ASK FOR COMPETITION ENTRY FORM *(See p. 20)*

A CRYSTAL SET FOR DISTANCE

Amateur Wireless And Electrics

Vol. IX. No. 212 SATURDAY, JULY 3, 1926 Price 3d

PRINCIPAL CONTENTS

WELL ILLUSTRATED

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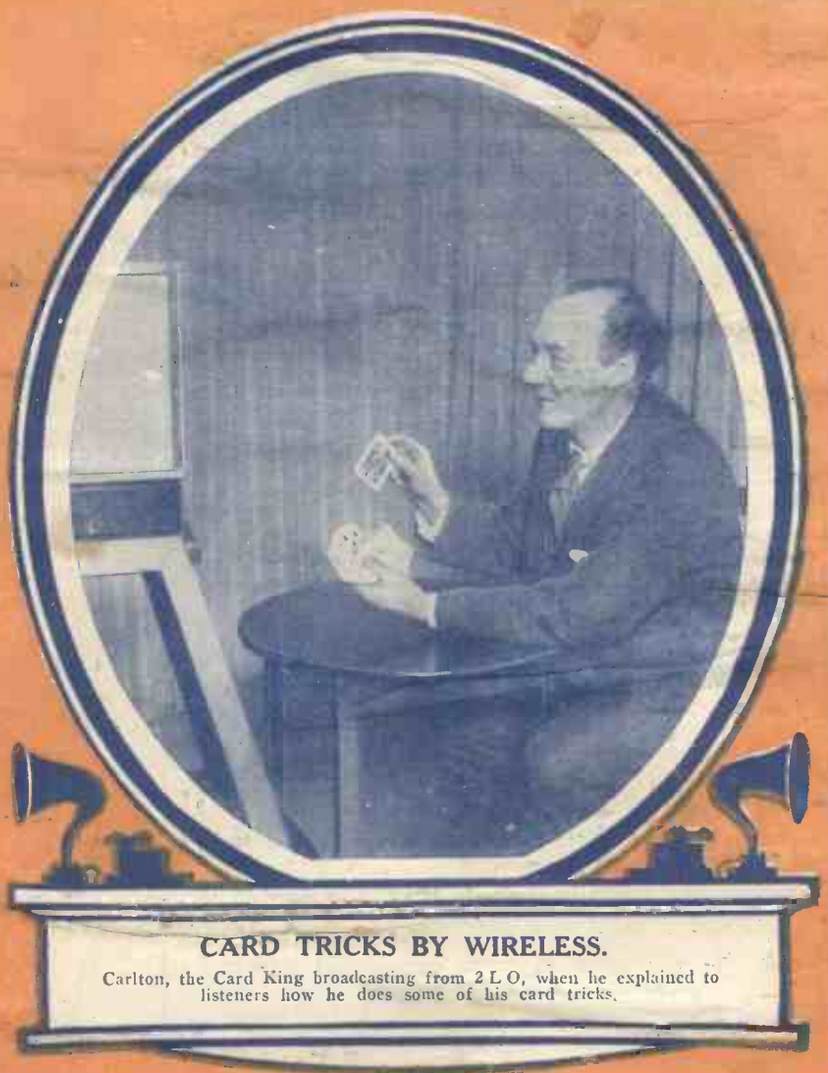

CARD TRICKS BY WIRELESS.

Carlton, the Card King broadcasting from 2 L O, when he explained to listeners how he does some of his card tricks.

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

Technical Adviser: SYDNEY BRYDON, D.Sc., M.I.E.E.

Vol. IX. No. 212 — JULY 3, 1926

Chief Contents

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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.

HAS YOUR SET "GONE OFF"?

DO you happen to be finding that things are not what they were with your wireless outfit? That it seems, somehow, to have "gone off"? You know what I mean. The DX won't come in like it used to do, the row once kicked up by the local station is but a shadow of its former self, the reaction coil has lost its kick, and the selectivity has disappeared.

A WIRELESS receiver is just as likely to depreciate as any other electrical or mechanical contrivance, though in its own particular ways. In this article the reader is told the nature of most troubles that are likely to occur, and how by a little attention the efficiency of the set can be maintained.

This usually happens when a new receiver has been in use for a few months, so don't get worried. It is merely "run down," and it is quite a simple matter to put some vim into it, and if you will sit up and take notice of the following points your set will soon regain its pristine vigour.

The Power Behind

First of all, how about the H.T. battery? If this has never been removed since the set was installed it is quite likely played out. It may have been a good one when new, but even so it is not like the brook and won't go on for ever. Stick a high-resistance voltmeter across its terminals when the set is working, and if this reads only fifty per cent. of what it should, scrap the battery. That will mean buying another, of course, and you can, if you like, get a five-shilling one of Continental make. This *may* be good, but probably it will be worse than the one you have just dropped in the dust-bin.

If you want to be sure of getting the goods where batteries are concerned, buy one made by a firm who have a reputation to lose. If you don't know one, turn to our advertisement pages or ask us direct. And, by the way, if you are running four or five valves, a good accumulator H.T. battery is a proposition worth while considering in spite of the expense.

Next take a look at the valves. That the filaments still light is hopeful, but doesn't necessarily mean much. If bright-emitters are worked pretty hard gas may be liberated from the electrodes, and then the vacuum inside the bulb ceases to be a vacuum and the valve becomes soft. Soft valves are poor amplifiers, but often beat hard valves hollow when plugged in the detector socket, so don't give them to the rag-and-bone man.

When your valves are of the D.E. type there is more likelihood of trouble. Very little extra juice put through the filaments may cause the thorium to go on strike, but it may often be induced to get back to work again by running the valves for a few hours with the H.T. battery out of action. However, the time will surely come (if the filament itself hangs out so long) when the dull-emitting properties will retire for good, and then new valves will be the only way out.

Fortunately, when a wireless set is feeling out of sorts it will usually try to tell you what is the matter with it. Besides failing to deliver the goods in the way of hefty loud-speaker work, it may crackle a good deal. By this it may be trying to inform you that the H.T. battery has outgrown its usefulness, but as we have already disposed of this component we will pass on.

Do the valve filaments glow steadily? If they flicker in brightness, make sure the H.T. accumulator is full of juice, and, if so, find and eliminate the loose connection, which will probably be between the filament rheostat arm and the coil of resistance wire.

Reliable Components

Supposing that the crackling occurs only when turning the dial of one of the condensers, you will know where the trouble is right away. Either a moving plate is touching a fixed plate or the spindle is not making good contact with the bush in the end-plate.

What is the value of your grid-leak?

(Concluded at foot of next page)

THE SUBURBAN AERIAL MAST

It is a simple matter to build a mast which will not be an eyesore. This article tells you how at a trifling cost.

ONE of the bugbears of the outside aerial is that it requires supporting at each end. The house usually performs one half of this function, while an erection variously designated as an "aerial mast," "wireless pole," etc., must be contrived to effect the other half. Judging from a survey of some suburban backyards, the provision of this latter has resulted in the building of some slightly unorthodox contraptions, and it is the purpose of this article to give details of an inexpensive mast suited to amateur needs.

This mast has been designed more particularly for the town-dweller, whose available space is usually very limited. First, as to the height. This should be about 30 ft., as to go much higher than this an elaborate layout of stays, etc., is required. The material should be pine or some other cheap wood of 3-in. by 2-in. section. Purchase two 16-ft. lengths of this, making sure they are free from serious faults.

Means of Support

The mast is supported by bolting it to a wall (Fig. 1), which is usually between 7 ft. and 8 ft. high, by means of two iron rods with threaded ends. For this two small holes will have to be made through the wall, one 1 ft. from the top, and the other directly below it the same distance from the foot. Rods of a suitable length with nuts to match may be obtained from any ironmonger. The iron plates 3-in. square with holes in their centres will also be required. These are placed under the nuts on the outside of the wall to prevent the rods pulling through under pressure.

This done, the work of assembling the mast may be commenced. If the yard is not paved the mast may be sunk in the ground a few feet to give it extra stability, and this must be allowed for when boring the holes for the rods that will secure it to the wall. These holes should be bored from a 2-in. side of the wood, so that the mast will rest against the wall edgewise.

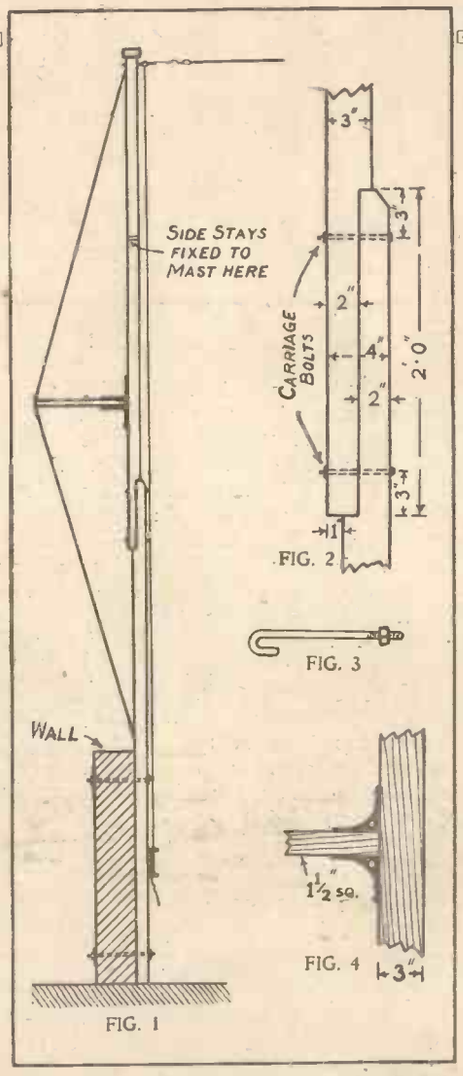


Fig. 1.—The Complete Mast. Fig. 2.—Details of Joint. Fig. 3.—Bolt for Securing Pulley. Fig. 4.—Method of Attaching Strut.

Before proceeding further it is advisable to test the work done by placing the length of wood in position against the wall and securing it in the position it will eventually occupy. If everything seems in order, take it down again and join the other length to it in the manner indicated in Fig. 2.

Needless to say, the joint must be very strong. No difficulty will be experienced if the measurements are followed.

Next cut the top of the mast to an inverted **V** shape and roof it with a piece of zinc. This is to prevent moisture running down the grain of the wood. Secure the pulley about 6 in. from the top with a bolt of the pattern shown in Fig. 3. Note that the pulley must be bolted to the edge of the wood, not the face.

Staying

If the aerial is a heavy one, a back stay is advisable. For this a 3-ft. length of wood 1½ in. square will be required, together with two strong angle-brackets as shown in Fig. 4.

The position of the strut will depend upon the particular case, and will be in the exact centre of that portion of the mast projecting above the wall. Secure the strut with the brackets as shown in Fig. 4. The stay wire need not be heavy, and is fixed just below the pulley, brought over the end of the strut, and finally anchored to the mast just above the wall. Of course this is all done before the mast is erected.

Two side stays are employed, one on each side. Use heavy stranded wire here, as thin stuff soon corrodes. They can be of one length of cable, the middle of which is twisted round the mast 5 ft. from the top and kept in position by half a dozen staples.

When the halyards are put in place the mast can be hoisted into position and the securing nuts finally tightened. The back stay will project over the wall and the pulley will face inwards. Drive two iron pegs in the wall, each 10 ft. from the mast, to take the side stays. Strainers may be used for tightening purposes here, though they are not necessary.

The mast is now complete, and the aerial may be hoisted into position.

J. R. R.

"HAS YOUR SET GONE OFF?" (*continued from preceding page*)

Oh, yes, it may be *marked* 2 megohms, and that may have been its resistance once upon a time. But what is it now? Sometimes the resistance varies quite a lot, you know. It may even have become infinity, and this will account for signals fading a short while after the set has been switched on and making you switch off the filaments or disconnect the H.T. battery for a moment in order to bring them back again.

If the flatness of the tuning is what is worrying you the trouble is damping. And damping is caused by resistance, so find out where it is. The aerial circuit is the proper place to look, and if there are no joints in the outside wire you can come right along the set and make sure that the tuning coil is a tight fit in its holder. After this trace the earth wire to its roots, and if you have not found the trouble before you will probably discover it at the earth connection.

When you have turned the set itself inside out and fail to find where the sound has been hiding, don't forget what it is that actually makes all the noise. What is the good of gingering up the set if the phones or the loud-speaker are dud? If the latter have lost their magnetism, the only safe plan is to return them to the makers for their attention or, failing this, to entrust the work to some firm which specialises in the subject.

And, finally, having found the trouble and cured it, make a careful note of it so that you will know right away next time. The real radio expert gets a very large proportion of his knowledge from his habit of looking for trouble and finding it. So now you know what to do. J. F. W.

A NEW SHORT-WAVE CIRCUIT—AND THE RECEIVER

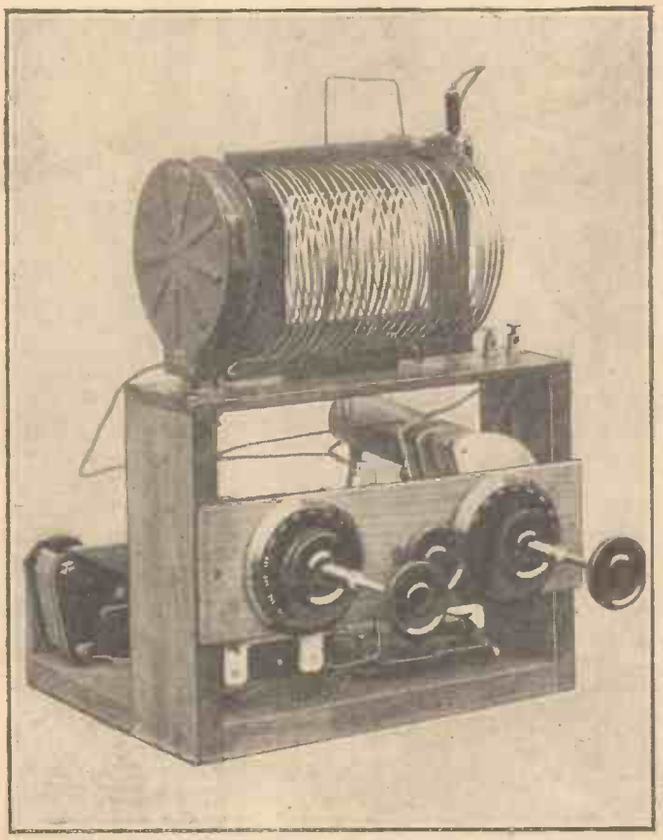
Being an account of some experiments in short-wave work and details of a novel receiver

THERE is much danger in the title of this article. One can anticipate the yell of the superior person who used the thing in the trenches in 1917. There is also the naval expert (retired) who toyed with it at Jutland, and even the vivacious antiquary will doubtless trace it to the venerable diagrams of Hertz himself!

A Modified Ultraudion

The nearest approach to the circuit used in this receiver is the Ultraudion. An attempt was, in fact, being made to induce this to function on the now moderate wavelengths of 20 metres or so when it was discovered. Ambitious bare-wire variometers were made and duly consigned to the junk-box owing to their disreputable behaviour below 100 metres. The next logical step was to replace the variometer by a condenser and coil. Theoretically this should have worked in conjunction with an aperiodic coil in the aerial circuit. Signal strength was poor, however, and capacity effects atrocious. Finally, the circuit shown in the diagram was evolved.

Here the condenser C1 is placed right across anode and earth, and the circuit, one would imagine, ceases to be an Ultraudion altogether.



Front View of Short-wave Receiver Embodying the Circuit Below.

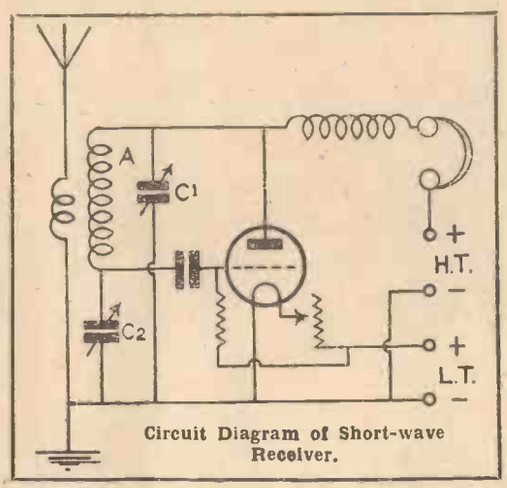
Results

The writer has been experimenting with receivers for reception of signals below 100 metres ever since there were any to be heard. Naturally all the usual circuits, Reinartz, etc., have been thoroughly tried out; so far, however, the new circuit has given the best results.

KDKA has been heard at excellent strength as early as eleven o'clock, and nearly all the short-wave transmissions come in well, down to the awe-inspiring din of POX on 20 metres.

The actual set illustrated was made from odd bits of wood and old parts left over from various receivers. The aperiodic and secondary coils can be short-circuited to give a wide band of wavelengths, and a loading coil can be used for the broadcast waveband, the aerial in this case being applied to the anode end of coil A. On the broadcast band the set appears as good as any two-valve H.F.-detector circuit the writer has heard; all the British and most Continental stations being readable on an average suburban aerial.

By substituting a 25-turn frame aerial for the coil A the local station eight miles away comes in splendidly, and the circuit should prove ideal for portable work.



Circuit Diagram of Short-wave Receiver.

Components

The following types of components are strongly advised: Igranic fixed-coupler coils for both short and broadcast wavelengths condenser C1, .00025 with vernier; condenser C2, .0005 with vernier. In the case of condenser C2 provision should be made for placing fixed condensers in parallel with it, as the value required is as much as .001 on the broadcast band. The grid condenser should be of the plug or clip-in variety. The grid leak must be variable. The R.F. choke is a No. 150 plug-in coil. The writer uses a Cossor Wuncell valve, and this is strongly recommended owing to its low capacity base. For other valves the value of the grid condenser may have to be varied slightly.

L.F. Amplification

If a transformer stage of L.F. amplification is added—and one is almost essential—the usual condenser across the transformer primary is best omitted for short-wave reception, but is retained for broadcast.

The condenser C2 must be of good quality, as if a short-circuit occurs the high-tension battery will be damaged. If the frame is used it must *replace* the coil A, and on no account be placed across the aerial and earth terminals of the set, or fireworks will result.

At the present time the writer is attempting to get down to five metres with this circuit.

The set will appeal to the home constructor, for by using single-circuit

(*Concluded at foot of next page*)

ALL ABOUT BROADCASTING IN SWEDEN

IT was with some considerable difficulty that the Swedish Government was able to pass a Wireless Telegraphy and Telephony Bill in the autumn of 1924 for the purpose of establishing a regular broadcasting service in that country. During two short periods previous to this date experimental transmissions had been made by a group of Stockholm manufacturers interested in the electrical industries; entertainments of a very sketchy nature were given towards the end of 1923 twice to three times weekly. As a result, requests for broadcasting licences were tendered to the Government by manufacturers, the Press and other bodies interested in the movement. A private syndicate, composed of the leading Swedish newspapers, the official Press agency (Tidningarnas Telegrambyra), and members of the wireless industry, formed a company on similar lines to that of the B.B.C., by which the Svenska Aktiebolaget for Radiotjaenst came into being.

The concession granted by the Government to this concern, dated January 1, 1925, was limited to a period of two years, the organisers binding themselves to erect a minimum of five stations, for which both financial and technical assistance would be granted by the Ministry of Posts and Telegraphs. The stations are actually managed by the Royal Swedish Telegraphs Administration, which remains the owner of the buildings and plant, the programmes being supplied by the Radiotjaenst.

