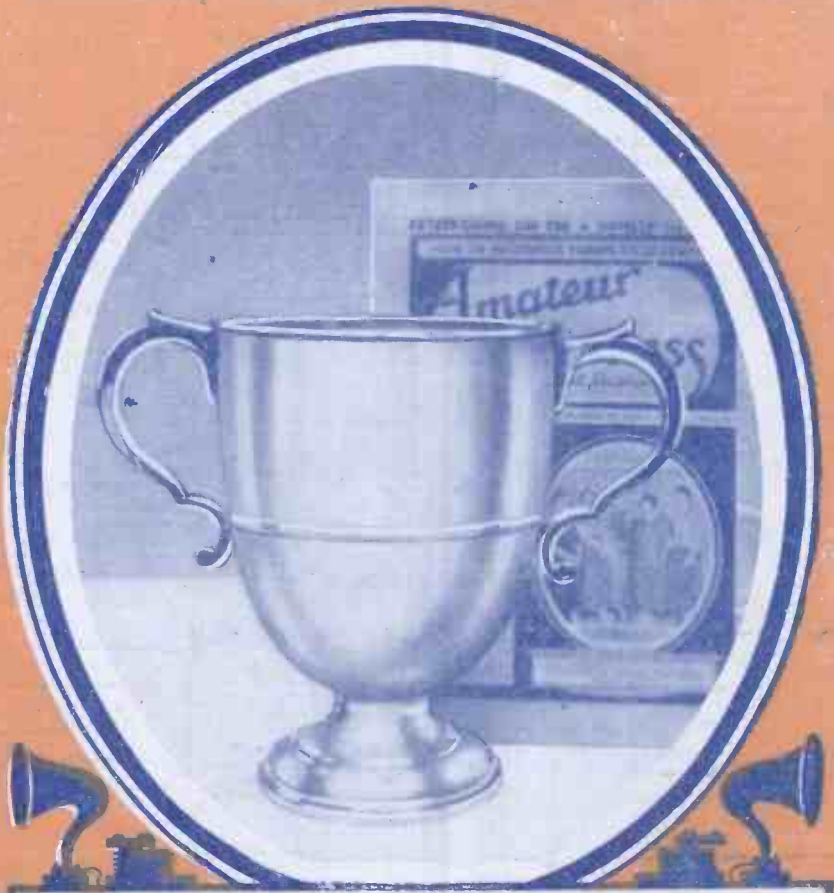
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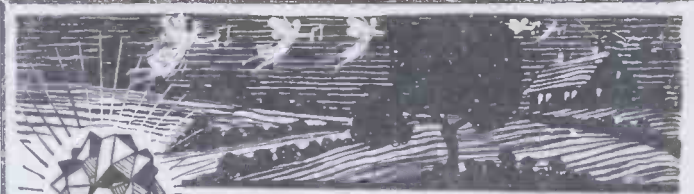
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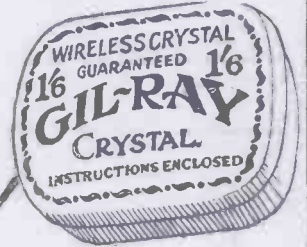


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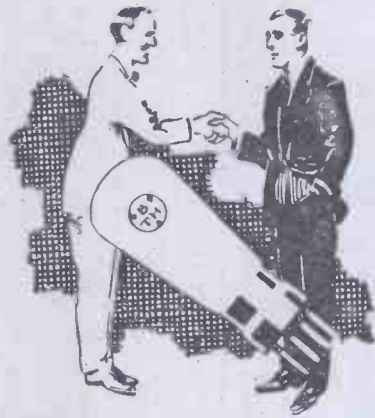


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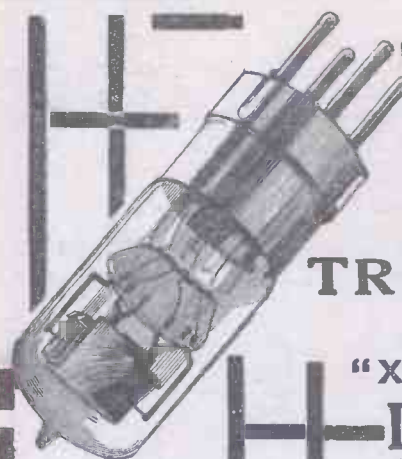


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Amateur Wireless

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

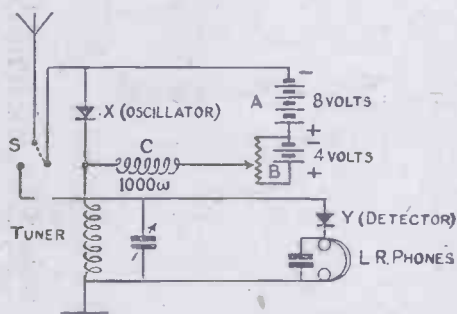
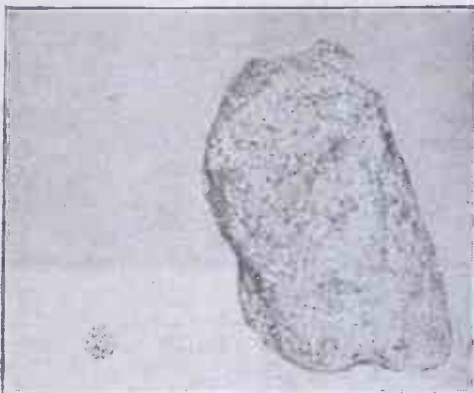


Fig. 1.—Oscillating Crystal Circuit.

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-

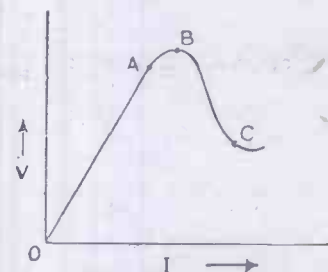


Fig. 2.—Curve showing the Characteristics of the Crystal.

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-

troducing 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.

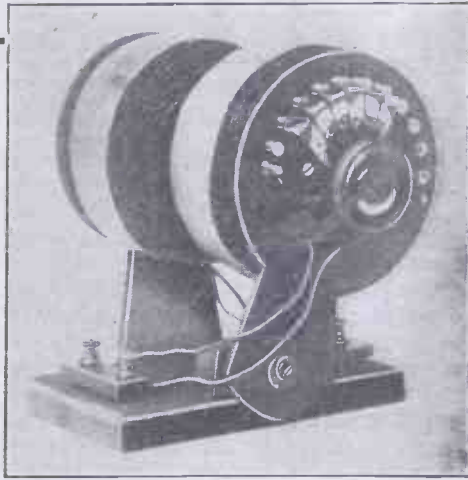


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AN "ALL-WAVE" TUNER UNIT

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-

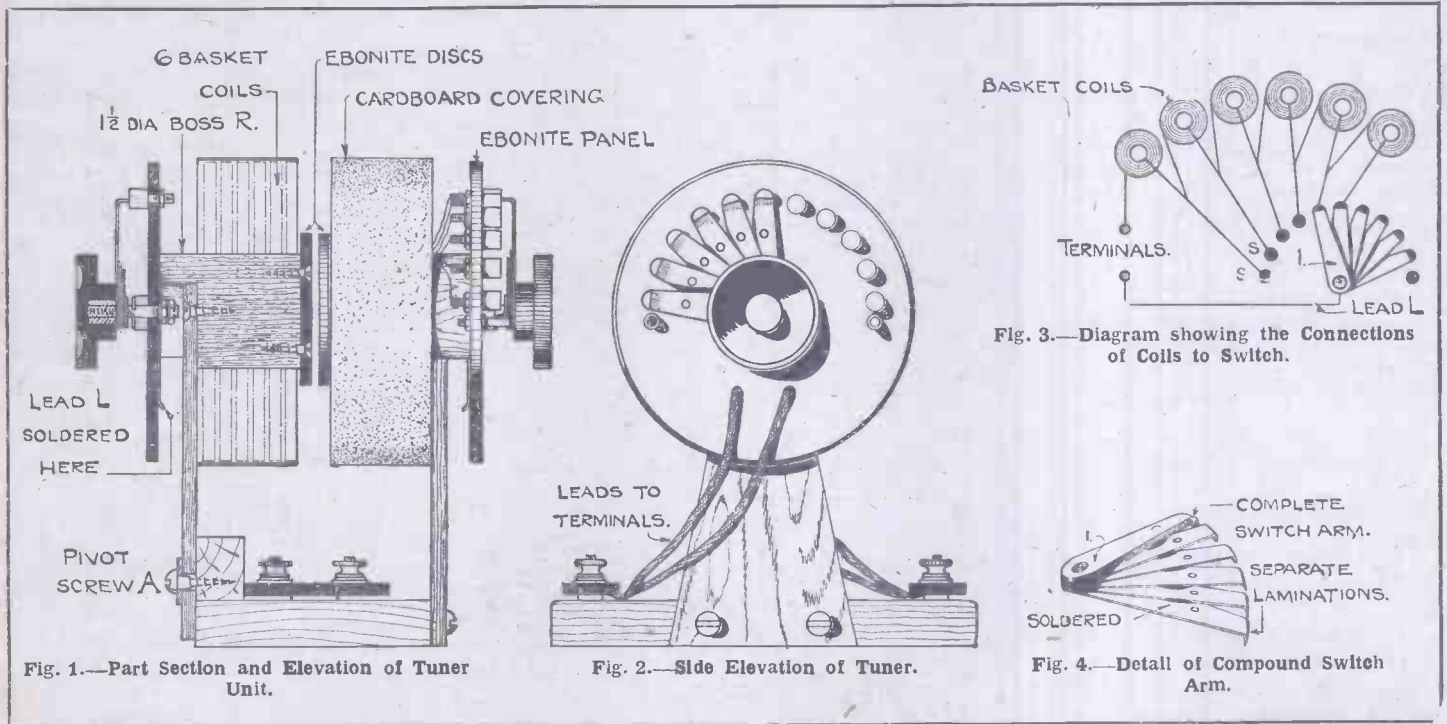


Fig. 1.—Part Section and Elevation of Tuner Unit.