The Main Stations

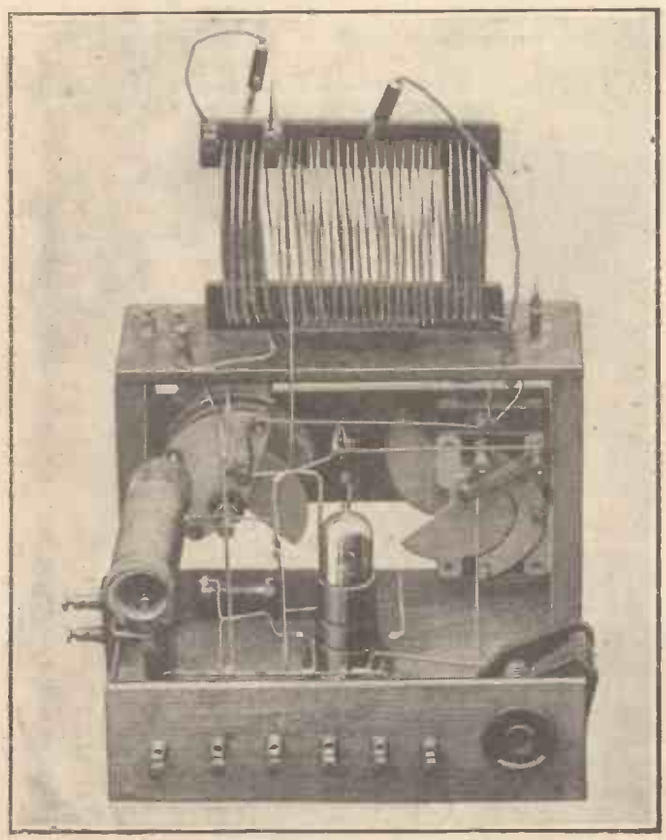
To-day, Sweden already possesses the following six main broadcasting transmitters: Stockholm (SASA), 430 metres, 1½ kilowatts; Gothenburg (SASB), 288 metres, 1½ kilowatts; Malmö (SASC), 270 metres, 1½ kilowatts; Sundsvall (SASD), 550 metres, 1½ kilowatts; Boden (SASE), 1,200 metres, 1 kilowatt; and Karlsborg (SAJ), 1,350 metres, 10 kilowatts.

The cost of the receiving licence to listeners, originally fixed at 12 Swedish crowns, has now been reduced to 10 kroner, or about 10s. per annum. When the original Stockholm station was opened, approximately 10,000 listeners had registered in the country, but so great has been the enthusiasm for broadcasting that this figure at the end of May last had already increased to approximately 200,000 subscribers. In order to supply a broadcasting service to most districts, arrangements have been made with the local wireless clubs by which small relay stations—the plant for which has been supplied by the Swedish Posts and Telegraphs—are operating daily as relays of the Stockholm programmes. On some days weekly, concerts are also broadcast by the local studios, and in the event of interesting transmissions, are conveyed by land-line to the capital, from which they are transmitted to other centres. Sweden can to-day boast of the following sixteen relay stations:

	metres	watts
SMUC (Eskilstuna) ...	250	250
SAZK (Falun)	370	1,500
SMXF (Gefle)	208	250
SMZD (Joenkoeping)	199	250
SMZW (Kalmar) ...	253	250
SMSM (Karlskrona) ...	196	250
SMXG (Karlstadt) ...	221	250
SMTY (Kristinehamn)	202	100
SMUV (Linkoeping) ...	467	250
SMVV (Norrkoeping)	260	250
SMYS (Säffle)	245	500
SMXQ (Trollhaettan)	322	1,000
SMSN (Umea)	215	250
SMYE (Helsingborg)	235	250
SMSO (Varborg) ...	385	250
SMTI (Orebro) ...	237	250

The 10-kilowatt station at present installed at Karlsborg is purely of a provisional nature, as a new 25-kilowatt transmitter is in course of erection on that site. A further State broadcast transmitter is also being erected at Oestersund; it will have a 1-kilowatt plant, and although the wavelength has not yet been definitely fixed, it is expected to operate on about 720 metres. The Radiotjaenst, however, have been very anxious to possess a high-power station in Sweden, and arrangements have now been concluded with the Marconi Co. for the erection at Motala, in the neighbourhood of Lake Vetter, of a broadcasting plant with aerial energy of at least 30 kilowatts, to be later increased if necessary. It is hoped to open this station in about six or seven months' time.

J. G. A.



Rear View of Short-wave Receiver

"A NEW SHORT-WAVE CIRCUIT—AND THE RECEIVER" (*continued from preceding page*)

tuning he has at once a one-coil receiver without tappings, the coil being replaceable by a frame aerial for local work. The frame aerial should be wound on the low-loss principle. Finally it may be emphasised that tuning requires a little practice, and at first broadcast hours should be barred; in fact, "Please, don't do it."

G. C. P. B.

LOW-FREQUENCY TRANSFORMER FAULTS

WHEN a series of howls or crackling noises or else a complete silence would seem to indicate that the low-frequency transformer has broken down, it should be tested for continuity on both the primary and the secondary windings, either with a galvanometer and battery or else with a pair of telephones. If the secondary winding has broken down it is of not much use; on the other hand, if the primary winding has burnt out and the secondary is still intact, then the good winding may be used in conjunction with a suitable condenser, etc., for coupling by the choke-capacity method, and a further period of life thus obtained. It is, of course, understood that the faulty winding is left free.

A. H. H.

THE H.F. TRANSFORMER—THAT RATIO PROBLEM

Some Useful Hints in Securing Efficiency

THE ordinary commercial H.F. transformer of the barrel or disc type can scarcely be considered an efficient article—at least, not when its windings are regarded as inductances, one or both of which can be tuned to a given wavelength by condensers. Generally the wire is of so small a gauge as to introduce appreciable damping losses, which makes the tuning flat, while the self and mutual capacities of the windings are undesirably large.

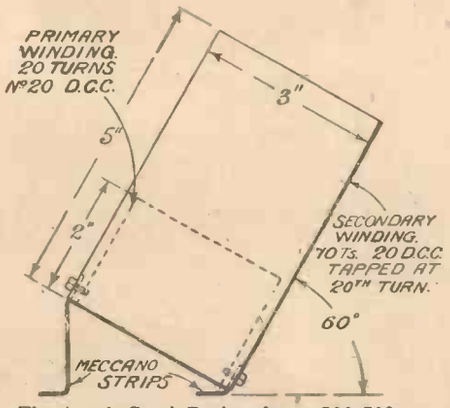


Fig. 1.—A Good Design for a 300-500 m. H.F. Transformer.

This latter fault can be remedied to some extent in the barrel type by making the slots deep and narrow.

On the other hand, there is the advantage that by introducing damping losses and by having windings of small diameter, stability is more easily obtained when more than one stage of H.F. amplification is used; in particular, the compact windings are convenient as their stray magnetic fields are less likely to interact. Interaction can, however, be prevented in another way, as shown below, and stability obtained without damping losses, so that sharper tuning is possible.

In the case of an L.F. transformer, it has been shown that the governing consideration is the relative impedances of the primary and of the plate circuit of the preceding valve, the impedance of the secondary not being of such importance, as it is, practically speaking, an open circuit. This is not the case with the secondary of an H.F. transformer, and the ratio of the number of turns on the primary and secondary should depend, for a given coupling between the two, on the relative impedances of the circuits to which they are connected, that is, the plate circuit of the first valve and the grid circuit of the second. The trouble is that this second impedance is not a fixed quantity for a given wavelength, as it has been found that it varies with the tuning of the plate circuit of the same valve, and so, for simplicity, it is perhaps better to treat the matter from a different standpoint.

If the inductance of the primary is made small and has a variable condenser in parallel, the circuit can be tuned to the frequency of the incoming waves, and if thick enough wire is used the circuit will then act as very high impedance at the frequency to which it is tuned. This impedance is much greater than that of the preceding valve, with the result that the potential drop across the circuit will be approximately equal to the potential between the grid and the filament of the preceding valve multiplied by the amplification factor of the valve (which should be high for an H.F. amplifying valve).

An induced voltage will then be applied to the secondary and so to the grid of the second valve (the detector or second H.F. valve). If the number of turns on the secondary is large compared with that on the primary a step-up of potential can be obtained. But the larger the number of turns on the secondary, the greater will be the self-capacity, which will act as a short-circuit to the high-frequency oscillations in the grid circuit of the second valve and cut down the amplification.

It is here that interesting experiments can be made. Try the effect of different turn ratios—say 1 to 1, 1 to 1½, 1 to 2, 1 to 3, and so on, with a varying number of turns on the secondary, the primary being tuned by a condenser. Then try tuning the secondary, the ratio being altered by reducing or increasing the primary turns. As the ratio is increased, it will be found that there is a gain in selectivity, but some loss in amplification.

A Good Design

A useful design for a transformer for the 300-500 metres band is given in Fig. 1. The primary is wound on the inner cardboard tube and the secondary on the outer, the inner being bolted to the outer by the screws fixing the supports. The latter are Meccano strips of such lengths as to incline the tubes at about 60 degrees to the horizontal, so that if two or more transformers are used the magnetic fields will not interact to any great extent. To get the right angle of inclination, it is convenient to use a cardboard triangle with one angle of about 60 degrees. As a reasonable compromise between selectivity and amplification a good turn-ratio is about 1 to 3½, that is, with 20 on the primary and 70 on the secondary, the latter being tuned by a .0005 microfarad variable condenser.

Tuning the secondary instead of the primary appears to increase stability, but two stages of H.F. amplification with low-loss transformers of this kind wound with, say, No. 20 wire would tend to be difficult to "tame." Instability can, however, be overcome without introducing losses by the neutrodyne method. This neat arrangement has often been dealt with in these pages, and so it will suffice to mention that if a tapping is taken off the secondary of the transformer and connected via a tiny variable condenser to the grid of the preceding valve, the capacity of the condenser can be varied until the internal grid-plate capacity of the valve is neutralised and no leakage of energy will take place between the grid and the plate circuits.

Fig. 2 shows a two-H.F.-detector circuit arranged on these lines, N1 and N2 being the neutrodyne condensers. No provision is made for reaction, as this is not likely to be required with two efficient H.F. stages. The aerial circuit is shown as aperiodic to increase the selectivity, and this circuit and the secondary can very well be wound on tubes similar to the H.F. transformers. An obvious modification is

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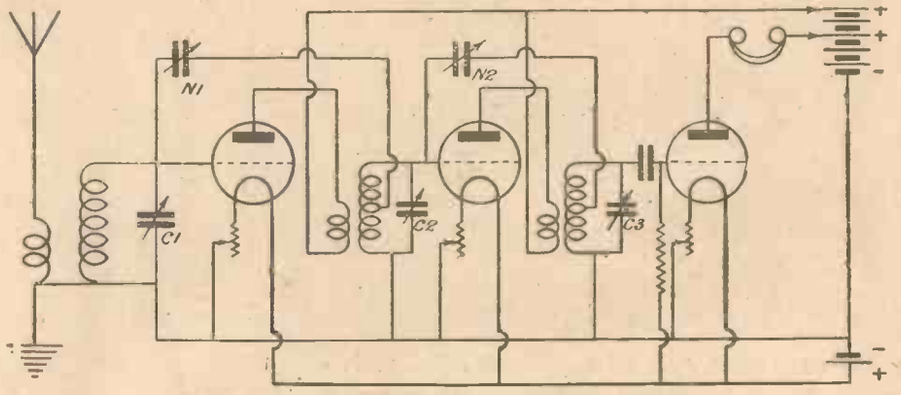


Fig. 2.—A Neutralised H.F. and Detector Circuit.

WHAT HAPPENS WHEN YOU USE REACTION

REACTION, simply stated, is the making of an amplified oscillation in the anode circuit of a valve which reacts on the grid circuit, reinforces the original E.M.F. on the grid, and introduces a building-up effect into the system.

This action can be best understood by a simple mechanical analogy. Imagine a pendulum which has been set swinging.

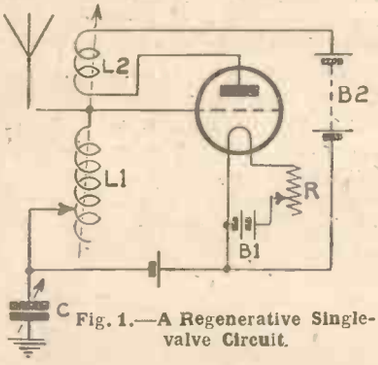


Fig. 1.—A Regenerative Single-valve Circuit.

It swings to and fro, with gradually decreasing amplitude in each swing until finally it comes to rest. The oscillations of the pendulum are, in other words, damped, and the causes of this damping are friction and air resistance. If the friction is reduced by ball, knife edge, or other bearing, etc., and the air resistance reduced by operating the pendulum in a vacuum, the rate of decrease of the amplitude of each oscillation is much smaller and the pendulum continues to swing for a much longer period.

Supposing now that a mechanical arrangement is contrived to give the pendulum a slight impulse at the end of each complete swing; if this impulse is correctly gauged it need not be of great power, but being given at precisely the right moment, and of just sufficient power to make up the losses, the pendulum will oscillate with regularly equal amplitudes and will swing for ever. Sustained oscillation such as just described takes place in watches and clocks, the mainspring supplying the small extra power to the pendulum or balance wheel.

Using a valve as a high-frequency oscillation amplifier, the amplitudes of the oscillations are greatly increased, but the damping of the oscillations remains practically unaffected. In order to obtain the effect just considered in relation to the pendulum—that is, sustained oscillation—a little added to the amplitude of each oscillation, a circuit must be devised which will have similar properties to those of a clock or watch.

The Reaction Circuit

The circuit, Fig. 1, is one which will act retroactively, and its operation is as follows. Oscillations induced into the aerial—L1C circuit vary the potential on the grid of the valve above and below its zero value. This control charge operates the amplified oscillations which will flow round the circuit provided by the electronic flow, the coil L2 and the high-tension battery B2. This means that oscillations of a greater amplitude, but exactly in time and at the same frequency (radio frequency) as those flowing in the coil L1, will be flowing in the coil L2. If this coil L2 is now coupled inductively to the coil L1, oscillations will be induced in L1, and as there already exist in this coil oscillations exactly similar in time and frequency, they will combine and produce oscillations which are still stronger.

One essential consideration in such a magnetic coupling is that the fields of the two coils must, of course, be arranged to assist each other, or else the tendency will be to prevent any flow of current at all. This can actually happen if the coil L2 is applied the wrong way round, and in constructing such a set means should be provided to reverse the connections of the coil L2. Further, the coupling of the two coils L1 and L2 should be variable, as it is desirable to be able to vary the degree of reaction when tuning the set.

It will be seen that each little push, to compare this circuit with the mechanical analogy of the pendulum, has the effect of lessening the damping of each oscillation, and a little thought will show that this can be carried to an extreme if care is not taken, and undamped continuous oscillations generated in the circuit which will be radiated by the aerial-earth system. This self-oscillation point must be watched; the most sensitive condition of the set is just before self-oscillation, and

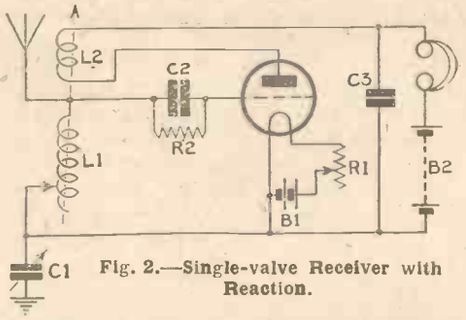


Fig. 2.—Single-valve Receiver with Reaction.

careful adjustment in the degree of coupling will ensure the operation of the set at this point.

As a means of reception of weak signals reaction has not a peer, and a set constructed to operate on this principle, although requiring greater skill in adjustment, will give very much better results than the ordinary methods in use. A total magnification of some thirty times is obtainable.

With the theoretical circuit described, the amplified signals will have to be detected in the ordinary way. A crystal and telephones can, of course, be used or another circuit added. Further, for those who are out for compactness in their receiving gear, it is possible to arrange a circuit in which reception, amplification, reaction, rectification and detection take place in the same circuit, using only one valve.

Such a circuit is shown in Fig. 2, and a study of the diagram will show that it can be resolved into three component but integral circuits.

(1) The aerial-earth tuning circuit having oscillations induced into it from wave trains passing in the ether.

(2) An amplifier-detector circuit where the condenser C2 and grid leak R2 provide the rectification components.

(3) The reaction circuit comprising a coil L2 and fixed condenser C3.

The method of operation is to tune the circuit by adjusting L1 and C1 with the coupling L2-L1 as loose as possible. Then adjust R1 and B2 until the loudest signals are obtained, and finally adjust the coupling L1-L2 until the best signals for comfortable reading are heard in the telephones.

A. E.

"THE H.F. TRANSFORMER — THAT RATIO PROBLEM" (*continued from preceding page*)

to make the transformers with bases and the windings connected to valve legs so that they can be plugged into sockets on a baseboard and changed for different wavelengths. The neutrodyne method, however, does not seem to function so well on high wavelengths, but, on the other hand, it is not so necessary. A series of transformers of this type has now been placed on the market by Messrs. Lissen, Ltd. The neutralisation of a set on these lines is best carried out by tuning in a signal and then taking out the first H.F. valve. An adjustment of the condensers will then bring in the signal again. Wrap a piece of paper or rubber round one of the valve filament legs and replace it in its socket, adjusting N1 until the signals are very weak or not heard at all. The process is then repeated for the second H.F. valve. The set is then properly stabilised.

DX work is fascinating with a properly neutralised set because there can be no self-oscillation, and stations are tuned in without the usual whistling. Moreover, the set is so sensitive that a distant B.B.C. station can be brought in at practically the same strength as the local one. E. A. L.

Co-axial Mounting

The new Constructional System which ensures (a) longer life (b) lower running costs and (c) greater uniformity in results. Used for the first time in this wonderful new Cossor Dull Emitter.

FOUR years ago Cossor astonished the Radio world by evolving a method of valve construction which, for the first time, utilised almost the whole of the electron stream. Two years later this success was followed up by the introduction of a unique triple-coated filament which operated at a phenomenally low temperature.

And now Cossor—in introducing the new Cossor Point One—demonstrates that the same spirit of progress which has always dominated its activities is as vigorous as ever.

Why valves vary in performance

It is well known that if a batch of valves were made up using identical filaments, grids and anodes without due regard being paid to the accurate spacing of the elements that every valve would vary considerably in results. There would be hardly two alike. Any variation of distance between filament and grid or between grid and anode exercises considerable influence upon performance. All elements must be mounted co-axially to obtain the best results and any method which *guarantees* this must result in an incomparably higher standard of efficiency.

In the new Cossor Point One there is at last available a patented system of mounting which infallibly aligns the filament, grid and anode from top to bottom.

How Co-axial Mounting is achieved

Owing to the peculiar advantages possessed by the shape of the Cossor grid and anode it has been found possible to secure these two elements together at the top by means of a seonite insulator. The grid itself ends in two prongs which are inserted into the base of the seonite insulator. The anode rests on a wide flange provided, and is welded at its base to two stout nickel supports. Even extreme force cannot disturb the exact relative positions of these two elements—once fixed in their places, to a hundredth part of an inch, they are there for all time.

The new Shockproof Filament Suspension System

Through the centre of the seonite tube runs a fine wire which holds the filament in its correct position. Unlike other valves the filament in the Cossor Point One is not held under tension. Its shockproof support provides exactly the degree of elasticity to enable it to absorb the sharp concussion caused by an accidental blow. A knock which would shatter the filament in an ordinary valve is rendered harmless by this amazingly efficient suspension.

Greater uniformity and economy

Thus with the filament, grid and anode in permanent alignment it is reasonable to expect a greater uniformity in results. The supreme importance of this will be instantly appreciated by users of Neutrodyne Receivers employing several stages of *matched* H.F. amplification.

But in addition this new valve is exceptionally economical. Its triple coated filament consumes only one-tenth of an ampere at 1·8 volts. A super-heterodyne using 7 of them would actually consume less current than a little one-valve set with a single bright emitter.

Bearing in mind, too, the fact that this filament operates at a glow which is practically invisible, it will be obvious that at last wireless enthusiasts have available a valve which must give an incredibly long and uniform service.

Types and Prices

Cossor Point One

RED TOP: For H.F. use 1·8 volts Consumption ·1 amp 15/6

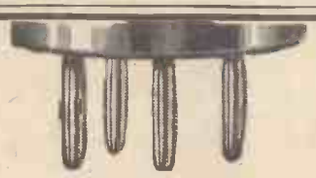
PLAIN TOP: For Detector 1·8 volts Consumption ·1 amp. 15/6

Cossor Stentor Two

GREEN TOP: For power use 1·8 volts Consumption ·15 amp. 18/6

The new Cossor Point One

—the long-life Dull Emitter with the new ·1 amp. filament



Gilbert Ad. 5378

On Your Wavelength!

Not So Black as It is Painted

IT was with considerable relief that I read that the hobby of the worse half of one of the pairs who were this year awarded the Dunmow Flitch was wireless. We have heard so much about the wireless widow who is driven to distraction by her husband's technical descriptions of new circuits, and of the numerous divorces that have been granted in America to wives who complained bitterly that since the man had taken up wireless there was no doing anything with him, that many of our Benedicts have begun seriously to wonder whether they should not take up spillikins or crosswords instead. But now at last we have clear, convincing proof that, whatever dire effects upon connubial bliss wireless may produce across the Herring Pond, in this country it creates a spirit of amity and concord. The only trouble I find is that Mrs. Thermion is so insistent upon listening to 2LO that my DX work is seriously curtailed.