Fig. 2.—Side Elevation of Tuner.

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

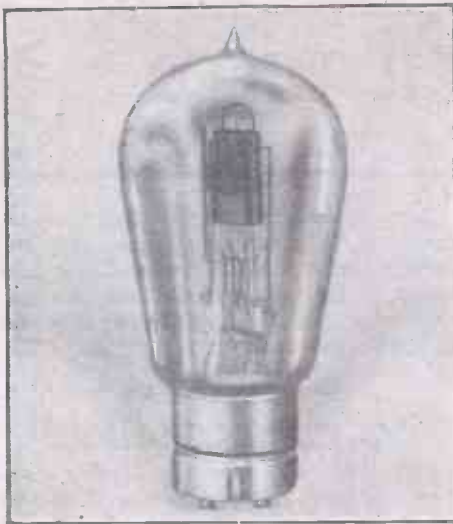
Fig. 4.—Detail of Compound Switch Arm.

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.

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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-

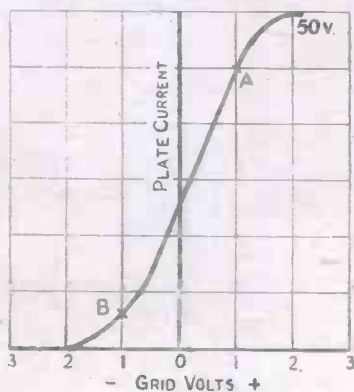


Fig. 1.—Grid-volts Plate-current Curve.

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

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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

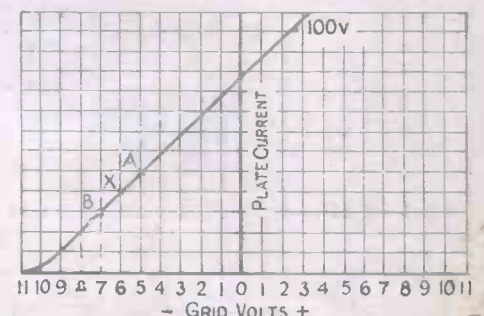


Fig. 2.—Curve of Power Amplifier.

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)

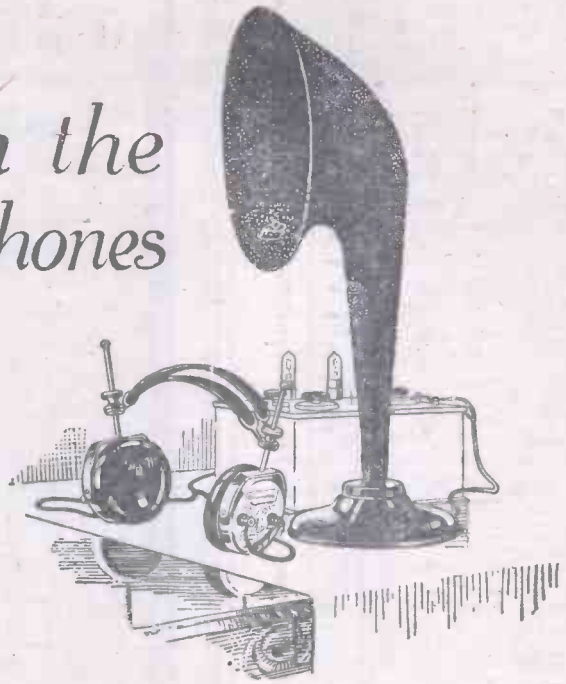
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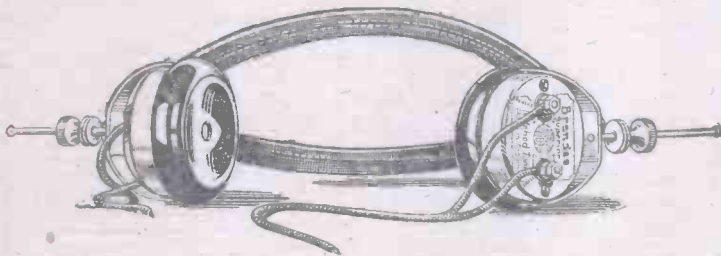
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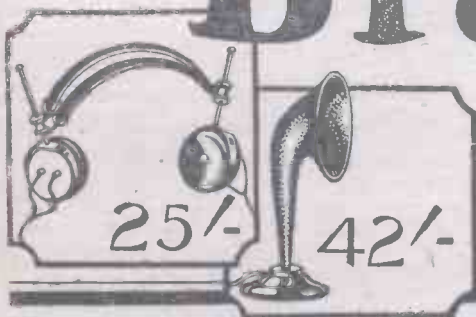
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On Your Wavelength!

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 2LO 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 2LO 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

2SH 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, 2SH! 6PD 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. 6VX 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 5XX and 2LO 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

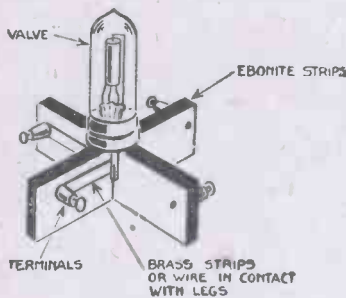
There is one instrument that has been shown to best advantage recently, and that is the piano, sometimes called England's national instrument. We have had William Murdoch, the Australian pianist, Irene Scharrer, Alice Couchman, and on Friday the great Continental artiste, Walter Gieseking. It is interesting 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.



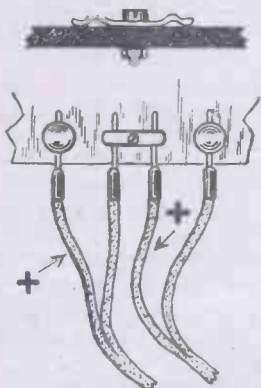
Simple Valve Holder.

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.

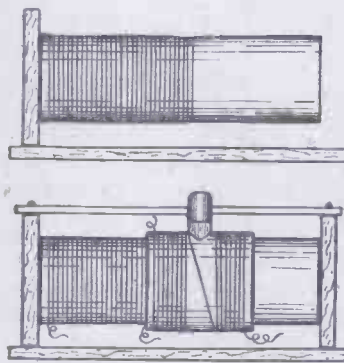
Connect a rusty knitting needle in place of the crystal cup. Lay a clean piece of copper wire on the needle (at right angles) and connect this up instead of the cat-whisker. Under favourable conditions this detector will give quite good results. J.

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



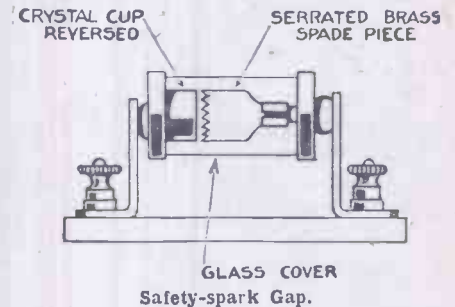
Slider-type Variometer.

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



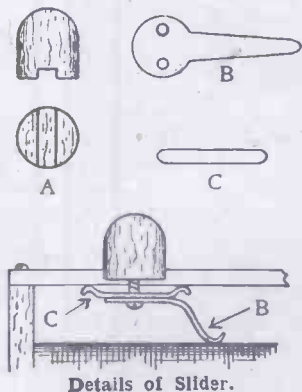
spade fitting clipped over the ball swivel of the detector.

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.

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No hair-catching projections.

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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.

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

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

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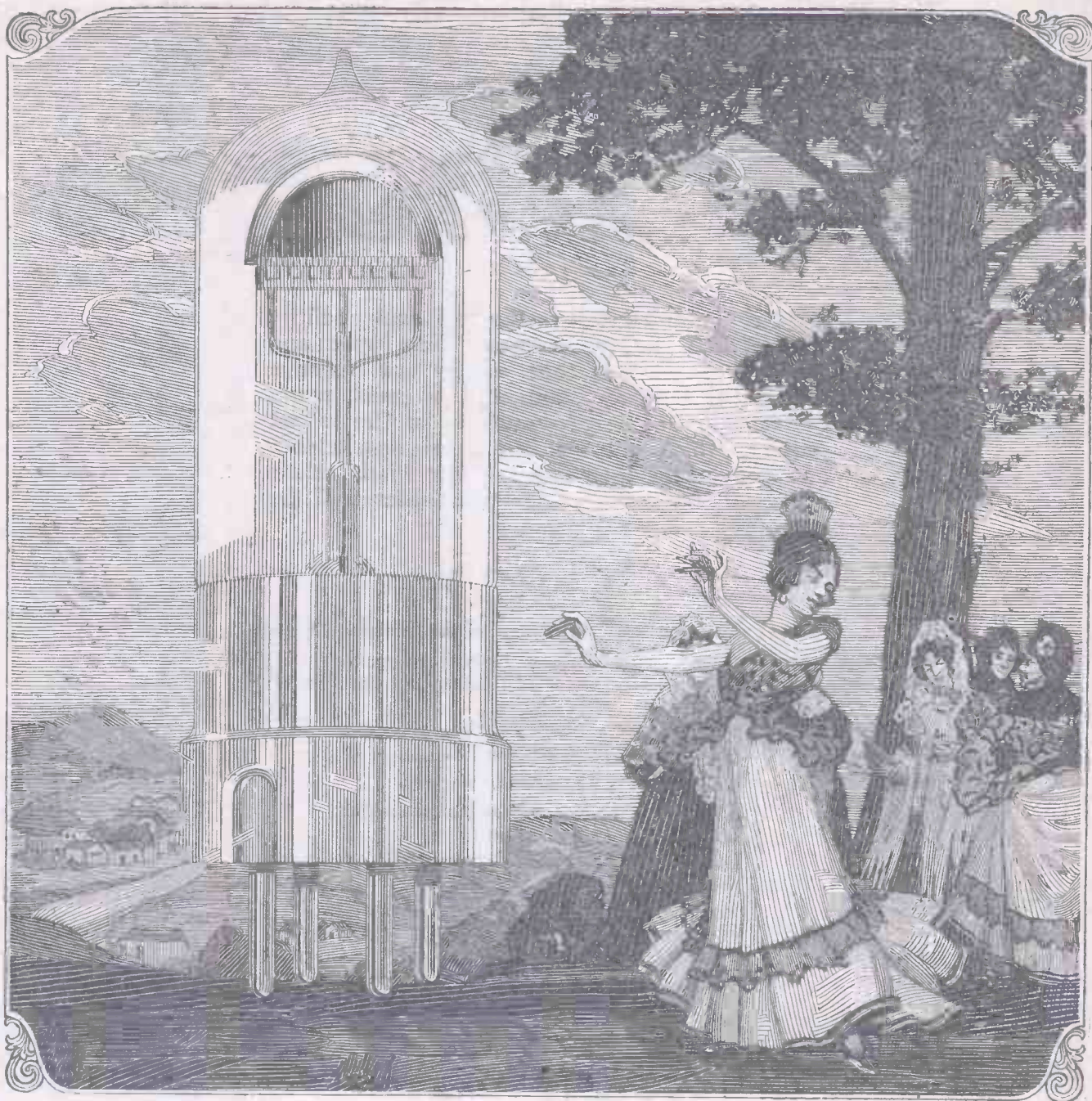
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Continental Series No. 1.

Spanish Broadcasting

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"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

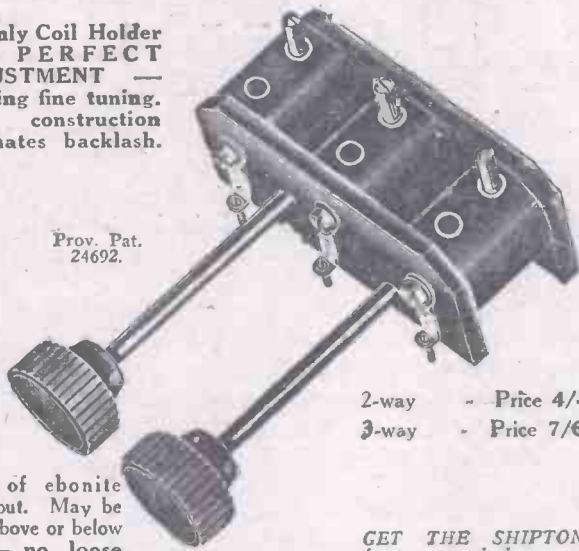
Model B. (Without resistance working direct from 2-volt accumulator.)

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

Valves

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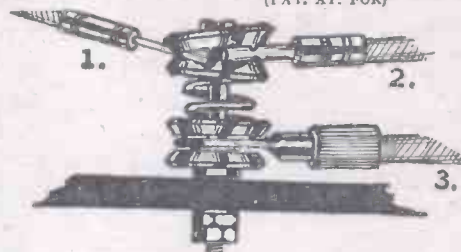
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VOLT METERS, 0 to 15 Volts, 5/-; double reading, 0-10, 0-100 volts, 12/-.
VALVE HOLDERS.—With 8 nuts and washers, 8d.; 5 Leg Valve Holders for K.4 Valves, 1/3; Valve Holders for Flush Panel Mounting, per set, 8d.; Valve Pins, 3d.; Valve Sockets with nut and washer, 1d.; Valve Windows, 6d.
BELL WIRE.—Single, 2 yards, 1/2d.; Bell Wire, Twin, per yard, 1/2d.; Bell Wire, Rubber-covered, for connecting up, per yard, 1d.
WIRES.—Tinned, No. 18 gauge, 3 yards, 2d.; Tinned, Square, 2 ft. lengths, 1/2d.; Tinned, No. 18 gauge, for connecting up or for Aerial, 100 ft., 1/6.
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Fig. 1.—Front of H.F. Panel.

CLOCK CIRCUITS.—III

THE HIGH-FREQUENCY AMPLIFIER

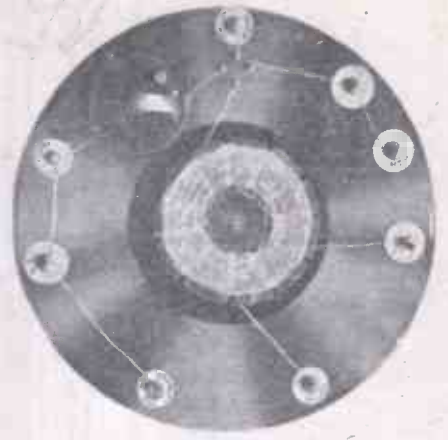


Fig. 2.—Back of H.F. Panel.

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."

RADION.

Free to readers of
"Amateur
Wireless"

A Copy of

"The Amateur Mechanic"

Send a postcard with your name and address to the Editor, "Amateur Mechanic," Room 97, Cassell's, La Belle Sauvage, E.C.4, and a free copy of this practical weekly will be forwarded to you post free.

SOME TOPICAL ASPECTS OF WIRELESS



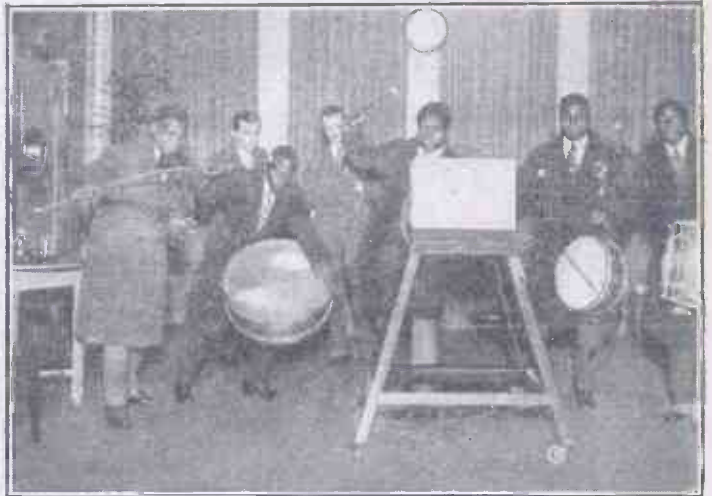
Mr. F. G. Kellaway, a former P.M.G., is to succeed Mr. Godfrey Isaacs as managing director of Marconi's Wireless Telegraph Co., Ltd.



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

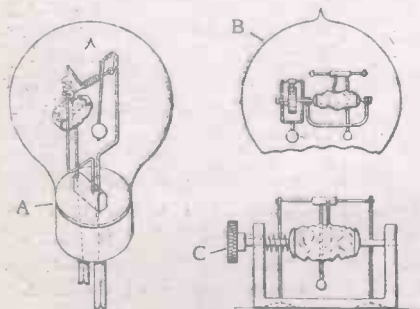
Q.—What is the difference between a variometer and a variocoupler?—S. C. (Chesterfield).

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.]

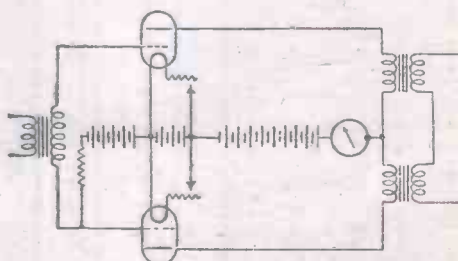
Push-pull Amplifier

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 with a coil one size larger than the A.T.I. and a loose coupling. It would perhaps be as well to mention at this stage that the circuit will function 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 FLEW

Particular interest attaches to the Flewelling and the field it o

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.

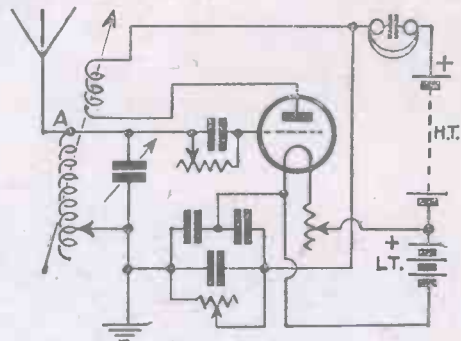


Fig. 1.—Circuit Diagram for Ordinary Aerial.