Yet Again

Yet again wireless has proved that it is the sailor's best friend. A few days ago the Hull steamer *Leicester*, on her way to Montreal, found herself amongst ice, and was badly damaged by a collision with a floating mass. The SOS sent out was promptly picked up, and customs vessels were sent immediately to her assistance. They found her with the forward deck flooded, the forehold full of water, and one bulkhead stove in. Thanks to their efforts, she was safely towed into port.

Something New in Valves

I see it reported that Americans are much interested in a new type of valve that employs no filament. Instead of this there is a cone-shaped metal cathode, wound with a coil of wire whose contacts may be connected directly to the lighting mains. The coil of wire serves the same purpose as those used in electric radiators. It is heated by the current which passes through it, and raises the temperature of the cathode until a point is reached at which its coated surface begins to emit electrons. The cathode is connected to the negative end of the high-tension battery, and a stream of electrons passes to the plate exactly as in an ordinary valve. The idea is an excellent one, for the problem of filament heating has always been one of the most troublesome in wireless.

There is, of course, not the slightest reason why you should use a filament for the cathode and heat it by passing through it a low-voltage current from an accumulator. It does not matter what form your cathode takes or how you supply the necessary heat; you might use a gas-ring to do the job, but that would not be very convenient. The principle of using a coil of wire for heating up the cathode is not in itself new, for a similar method has been employed for some time now in "cleaning up" dull-emitter valves. At the same time its application in this particular way is a distinct novelty, and I rather fancy that it may lead to some most interesting developments in valve design. It needs no words of mine to emphasise the enormous advantage of being able to run your valves directly off the mains no matter what the supply voltage may be or whether the current is direct or alternating.

A Revolution

The adoption of a cone-shaped cathode instead of a filament will give the valve designer a tremendous scope for his activities. In the future we may see valves turned, so to speak, inside out. Immediately inside the bulb will be the conical cathode surrounded by its heating coil. Within the cathode will be the grid, and inside that the plate. Owing to the comparatively enormous emission surface provided by a cathode of this kind, quite a small plate potential should suffice to produce a large current flow through the valve. Thus, in addition to the convenience of heating valves direct from the household supply mains, we may have the added advantage of being able to use a plate battery consisting of very few cells. Valves built on these lines would be practically everlasting. It should be possible to make them quite cheaply, and they should be very much more constant in their action than those employing the flimsy filament, which is always liable to displacement.

Unlikely

I see that Dame Clara Butt, who has often delighted listeners with her wonderful voice, has recently made a suggestion that the present licence fee should be doubled in order to obtain an ample revenue, which would make it possible to have no artistes but those of the highest class as contributors to the broadcast programmes. Whilst everyone wishes that the very best talent should be available for broadcasting, I do not think that Dame Clara Butt will find that her suggestion meets with any warm support amongst the public.

Ten shillings a year is admittedly a small amount to pay for a daily service of entertainment; but what those who make such suggestions often forget is that the enormous majority of listeners are users of crystal sets, and a very good crystal set can be made to-day for a matter of shillings. Thousands of wireless enthusiasts find it difficult to pay the present ten-shilling fee, and if this were doubled they would have no choice but to give up wireless or to become pirates. And when you come to think of it, there should already be enough money to pay for a pretty good service. There are more than two million licensed wireless folk to-day, which means that over a million pounds has been paid for licences in the last twelve months.

A Queer Fault

I came across a very strange fault in a friend's set the other day. Finding his gear completely out of action, and having failed to discover the cause of the breakdown, he besought me to see if I could enact more successfully the part of the radio-sleuth. As it turned out, it was not a very long job, for something prompted me to test out the fixed condensers, and on doing so I found that the grid condenser of the rectifying valve had completely broken down. The fitting of a fresh three-noughts-three put matters to rights at once.

What is puzzling me is to find any satisfactory reason for the breakdown of that condenser. It was of good make, the mica dielectric being apparently of first-rate quality. Now if you examine a table of "puncturing voltages" you will find that a given thickness of mica requires a greater potential to break it down than almost any other insulator. Taking a very ample margin of safety, a condenser made with mica dielectrics .002 in. thick (this is the usual thickness) should be able to stand up to several hundred volts quite comfortably. There can never be any high potential across the grid condenser of a rectifying valve, yet this one was absolutely and completely broken down. It is quite beyond me.

Black Sheep and White Sheep

Howling has been so bad of late in certain areas that the B.B.C. has found it necessary to revive the old black list. On the other hand, there is also a "white list" which contains those areas in which the ether is untroubled by the moans and howls of the ham-handed. Personally I hope that they will keep their white list dark—that is, perhaps, rather badly expressed, but you will see what I mean—for I am sure that its publication would be simply asking for trouble. There is no surer way of making a boy thoroughly evil than to give him a good-conduct prize, and I should fear the worst if I found that my own neighbourhood had been included in

On Your Wavelength! (continued)

the list of perfectly behaved areas. My own is, I think, neither a white nor a black area, but a grey one. Oscillating Oswald and Ham-handed Henry still chirp at times, and their occasional misdeeds serve as a warning to others.

Why Not Plate Rectification?

I am unable to appreciate the present popularity of cumulative grid rectification, commonly known as grid-leak rectification. I am sure that seventy-five per cent. of the sets at present in use would benefit materially if plate rectification were used both as regards purity of reproduction and also selectivity. The use of grid rectification, with its attendant risk of obtaining imperfect rectification, is the cause of slight distortion at the amplifier end of the receiver, and this cause is often entirely unsuspected. Moreover, grid rectification considerably flattens the tuning curve of a set and renders moderately sharp tuning impossible.

Plate rectification is easily applied to any set, yet I suppose that owing to the fact that grid-bias batteries are prone to run down it is not so economical as the grid-leak method of obtaining similar results. All you need do is to connect your coil direct on to the grid of the valve and apply sufficient negative volts to the L.T. end of the coil to reduce the plate current (the steady plate current flowing from the H.T. battery) to zero. The current will rise when signals are being received, but will be zero at all other times. By adopting this method an economy in current consumption from the H.T. battery is effected, which is alone a desirable state of affairs in a multi-valve receiver, and probably offsets the cost of installing the grid-bias battery.

Pianoforte Interludes

In a recent issue doubts were expressed as to the wisdom of the B.B.C. confining the 7.25 period to pianoforte recitals. Admirable as these have been both in selection and execution, it was felt that the section of listeners who were not interested in "interpretation" would become indifferent to these performances. One can understand the keenness of the student of the pianoforte, but to me, an average listener and perhaps somewhat limited in power of appreciation, came the conviction that amusement would be increased if these recitals were extended to other popular instruments. I am now delighted to hear that the B.B.C. are considering the development of this type of musical serial. These recitals are admirable even if only for one purpose, namely, that of making one acquainted with the infinite range of compositions for various instruments.

I hazard a guess that the next series will be devoted to the 'cello. The change will give enormous scope, but could not the stringed instruments be taken in turn each week? True, this would break the progressive continuity, but such a practice would provide that imperative variety. To the ordinary listener one of the drawbacks to this serial type of interlude is that it detracts from the pianoforte or 'cello recital later in the evening, but to the student or enthusiast this does not apply.

A Rumour

There was a queer rumour the other day that "feelers" were being put out by American broadcasting concerns with a view to obtaining the services of the B.B.C.'s experts when the company comes to an end, as it will do so, as far as can be seen, at midnight of December 31 next. America may capture our old masters and even our ancient buildings, but when it comes to our B.B.C. people she must be met with a loud and emphatic "No," if, indeed, she has any intentions in that direction. For myself, I rather doubt whether there is any truth at all in the rumour. For one thing, America has no large organisations such as the B.B.C., the bulk of broadcasting over there being conducted by an amazing variety of private concerns, such as newspapers, stores, churches, schools and manufacturers of all kinds.

Wireless versus Electrics

I met a man the other day who holds strange views regarding the position which he allots to wireless in the engineering world. In his opinion, wireless is something totally different to electrical engineering, but he seems to have no very tangible data on which to base his comparisons.

The truth of the matter is that, generally speaking, the fundamental laws which govern electrical engineering govern wireless. To put the whole thing in a nutshell, wireless engineering is merely an adaptation of knowledge common to all electrical engineering, with the difference that the conducting medium is that still unknown medium, the ether.

A Development

I notice a strong tendency among expert constructors at the present time to discard the rheostat in favour of the fixed resistor. Some years ago, when the filament current was quite critical, the rheostat was essential for good working; but nowadays matters are very different. The majority of modern valves are not in the least finicky about their filament supplies; the only important thing is not to overrun them if you want them to last. This being so, there is no good reason why the fixed resistance unit should not be adopted. Fixed resistors are cheap either to make or to buy, and as they are placed inside the cabinet they reduce the number of panel excrescences. But the strongest point in their favour is this: If you are using a rheostat and the filament battery voltage begins to fall off, there is a very great temptation to get the last available watt out of the accumulator by turning the knob further and further towards the full-on position. In doing so you are inflicting, most likely, a grievous injury upon your battery, for when the specific gravity of the electrolyte drops below a certain point the acid in the solution is able to attack the lead of the plates violently and to form that coating of lead sulphate which may prove fatal. With a fixed resister you cannot do this. When signal strength falls off the only course open is to close down.

Have You Entered for the International Set Competition?
(See page 20)

A Big Difference

As an earnest student of American wireless literature, I have always been struck by one great difference between their constructors and ours. This is that, though heaps of them "make" their own sets, their constructional work is confined to the insertion of a few screws, usually into ready drilled holes. In this country we do make a good deal of our own stuff. Not so many years ago quite a number of us were turning out such things as low-frequency transformers and even variable condensers, cutting out the plates of these from sheet zinc or brass and turning up the spindles and even the knobs.

We do not do this kind of thing nowadays because we can buy far better condensers and other components than we can possibly make for ourselves; but we do construct quite a number of smaller components, and most of us do our own drilling, tapping and general fitting. This is largely due to the fact that long before wireless became popular, model-making was a national hobby in this country.

We Must Wake Up

I see it reported that American radio manufacturers are rapidly obtaining the lion's share of trade in some of our Colonies. The trouble is *not* that American sets are better than ours, but that our makers will not realise local conditions. In a vast country like Australia, for instance, which has not a great number of broadcasting stations, there is more call for big valve sets than for anything else. Yet our people have been exporting crystal sets or small valve receivers, for which there is only a limited use. The Americans, on the other hand, are sending out reasonably priced five-valvers and are doing a roaring trade. THERMION.

WIRELESSING PICTURES ACROSS THE ATLANTIC

Working Details of the Ranger System of Photo-telegraphy

By T. THORNE BAKER, F.Inst.P., F.R.P.S.

A REGULAR service of wireless pictures across the Atlantic has now been established, and several pictures are being transmitted daily from London to New York. The system in use is that of Capt. R. H. Ranger, whose apparatus at New York is also transmitting to California and Honolulu.

The apparatus in London is installed at Radio House, and the signals travel 220 miles over the landline from London to Carnarvon, where the Marconi station transmits them by wireless to the river-head station of the Radio Corporation of America. The latter station is on Long Island, and the wireless signals received there are re-transmitted by wire again to the apparatus in New York City.

Capt. Ranger makes use of the photo-electric cell, and a scheme of transmission in its simplest form is seen in the diagram. Here P is a Pointolite lamp with a reflector R behind it, C represents a glass cylinder over which a photographic transparency is placed. M represents a small prism, and the rays of light from the lamp are reflected by this prism through the photograph with a lens system so that a small portion of the image crossed by the rays is thrown upon a small aperture D about $\frac{1}{64}$ in. square; the rays passing through this aperture are reflected by a mirror N upon the photo-electric cell PE.

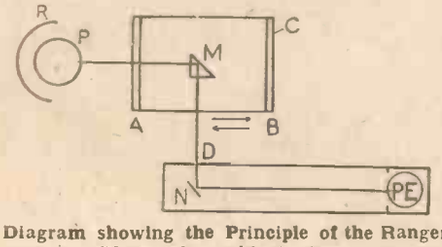


Diagram showing the Principle of the Ranger Photo-telegraphic System.

The photo-electric cell, as readers know, generates a minute electric current (in this case about 2 microamperes) when light falls upon it, and arrangements have been made whereby the current generated is more or less faithfully proportional at each instant to the density of that portion of the picture traversed by the rays of light.

The photo-electric current is greatly amplified by means of valves, the actual current applied to the telegraph circuit being about 15 milliamperes. This current operates an ordinary high-speed telegraph relay. An interesting feature of the apparatus at Radio House is that the photograph being transmitted to America is picked up from Carnarvon by a receiver working side by side with it; it is thus possible for the operator to watch the progress of the transmission, and should it be in any way faulty he can to a large extent control the transmitting machine.

The receiving apparatus has been arranged for continuous-wave telegraph signals by the heterodyne-beat method. The rectified signals, after amplification, operate a siphon recorder, which is one of the most ingenious units of the whole system. This recorder dips once for each signal and makes a dot upon the paper attached to the drum of the receiving instrument. It operates with marvellous quickness, and as a feature of the transmitter is to

(*Concluded on page 16*)

RADIOPHOTOGRAM OF STRIKE Preparations in London; Troops Marching Past Law Courts; Photograph by World Staff Photographer YESTERDAY

This picture was actually published in a New York paper the day after the photograph was taken in London.

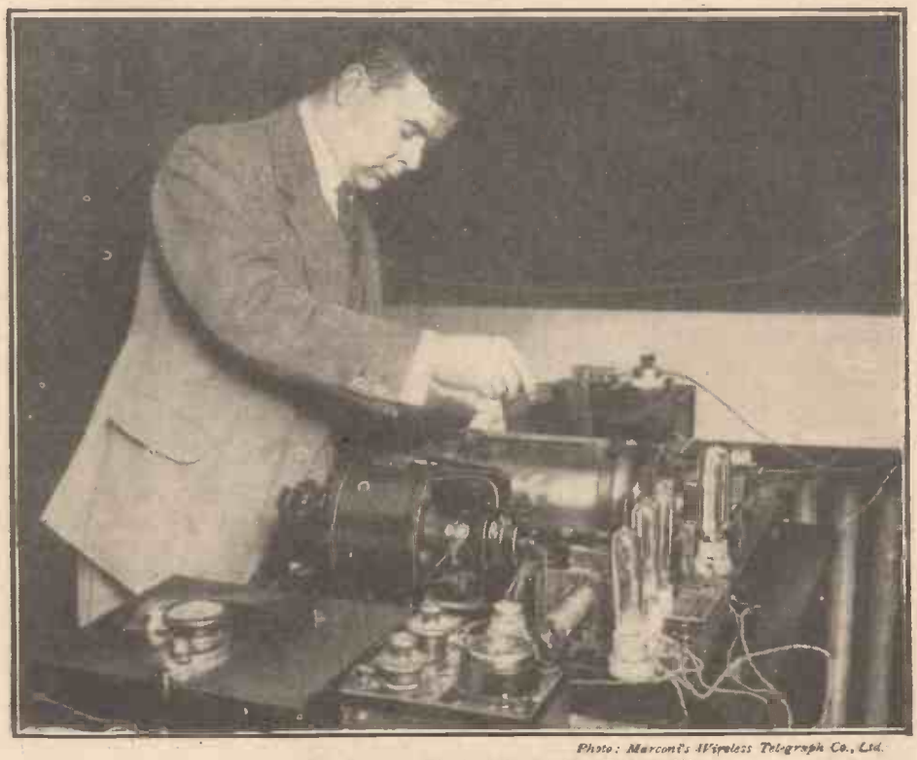


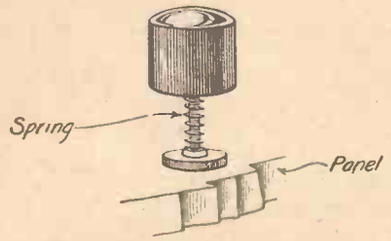
Photo: Marconi's Wireless Telegraph Co., Ltd.

Operating the Ranger Photo-telegraphic Transmitter.

PRACTICAL ODDS AND ENDS

Fixing Loose Control Knobs

IT sometimes happens that the thread of the spindle of a component, such as a variable grid leak or anode resistance, becomes worn. As contact is made between

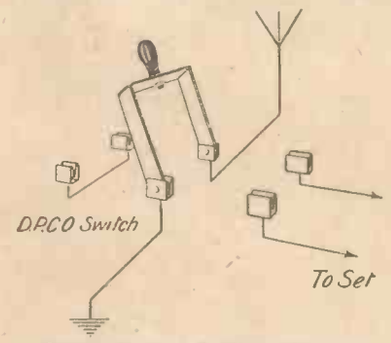


Method of Fixing Control Knob.

the spindle and the mounting bush the defect is a troublesome one, often resulting in loud crackling noises. This can be remedied very simply by inserting a small coil spring between the knob and the panel-mounting collar. The spring does not interfere with the operation of the component, but by exerting pressure on the knob it holds the thread of the spindle in good contact with the bush through which it works. H. P.

Earthing the Aerial

DURING the summer the amateur should see that his aerial is provided with an efficient earthing switch. The switch wired so that it merely forms a shunt across the aerial and earth terminals of the set and does not cut it out alto-



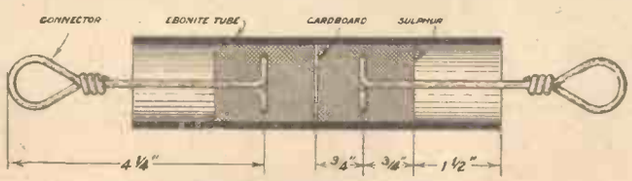
Connections of Earthing Switch.

gether is by no means a satisfactory safety device. The best way of arranging an earthing switch is that shown in the diagram. When such a switch is thrown over to the right, the set is connected to the aerial and earth; when it is turned over to the left, the set is completely cut out and a direct path from aerial to earth is provided. The switch, which should be of large size and mounted upon a porcelain base, should be installed outside the house. Be very careful to see that a good connection is made to all the switch contacts, and use a stout wire between the two clips shown on the left of the diagram. J. R.

Rain-proof Insulator

THE diagram illustrates in section an easily-made insulator that is absolutely unaffected by climatic changes. The construction of a single insulator necessitates the purchase of a 6-in. length of good-quality ebonite tube having an external diameter of approximately 1½ in., ¼ lb. of flowers of sulphur, and a length of No. 14 S.W.G. galvanised-iron wire.

The iron wire is bent into two loops, as shown, which are held firmly in the sulphur in the middle of the tube. A china or fire-clay vessel should be used for heating and



Section of Rain-proof Insulator.

melting the sulphur, as a sulphide easily forms if a metal vessel is used.

Having melted the sulphur, the tube is held vertically and the sulphur poured in to a depth of about 1½ in., the cardboard disc preventing any leakage. Just before the sulphur begins to solidify the coiled end of one of the iron wire connections is immersed centrally in the liquid. It is held in position until the sulphur sets. The tube is then inverted and the second connector attached in a similar manner.

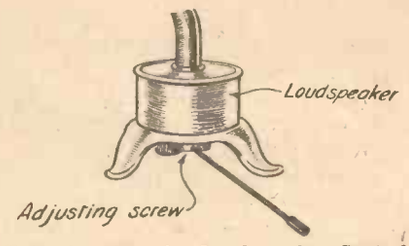
B. H.

Battery Attention

IN hot weather both accumulators and dry batteries should receive a little extra attention in order to keep them in first-rate condition. Look at the accumulator every now and then to see that the electrolyte has not fallen to too low a level owing to the effects of evaporation. Should it be below the tops of the plates, replace what has been lost by adding distilled water only. On no account use water from the tap, for this contains impurities which are liable to set up undesirable chemical actions. Keep a dry-cell high-tension battery in a place where it is not exposed to the direct rays of the sun. H.

Loud-speaker Adjustment

DELICATE control of the air gap between the poles and the diaphragm of a loud-speaker is absolutely essential if the maximum volume is to be obtained.

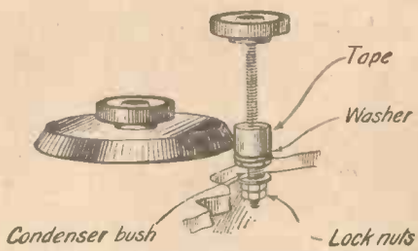


Extension Arm for Loud-speaker Control.