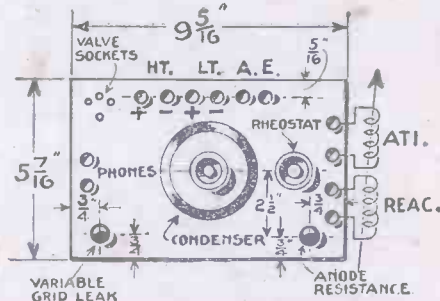


Fig. 4.—Layout of Panel.

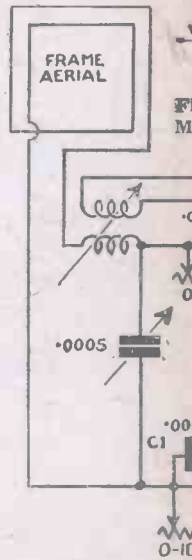
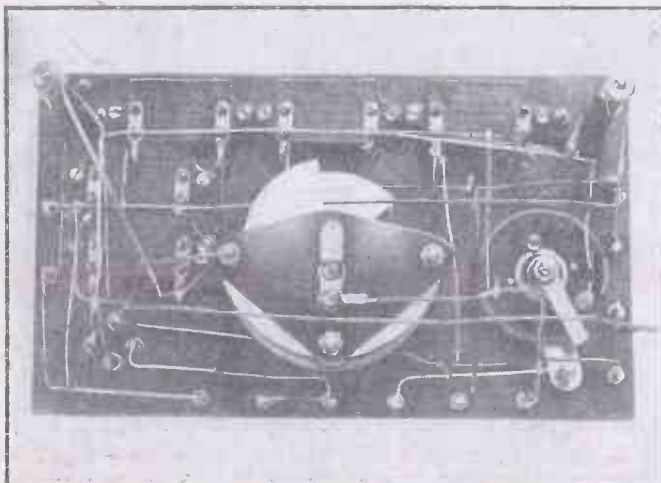


Fig. 2.—Circuit I



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

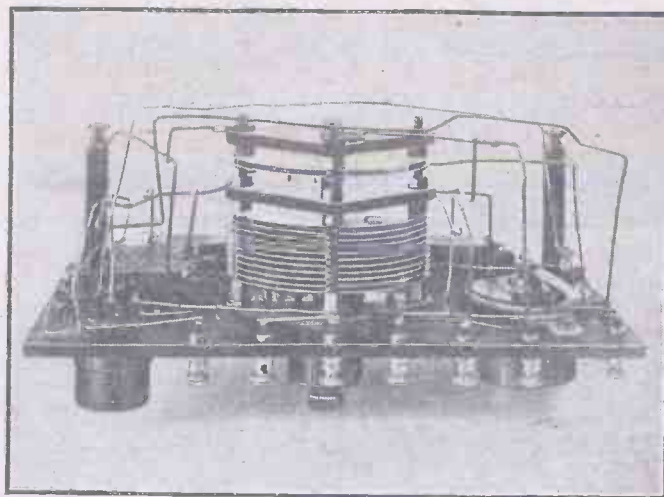
g circuit, both on account of its sensitiveness
offers for experiment

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),



View of Under Side of Panel.

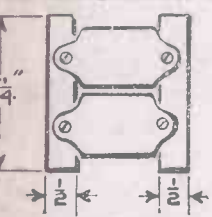


Fig. 6.—Method of Mounting Telephone and Grid Condensers.

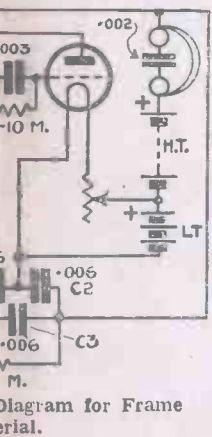


Diagram for Frame Aerial.

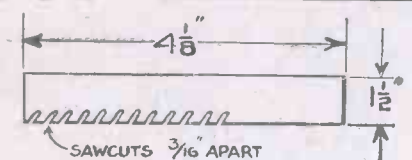


Fig. 7.—Wire Supports for Frame Aerial.

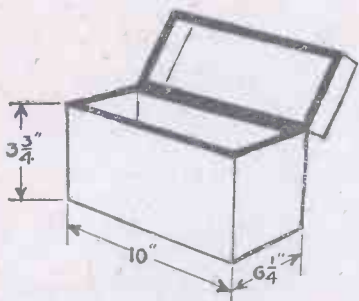


Fig. 3.—Details of Case.

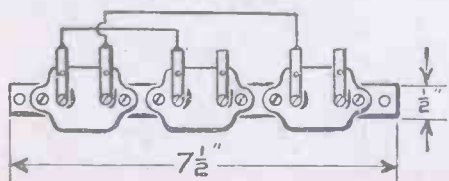


Fig. 5.—Arrangement of Fixed Condensers.

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

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,

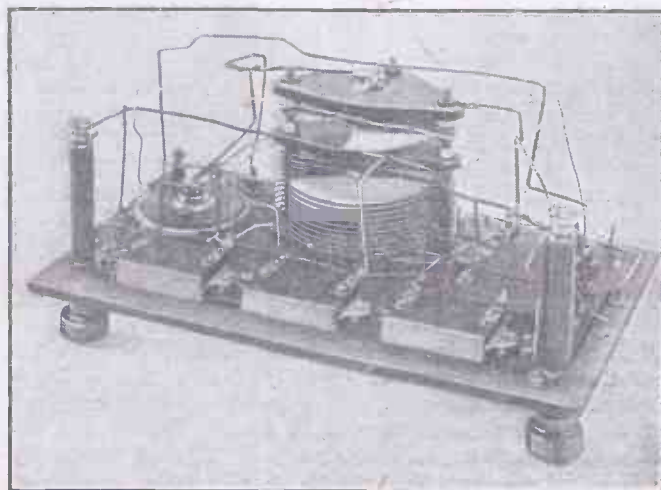
mounted on two separate strips of ebonite as shown in Fig. 6. All the condensers are screwed to the under side of the panel, as shown in the photographs by means of the ebonite strips. By this means a good and quick fixing is secured in a small space with a minimum amount of undesirable metal in the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



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

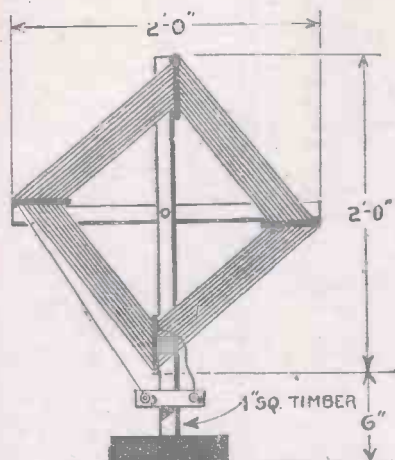


Fig. 8.—Constructional Details of Frame Aerial.

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.

"BROADCAST OVER BRITAIN"

TO control the multifarious activities of such a quickly-growing organisation as the B.B.C. in the best interests of the community is an enterprise not to be undertaken without an adequate realisation of the responsibilities that it entails.

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

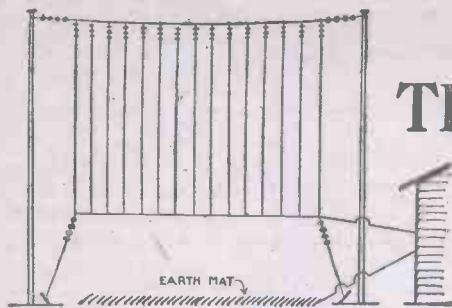


Fig. 15.—Directional Aerial with Tuned Screen.

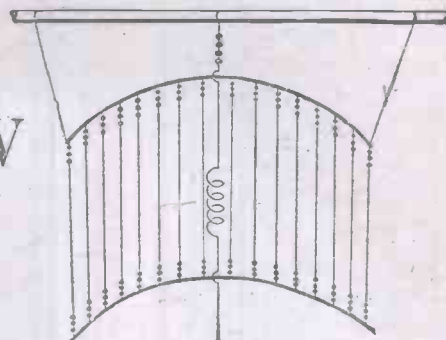


Fig. 14.—Short-wave Directional Aerial with Tuned Reflectors.

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 $I^2 R_r$, 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-

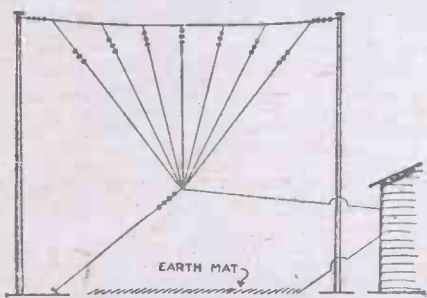


Fig. 16.—Directional Aerial with Fan-shaped Tuned Screen.

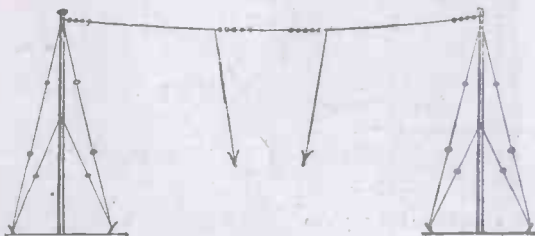


Fig. 17.—Arrangement of Transmitting and Receiving Aerials for Duplex Working.

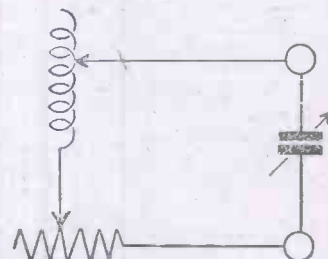


Fig. 18.—Connections of Phantom Aerial.

even of large dimensions, may be constructed having a very low actual ohmic resistance, and we thus expect a very large value for I , 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.

FAMA DUTCH VALVES
USUAL TRADE DISCOUNTS

	Retail Prices
Amplifiers, Fil. 4-volt Anode, 30 to 100 volt ..	each 4/8
Detectors, .. 4-volt Anode, 30 to 60 volt ..	each 4/11
Dull Emitters, 0.06 amps. Fil. 1.6-volt Anode, 20 to 100 volt	each 14/-
Sidpe (Continental) L.F. Transformers	each 9/6
Best Continental Adjustable Diaphragm 4,000-ohm Headphones	pair 11/6

Please remit Postage.

BISHOPSGATE ELECTRIC SUPPLY (1924) CO.,
180, Bishopsgate, London, E.C.2.
Phone: Central 7361.

WONDERFUL WIRELESS INVENTION
MAKES "LESS" WIRELESS
Catwhiskerless, Batteryless, Worryless, Fuss - and - Botherless Wireless



No batteries; no fiddling with cat-whiskers and other delicate adjustments; no worry; no disappointment. Simple turn of milled screw and "Hovimo" Crystal Valve gives instant reception—uninterruptedly pure and bell-like tone. Can be easily adjusted to any set employing crystal detection or rectification.

3/6
BRITISH MADE
EVERY ONE
GU RANTEED

"HOVIMO"
CRYSTAL VALVE

Specially recommended for Crystal loud speaker systems. An entirely new invention and must not be confused with the ordinary "permanence" detector or confused with Silicon boronite or similar combinations. Ask your dealer for it, or write to—

A. MOLBACK, 27, High Holborn, London, W.C.1. Ph no: Chancery 8391

DON'T PAY MORE!

All the Best Dealers can now supply you with

BOWERMAN'S
(Guaranteed)
BEST BRITISH MADE POWER HEADPHONES
4,000 ohms
Stalloy Diaphragms.
Highly polished Duralumin Bands.



12/6

Show this advertisement to your Dealer and tell him we can supply him at the right price.

BUY AND TRY A SET "ON APPROVAL."

Money Back AT ONCE if these Headphones do not please you in every way as being the biggest value on the market to-day.

We are out for big sales at a small profit. That's our idea of helping British Trade and industry. Is it yours?
If any difficulty in supply, we will send to you direct.

BOWERMAN'S PHONE,
12, Ludgate Hill, London, Eng.
IRISH OFFICE 36, Arthur Street, BELFAST.

ELECTRADIX RADIO BARGAINS
World-renowned and Universally Sought

Still offering a few 3-valve amplifiers with Trumuse Table Talkers for £3 15s. This was a wonderful bargain and went well. Brand new goods. WAVEMETERS Townsend Broadcast, 50/- Long range 120/4,000 m., £6. Paul, 120/3,000, £5 10s. Forward, 80/9,000 m., £7 10s. Special low for America, 40/100 m., £4. RECORDERS. R.A.F. Morse, G.P.O. type, £7 10s. Wheatstone Recorder, £8. Perforators, 25/- DYNAMOS. Newton A.C. to 3,000 volts, £4 10s. D.C. charging L.T., 12 volts 8a, £3. H.T.D.C. Marconi, 1,500 volts, £8; 2,000 volts 1,000 m/a, £38. Voltmeters, 1,000 volts, £5. 1,500 volts, £6 10s.; 2,500 volts, £7 10s. MASTS, R.A.F., steel tube, any height, 2/6 x 5". TRANSMITTERS. 1-Valve with H.T. unit £4 10s. 2-Valve R.A.F. £3. Spark, 1", 15/6; 2", 35/-. Huge Marconi 10" spark coils, £3 10s. RECEIVERS, Crystal, 7/6. Crystal valve reflex, £3. R.A.F. 3-valve, £3 15s. R.A.F. Ten, 5-valve, £5 5s. AMPLIFIERS. 2-Valve, T.B., £2. 3-Valve, M.I.I., £3. 6-Valve, £5 10s. Marconi 3-valve, 5s, £8. Loud Trumuse speakers, curved horn adj., 4,000 ohms; Magnets, 19/-. TESTERS. Res. boxes, ex-lab., absolute 1 ohm to 5,000. Various ranges, 17/6 to 55/-. Bridges, L.R. £3, H.R. £4. Ohm meters, £10; Meggers, £15, Lab. standard. Plug-in condensers, 1/2 to 40 mfd., 10/- to £3. Micro-ammeters, show crystal strength, 65/-. PHONES. Single, 1/6. Brown's for rewind on diaph., 5/-. Ebonite horn and base screwed for Brown's, 10/6. Horn only, 8/- Sullivan's L.R. head sets, 5/6. Western 4,000 ohms, 12/6. Br. Thomson-Houston, 14/6. Micro buttons, 4/-. Insets, 1/-. Weston relays, the latest super-sens. microamp. Naval relay, in brass case, 20/- G.P.O. polarised A or B, 35/- Galvos, 20/- SWITCHES. Distant control of filament current, auto, 15/6. Indoor, 22 gau. insul. phone wire, 3/- 300'. Dewars for panels, 2/6. Large stock of special switches. VALVES. "C" 6/6 VALVES. The low capacity Ediswan "C" R.A.F. is the best for long distance work and amplification. R.A.F. Marconi rounds, 2 volts, 3/6. ELECTRIC DRILLS. Engines and Dynamos, Motors 12 volts to 500 volts in stock.

NOTE.—Valves not included in prices. Sent at buyers' postal risk.

For hundreds of other interesting items see our new and Enlarged Illustrated Catalogue and Price List, 4d. stamps, post free.

LESLIE DIXON & CO.
9, Colonial Avenue, MINORIES, E.1

Call and see us, we are convenient and central. Near Aldgate Station, Met. Railway.

Take your Family for a Trip
round the World this
evening



—in effect,
that is what the "Baby Ciné"
Projector does for you.

Whilst affording all the delights of a first-class "movie" show in your own home, the choice of pictures rests entirely with you. You can show them at your discretion.

TRAVEL PICTURES, TOPICAL
EVENTS, NATURAL HISTORY
FILMS, SPORT, COMEDY, THE
DRAMA.

Any intelligent child can operate the Projector efficiently, and—since the films are non-inflammable—give absolute safety. It is a real Cinema which will prove the ideal gift this Christmas for young and old.

Light is obtainable from the ordinary house circuit; for houses where no electric lighting exists the Projector is fitted with a small dynamo.

A Catalogue of films is published each month showing the most recent editions.

*An Xmas Present
for the whole
Family*

Owners of a Projector are thus assured of a regular and constant supply of the world's best films. Price 3/- each.

**"Baby Ciné"
PROJECTOR**
Mirrors the World in your Home

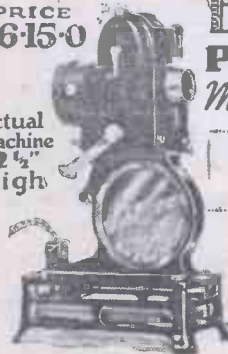
Write for literature and name
of nearest dealer.

Pathé of France Ltd

5 LISLE ST.
LEICESTER SQ.
LONDON, W.1.

PRICE
£6.15.0

Actual
Machine
12 1/2"
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**

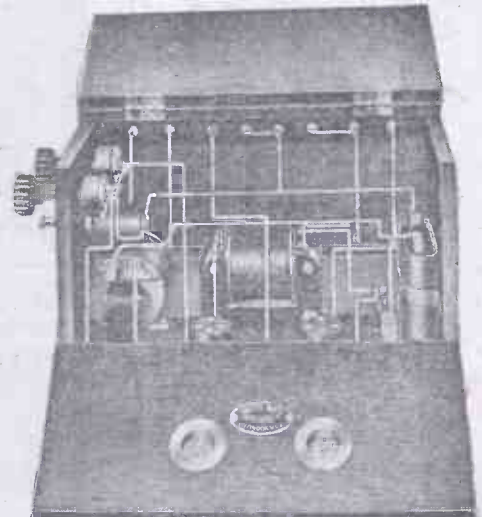
by simply connecting their present set to the input terminals of the SUPRATONE Amplifier, and batteries and loud-speaker to terminals indicated.

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.

WATES
BROS., LTD.,

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 *Radioélectrique*, broadcast the first of four query programmes on November 18. *Radioélectrique* 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 OR YOUR MONEY RETURNED.** **1/3 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.

M. VERSTRAETEN

(Dept. 10), Melville Chambers, 50a, Lord Street, Liverpool 0

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.,
20, Radio House, Percy Street, Tottenham Court Road, LONDON, W.1.



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.

Conforms to conditions of Supply and Insurance Companies. Send now 25/- for the cheapest, simplest, neatest and most practical job on the market, complete with explicit fitting instructions and diagram. Size of "Chaseway" Charger, 9 in. by 8 in.

Cross Cheques and P.O. "not negotiable."
THE CHASE ELECTRICAL MANUFACTURING Co., Ltd.
188d, Fleet Street, London, E.C 4

Trade Enquiries Invited v.p.

25/-
post free

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.