With some types of loud-speaker the adjustment is very critical, and an extension arm fitted to the control knob is then an advantage. The arm, which may consist simply of a length of screwed brass rod, is easily attached to the control knob, and a small ebonite knob should be fitted at the other to facilitate adjustment. P.

Vernier Adjustment

DETAILS of an easily made vernier adjusting device for variable condensers are shown in the accompanying sketch. It will be seen that a small roller of adhesive insulating tape is arranged to rub against the edge of the condenser dial. The screwed rod on which the roller is mounted may be of any convenient length, and if hand-capacity effects are often experienced with the receiver it may be an advantage to have this rod some 10 in. or 12 in. in

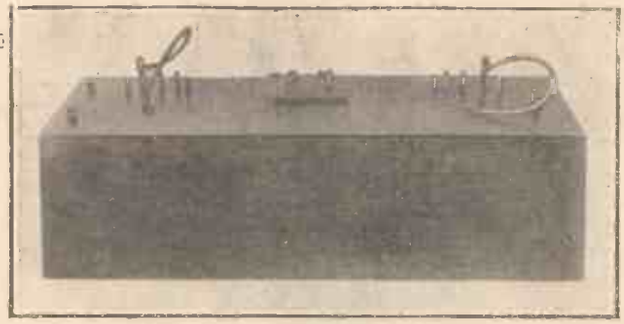


Vernier Adjustment for Condenser.

length. The method of mounting the control spindle is clearly shown in the diagram, the spring washer being placed between the roller and the panel to prevent looseness and backlash.

The roller of adhesive tape should bear against the edge of the dial with just sufficient pressure. G. J.

A CRYSTAL SET FOR DISTANCE



Photograph of Complete Receiver.

IN No. 193 a brief account was given of a crystal receiver for which some remarkable claims of long-distance reception were made. Very many requests for further details of this set have been received, and these are given in this article. Although at a distance of thirty miles from a main broadcasting station the writer obtains quite comfortable signal strength, and within short ranges the volume is sufficient to work a loud-speaker so that reception is nicely audible, it should be distinctly understood that this will not be possible in every case, as so much depends upon individual conditions.

The chief factors in the efficiency of a crystal set are resistance and self-capacity. Both resistance and capacity reduce signal strength and should be kept as low as possible. Self-capacity and resistance to H.F. currents occur in the aerial system, in the wiring, and in the tuning coil. Consequently stiff bus-bar must be used for the connections; and each wire properly separated from its neighbour by a space of at least half an inch.

The Tuning Coil

The coil demands a good deal of consideration. In this particular set a heavy solenoid coil is used with a length of 12 in. and a diameter of 4 in. It is wound with 7/22 copper wire of the kind commonly sold for aerial purposes.

The circuit diagram is given in Fig. 1. It will be noticed that a small fixed condenser of .0003 microfarad capacity is inserted in the aerial lead; this sharpens the tuning by reducing the damping effect of the aerial.

The following parts will be required for the construction of the set: One ebonite panel 14 in. by 5 in. by ¼ in.; one mahogany cabinet 14 in. by 5 in. by 6 in.; two fixed condensers, .002 and .0003 microfarad; ten valve sockets and 2 valve pins; one crystal detector; 70 ft. of 7/22 copper wire; one cardboard tube 12 in. by 4 in.; a quantity of bus-bar wire and a few screws.

The drilling diagram is given by Fig. 2.

The cardboard tube should be given a light coat of shellac varnish to keep out the damp. Use the varnish sparingly, as it has the effect of increasing the self-capacity of the coil. When the varnish is dry wind

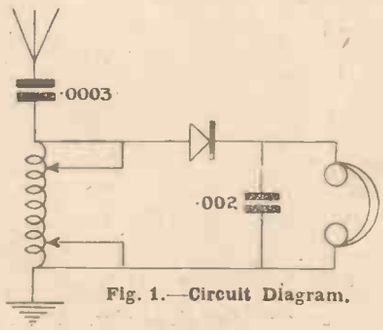
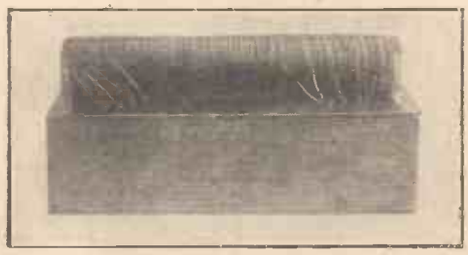


Fig. 1.—Circuit Diagram.

the coil with 70 turns of the 7/22 copper wire. The tube is then secured to the ebonite panel by means of two Meccano brackets. Five tappings are taken from



Photograph of Under Side of Panel.

each end; those on the right are for fine tuning and are connected to the last five single turns; the tappings on the left are for rough tuning and are connected at intervals of five turns. The tappings are carried out with the aid of stiff bus-bar firmly soldered to the coil and to the valve sockets on the panel (see Fig. 3). Other details will be apparent from the photographs and drawings.

A tuning condenser is not required, because sufficiently sharp tuning can be obtained by means of the right-hand tappings.

The operation of this receiver presents no difficulty. The desired station is first brought in with the left-hand switch and fine tuning carried out with the switch on the right. It is a good idea to make a note of the position of the two plugs for the various stations, so that any particular transmission may be readily tuned in at a moment's notice.

In conclusion, the reader would be well advised to pay the most careful attention to his aerial and earth. With a poor aerial even the best of sets will give disappointing results. Erect the aerial as high as possible and take care that it is properly insulated. On no account run the lead-in near to any metallic objects, such as pipes and gutters. Make the earth connection as short and efficient as possible and bury the earth plate in a spot which can always be kept damp.

G. J. M.

SMALL SOLDERING BITS

FOR wiring up receiving sets light soldering-bits of very small size should be used. These are far handier for such work than the full-sized bit; the only drawback to their use is that they so rapidly cool. An excellent tip is to use a spirit-lamp for heating purposes and to work with a couple of small bits. A holder for supporting the iron that is not in use at the moment and for keeping its bit in the flame of the lamp is easily made from a short length of No. 18 bare copper wire. When soldering is in progress one bit is always being heated whilst the other is in actual use.

W.

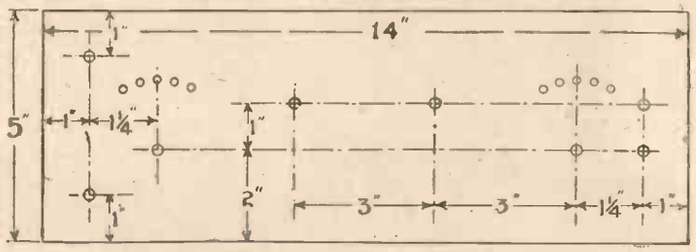


Fig. 2.—Layout of Panel.

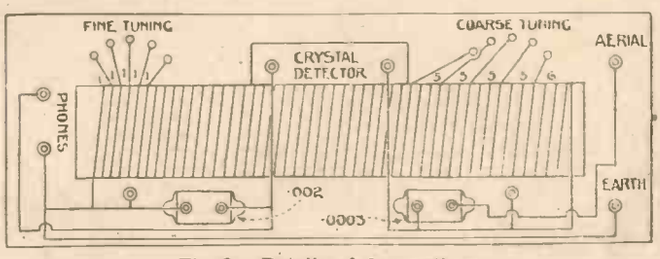


Fig. 3.—Details of Connections

DETAILS COUNT VALVE

Economy and Good Performance :: Concentric
Low Current Consumption :: Low

This photograph shows the neat appearance of the new Cossor valves.

JUST over three years ago a new valve of unorthodox appearance and construction was placed on the market by the now well-known firm of A. C. Cossor, Ltd. Its introduction created a mild furore amongst those who had accustomed themselves to the more conventional type of valve having a spiral grid and tubular plate, but despite its unusual appearance it soon became extremely popular. Even to-day the original valve—known as the P1—ranks among the first-class British bright emitters.

Gradually the valve has developed, but the distinctive design of the hood-shaped plate and grid and the arched filament has always been maintained. With this special shape of plate and grid it is claimed that the entire electronic emission from the filament is used, and that as a greater length of filament is necessary a greater emission surface is available.

Improvements

The latest development in Cossor valves introduces some excellent features, and we feel sure that our readers will welcome details, together with our own experiences, of the new group of valves just produced.

Not only is a great improvement shown in the electrical properties of the new valves, but there is one particular feature in the mounting of the electrodes which is well worth describing. We refer to the method of supporting the electrodes, in which a seonite insulator securely holds the grid and plate and, to all intents and purposes, becomes an integral part of these two elements, rendering the slightest movement of either of them impossible. Through the centre of the insulator is passed the fine wire which retains the filament in position. It is thus practically impossible for the electrodes to become displaced in relation to each other. *This ensures that the working characteristics of the valve remain unaltered throughout its life.*

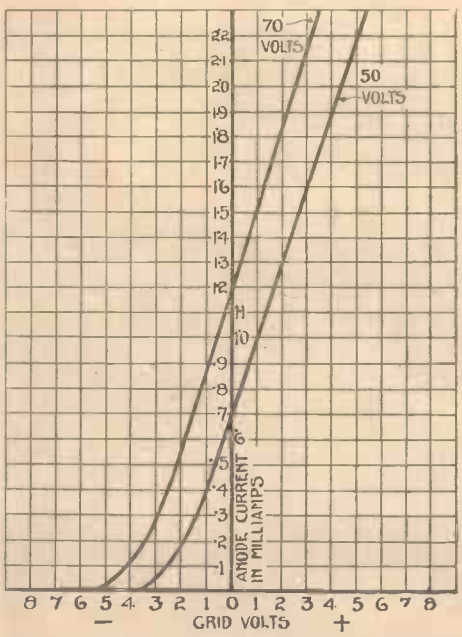


Fig. 2.—Curves Illustrating the Excellent Amplifying Properties of the Red Top Valve.

Hitherto it has been difficult to prevent variations between valves of the same class owing to small differences in the spacing of the electrodes. Even if complete uniformity were possible in the factory, the wear and tear to which the valve is subjected causes changes in the relative positions of the grid, plate and filament. Later on, however, we shall have more to say concerning the uniformity of the new valves.

The New Types

Three new types of valve are being produced, as follow: The Cossor "Point One" Red Top is a high-frequency amplifying valve, the "Point One" Green Top is a detector, whilst the Stentor Two is a low-frequency power amplifying valve. All three valves are designed to work off a 2-volt accumulator, the H.F. and detector valves taking a filament current of .1 ampere and the power valve .15 ampere. It will thus be seen that the valves are very economical to run, especially when it is pointed out that if seven of these valves were used in a super het, the total current consumption would only equal that of a single-valve set using an ordinary bright emitter.

Although the filament voltage is rated at 1.8 volts, the valve will function satisfactorily at a voltage as low as 1.2, and has been given a life test at 2.2 volts at the works. This latitude is very desirable and allows for the use of dry batteries instead of accumulators.

The Electrodes

By reason of the unusual construction, the filament is exceptionally long and is arched, being supported at the apex by a fine wire attached to the seonite insulator. This support, which is clearly seen in the photographs and sketch, permits the slight elasticity necessary for the absorption of shocks caused by rough usage. No tension, however, is exerted on the filament.

Enclosing the filament is the hood-shaped grid, which is wound on strong molybdenum supports, each turn of wire being electrically welded to the supports.

The plate, also hood-shaped, is deep and completely encloses grid and filament. It is greatly strengthened by the rib which passes round the perimeter.

As previously indicated, the three electrodes are held in position by the small seonite insulator, giving a co-axial mounting. They are, of course, further supported by the glass pinch through which the connections to the pins are taken.

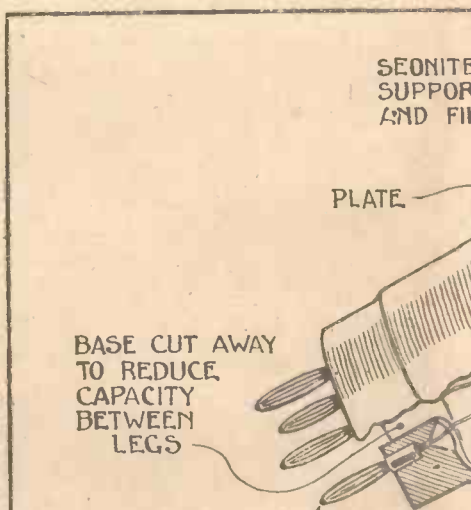


Fig. 1.—This Diagram shows the Special Fe

General Design

In appearance the new valves differ in

T *in* DEVELOPMENT

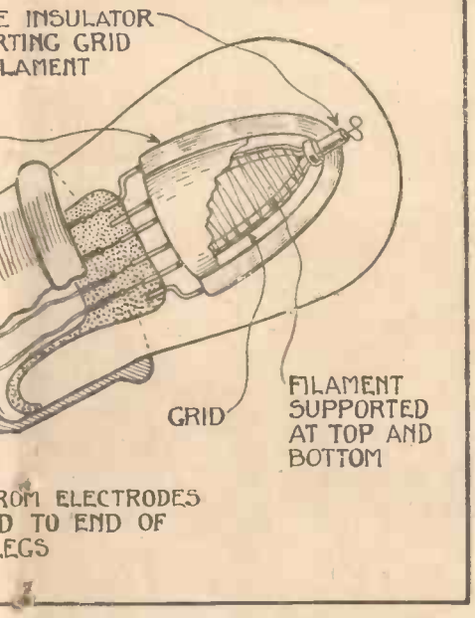
Electrode Support :: Uniform Characteristics
-loss Features :: Anti-microphonic

The co-axial method of mounting the three electrodes is clearly seen here.

many respects from the older types. The glass bulb is pipless and is made of strong glass. The base, while possessing the usual low-loss design, in which all superfluous insulating material is removed, possesses a wide flange to facilitate the withdrawal from a stubborn valve holder without fear of damage. New pins are employed, which, instead of having a single slot, possess two slots in intersecting positions. In addition, the pins are tapered so that the valve may be easily inserted. The sketch, Fig. 1, shows the internal construction of the valve.

The H.F. Valve

The manufacturers state that the Point One Red Top valve is suitable for H.F. or resistance-capacity amplification, as well as for reflex work. For H.F. work



atures in the Construction of the New Valve.

the amplification factor should be high and the characteristic curve of the valve should be steep. As will be seen from Fig. 2, which is the anode-current grid-volts curve of the H.F. valve, a good steep curve is obtained. The amplification of signals, however, does not depend only on the amplification factor of the valve, but is proportional to the product of the amplification factor and the mutual conductance, so that the greater the mutual conductance the greater will be the total amplification. The mutual conductance is really the slope of the characteristic curve. The impedance of the H.F. valve is usually high on account of the high amplification factor required.

On a series of calculations the average impedance of the Red Top valve is 42,000 ohms, the average amplification factor 13, and the mutual conductance or slope (at 70 volts) 32,000 ohms. These figures indicate good H.F. amplification. Tested in an actual receiver having two stages of H.F. amplification, results were very satisfactory and, indeed, were well above those obtained from our standard 2-volt H.F. valves. The most suitable plate voltage is about 70.

For resistance-capacity amplification a much higher voltage is required. A suitable value is about 120 volts, using 100,000-ohm anode resistances. With two or three stages of resistance-capacity amplification the reproduction of speech and music is very pure.

The Plain Top Valve

While the Plain Top valve may be used as a first-stage low-frequency amplifier, its chief purpose is the important one of rectification. A rectifying valve, using the leaky-grid method of rectification, must have a sharp rise in grid current when the grid becomes positive with respect to the filament. In this manner the positive cycle of each incoming oscillation is suppressed.

L.F. Amplification

For a first-stage low-frequency amplifier the amplification factor should not be too high, nor as low as is usual with the second stage. The reason for this will be explained later. At the same time, however, for pure reproduction the portion of the characteristic curve to the left of the zero grid-volts line should be long and straight, so that sufficient negative grid bias can be applied to make sure that no grid current will flow however strong signals may be. With about 110 volts on the plate of the Plain Top valve and a negative grid bias of 3 volts, good first-stage amplification is obtained. As a detector a plate voltage of 60 is recommended. Fig. 3 is the characteristic curve.

The impedance of the valve has an average value of 22,000 ohms, the amplification factor being about 9 and the mutual conductance at 50 volts approximately 20,800 ohms.

The Stentor Two

In discussing the H.F. valve it was stated that when the amplification factor and the mutual conductance are high, the total amplification is large. If the amplification factor is high the curves for different plate voltages are close together in a horizontal direction, and if the curves are not very steep (that is, if the mutual conductance is low), a large increase in anode voltage will not bring the straight portion of the curve much farther to the left of the zero grid-volts line and the valve will never be a good power amplifier.

If we reduce the amplification factor, the curves are separated and are brought farther to the left as the plate voltage is

(Continued at foot of next page)

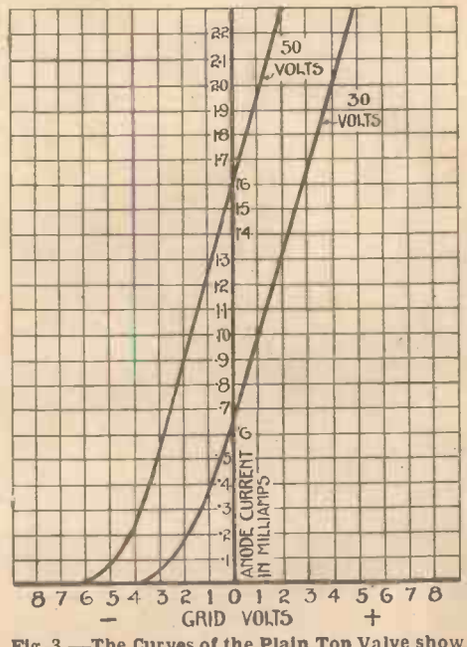


Fig. 3.—The Curves of the Plain Top Valve show Its Usefulness as a First-stage L.F. Amplifier.

Fred Collier

NEXT WEEK AT 2LO

By "THE LISTENER"

In the Programmes

AS next Sunday is the famous "Fourth" of July, Independence Day of America, a special American programme will be given, the details of which are to be sprung upon us, I believe, at the last moment. The 9.15 programme will be provided by Albert Sandler and his orchestra relayed from Eastbourne.

On Monday a symphony programme will be relayed from Crane Hall, Liverpool, where the Liverpool Station Symphony Orchestra will be conducted by Frederick Brown, the soloists being Lewys James (baritone) and Stephen Wearing, the pianist who was responsible a little while back for the week of Rachmaninov preludes at 2 L O.

For those who like "stunts," one of exceptional interest is promised at 10.10, when Mr. Frank Shield, an ex-naval diver, will make a descent into the Thames and from beneath the water will talk to listeners. The variety programme which follows includes Lawrence Anderson and Josephine Trix. Since one of these famous sisters married and retired from the double turn in which they had made themselves famous, Miss Josephine has been appearing as soloist.

For Tuesday a competition has been arranged by our contemporary, *Pearson's Weekly*, to broadcast four sketches, under the title "What Would You Do?" each of which terminates in a problem. For the solution of these, prizes to the value of £100 are offered. Later follows an orchestral programme conducted by Dan Godfrey, with Sydney Coltham and Montague F. Brearley (violinist) as soloists.

Considerable contrast is provided on Wednesday as regards the evening programme, for Willie Rouse (Wireless Willie) and his party entertain from 8 o'clock until 8.30, when from the studio will be performed Verdi's rather unpleasant opera *Rigoletto*. The 2 L O orchestra will be conducted by Percy Pitt, while the cast includes Sylvia Nelis (who, by the way, was the original "Polly" in the *Beggars Opera*), Gladys Palmer, Gwen Knight and three prominent members of the B.N.O.C., namely, Dennis Noble, Frederic Collier and Tudor Davies.

The Royal Parks Band will be relayed from Hyde Park on Thursday, with studio interludes by Joseph Farrington, of the B.N.O.C., and Winifred Fisher. The variety programme at 10 includes the "Aucklands," concertina duettists, who have a third member in the company in the form of a roller canary, which accompanies with real bird trills as they play. Other artistes will be Nick Adams, the original creator of the rôle of Mawruss in *Potash and Perlmutter*, as well as Jeffrey Hazel and Hastings Canler.

It would be hard to find two more opposites of music than the items promised for Friday evening, when at 8.45 from the Summer Theatre, Felixstowe, will be relayed the well-known Margate concert party run by Murray Ashford, followed at 10 by a programme of English music.

On Saturday evening a programme arranged by André Charlot is to be broadcast.