Special Shunt Boxes are supplied giving the following additional readings: (a) 12 ma. and 3 amps. 11/6. (b) 120 ma. and 6 amps 12/6 (c) 12ma. and 1 1/2 amps 12/6.

All types and ranges of measuring instruments supplied at moderate prices. List Free (Special Terms to Trade).

Complete A.C. motor rectifying charging board £4.5.0.

F. C. HEAYBERD & Co.
9, TALBOT COURT, EASTCHEAP
1 minute from Monument Underground Station.



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Tel.—Royal 4082



MH CRYSTAL

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**

L.M. MICHAEL LTD
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

MERTON DAVIS, PARNELL & CO, 359 STRAND, LONDON, W.C.2 Regent 4232

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

NOTE

"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!

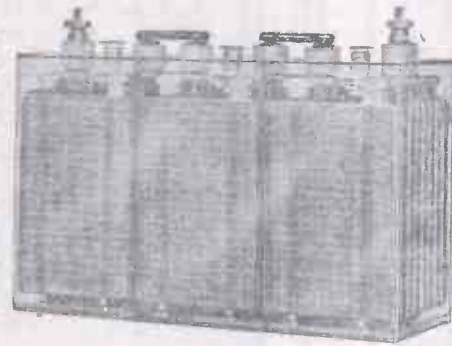
The
MARS
SUPER
AERIAL

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
20/6	27/-	35/3	41/9	46/9	6 Volts

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/-**

AS ILLUSTRATED WITH WANDER PLUGS

The Imperial Motor Industries, Ltd.

Denmark Street, Charing Cross Road, W.C.2.

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.

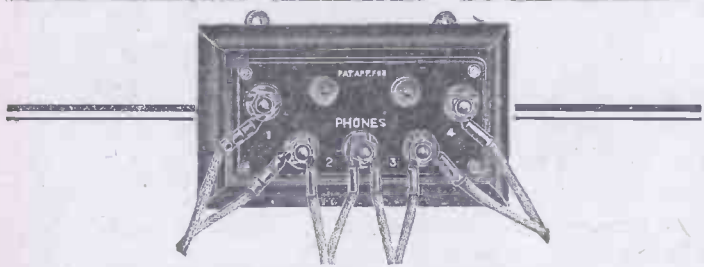
There is an effort on foot in some quarters to change the name "broadcasting" to "radiocasting," but the majority of listeners prefer the more euphonious word to "radiocasting"—tongue-twisting and scarcely descriptive.

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.

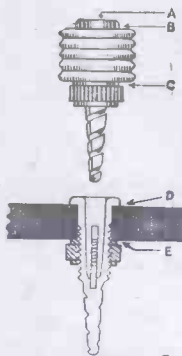
All carry a six months' guarantee

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

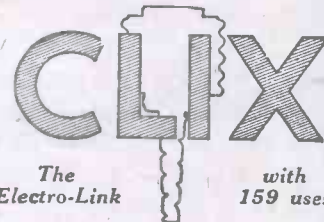
CLIX with Locknut, 3d.
CLIX INSULATORS (Six colours) 1d. each.
CLIX BUSHES (Six colours) 1d. pair

Clix Popularity—the Secret!

You can't have efficiency in Radio anywhere unless you have efficient contact everywhere.

You can't use solder everywhere—but you can use CLIX.

By virtue of the tapered threaded design of its plugsocket, CLIX ensures perfect contact—an obvious improvement on various forms of split-pin plugs, which, however accurately machined, can only permit of a "two-point" contact. Think it out!

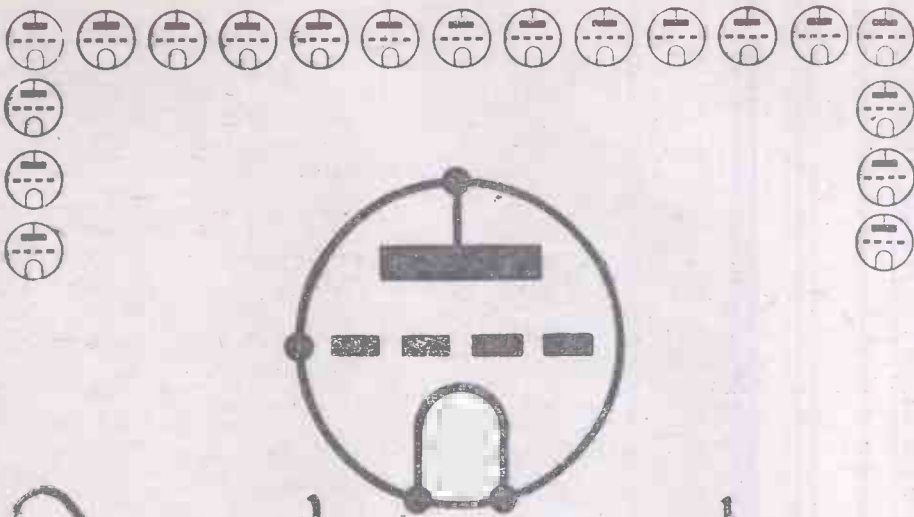


Obtainable from all Wireless Dealers or direct from the Patentees and Manufacturers:

AUTOVEYORS LTD

Radio Engineers and Contractors

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

COMPLETE LIST. 1s. 6d. net each; 1s. 8d. post free.

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 Cordage. 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.


CASELL & COMPANY, Ltd., La Belle Sauvage, London, E.C.4. AND ALL BOOKSELLERS.

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.

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
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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

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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.*



Ducon 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

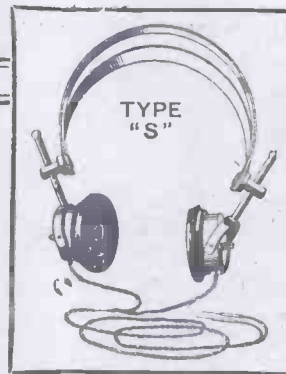
DAYZITE Regd.

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.,

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REPRODUCTION
THAT SURPASSES
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The extreme sensitivity and complete absence of distortion of the New Improved M.E.L. Phone, coupled with the greater volume and clarity of reproduction which they afford, simply surpasses all belief of those who have not tried them.

The spring Slider Adjustment of the Earpieces allows of instant and easy setting to the most comfortable position and prevents any "sloppiness" due to wear. Each pair of Phones is individually matched and tuned, resulting in perfect "balance."

M.E.L. Phones are the unswerving choice of every expert and amateur who has used them.

Your usual Dealer will be glad to show you a pair—ask him to let you try them, a test will readily convince you.

Price only 17/6 per pair.

M. E. L. LTD.
45-47 KINGS ROAD
CAMDEN TOWN, N.W.1

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 Matt 1 3/16
 9" x 6" 2/2 1/10
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 15" x 12" 7/6 5/8
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 7" x 5" 1/6 1/2
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 Any Size Cut
 Sq. in 1" 1d. 1" 1d.

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TRADE
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VAR. CONDENSERS
 .001 panel type 7/-
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 Knobbed dial 1/- ex
 Stock "Fallon" &
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 All "Igranic" "Lis-
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 100', 3/6, 2/6, 1/1
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 Ashley fixed .. 2/6
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 Shell, 2 1/2 x 2 1/2 4d.
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H.T. BATTERIES
 With Wander Plus
 60v., 8/-, 36v., 4/10
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SWITCHES, Ebonite
 .. Tumbler 1 1/2 1/-
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 Good quality .. 1/6
 Igranic 4/6, Vern. 1/-
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 Type A 7d., Polar 1/3
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 No. 2 .. 22/6
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 10d. Superior 1/3
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 DuMier (usual)
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 2m.f. 1/8-1/36 m.i. 8d.

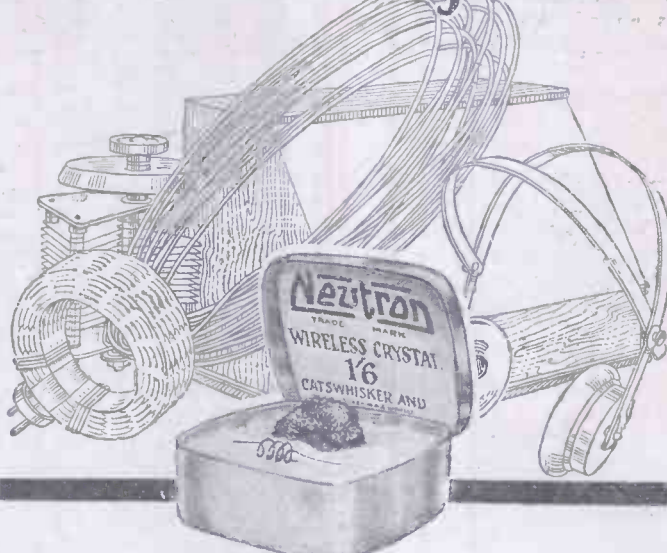
IRON CORE CHOKES
 1,000 & 750 ohms 8d.

MICA .002 DOZ.
 3" x 2 1/2", 2" x 1 1/2" 4d.

CARRIAGE PAID
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The most important item in your outfit is the Crystal



Upon the choice of a really good crystal depends your success in clear, loud and faithful reception.

A good aerial, heavy-gauge, efficiently-wound coils, minimum self-capacity, good phones, all these count, but the most important of all is your Crystal... There are many efficient Crystals; but you may try twenty before you find a good one—unless you ask for NEUTRON, in the black-and-yellow tin. If you take this precaution, you will undoubtedly secure a crystal that will give you full efficiency first time, requiring no "searching" for sensitive spots, and giving you continued joy-in-listening.