"WIRELESSING PICTURES ACROSS THE ATLANTIC" (*continued from page* 11)

give a number of signals very close together for dark parts of the picture, and at longer intervals for lighter parts of the picture, so the siphon works a string of closely adjacent dots for a dark line or a string of more or less widely separated dots for a grey line. These dots are, needless to say, combined together to build up the photographic reproduction much on the lines indicated in previous articles on picture-telegraphy. It is interesting to note, however, that Capt. Ranger uses a different motion to that employed by Korn, Belin, the writer and others. In his case the prism inside the glass cylinder, and not the cylinder itself, travels laterally, that is, parallel to the axis, so that the pencil of rays passing through the photograph traces a line-path from one end to the other, from A to B in the diagram. The cylinder is then rotated through a very small angle, and the prism then travels back again from B to A. These backward and forward motions are continued until the cylinder has rotated sufficiently for the whole of the picture to have been traversed by the pencil of light, when, of course, the transmission is finished.

Each machine is operated by a small synchronous electric motor, controlled by a tuned reed. A photograph of one of the instruments is shown. T. T. B.

"DETAILS COUNT *in* VALVE DEVELOPMENT" (*continued from preceding page*)

increased. This will be clearly seen by comparing the curves of the H.F. and power valves, Figs. 2 and 4, respectively. It will be seen that the straight portion of the curve of the power valve to the left of the zero line is greatly increased by the reduction of the amplification factor, and the valve will therefore deal with more power without distortion. This explains why power valves have a comparatively low amplification factor.

From the curves it is evident that the Cossor Stentor Two (Green Top) has been designed to give distortionless amplification. The impedance, which should be low, is 8,000 ohms, the amplification factor 8, and the mutual conductance 1,100 ohms at 130 volts. At this plate voltage a negative grid bias of 5 volts is required. In conjunction with a good transformer, this valve will give beautiful reproduction, quite free from distortion. The filament

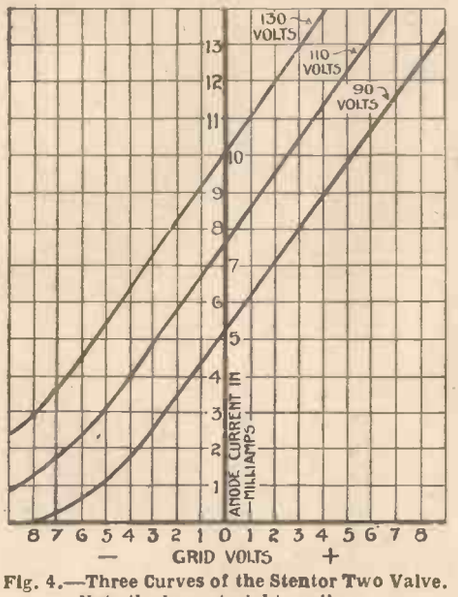


Fig. 4.—Three Curves of the Stentor Two Valve. Note the long straight portions.

consumption of this valve, by the way, is .15 ampere. The total electronic emission is very high and, for this reason, the valve is very suitable for use as an oscillator in a super-heterodyne receiver.

Uniform Characteristics

By way of testing the uniformity of the valves supplied to us for testing purposes, we inserted samples of each type into the valve holder of our valve-testing apparatus and noted the plate current at a fixed grid and filament voltage. In no case did the samples of each type give a plate current reading that differed by more than .05 milliampere. This test shows up the wonderful uniformity of the valves produced.

In conclusion, we congratulate the firm of A. C. Cossor, Ltd., for producing a group of valves which are not only economical in their current consumption, but which give results equal to 6-volt valves.

"A.W." TESTS OF APPARATUS

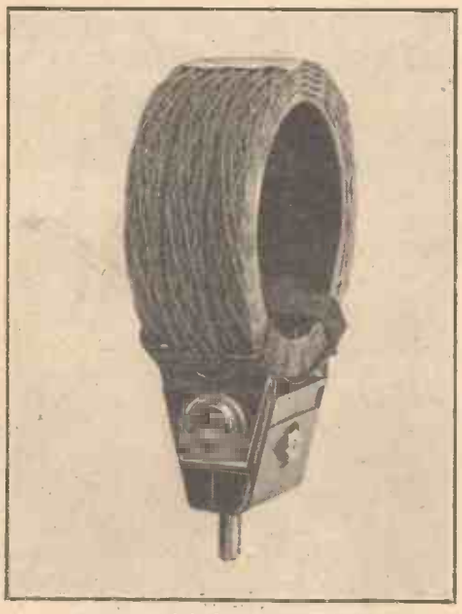
Conducted in the "Amateur Wireless" Research and Test Department

A.J.S. Safety Switch

WHEN a wireless receiver is not being used it is always safer to disconnect it entirely from the aerial and to connect the latter direct to earth. It must be remembered that it is not only necessary for the aerial to be actually struck by lightning for damage to occur to the set. Should a heavy static charge gradually accumulate on the aerial it is possible for damage to be done.

The A.J.S. aerial switch will give adequate protection to any type of receiver. The instrument consists of a small rotary switch provided with four terminals marked A, E, AR and ER. Aerial and earth wires are connected to A and E respectively, whilst the aerial and earth terminals of the receiver are connected AR and ER. When the switch is in the "on" position the aerial and earth are connected to the receiver, but a small spark gap is present to enable heavy static charges to discharge directly to earth without entering and damaging the receiver. With the switch in the "off" position the aerial and earth are connected together and totally disconnected from the receiver.

The address of the manufacturers is A. J. Stevens, Ltd., Wolverhampton.



Igranic Triple-honeycomb Coil.

Tudor H.T. Accumulator

WE have received from the Tudor Accumulator Co., Ltd., of 2, Norfolk Street, Strand, W.C.2, a sample of their 60-volt H.T. accumulator. This battery is made up of 30 2-volt cells of ample proportions, each cell containing one positive and one negative plate. The cells are connected in series by short lead straps, in the centre of each of which a hole is made to take a wander plug. In this manner any voltage up to 60 may be tapped off in steps each of 2 volts.

A point which we are glad to note is the method of arranging the cells in two rows of fifteen. With this system it is possible to inspect every cell without the necessity of removing them from their position.

Tudor H.T. Accumulator.

This may seem a minor detail, but it is most important that the acid level of all the cells should be kept up to the level indicated on the glass container, and with the cells all clustered together it is no easy matter to see whether the acid level has fallen or not.

Vent holes of a sensible size are provided, enabling the introduction of electrolyte into each container a comparatively simple matter. The battery is mounted in a wooden crate having dimensions 18½ in. by 5½ in., and connections are brought out to two large terminals mounted on, but insulated from, the side of the crate. An aluminium plate, giving instructions for charging and maintenance, is also attached to the side of the crate. The actual capacity is 2.5 ampere hours and the charging rate .1 to .2 ampere.

New Igranic Coils

THE IGRANIC ELECTRIC CO., LTD., of Queen Victoria Street, London, have just produced a new type of honeycomb coil, the special feature of which is that each coil is divided into three sections wound side by side and connected in series. It is claimed that this manner of winding reduces the self-capacity of the coil to a considerable extent, in some cases being less than one-quarter of the self-capacity of the older type of coil.

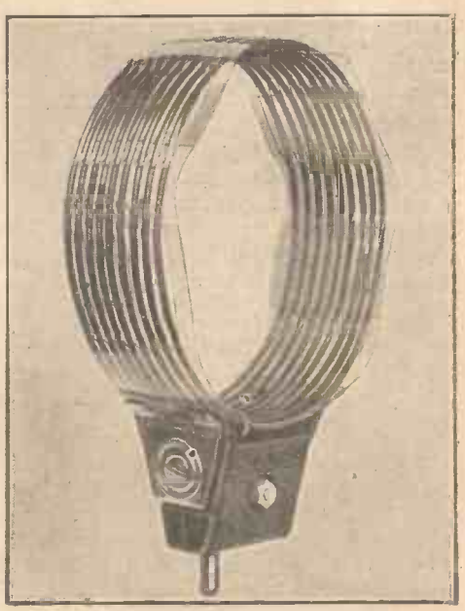
As can well be imagined, if anything like uniformity is to be obtained between coils of the same rated value the spacing between the three sections must be identical. This can only be done by precision methods of manufacture which the Igranic Co., who have many years' experience of coil manufacture, employ.

It has been found that a much wider wavelength range is covered by one of the triple-wound coils than the original type, so that fewer coils are required to cover the complete tuning range of 100 to 25,000 metres.

We are also glad to note that, owing to improved methods of manufacture, the price of these coils is very reasonable, the four smaller sizes being priced at two shillings and ninepence each.

Another new production by the Igranic Electric Co. is the short-wave coil illustrated in the accompanying photograph. Short-wave reception holds such scope for interesting experimental work that it is surprising how few amateurs possess the means for tuning down below the usual broadcast wavelengths. Contrary to popular belief, the reception of short waves does not necessitate the use of special apparatus, and it is only necessary to employ components of first-class quality.

The Igranic short-wave coils, of which there are four, are intended for reception on wavelengths of 10 to 100 metres. Each coil is wound with a heavy gauge of bare wire, supported in such a manner as to preserve the accuracy of spacing with a minimum of supporting material. The standard plug-mounting is used so that the general design of a short-wave receiver using these coils need not cause the constructor any difficulty. The coils are made with 2, 4, 6 and 9 turns, giving a complete wavelength range.



New Igranic Short-wave Coil.

AT the recent meeting of the International Aeronautical Conference in Paris a proposal was made that all short-wavelength transmissions in both morse and telephony should be exclusively reserved to aircraft.

Laddie Cliff, Roy Royston, Bobby Howes, Denis Cowles and H. B. Hedley, who recently gave a special broadcast from Glasgow to all Scottish stations and Belfast, have asked that their entire fee should go to the benefit of ex-service men. The B.B.C. will accordingly send the cheque to Viscountess Barrington's Village Homes and Welfare Institute.

A novel broadcast has taken place from the Glasgow station, the entertainment consisting of a relay from the lounge of the Anchor liner *California,* in harbour in Glasgow. Miss Evelyn Laye, Miss Mary Leigh, Mr. Jack Hobbs and Mr. Wilfred Temple took part, and there were also selections by the ship's orchestra.

The Free Church of Scotland has voted against co-operating in the broadcasting of religious services by declining to appoint a representative to serve on the B.B.C. National Religious Advisory Committee. Other Scottish churches have, however, shown a readiness to assist the B.B.C.

An agreement has been made between the Marconi Co. and the Egyptian Government regarding wireless broadcasting. The agreement is for a period of thirty years, and will be renewable subsequently for periods of ten years.

Sir Harry Lauder is making his third appearance at 2 L O at 10 p.m. on Saturday, July 3, when his entertainment will be simultaneously broadcast from all stations of the B.B.C.

In the tenth series of "Shakespeare's Heroines," to be given on Sunday, July 4, Miss Madge Titheradge will take the part of Katherina in *The Taming of the Shrew.* She will be supported by Ben Webster and Edmund Willard.

"Wireless Willie" (Willie Rouse), assisted by his own party, will give an entertainment at the London station on July 7.

The organ recitals during this month will be relayed from St. Botolph's Church, Bishopsgate, the organist of which is Dr. W. Herbert Hickox, F.R.C.O., professor at the Guildhall School of Music.

On the occasion of the University of Sheffield's anniversary celebrations on July 1, the speeches at the ceremony taking place at the Victoria Hall will be relayed to many B.B.C. stations. Honorary degrees are to be conferred on Princess Mary, Viscountess Lascelles, and Sir Austen Chamberlain.

The German Reichspost has now definitely decided to erect a new transmitter in the former Grand Duchy of Baden. The station itself will be installed at Freiburg-im-Breisgau, which lies at the foot of the Black Forest about thirty-nine miles north-east of Basle (Switzerland). It will be connected by landline to a studio at Karlsruhe.

The Hilversum broadcasting authorities have applied for permission to broadcast H.M. Queen Wilhelmina's speech at the opening of the Dutch Parliament.

Twice weekly the Hilversum broadcasting station now relays the concerts given at the Scheveningen Kursaal.

Radio-Zoologie, the Antwerp relay station, has installed a microphone in one of the largest hotels for the relaying of dance music.

The Basle (Switzerland) broadcasting station was formally opened on June 20. It transmits a daily concert, on 1,000 metres, from 20.15 B.S.T. onwards.

The thirtieth anniversary of the granting of the first Marconi wireless patent was celebrated at Bologna recently, when all the authorities took part in the ceremony. The King sent a message of congratulation and the Minister of Economy represented the Government and Signor Mussolini. The mayor presented Signor Marconi with a gold medal.

Miss Josephine Trix (one of the Trix sisters) will broadcast syncopated songs from the London studio on Tuesday, July 6.

Vivian Foster, "The Vicar of Mirth," will again preside at the Village Concert to be broadcast by the Roosters from the high-power station on Tuesday, July 6.

A further relay of music from the bandstand, Hyde Park, will be made by the London station on Thursday evening, July 8.

According to official figures published by the Hungarian Posts and Telegraphs Department, the number of registered licence-holders in that country on April 20 was 45,840, of which 26,000 were residents in Buda-Pesth.

A small group of French wireless enthusiasts has installed a broadcasting station at Beziers (France). Transmissions are made nightly at 9.30 p.m. on 95 metres using a power of 100 watts.

According to the latest official statistics, Austria now possesses 200,000 wireless licence holders, of which 165,185 are resident in Vienna.

The French Colonial Posts and Telegraphs Department has erected a small 100-watt transmitter at Algiers (North Africa). Until local programmes have been developed, concerts will be limited to Mondays and Thursdays from 9.45 to 11 p.m. The station operates on a wavelength of 310 metres, and it is proposed to relay the Eiffel Tower transmissions for local reception.

A short talk on sport is to be given by Mr. "Pat" Hendren from the London station on July 3.

Mr. George Grossmith, the well-known actor, is to give a reading of light verse from 2 L O on July 19.

Vegetable growing by wireless energy is said to have been accomplished by an amateur gardener of West Bridgford. He accidentally discovered, it is stated, that tomato and cucumber plants were drawing energy from his aerial and making wonderful headway as a direct result of this activity.

Another high-power station which will soon be available to English listeners is that at Langenberg, near Cologne. This station will use more than twice the power of Daventry.

For the Royal Air Force Pageant at Hendon on July 3 the Marconiphone Co. are erecting an enormous loud-speaker installation. Twenty loud-speakers and over a hundred valves are to be used. Exide batteries will be used.

It is understood that if the proposed new naval wireless station at Plymouth is erected, the site will be near the waterfront at Stonehouse. In this case the present station at Rame Head would be abolished.

Russia, which has already in existence a comprehensive and enterprising system, is to go further and build seven more stations, which will be rated at 2 kilowatts each. There are already five broadcasting stations in Moscow, the chief of which, Moscow Central, with a power of 12 kilowatts, gives lessons in English, Esperanto talks, and frequent broadcasts from the Moscow Grand Theatre.

In response to numerous requests, the B.B.C. have decided to broadcast through Daventry a concert from the Winter Gardens, Bournemouth, on July 8.

The whole of Verdi's opera *Rigoletto* is to be given on July 7 through several stations. This is one of the series of operatic broadcasts which have been arranged to take place during the next few months.

Memo. to the Reader: I have personally arranged with American authorities for amateur British-built sets to be sent over the Atlantic to compete against American sets.
THE EDITOR, *Amateur Wireless.*

The Editor to The Reader

A Great International Set Competition

When I was in America in April and May, a most interesting challenge was thrown out to me. I was discussing matters with the Secretary of the Radio Manufacturers' Show Association and we were commenting upon the essential differences between American and British sets. He suggested that the American public would like to see a number of representative British receivers, as to which there was much curiosity but little knowledge. Suddenly we alighted upon the idea that there might be very active support for an international competition in which American and most certainly British amateur set-builders would take part, and in which it was hoped that French and German constructors might also be represented.

The upshot was that I expressed my willingness to take the responsibility of organising a British Elimination Competition for the purpose of finding 25 sets to send to New York to represent this country, and I now have pleasure in inviting every skilled home-constructor to take part in such an Elimination Competition.

I want valve sets of every kind, as long as they are well-designed, well-made and representative of thoroughly up-to-date practice. I do not mind what the origin of the set is, whether the design first appeared in the pages of AMATEUR WIRELESS, WIRELESS MAGAZINE or any other periodical, or whether the design has never been published at all. That is quite immaterial. Certainly, I do want readers of this paper to support the competition in great strength, and I want the designs published in this paper and in the WIRELESS MAGAZINE to be well represented too. But I want *every* home-constructor who has produced a set of outstanding quality to enter it for the Elimination Competition.

WHERE AND WHEN

I wish to send the 25 sets to the United States during the first week of August, that is, in not more than four weeks' time. There is, therefore, not a moment to lose. I propose to hold the Elimination Competition just as quickly as it can be organised. I have had prepared a printed entrance form and set of rules (there is nothing irksome in the rules), and what I want qualified readers to do is to send me straightaway an application for the entrance form and rules. These I shall send in duplicate—one entrance form to be returned completed with as little delay as possible, and the other to be retained for the competitor's reference.

Not until I have received the completed entrance form shall I be in a position to send the necessary printed labels, inasmuch as before I can decide where the sets are to be sent I must first form some idea, however approximate, of the number of sets there will be.

I want all the sets entered for the Elimination Competition to be on public view for a short time.

I repeat then: Let the qualified reader write me immediately for entrance form and rules. In due course I will send to him all the necessary information.

PRIZES

Twenty-five sets will be selected to go to the United States. The owner of each will be awarded by us a BRONZE MEDAL. The American organisers will distribute three prizes among the British Competitors, in addition to a certificate to each, and will award

AN INTERNATIONAL CUP OR MEDAL

for the best amateur-built set exhibited, whether by American, British or other nationals.

Should the International Prize be awarded for a British-built set that has passed through our Elimination Competition and been sent by us to the United States, then, in addition to the International Prize, we ourselves will award

A GOLD MEDAL SPECIALLY STRUCK FOR THE PURPOSE

So you see that the prizes are worth having and anybody may be well proud of them. I have great hopes that my readers will seize upon this opportunity of taking part in the first international competition of this sort that has ever been organised.

The rules which will be sent to every applicant will be found to cover, it is hoped, almost every possible contingency, and in themselves they are simple and encouraging, but perhaps there are a few points upon which I may make a public note.

AMATEUR WIRELESS and the WIRELESS MAGAZINE are responsible for the Elimination Competition only. The American authorities are responsible for the organisation and judging of the International Competition in the U.S.A.

No wireless manufacturer or salesman, no employee of any wireless manufacturer or salesman, and no other member of the wireless industry may compete; neither may any employee of the proprietors of AMATEUR WIRELESS and the WIRELESS MAGAZINE.

Do not send me the set until the proper formalities have been complied with; in other words, first apply for the entrance form, upon receiving it complete it, return it to me and await the supply of labels which I will send you.

The 25 sets selected to go to the U.S.A. will be sent and returned free of all expense to the competitors, and will be insured from the moment they leave London until they are returned to the competitors.

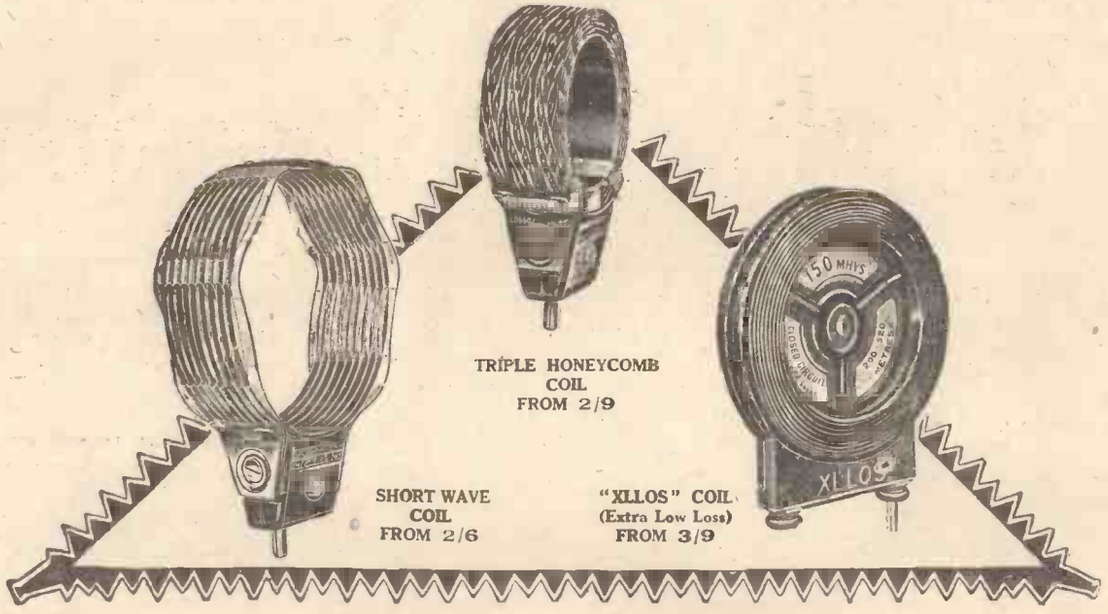
No crystal set is eligible.