"The Best Crystal Obtainable."

Long Distance Circuit Diagram FREE.

"T.C." of Radcliffe, Lancs., writes, "I am writing to say that without doubt NEUTRON is the best Crystal obtainable. I have no difficulty in tuning in Liverpool relay, about 40 miles away. This is on a home-made Crystal set, single slider, in a cigar box... I have tried the following, and none are equal to Neutron." (Here follow names of seven different crystals)

Ask your Dealer for Diagram, given free on request to purchasers of NEUTRON, of the circuit used by "5 B T" in receiving Brussels from Chiswick on a NEUTRON.

We send one direct with sample NEUTRON if you enclose stamped envelope and 1/6, with Dealer's name.



Concert Tested & Guaranteed Radio Crystal

Produced by NEUTRON, LTD., Sicilian House, London, W.C.1. Phone: Museum 2677. Sole distributors:

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Stocked by the Best Radio Dealers. Packed in tins with silver catswhisker. Insist on Neutron in the Black and Yellow Tin— 1/6

MICROMETER FILAMENT DIMMER.

0-5 ohms 3/6 0-20 ohms 4/-
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PATENTS APPLIED FOR

SPARE CARTRIDGES
 0-5 ohms 1/- 0-10 ohms 1/3 0-20 ohms 1/6 0-30 ohms 1/9

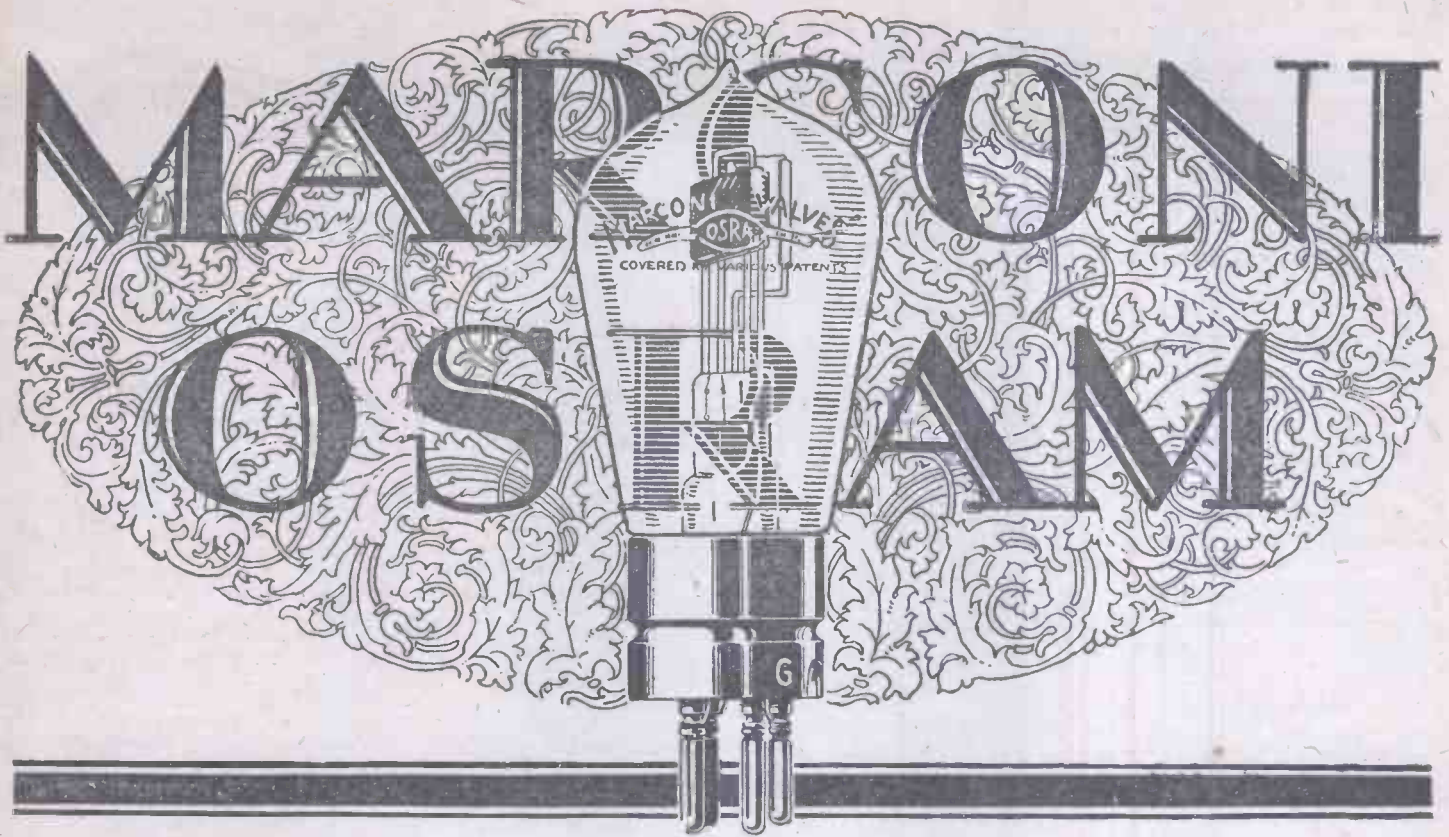
It's the Cartridge that counts

Also MADE as a GRID LEAK which is **CONSTANT**
 2-5 MEG., 3/6. 5-10 MEG., 4/-.

ASK YOUR DEALER: IF UNABLE TO SUPPLY WRITE TO MAKERS ENCLOSING 3d. FOR POSTAGE EXTRA

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 GRAPE STREET, Shaftesbury Avenue, LONDON, W.C.2





The two great names behind the Valve in the Purple Box

Since the first days of wireless the name MARCONI has been identified with every forward achievement. That unique knowledge has been added to the vast experience of the OSRAM manufacturing organisation. To these combined efforts in research and valve production is largely due the present-day development of wireless as a pastime for the million.

MARCONI VALVES

MADE AT THE OSRAM LAMP WORKS

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Read the authoritative wireless work, *The Book of MOV*. Get a copy from your Dealer, or write to the M.O. Valve Co., Ltd., Brook Green, Hammersmith, London, W.6.



Get the Valve in the Purple Box!



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 (5IT), 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 (Kjbenhavn Radiostation), 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.

L'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)

Dance to Real Music at Home



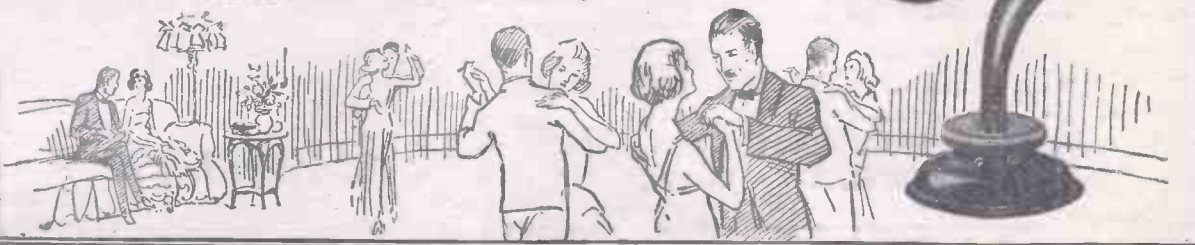
LOUD SPEAKER

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.

120 ohms, £4 15s. 2,000 ohms, £5. 4,000 ohms, £5 10s.
C.A.V. Junior £2 15s. C.A.V. Tom Tit 30s.

Write now for Illustrated Loud Speaker Folder from

Telephone: C.A.V. Vandervell & Co. Ltd. Telegrams: Cuiswick 2000 ACTON VALE, LONDON, W. 3. "Vanteria," Phone



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:

- 6 Terminal Studs, 6 Multi Connectors, 4 Coloured Connectors, 8 Discs (Black, Red and Blue),

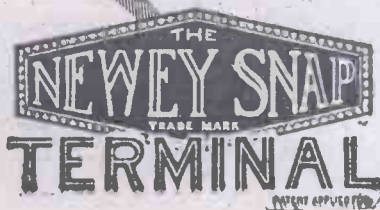
printed as follows:

- PHONES + HIGH TENSION + LOW TENSION + EARTH -
- PHONES - HIGH TENSION - LOW TENSION - AERIAL

With instructions for use. PRICE 2/-.

NO more waiting for your turn—no more missing the very piece you wanted to hear. As many headphones as your set will stand can be added in a second by means of the Newey "Snap" Terminals. All the family can listen in with a small set and extra visitors can easily be accommodated. The Newey "Snap" Terminals and Connectors can be used in dozens of ways by the Wireless enthusiast. Despite their absolute simplicity they form perfect contact and have been proved to be both electrically and mechanically perfect.

ASK YOUR WIRELESS DEALER ABOUT IT, OR SEND FOR LEAFLET TO-DAY.



Pettigrew and Merryman, Ltd.
124, Tooley Street, London, S.E.1.
H.C.T.

See this new device on Stands 10, 11, 12 and 13, at the All-British Wireless Exhibition, at the White City, November 15th to 29th.

The Big Ben of L.F. Transformers



30/-

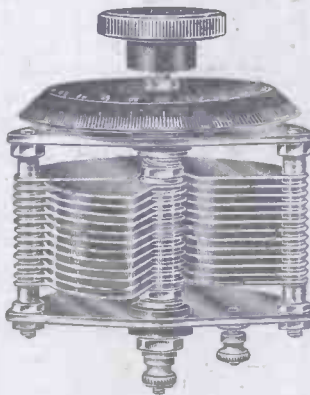
Guaranteed for 2 years.

Contains almost twice as much wire as any competitor sold at 25/-.

Gauge of wire such that a current of 20 milli-amps can safely be carried continuously; therefore suitable for use with biggest types of power valves.

Weight 2 lbs.; size 3 3/4 in. long by 2 1/2 in. over terminals. Stampings best stallooy dull-blackened; nickel-plated terminals and straps.

A LISTOLEON Transformer (price 30/-) will free reception from all discordant noise and metallic harshness.



LISTOLEON Variable Condenser

Constructed with amazing exactness; correspondingly successful in results. No finer means of delicate tuning exists than a LISTOLEON Condenser.

Prices:—

Capacity	Price	With Vernier	Price	Capacity	Price
.001	8/-	9/6	5/-	.0002	5/-
.00075	7/-	8/9	.0001	4/6	
.0005	6/-	7/6	.00005	4/-	
.0003	5/6	7/-			
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Telegrams: Radpholim, Rand, London.

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 (IRO), 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.

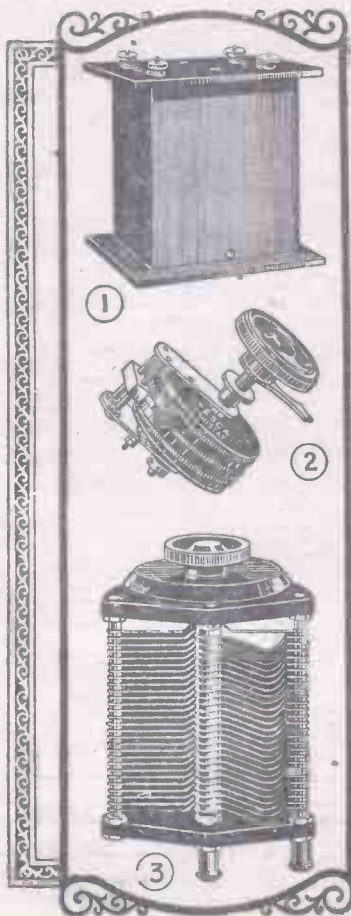
Lausanne (HB2), 780 m. (500 w.). 07.05, weather; 12.30, weather, markets, time sig., news; 16.00, children (Wed.); 17.55, weather, news; 20.15, con. (exc. Wed.), dance (Thurs. and Sat.).

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

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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



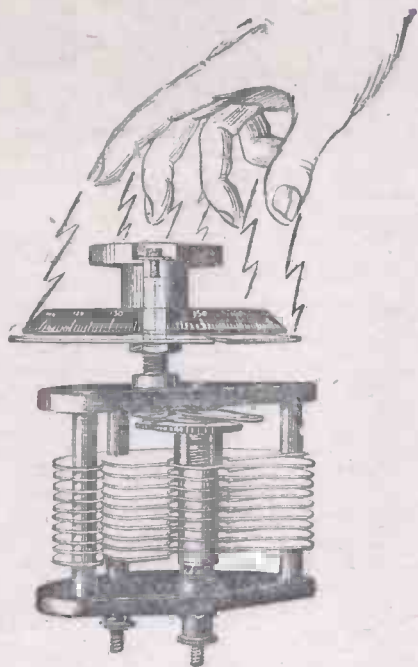
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THE NAYLOR "FULSTOP" CONDENSER enables tuning to be carried out with a wider range of accuracy than has hitherto been obtained. In addition to being a square law condenser, which avoids the overcrowding of stations at any particular point, the dial 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.

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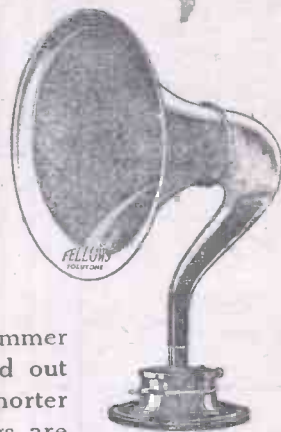
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Good night Everybody!

"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
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Both fitted with adjustable diaphragms.

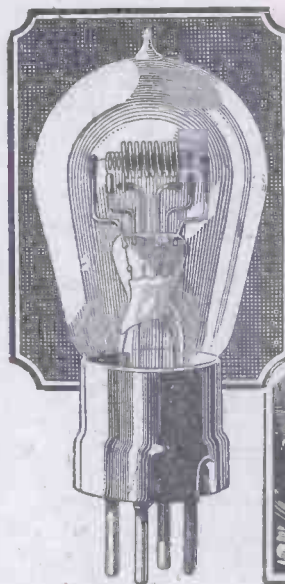
On a boisterous evening when we are all laughing and fooling, the Volutone plays with the loud pedal down and fills the room with music. On such a night as this, when I sit quietly by the fire, he sings softly and sweetly for me alone.

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

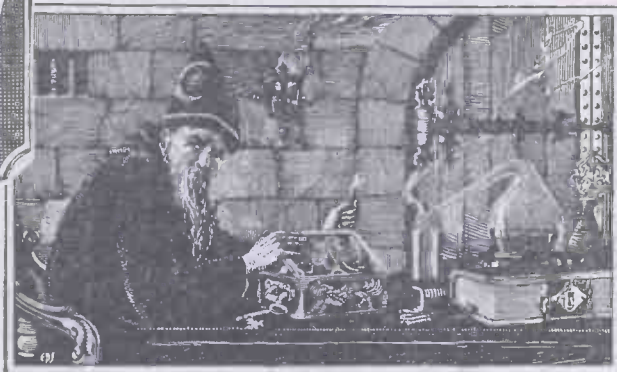
Muel, Fellows

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

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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 id.; 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.

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CARPAX PERMANENT DETECTOR SET



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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.

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SHINY POLISHED
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Send for constructors list free
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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.

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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. $\frac{1}{2}$ -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.

SIGNALLING 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.

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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.

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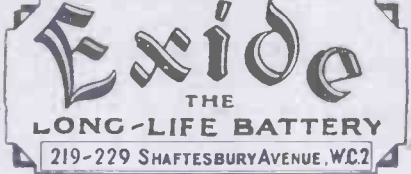
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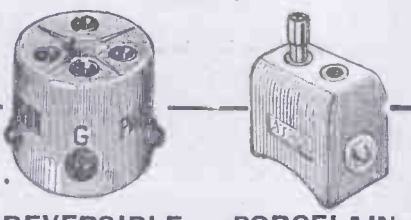
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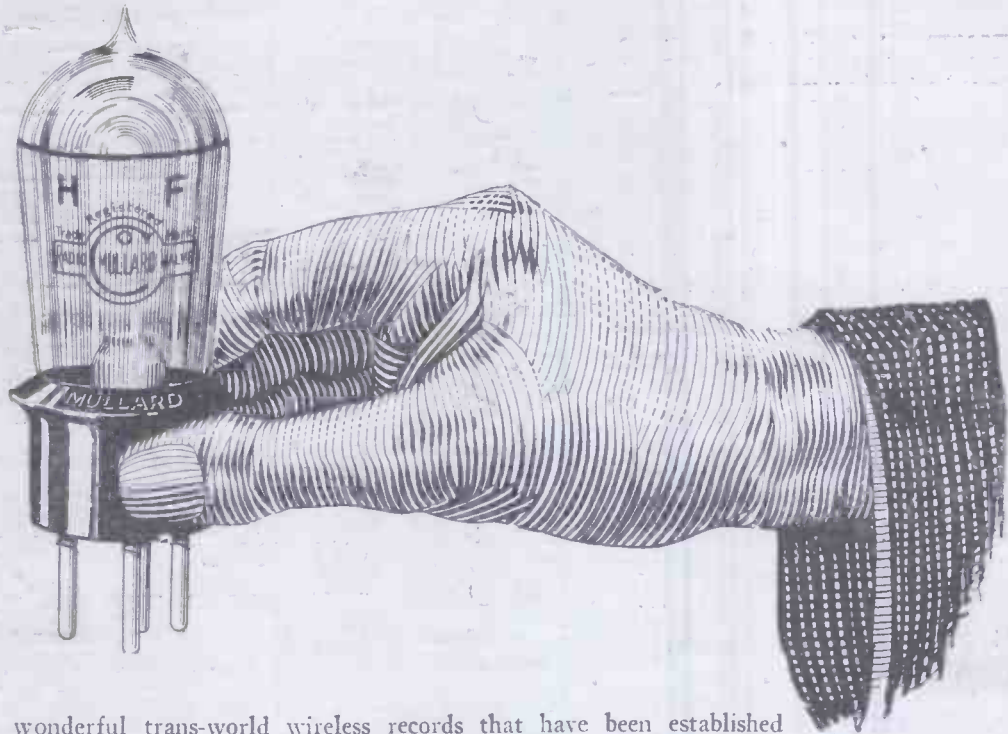
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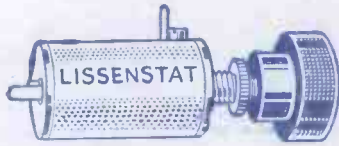
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