Please post me immediately the application for entrance form and rules. Address your application to:

INTERNATIONAL COMPETITION,

THE EDITOR,
"Amateur Wireless,"
La Belle Sauvage,
Ludgate Hill, London, E.C.4.

Better coils — lower prices!



THE IGRANIC ELECTRIC CO.

have pleasure in announcing three new ranges of Inductance Coils.

THE NEW TRIPLE HONEYCOMB COILS are made in seventeen sizes covering a wavelength range of approximately 100 to 25,000 metres. They replace the original Honeycomb Coils and have very much lower self-capacity, greater wavelength range and lower high frequency resistance. *The new method of construction has enabled the prices to be reduced very considerably.*

THE NEW SHORT WAVE COILS are made in four sizes covering a wavelength range of approximately 10 to 100 metres. They are wound with heavy gauge bare wire rigidly supported so as to preserve the accuracy of spacing. They are very highly efficient and the prices are low.

THE "XLLOS" (EXTRA LOW LOSS) COILS with their special winding and method of construction are ideal for the coil user who desires the utmost efficiency. The special adjustable mounts still further increase their efficiency and permit of great adaptability in use. The range of ten "XLLOS" Coils cover a wavelength range of approximately 220 to 3,000 metres.

EVERY READER SHOULD SEND FOR PARTICULARS OF THESE NEW AND WONDERFULLY EFFICIENT COILS. FULL INFORMATION WILL BE SENT FREE ON REQUEST FOR LIST NO. D16.

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149, Queen Victoria Street, London. Works: Elstow Road, Bedford.

Valve Coupling

SIR,—In your issue of June 12 you published a letter by S. O. (Bradford) regarding valve coupling. Transformers do not distort horribly, but by reason of their iron core cannot be distortionless.

In regard to S. O. saying that resistance capacity cannot amplify evenly, everyone knows this is quite incorrect. He gives as the reason that a condenser "pass on" is proportional to the frequency applied. He evidently, like so many people, forgets that this rule only applies to *current* vibration, and as resistance coupling is entirely potential amplification, his reason is incorrect.

Since I am writing, may I add a word to those who wrote to me as the result of a few letters upon the subject in March? The point which seems to puzzle most people is the question of valve impedance. One writer stated that no advantage would accrue were the external resistance more than three times the internal impedance. Even using ordinary valves, the increase of amplification by increasing the ratio to five times is marked, whilst the only limiting factor is the inter-electrode capacity.—R. G. T. (Northampton).

Elimination of Atmospherics

SIR,—At the present time atmospherics are causing a great deal of annoyance, and I have been experimenting with a means of partially eliminating these. I do not claim to have been entirely successful, but I have had a certain amount of relief. The method I use depends upon an old principle, but I think the adoption is fairly original.

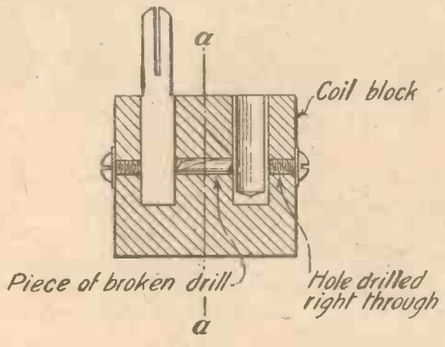
It is well known that atmospherics of the best-known varieties have a fundamental wavelength of some 100,000 metres, and it is an established fact that a condenser offers a much higher resistance to a current of low frequency than to one of a higher, and conversely an inductance offers more resistance to the higher frequencies. Bearing these points in mind, a choke of high inductance was connected between aerial and earth, a .0001-microfarad condenser was joined between the aerial and aerial terminal of the receiver, and the earth terminal was connected direct to earth. By experimenting with chokes of various sizes one is able to reduce the strength of atmospherics to a great extent without affecting the normal signals. It might be mentioned that in order to obtain a choke of sufficient inductance it might be necessary to use one with an iron core, and if the core will slide in and out, the inductance may be varied.

It is evident that the above method cannot possibly give complete relief from atmospherics, since they appear on several harmonics apart from the fundamental, but it *does* improve matters.—F. P. (Keighley).

Test your Components

SIR,—The necessity for testing most critically any component is strikingly exemplified by the experience of a young friend of the writer's.

He very carefully made up a coil and mounted it on a coil block (evidently a cheap one); then with the utmost confidence he plugged in his very carefully



Section of Coil Holder showing Fault.

constructed coil and got—nothing. Finally it occurred to him to test the coil block, after disconnecting the coil, when he discovered a "short" between the pin and socket. The accompanying sketch will show how a saw-cut across the block from *a* to *a* revealed a broken-off piece of twist drill embedded between the two pins, thus causing the short.—W. P. A. (London, S.W.).

The Power of 2 L O

SIR,—THERMION'S remarks in No. 210 about the difference of power of the new 2 L O station and the old surprised and interested me.

I am also "nearly thirty miles from London" (six and a half miles south of Chelmsford), but my experience is the exact opposite of THERMION'S. So far as crystal reception is concerned, breakdowns of the new 2 L O are a benefit here, as the transmissions from Marconi House are much louder than those from the Oxford Street aerial. In fact, speech, etc., from Marconi House comes in often at greater strength than that from Daventry.

Is THERMION north or south of 2 L O? [North.—ED.].—B. D. (Stock).

WIRELESS IN PARLIAMENT

From Our Own Correspondent.

MR. T. SHAW asked the Postmaster-General if it was a fact that the employers and the workers in the national boot and shoe trade had agreed to broadcast a description of their conciliation scheme, which had prevented any general upheaval for upwards of thirty-one years; whether the independent chairman of the Conciliation Board in the industry had agreed to broadcast, and for what reason the Postmaster-General refused to allow the broadcasting to take place.

Sir W. Mitchell-Thomson: "The facts are as stated. The only point of such a broadcast at this moment was that it should imply the advocacy that a similar scheme could and should be forthwith applied to the mining industry. A suggestion of this nature may or may not be desirable, but it is undoubtedly controversial, and consequently was not permitted as a broadcast."

Mr. Ramsay MacDonald asked whether the Postmaster-General would reconsider his decision in view of the fact that this was interesting information which the country ought to have; and if it was prevented from being broadcast, did not that show that the Broadcasting Co. was being controlled for political purposes.

Sir W. Mitchell-Thomson said there was not a shadow of foundation for that suggestion.

Later, Mr. Shaw raised the question on the adjournment. The Postmaster-General gave a very full reply, and stated that since the general strike was over the Government had exercised no control whatever over the operations of the British Broadcasting Co. This action of his was taken in the ordinary way, in his ordinary capacity as Postmaster-General, and he was enforcing the understanding under which there was a rule that topics which related to matters of political controversy should not be broadcast by the B.B.C.

Result of Cassell's Great Holiday Ballot Competition

The result of the Ballot of many thousands of our readers entering this interesting competition, naming in correct order the SIX MOST POPULAR EAST COAST RESORTS, is as follows:

1. SCARBOROUGH **3. HARROGATE** **5. CROMER**
2. YARMOUTH **4. CLACTON** **6. FELIXSTOWE**

Only one competitor named the above Six Resorts in the order given:—

FIRST PRIZE—£100

K. A. BATSON, "Morningside," Pennington, Lymington, Hants.

There were twelve competitors who named five resorts in the correct order, and so we have decided to add another £70 to the second prize of £50 so as to give each of the twelve £10. The successful twelve were as follows:—

C. H. Burden, Nunhead, S.E.15.
E. Cartlidge, 14, Cleveland, Mansions, N.W.6.
Mrs. A. Giles, South Heath, Gt. Missenden.
S. H. Gooch, Constable Road, Ipswich.
C. A. F. Hall, 1, Hampton Park, Redland, Bristol.
Mrs. Hayward, 274, Lewis Trust, Walham Green, S.W.6.
T. Parry Jones, Rhostyllen, Nr. Wrexham.
E. H. Madley, 47, Tufnell Park Road, N.7.
G. B. Newton, 24, Rose Hill Terrace, Brighton.
S. Smith, North Road, Bourne, Lincs.
J. Tanton, 29, Minster Road, Oxford.
T. Ward, 19, Walnut Street, Liverpool.

We received 152 coupons naming four resorts in the correct order, and so we have decided to add another £52 to the twenty prizes of £5 each, making £152 to distribute equally between them. The senders of the following 152 coupons will therefore receive £1 each.

Mrs. W. R. Andrews, 56 Amesbury Avenue, S.W.2; W. Barber, 10 Mysore Road, S.W.11; G. G. Barley, 29 Kimberley Road, S.W.9; H. Bartholomew, 59 Mildmay Road, Romford; A. Batkin, Swan Bank, Penn, Wolverhampton; K. A. Batson, Pennington, Lymington; L. B. Bays, "Tranmere," Old Colwyn; Miss E. Beves, 28 Claremont Road, Fratton (2 shares); Mr. Wm. Bishop, 5 Kings Wall, Malmesbury; Mrs. E. Blackwell, 92 New John Street West, Birmingham; Mrs. A. J. Blake, 9 Harcourt Road, Southampton; W. Boby, 12 Chatsworth Road, N.W.2; C. Booker, 59 Englefield Road, N.1; Miss H. Bowden, 3 Clifton Gardens, W.9; Miss D. Box, 36 Dudley Road, Eastbourne; Mrs. A. W. Breeden, 52 West Hill, Epsom, Surrey; Mrs. W. J. Brinkman, 102 Onslow Gardens, Wallington; Miss D. Brooks, Willow Bank, Dunmow; Miss A. Brown, "Talfourd Lodge," Deal; K. M. Buttifant, 15 Britannia Road, Westcliff-on-Sea; A. J. Bulman, 90 Connaught Road, Cardiff; Miss M. Bultz, South Devon Hospital, Plymouth; G. Bunker, 76 Church Road, Croydon; F. Burch, 36 Hawes Street, Ipswich; Miss D. Burkley, 180 Huddersfield Road, Oldham; Miss Cameron, Woolton Hill, Newbury; F. Charlson, 255 Green End, Sutton Oak (2 shares); Miss Charters, 25 Bracewell Street, Burnley; Mrs. E. Cheshire, 112 High Street, Colchester; Mr. H. L. Cheshire, 171 High Street South, Dunstable; Miss I. Chipperfield, 59 Doyle Gardens, N.W.10; Miss M. L. Clegg, 13 Bilton Grove Avenue, Harrogate; Mrs. M. Clifford, 22 Navarino Road, Worthing; A. Cole, St. Phillips Avenue, Eastbourne; Mr. G. A. Coles, Weeke, Winchester; Miss D. Cooke, Fillerest Road, Bournemouth; T. E. Coombe, 26 Ouseley Road, Wandsworth Common; Miss C. Corturier, Westerham, Kent; Miss A. Cullen, Chertsey Road, Windlesham; L. B. Cundall, Milner Road, Mitcham; Miss H. M. Cunnington, 88 West End Lane, West Hampstead; F. Dark, 99 Imperial Road, Small Heath, Birmingham; G. W. S. Davies, 37 Nightingale Way, Baldock; J. J. Douglas, 430 Blandford Road, Beckenham; H. East, 6 New Road, Heath End, Farnham; Mrs. F. H. Edwards, Slade Road, Portishead; Mr. H. Edwards, 20 Ellington Road, N.10; Mrs. A. M. Elson, Heather, nr. Leicester; B. R. Flateau, 23 The Pavement, S.W.4 (2 shares); Mrs. Floyd, 12 Belsize Road, Thorpe Hamlet; Miss E. Fox, 65 Redcliffe Gardens, S.W.10; Miss K. Fox, 31 Spencer Park, S.W.18; J. Garden, 189 Broomhill Road, Aberdeen; Miss F. E. Goodey, Woodbridge Road, Guildford; S. H. Gooch, Constable Road, Ipswich (6 shares); Miss B. Graham, 6 Chelsea Court, S.W.3; H. Grayson, 47 Beresford Street, Manchester; V. Granville, 172 Hardsborn Street, St. Helens; Wm. J. Green, 104 Parkinson Street, Burnleywood; Miss S. Green, Waterworks, Kidderminster; C. Grimsdale, 43 Napoleon Road, Twickenham; Mrs. E. Halle, 58 Anerley Station Road, S.E.20; J. Harrington, 85 Salisbury Road, Barrow; Mrs. A. Harrow, Reading Street, Broadstairs; J. Harvey, 31 Elizabeth Street, Aberdare; Miss G. Harwood, Spinney Hill, Northampton; W. A. Bawkey, 18 Woodhouse Grove, E.12; Mr. R. Hayter, 105 Lancefield Street, W.10; E. J. Hobbs, 40 Downsell Road, E. 15; W. E. Hobson, 30 Victoria Road, Worthing; A. S. Hodge, 18 Denver Road, N.16; F. W. R. Hodgson, 188 Chapeltown Road, ——; A. D. Hughes, Cefn Mawr, Anglesey; Miss A. Hutchinson, Hazelthwaite, Westmorland; Miss M. Irving, The Children's Hospital, Great Ormond Street, W.C.1; Mr. Jenkins, 85 Paynes Road, Freemantle, Southampton; Mrs. C. Jebbron, 38 Templemore Avenue, Rathgas, Dublin; Miss E. Jones, 6 Auckland Road, Smethwick; Miss R. M. Jones, 80 Sandrock Road, S.E.13; H. Kedward, 3 Hilden Street, Leigh; Mrs. Kelynack, "Hemecot," Harpenden; Miss G. Kincar, 223 Cumbernauld Road, Dennistoun; E. L. Langton, "Overdale," Ambergate; E. Lewis, 18 Park Court, S.W.4; L. M. Lewis, Penygarc, Llanover; Mrs. J. H. Lingard, Wilneslow, nr. Manchester; Miss D. V. Lord, 2 Marmion Avenue, Southsea; Mrs. MacCurdie, 28 Mackworth Terrace, St. Thomas, Swansea; Miss Mansell, 84 Devonshire Road, Princes Park, Liverpool; Mrs. E. McDonnell, 18 Norfolk Road, Thibsboro', Dublin; C. P. McIlvenna, 2 Fenwich Terrace, Jermond; J. A. McKay, 85 Manor Road, Manselton, Swansea; Miss E. Millard, 12 Salisbury Street, Derby; Miss B. Mills, 30 Mountfield Road, N.3; E. J. Mitchell, 8 Victoria Drive, Orrell Park, Liverpool; N. Mitchell, Brereton, Rugeley; M. M. Murray, 26 Aubrey Street, Everton; W. Murray, 42 Abbots Park Road, E.10; F. Naylor, 64 Bostall Lane, S.E.2; R. Norton, Windmill Cottage, Avon Dassett, Leamington Spa; G. Norwood, Montrose, Bolney Avenue, Peacehaven; A. Owen, 34 College Road, Bangor (2 shares); V. Oakes, 8 St. James Street, Eccles; H. Parkes, 59 Grosvenor Road, Barborne; E. Parrett, 22 Somerset Road, W.5; A. A. Pearson, 21 Upland Road, Harehills, Leeds; E. W. Reynolds, 62 Summerlerre, Lydney; Miss M. E. Pitt, 76 Belmoor Road, Small Heath, Birmingham; B. F. Phillips, Manthorpe Vicarage, Grantham; Mr. L. R. Pollard, 64 Larrowdene Road, Knowle; Mr. C. F. Porter, Stratherne, Crow Lane, Newton-le-Willows; S. Pratt, 28 Wedeland Avenue, Guildford; Miss F. Price, 20 Charlotte Road, Edgbaston; Mr. H. W. Preden, 61 Cecil Road, E.13; Mrs. A. N. Rae, Lyncombe Vicarage, Bath; Mrs. S. Rayner, Shirehall Hotel, Norwich; Eric Rheinberg, 55 The Avenue, N.W.6; Mr. Rice, 28 St. Nicholas Road, S.E.18; Mr. W. C. Riley, 66 Rawlings Road, Smethwick; F. Roche, 52 Bounces Road, N.9; Miss M. Saint, 12 Westminster Road, N.9; Geo. M. Schreiber, 91 Church Road, Richmond; L. R. Secden, Prospect Row, Cambridge; Miss E. Sherlaw, Willow Bridge, Choppington, Northumberland; Mr. J. Shortland, 66 Whitney Road, E.10; A. Skinner 36 Silver Crescent, W.4; W. C. Spring, 28 Nightingale Square, S.W.12; Mrs. E. Stebbing, 13 Oxford Gardens, W.4; H. Stinton, 47 St. Dunstans Crescent, Worcester; B. Thomas, 23 Waterdale Crescent, Sutton Oak, Lancs.; E. B. Twigg, 48 Adelaide Street, Brierley Hill; R. Watkins, 5 Avendale Street, Lincoln; Mrs. W. H. Walton, 79 Worthing Road, Lowestoft; Mrs. J. Watson, 6 Withpoll Street, Ipswich; Mrs. Wilbond, Downshire Park, Carrickfergus; F. B. Williams, 8 Chaltcn Street, Cheltenham; C. Willmott, High Street, Clifland Common, Bristol; Miss G. A. Willmott, 187 Radford Boulevarde, Nottingham; Wm. H. Woodley, 35 Neath Road, Plymouth; Miss K. Woollam, Pulford, Wrexham; T. A. Woods, Wembley; Miss A. M. Worger, 32 Jermond Avenue, Wembley; G. H. Wyman, Albert Street, Lydney; Mr. A. W. Yates, 25 Bow Street, Birmingham.

We have thus added £122 to the Prize Money so as to deal as generously as possible with our readers.

Read again what distinguished residents say about the SIX WINNING RESORTS IN CASSELL'S GREAT HOLIDAY BALLOT COMPETITION

SCARBOROUGH. By Councillor G. Whitfield, His Worship the Mayor.
"There are entertainments to suit every taste, and it is the Children's Paradise. Scarborough, as the 'Queen of Watering Places,' still 'reigns supreme.'"

HARROGATE. By F. J. C. Broome, Esq., Publicity Manager to the Harrogate Corporation.
"Harrogate offers the money-and-time-saving proposition of a 'cure' and a holiday combined. 'The Mecca of the Ailing, the Playground of the Robust,' expresses Harrogate in a few words."

CROMER. By Commander Locker-Lampson, M.P.
"Cromer has the record for sunshine of any seaside resort in England, and its sands, its sea, and its surroundings are as charming as anywhere in the United Kingdom."

YARMOUTH. By Councillor A. W. Yallop, His Worship the Mayor.
"Yarmouth's health-giving breezes and invigorating air are unsurpassed. It provides all that is best in amusements, has the most up-to-date attractions, and its golden sands make it the ideal resort."

CLACTON. By Councillor W. Fenton-Jones, J.P., Chairman of the District Council.
"Clacton-on-Sea faces South, and combines a tonic air with warmth and abundant sunshine. It is a Garden City by the sea which provides every facility for a healthy and pleasant holiday."

FELIXSTOWE. By H. F. Douthwaite, Esq., Chairman of the District Council.
"Felixstowe is Peter Pan's own playground. For the tired—rest and recuperation; for the virile—games galore. Merry entertainers, bright music, clean air, sparkling seas and golden sunny days."

YOU CAN OBTAIN FULL INFORMATION AT ANY L·N·E·R· INQUIRY OFFICE OR AGENCY

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 British Summer Time.

London (2LO), 364 m. 1-2 p.m., con.; 3.15-4 p.m., transmission to schools; 3.30-5.45, con. (Sun.); 4.15 p.m., con.; 5.15-5.55, children; 6 p.m., dance music; 7-8 p.m., time sig., news, music, talk; 8-10 p.m., music; 9.0, news (Sun.); 9.30 p.m., time sig., news, talk; 10 p.m., special feature (Mon., Wed., Fri.). Dance music on Thurs. and Sat. until midnight.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 440 m. **Birmingham** (5IT), 479 m. **Bournemouth** (6BM), 386 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 422 m. **Manchester** (2ZY), 378 m. **Newcastle** (5NO), 404 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 315 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 321.5 m. **Liverpool** (6LV), 331 m. **Nottingham** (5NG), 326 m. **Plymouth** (5PY), 338 m. **Sheffield** (6FL), 306 m. **Stoke-on-Trent** (6ST), 301 m. **Swansea** (5SX), 482 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 4 p.m. onwards, own con. on Mon. Dance music daily (exc. Sun. and Tues.) till midnight; on first Friday in each month until 2 a.m.

IRISH FREE STATE.

Dublin (2RN), 397 m. Daily, 7.30 p.m. Sundays, 8.30 p.m. until 10.30 p.m.

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. B.S.T.

AUSTRIA.

Vienna (Radio Wien), 582.5 m. and 531 m. (temp.) (10 kw.). 11.00, con. (almost daily); 15.30, con.; 19.25, news, weather, time sig.; con., lec., news; 20.00, con.; 22.00, dance (Wed., Sat.).

Graz, 402 m. (1 kw.). Relay from Vienna. Also own con. (Tues., Wed., Fri.), 20.10.

BELGIUM.

Brussels, 487 m. (1½ kw.). 17.00, orch. (Tues., Thurs., Sat. only), news; 20.00, lec., con., news. Relay: Antwerp, 265 m. (100 w.).

CZECHO-SLOVAKIA.

Prague, 368 m. (5 kw.). Con., 20.00-23.00, daily.

Brunn (OKB), 521 m. (2.4 kw.). 10.00, con., news (Sun.); 19.00, lec., con. or dance (daily).

DENMARK.

Copenhagen (Radioraadet), 347.5 m. (2 kw.). Sundays: 15.30, lec.; 17.30, children; 20.00, play; 21.15, news, con.; 21.15, news, Esperanto (Mon.), silent night. Weekdays: 20.00, lec., con., news, con.; 21.30, dance (Sat.).

Ryvang, 1,150 m. (1 kw.). Sundays: 09.00, sacred service.

Odense, 810 m. Relays Copenhagen.

Sorö, 1,150 m. (1½ kw.). Relays Copenhagen.

FINLAND.

Helsingfors (Skyddskar), 504 m. (500 w.).

Helsingfors, 440 m. Con., 18.00 (Tues., Thurs., Sat., Sun.).

***Tamafors**, 368 m.

***Jyvaskyla**, 561 m. (200 w.).

***Uleaborg**, 233 m. (200 w.).

* Relay Helsingfors.

GRAND DUCHY OF LUXEMBURG.

Radio Luxemburg (LOAA), 1,200 m. Con.: 14.00 (Sun.), 21.00 (Thurs.).

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 07.15, 08.00, physical exercises; 11.00, markets (exc. Sun. and Mon.); 11.20, time sig., weather; 15.00, 16.45, Stock Ex. (exc. Sun. and Mon.); 18.00, talk, con., news; 19.00 and 23.10, weather; 21.00, con. (daily). Relays PTT, Paris: 07.15, 08.00 (daily).

Radio-Paris (CFR), 1,760 m. (about 3 kw.). Sundays: 12.45, con., news; 16.30, Stock Ex., con.; 20.15, news, con. or dance. Weekdays: 10.40, news; 12.30, con., markets, weather, news; 16.30, markets, con.; 20.15, news, con. or dance.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (800 w.). 07.15, 08.00, physical exercises; 14.00 or 15.00, studio con. or outside relay; 20.30, lec. (almost daily); 21.00, con. (daily).

Le Petit Parisien, 333 m. (1 kw.). 21.15, con. (Tues., Thurs., Sat., Sun.).

Radio L.L. (Paris), 350 m. (250 w.). Con. (Mon., Wed., Thurs.), 20.30.

Radio-Toulouse, 431 m. (2 kw.). 12.30, con., time sig. (daily); 17.30, news (exc. Sun.); 20.45, con.; 21.25, dance (daily).

Radio-Lyon, 280 m. (2 kw.). 20.20, con. (daily). Temporarily closed.

Strassburg, 200 m. (120 w.). 21.15, con. (Tues., Thurs.).

Radio Agen, 318 m. (250 w.): 12.40, weather, Stock Ex.; 20.00, weather, Stock Ex.; 20.30, con. (Tues., Fri.).

***Lyon-la-Doua**, 486 m. Own con., 20.00 (Mon., Wed., Sat.).

***Marseilles**, 351 m. (500 w.).

***Toulouse**, 280 m. (2 kw.).

***Bordeaux**, 411 m.

* Relays of PTT Paris.

Montpelier, 220 m. (1 kw.).

Angers (Radio Anjou), 300 m. (500 w.). Daily: 20.30, news, lec., con.

Bordeaux (Radio Sud-Ouest), 330 m. Con., 21.00 (Mon., Fri.).

Mont de Marsan, 390 m. (300 w.). Con. (weekdays only), 20.30.

Algiers (N. Afr.) (PTT), 310 m. (100 w.). 21.45, con. (Mon., Thurs.).

GERMANY.

Berlin, on both 504 and 571.5 m. (4 kw.). 06.30, con. (Sun.); 09.00, sacred con. (Sun.); 11.00, con. and tests; 12.55, time sig., news, weather; 15.00, educ. hour (Sun.), markets, time sig.; 17.30, orch.; 20.30, con., weather, news, time sig., dance music until 24.00 (Sat., Sun., Thurs). Relayed on 1,300 m. by Königswusterhausen (1,300 m.) and Stettin (241 m.).

Königswusterhausen (LP), 1,300 m. (8 kw.). 11.30-12.50, relays Berlin (Sun.); 15.00, lec. (daily); 18.30, relay of Berlin (Vox Haus) con. (daily). 2,525 m. (5 kw.), Wolff's Buro Press Service: 06.45-20.10. 2,880 m., Telegraphen Union: 08.30-19.45, news. 4,000 m. (10 kw.), 07.00-21.00, news.

Breslau, 417 m. (4 kw.). 12.00, con. (daily), Divine service (Sun.); 12.55, time sig. (Sun.), weather, Stock Ex., news; 16.00, children (Sun.); 17.00, con.; 19.00, lec.; 20.30, con., weather, time sig., news, dance (relays Berlin). Relay: Gleiwitz, 251 m.

Frankfort-on-Main, 470 m. (1½ kw.). 08.00, sacred con. (Sun.); 11.55, time sig., news; 12.55, Nauen time sig.; 16.00, con. (Sun.); 16.30, con.; 18.00, markets, lec.; 20.00, lec., con., weather. Dance: relays Berlin. Relay: Cassel, 273.5 m.

Hamburg, 392 m. (4 kw.). Relayed by Bremen (277 m.), Hanover (297 m.), Kiel (233 m.). Sundays: 07.25, time sig., weather, news, lec.; 09.15, sacred con.; 13.15, con.; 18.00, con.; 19.15, sports, weather, con. or opera, dance. Weekdays: 05.45, time sig., weather; 07.00 and 07.30, news, weather; 12.55, Nauen time sig., news; 14.00, weather, con.; 16.15 and 18.00, con.; 19.00, lec.; 19.55, weather and con.; 22.00, dance (Sun., Thurs., Sat.).

Königsberg, 462 m. (1 kw.). 09.00, sacred con. (Sun.); 12.55, time sig., weather, news; 16.30, con.; 17.00, con. (Sun.); 19.30, lec.; 20.00, con. or opera, weather, news, dance (irr.).

Leipzig, 452 m. (700 w.). Relayed by Dresden (294 m.). 08.30, sacred con. (Sun.); 11.00, educ. hour (Sun.); 12.00, con. (daily); 12.55, Nauen time sig., news; 16.30, con., children (Wed.); 20.15, con. or opera, weather, news, cabaret or dance (not daily).

Munich, 485 m. (3 kw.). Relayed by Nuremberg (340 m.). 11.30, lec., con. (Sun.); 14.00, time sig., news, weather; 16.00, orch. (Sun.); 16.30, con. (weekdays); 18.30, con. (weekdays); 19.15, lec.; 19.30, con. (Sun.).

Munster, 410 m. (1 kw.). Relayed by Elberfeld (259 m.), Dortmund (283 m.). 11.45, radio talk, Divine service; 12.00, news (Sun.); 12.30, news (weekdays); 12.55, Nauen time sig.; 15.30, news, time sig.; 16.00, con.; 17.00, children (Sat.); 19.40, news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 24.00 and 04.00, weather and news.

Stuttgart, 446 m. (1½ kw.). 11.30, con. (Sun.); 16.30, con. (weekdays); 17.00, con. (Sun.); 18.30, time sig., news, lec., con. (daily); 21.15, time sig., late con. or cabaret.

HOLLAND.

Amsterdam (PCFF), 2,125 m. (1 kw.). Daily: 06.35-15.30 (exc. Mon. and Sat., when 12.30-13.30), news, Stock Ex.

Hilversum (HDO), 1,060 m. (5 kw.). 09.00, sacred service (Sun.); 19.10, con.; 21.00, news, etc. Testing on 25 kw.

HUNGARY.

Buda-Pesth (Csepel), 560 m. (2 kw.). 09.00, news; 12.00 and 15.00, weather, news; 17.00, dance music; 20.00, con. or opera, dance.

Kosice, 2,020 m. (2½ kw.). 19.00, con.

ICELAND.

Reykjavik, 327 m. (700 w.). Tests: 22.30, 24.30.

ITALY.

Rome (1RO), 425 m. (3 kw.). 10.30, sacred con.; 13.15, official communique; 17.00, children; 17.30, relay of orch. from Hotel di Russia; 17.55, news, Stock Ex., jazz band; 20.30, news, weather, con.; 22.15, late news.

Milan, 320 m. (2 kw.). 20.00-23.00, con., jazz band.

JUGO-SLAVIA.

Belgrade (Rakovitza) (HFF), 1,650 m. (2 kw.). 17.00, news (daily), con. (Tues., Thurs., Sat.).

Agram (Zagreb), 350 m. (500 w.).

LETTLAND.

Riga, 475 m. (2 kw.). Con. daily, 21.00-22.00.

NORWAY.

Oslo, 382 m. (1.2 kw.). 11.00, Divine service (Sun.), Stock Ex. (weekdays); 13.15, markets; 19.15, news, time, lec., con.; 22.00, time, weather, news, dance relayed from Hotel Bristol, Oslo (not daily).

Bergen, 358 m. (1½ kw.). 19.30, news, con., etc.

POLAND.

Warsaw, 480 m. (6 kw.). Daily: con., 11.00-13.00; 15.00-23.00, daily.

RUSSIA.

Moscow (RDW), 1,450 m. (12 kw.). Weekdays: 12.30 and 17.55, news and con.; 23.00, chimes from Kremlin.

(Popoff Station), 1,010 m. (2 kw.). 10.00, 11.00, lec.; 13.00, 19.00, con. (Tues., Thurs., Fri.).

Radio Peredacha, 410 m. (6 kw.).

Trades Union Council Station, 450 m. (2 kw.). 18.00, con. (Mon., Wed.).

Leningrad, 940 m. (2 kw.). Weekdays: 16.00.

Nijni Novgorod, 1,400 m. (1.2 kw.). 21.30, con.

SPAIN.

Madrid (EAJ6), 392 m. (1½ kw.). Daily:

(Concluded on page 26)

MORE FACTS ABOUT L.F. TRANSFORMERS

The simplified expression giving the amplification ratio of valve and L.F. transformer is :—

$$\mu \times \sqrt{\frac{Z^2}{R^2 + Z^2}}$$

where μ is the amplification factor of the valve

"Z" is the impedance of the transformer.

"R" is the impedance of the valve.

If, at a given frequency, the valve impedance "R" equals the transformer impedance "Z," the expression becomes $\mu \times \sqrt{\frac{1}{2}}$ or $\mu \times 0.7$.

On the other hand, the greater the transformer impedance "Z" the more nearly does the expression become equal to $\mu \times \sqrt{1}$ or $\mu \times 1$.

Thus, the greater the transformer impedance the greater the amplification ratio, and to choose a transformer of lower impedance to match the impedance of the valve merely results in impairing the amplification.

Therefore, to obtain the best results choose a transformer of very high impedance, and, seeing that transformer impedance varies with frequency whilst valve impedance is practically unaffected by frequency, choose a transformer which has high impedance at low frequency, say 100 ; otherwise, low notes will not be reproduced satisfactorily.

FERRANTI

BRITISH MADE L.F. TRANSFORMERS

TYPE AF3

HAVE THE FOLLOWING IMPEDANCES

At 100 Periods - - **50,000 OHMS**

At 500 Periods - - **410,000 OHMS**

NO BETTER TRANSFORMER IS AVAILABLE AT ANY PRICE

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25/-

RATIO 3.5 to 1
FOR USE IN BOTH FIRST AND SECOND STAGES.

Solution and Prizewinners of the HMH HEADPHONE Crossword Puzzle

The following three competitors were correct:

1. Miss E. L. Cook, "The Brow," Everton, Liverpool;
2. Mrs. N. Heurteon, "Shammar," Church Rd., Richmond, Surrey;
3. F. Land, 1005, 3, Coventry Road, Birmingham;

and each receive £28 - 6 - 8.

The following 25 with one mistake win a consolation prize of a pair of HMH HEADPHONES.

H. Robbins, "Hunston," Chatsworth Road, Parkstone, Dorset; E. Turner, 6, Bryngwyn Road, Abertillery, Mon.; M. Hall, 6, Nightingale Place, Woolwich, S.E.18; Mrs. A. E. Case, 71, Gillott Road, Birmingham; C. Richmond, 21, Colville Terrace, London, W.11; W. F. Lee, 2, Jolls Cóttage, Devonport; W. E. Pugh, Ashton Road, Birkdale, Southport; Frank E. B. Blanc, 25, Rutland Square, Edinburgh; Mrs. I. Robinson, Darwin House, Mountfields, Shrewsbury; P. G. Carvey, Moor House, East Hanningfield, near Chelmsford, Essex; Mr. Woolnough, 11, Benhilton Gardens, Sutton, Surrey; H. Williams, 23, Cemetery Road, Beeston Hill, Leeds; E. J. B. Carpenter, 16, Southfield Place, Portobello; C. A. Hoggett, 19, Flamsted Avenue, Wembley, Middlesex; William McKee, 6, Lansdown Road, Canterbury; Frank S. Downs, 14, Harold Terrace, Dover, Kent; W. C. Geeson, 1, Victoria Street, Aylesbury, Bucks; H. Robbins, "Hunston," Chatsworth Road, Parkstone, Dorset; Mrs. M. E. Wells, 9, Glenmore Avenue, Stoke-Plymouth, Devonshire; A. S. Draisey, Station House, Kew Bridge, Middlesex; Arthur Fredk. Lewis Hills, 24, Caversham Road, London, N.W.5; D. Heatley, 17, Rolls Street, Canton, Cardiff, S. Wales; C. J. Bolton, "Garden Reach," St. Anthony's Drive, Newcastle, Staffs; O. P. Lawrence, 100, High Road, Balham, S.W.12; C. H. Crombie, 137, Elm Park Mansions, Park Walk, Chelsea, S.W.10.

HARRY MORSER & CO. (Wireless), LTD.
67-68, HATTON GARDEN, E.C.1.

"BROADCAST TELEPHONY" (*cont. from page 24*)

con. (times vary daily). Closes at 24.00 on Sun., Wed., Sat.

Madrid (EAJ7), 373 m. (4½ kw.). 17.30-24.00, con. (almost daily).

Madrid (EAJ4), 340 m. (3 kw.). 16.50, con.

Barcelona (EAJ1), 324 m. (3 kw.). 17.00-21.00, news, lec., con. (Sun.); 18.00-23.00 (daily).

Barcelona (Radio Catalana) (EAJ13), 462 m. (3 kw.). 19.00-23.00, con., weather, news.

Bilbao (EAJ9), 415 m. (1 kw.). 19.00, news, weather, con. Close down 22.00.

Bilbao (Radio Vizcaya) (EAJ11), 418 m. (2 kw.). 22.00-24.00, con. (daily).

Cadiz (EAJ3), 360 m. (550 w.). 19.00-21.00, con., news. Tests daily (exc. Sun.), 24.00.

Cartagena (EAJ15), 335 m. (1 kw.). 20.30-22.00, con. (daily).

Seville (EAJ5), 357 m. (1½ kw.). 21.00, con., news, weather. Close down 23.00.

Seville (EAJ17), 300 m. 19.00-22.00, con. (daily).

San Sebastian (EAJ8), 343 m. (500 w.). 17.00-19.00, 21.00-23.00 (daily).

Salamanca (EAJ22), 405 m. (1 kw.). 17.00 and 21.00, con. (daily).

Saragossa, about 325 m. Testing.

SWEDEN.

Stockholm (SASA), 430 m. (1½ kw.). 11.00, sacred service (Sun.); 12.30, weather; 14.00, con. (Sun.); 17.00, children (Sun.); 18.00, sacred service; 19.00, lec.; 21.15, news, con., weather. Dance (Wed., Sat.).

Relays.—Boden (SASE), 1,200 m.; Eskilstuna, 250 m.; Falun (SMZK), 370 m.; Gothenburg (SASB), 288 m.; Gefle, 208 m.; Helsingborg, 235 m.; Joenkoeping (SMZD), 199 m.; Kalmar, 253 m.; Karlsborg (SAJ), 1,350 m.; Karlscrona (SMSM), 196 m.; Kristinehamm (SMTY), 292 m.; Karlstadt (SMXG), 221 m.; Linkoeping, 467 m.; Malmo (SASC), 270 m.; Norrkoeping (SMVV), 260 m.; Orebro, 237 m.; Ostersund, 720 m.; Säffle (SMTS), 245 m.; Sundsvall (SASD), 550 m.; Trollhattan (SMXQ), 322 m.; Umea, 215 m.; Varborg, 385 m.

SWITZERLAND.

Lausanne (HB2), 850 m. (1½ kw.) (temp.). 20.00, lec., con. (daily).

Zurich (Hongg), 515 m. (temp.) (500 w.). 11.00, con. (Sun.); 12.00, weather; 12.55, Nauen time sig., weather, news, Stock Ex.; 13.30, piano solo; 17.00, con. (exc. Sun.); 18.15, children, women; 19.00, news, weather; 20.15, lec., con., dance (Fri.).

Geneva (HB1), 760 m. (2 kw.). 20.15, con. (daily).

Berne, 435 m. 10.30, organ music (exc. Sat.); 16.00, 20.30, con.

Basle. 1000 m. (1½ k.w.), con. daily 20.30.

"Helpful Notes on Electric Bells" is the title of an article appearing in the current issue of "The Amateur Mechanic and Work" (3d.), and will doubtless be of great help to many readers. Other articles appearing in the same number are: "A Gift Jewel-box," "A Simple Method of Renovating Book Covers," "Building a Dog-kennel," "The Reflecting Telescope and How to Use It," "Making Things in the Home," "Motor-cycle Pillion-riding Tips," "Making a Loud-speaker One-valver," "Repolishing Tables," "Sound and Neat Soldering," "An Old-time Fireside Seat," "A Vertical Slide-rest for the Lathe," "Photographic Pars."

The Ravag Broadcasting Co. of Vienna has installed a microphone in St. Stephen's Cathedral to relay organ recitals.

CHIEF EVENTS OF THE WEEK

SUNDAY, JULY 4

London	Shakespeare's Heroines.
Bournemouth	Concert from the Royal Bath Hotel.
Cardiff	Independence Day Programme.
Newcastle	Vocal and Instrumental Concert.

MONDAY

London	Leslie Henson.
Birmingham	Light and Lyrical.
Bournemouth	*The Last.*
Cardiff	A Musical Medley.
Glasgow	Light Orchestral Concert.
Liverpool	Symphony Concert.
Newcastle	"The Radio Follies."

TUESDAY

London	"What Would You Do?"—a Competition.
Daventry	A Village Concert.
Cardiff	The Genius of Hungary.
Glasgow	"The Radio Follies."
Manchester	"A Breath of Sea Air and a Round of Golf."

WEDNESDAY

London	*Rigoletto.*
Aberdeen	Scottish Programme.
Glasgow	Elizabethan Programme.
Newcastle	The Black Dyke Mills Band

THURSDAY

London	The Royal Parks Band.
Bournemouth	Concert from the Winter Gardens.
Cardiff	A Summer Night on the River.
Dundee	The Dundee Colliery Prize Band.
Glasgow	Popular Concert.
Leeds—Bradford	The Second Birthday of 2 L.S.
Nottingham	The Clifton Colliery Prize Band.
Plymouth	*Julykus.*
Swansea	Round the Relay Stations.

FRIDAY

London	Murray Ashford's Entertainers.
Birmingham	"The Radio Follies."
Bournemouth	"John Citizen" has a Picnic.
Belfast	Variety Programme.
Glasgow	The Black Dyke Mills Band.
Manchester	Spanish Landscape.

SATURDAY

London	Programme arranged by Andre Charlot.
Birmingham	The City of Birmingham Police Band.
Glasgow	Music and Mirth.
Newcastle	A Ballad Concert

Mr. A. C. Hunold, the chief representative in Switzerland of the Northern News Service, has just been appointed director and first announcer of the broadcasting station at Zurich. Mr. Hunold speaks and writes English fluently, having studied at British universities.

CHOOSING YOUR BATTERIES

A GREAT deal of trouble in connection with valve receivers can be obviated by carefully choosing the H.T. and L.T. batteries. An interesting booklet describing Columbia wireless batteries has been issued by J. R. Morris, of Imperial House, 15-19, Kingsway. The booklet (a copy of which will be sent post free to any reader) is full of valuable information, and is a supplement to that published a year ago, "How to Get the Most Out of Your Radio Batteries." In addition to full details of Columbia batteries, a number of circuits are given, together with an amount of electrical data of great use to the constructor. A simple explanation is also given of the functioning of the H.T., L.T. and grid batteries in a receiver, so that the amateur can realise the necessity of choosing the right type of battery.

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

CLUB DOINGS

Irish Radio Transmitters Society.

Hon. Sec.—W. R. BURNE, ESQ., 34, Dame Street, Dublin.

A WIRELESS society devoted to the interests of the transmitting amateur has been formed in the Irish Free State. Interested experimenters residing in different parts of Ireland, such as Co. Kerry, Kilkenny, Wexford, Waterford, and many others, have already joined the society, which at present consists of 25 members.

At a meeting held at 34, Dame Street, Dublin, on May 20, Mr. W. R. Burne was elected hon. secretary, while Messrs. D. B. Bradshaw, L. H. Carder and D. F. O'Dwyer were appointed as a temporary committee.

Future meetings will be held fortnightly, and it is hoped that all who take an interest in amateur short-wave work will join this new society without delay. It is not necessary for prospective members to hold transmitting permits. Provided they are keenly interested in short-wave experimental work the above society will be very pleased to welcome them.

Etherplus Valve-holders.—With reference to the report on the Etherplus valve-holder, published in No. 210, we regret that we stated that the connecting strips to the valve legs were brass instead of phosphor bronze. We would also point out that the movement of the disc on which the valve legs are mounted is limited on one side by the moulding itself and on the other side by the baseboard. Etherplus valve-holders are made by M. and A. Wolff, of 9 to 15, Whitecross Street, London, E.C.1.

An excerpt from the musical play *Hearts and Diamonds*, as now being performed at the Strand Theatre, is to be broadcast from most of the B.B.C. stations. Listeners will be given the opportunity of hearing Madame Louise Edvina, Miss Anita Elsom and Lupino Lane.

Seamen's unions in Australia are demanding that wireless receivers be installed in all vessels irrespective of tonnage.

The new Radiopolis telegraphy station installed in the neighbourhood of Santa Cruz (Brazil) has been opened.

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 (as below) and stamped addressed envelope are sent us.

The Swedish Government has passed the plans for a high-power broadcasting station to be erected in the neighbourhood of Motala, a little town situated on Lake Vetter, approximately 42 miles west of Norrkoeping on the Göta Canal.

The Nijni-Novgorod (Russia) Laboratory is making transmissions on wavelengths of 83, 102 and 104 metres.

PREPAID ADVERTISEMENTS.

Advertisements under this head are charged FOURPENCE PER WORD, minimum charge FOUR SHILLINGS.

DEPOSIT SYSTEM.

As the Publishers cannot accept responsibility for the bona fides of Advertisers in this publication they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The Deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom, double fees are charged.

The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to

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WIRELESS.—Capable, trustworthy men with spare time who wish to substantially increase income, required where we are not fully represented. Applicants must have practical knowledge of installation of Set and Aerial, be a Householder or live with parents, and be able to give references. State age and experience.—Address, Dept. 28, General Radio Company, Limited, Radio House, Regent Street, London, W.1.

PATENTS.—Trade Marks. Advice Handbook free.—B. T. King, Regd. Patent Agent, 146a, Queen Victoria Street, London.

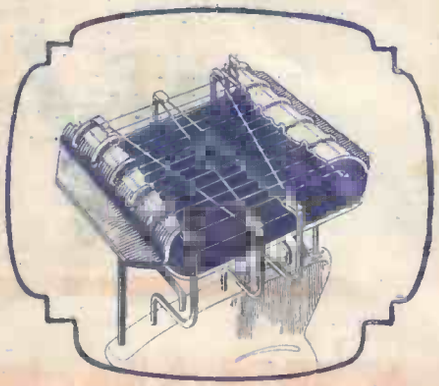
PATENTS and Trade Marks obtained.—H. T. P. Gee, Patent Agent, Member R.S.G.B., A.M.I.R.E., 51/52, Chancery Lane, London, W.C.2. Phone Holborn, 1525.

Do you know

that the factors controlling the volume of pure reproduction from your receiver are based on the design of the filaments of your valves

Everybody

who knows about valves will tell you that a filament that is up to 3 times greater in length and has an increased emission surface up to 5½ times that of the ordinary filament will mean a 33% increase in your results.



There is no mystery in the construction of a valve. Any anode and grid will operate with any filament but it is the filament that counts, and this is what you pay for.

For 4-volt accumulator or 3 dry cells
THE P.M.3 (General Purpose) 0·1 amp. 16/6
THE P.M.4 (Power) 0·1 amp. 22/6
For 6-volt accumulator or 4 dry cells
THE P.M.5 (General Purpose) 0·1 amp. 22/6
THE P.M.6 (Power) 0·1 amp. 22/6
For 2-volt accumulator
THE P.M.1 (General Purpose) 0·1 amp. 15/6
THE P.M.2 (Power) 0·15 amp. 18/6

Now look at The Mullard P.M. Filament

Its increased length completely within the field of the anode and grid is obviously greater than that of any other valve on the market. It is supported by five strong but resilient hooks. It has a large core of a special ductile metal that prevents it from breaking except by the very roughest handling.

It consumes ONLY ONE TENTH AMPERE and is so economical that no sign of glow can be discerned. Will give you consistent powerful results during a long life.

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for the Valves with the P.M. Filament

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THE · MASTER · VALVE

ADVT. THE MULLARD WIRELESS SERVICE CO., LTD., BALHAM, LONDON, S.W.12

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AMATEUR WIRELESS, July 10, 1926.

AN "ALL-EUROPE" LOUD-SPEAKER SET

ENTER THE BIG COMPETITION *(See p. 48)*

Amateur Wireless And Electrics

Vol. IX. No. 213 SATURDAY, JULY 10, 1926 Price 3d

PRINCIPAL CONTENTS

WELL ILLUSTRATED

Registered at G.P.O. as a Newspaper.

CAPABLE OF RECEIVING ALL EUROPEAN STATIONS!

Constructional details of this fine receiver are given in this issue.

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

Vol. IX. No. 213 — Technical Adviser: SYDNEY BRYDON, D.Sc., M.I.E.E. — JULY 10, 1925

Chief Contents

"Amateur Wireless and Electrics." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. 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 and 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.

THE WAVELENGTH RANGES OF POPULAR CIRCUITS

Some reasons why you may not be getting the best results

MANY amateurs who have used one of the popular circuits, such as the Reinartz, Ultraudion, Flewelling, etc., with great success on the broadcast wavelengths are disappointed when they try and receive Daventry with the same circuit.

While the number of valve circuits in popular use has increased greatly each year since broadcasting commenced, it is only natural that particular attention should have been paid to reception on wavelengths between 300 and 500 metres. As there are many circuits which work excellently on the lower wavelengths, but only moderately well—in some cases not at all—on the longer waves, a brief survey of the useful wavelength ranges of some of the more widely-used circuits may be the means of preventing disappointment to a large number of wireless enthusiasts.

Super-regenerative Circuits

Considering the super-regenerative circuits first, it should be noted that these are not worth while on wavelengths above 500 metres. Optimum results are obtained on very short wavelengths indeed, and the efficiency decreases as the wavelength increases, so much so, in fact, that the efficiency is about four times as great on 200 metres as on 400 metres. On 500 metres a super-regenerative circuit is very little better than a straight single-valve circuit with reaction, and above this wavelength it is usually not so good.

Claims have been made by various amateurs that a Flewelling works just as well on 1,600 metres as on the broadcast band, but these people cannot have grasped the principles employed in super-regenerative reception. It may sometimes happen that slightly better results are obtained with a Flewelling on this long wavelength than are given by a straight single-valver, but, if so, it is not due to any super-regenerative action. It has been suspected that a certain amount of L.F. reaction occurs in this circuit, which may account for the effect mentioned. The same remarks apply equally to the Armstrong super-regenerative circuits.

The Reinartz System

The Reinartz tuning system may be employed on any wavelength, but at the same time it is seen to its best advantage when used for the reception of stations working below 500 metres. An essential part of this arrangement is an H.F. choke connected between the plate of the detector valve and H.T. positive. Usually a special H.F. choke coil is used for this purpose, but in those cases where a special coil is omitted the winding of the telephones or the primary winding of an L.F. transformer acts as a choke. As the impedance of any inductive coil decreases as the wavelength is increased, it is more difficult to choke back the oscillations effectively when their wavelength is long.

On broadcast wavelength a 250- or 300-turn coil makes an efficient choke, while on Daventry's wavelength a 1,000-turn coil might be used. However, when working on wavelengths above 1,000 metres, a rejector circuit, tuned to the signals, should be used instead of a choke coil if best results are to be obtained. This introduction of another tuning control takes away from the Reinartz circuit its great advantage of simplicity of operation. Also, as the Reinartz circuit is not a convenient one to use when a very wide band of wavelengths is to be covered, it is advised that this circuit be employed only when the maximum wavelength to be received does not exceed 500 or 600 metres.

The Ultraudion and Long Waves

The Ultraudion circuit, though by no means new, appears to be passing through

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BROADCASTING HEAT AND POWER

An article discussing the possibilities of power radiation

By T. THORNE BAKER, F.Inst.P., F.R.P.S.

A FAMOUS university professor suggested recently that the day was approaching when both heat and power would be broadcast and that the universal radiation of heat, power and light by wireless from central power stations would perhaps solve the fuel problems of the future.

Years ago when Tesla promised wireless power, the general public (or, indeed, the then wireless experts) knew so little about wireless that such an announcement was received with ready credence. To-day, with thousands of potential wireless experts and millions of amateurs with some general knowledge, one needs something substantial to go upon before making such a prophecy. Now, what really are the prospects of ever sending power and light and heat by wireless transmission?

Cable v Wireless

We must first consider the matter from a purely common-sense standpoint. Wherever there are existing cables for the supply of electric power it would be folly to think of substituting wireless transmission. The possibilities would occur in countries where water power is abundant and is so often turned into electric power on the spot. The most obvious case is that of the Niagara Falls, where part of the water power is utilised to drive water turbines and generate electricity. Such stations, situated on the spot where the water is available, may be hundreds of miles from the industrial towns where the power is wanted, and here high-tension current at a pressure of perhaps 100,000 volts is transmitted by overhead cables, with their attendant losses and inconvenience. Could such power be transmitted by wireless it might be a great convenience, and would obviate the necessity of the installation and upkeep of the high-tension conduits.

But how is the power to be transmitted? In every case where any power is set in motion by a wireless signal, such as, for example, the control of a ship or train, the received signal after rectification is amplified, and the whole of the amplification is done by means of *local power supplied by the receiving station.* Your loudspeaker is not operated by wireless; it is worked by the power of your own accumulators.

The Beam System

One of the first great feats of wireless radiation was probably that of the Marconi Co., when by means of the beam system they got perfect telephony from Hendon to Birmingham with 18 watts. The amount of current received, however, was sufficient to give, with amplification, perfect telephony. In other words, with the help of the greatest advances that have been made in directive wireless, the loss of energy over a hundred miles can be so minimised that a sufficient percentage of the 18 watts is obtained to actuate, with amplification, one of the most sensitive instruments known to science—the telephone! Yet we talk glibly of transmitting thousands of horse-power with commercial efficiency.

The metallic circuit has another primary advantage—it leads current to each of any number of places just as a big railway line can take passengers to any number of distinct places. This is where one finds, to my mind, an almost insuperable difficulty in the successful transmission of wireless energy.

Suppose a station in central London were radiating energy to factories in a dozen towns in outer London, situated on the circumference of a circle. How could each factory tap the energy unless any intermediate spot on the circumference of the circle could do so too? Obviously it could not. Therefore the central station must radiate energy in *all* directions with practically zero efficiency.

Remote Possibilities

The only alternative would be for one power station to concentrate its radiated energy along a narrow line in one direction, so that any factory in that line, but only in that line, could tap it. It would be interesting to know what power engineers would think of such a scheme.

The weak spot in wireless power transmission is that indispensable difference from wireless telephony. In the latter we amplify what we receive by means of valves and *an abundance of local power;* if we ran our engines or heated our homes by wireless, we should have to receive sufficient energy *off the aerial direct* without any amplification.

No serious-minded student of wireless is foolish enough to say, "It will never be done." But here are sufficient arguments to make us think, and to accept with reserve forecasts which it would perhaps be wiser to modify with care. T. T. B.

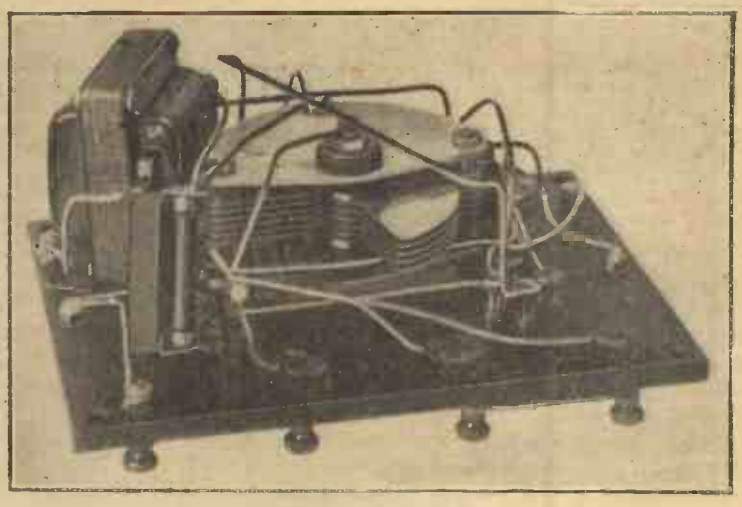
"THE WAVELENGTH RANGES OF POPULAR CIRCUITS" (*continued from preceding page*)

a period of revived popularity at the moment. This is another circuit which performs at its best on short wavelengths. There are several reasons why its performance on long wavelengths cannot allow it to be recommended for general use for the reception of Daventry. In the first place, it is a circuit employing reaction through the capacity between the grid and plate circuits of the valve. This capacity is very small, but will pass sufficient energy to bring the set to the oscillation point when the oscillations concerned have a sufficiently high frequency. When the wavelength is increased much above the broadcast band, however, it becomes necessary to supplement this stray capacity coupling either by introducing magnetic reaction or further capacitative reaction through a variable condenser. In either case the chief feature of the Ultraudion circuit is lost, and it would be better to employ a straight circuit.

Another essential feature of the Ultraudion is the placing of a variable condenser in series with the aerial-tuning coil. This tends to reduce the wavelength to which the set will tune, and therefore abnormally large coils are required for the longer wavelengths. It is bad practice to use a series aerial-tuning condenser for wavelengths above 600 metres when the usual broadcast receiving aerial is employed. The rule about high inductance, small capacity, applies only when the capacity is *in parallel* with the inductance. However, the Ultraudion is a good circuit to use when most reception is done on the broadcast band, and the occasional reception of Daventry can be carried out fairly satisfactorily by using a 250-turn coil.

The Cockaday circuit is another arrangement in which the stray capacities between the grid and plate are utilised to provide the reaction coupling. For the same reason as was mentioned in connection with the Ultraudion, this coupling fails to be sufficient to bring the set to the point of oscillation when the wavelength to which the set is tuned reaches a certain figure, so that this is another arrangement which cannot be advocated for the reception of Daventry. It might also be mentioned that in the Cockaday, as in the Reinartz, it is not convenient to alter greatly the wavelength range of the set above or below that for which it is designed.

Although the actual wavelength up to which any of these circuits will work efficiently will vary according to conditions, it is sufficiently accurate to state that they give the best results only when used for reception below 500 metres. J. J. F.



Two Photographs showing the Complete Receiver and an Under-panel View Respectively.

AN INTERESTING V-I UNIT

Constructional Details of a particularly Compact Two-valver

THE simple receiving set consisting of detector with one stage of low-frequency amplification is universally popular, and can be made in a very compact form. One capable of withstanding very rough use can be built by adopting the ideas explained in this article.

The photographs may give the impression of overcrowding and consequent inefficiency, but a second thought will show that the shielding properties of the metal case will prevent the fields of the tuning coils intercoupling with those of the low-frequency amplifier. Another point of controversy may be the use of so small a variable capacity, but this has been introduced with a view to facilitating sharp tuning.

It is highly probable that the miscellaneous box of the prospective constructor contains most of the parts required, but should they vary from the list here given, measurements must be taken to ensure that they are entirely suitable. Fig. 1 shows the circuit.

The transformer advised for the maximum signal strength is of high ratio, but for slightly better quality with an attendant decrease in volume, a 3-1 of the same make can be substituted.

The parts required are: One Radion panel, 5 in. by 7 in.; one Trix L.F. transformer (5-1 or 3-1); one Microstat filament resistance; one Ormond variable condenser, .00025 microfarad; one .00025 fixed condenser and 2-megohm leak; ten terminals complete with nuts and washers; eight Seleezi valve legs; one piece of Fabrikoid cloth, 14 in. by 12 in.; two 4 B.A. countersink screws; eight ½-in. brass countersink wood screws; one sheet tin (xxx), 12 in. by 10 in.; 2 yd. connecting wire.

The panel should be carefully marked off and drilled in accordance with the diagram (Fig. 2), after which the assembling should be commenced, the valve legs, terminals and variable condenser being fixed.

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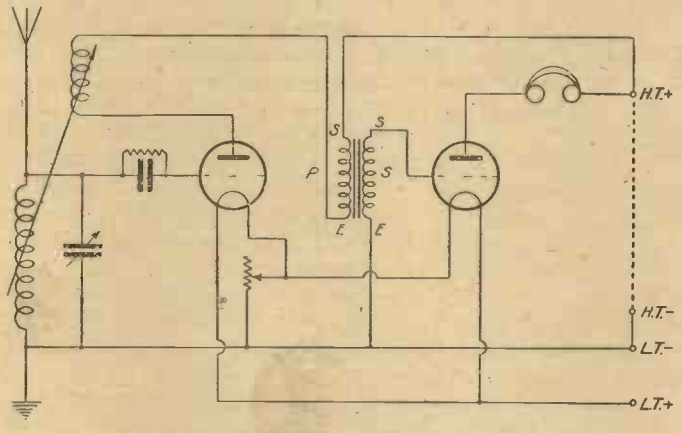


Fig. 1.—The Two-valve Circuit Diagram.

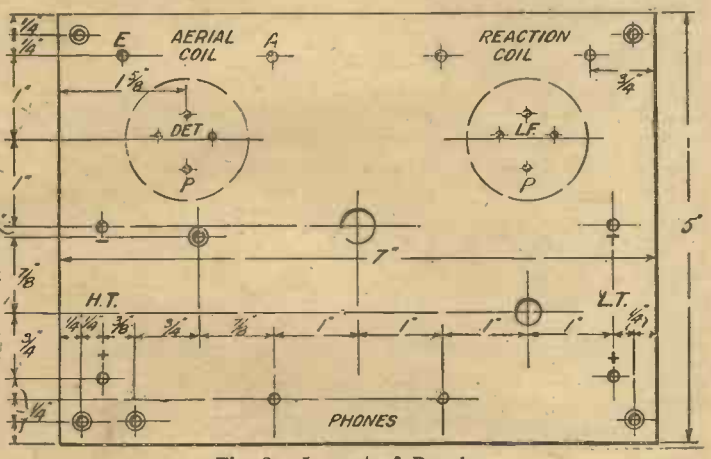


Fig. 2.—Layout of Panel.

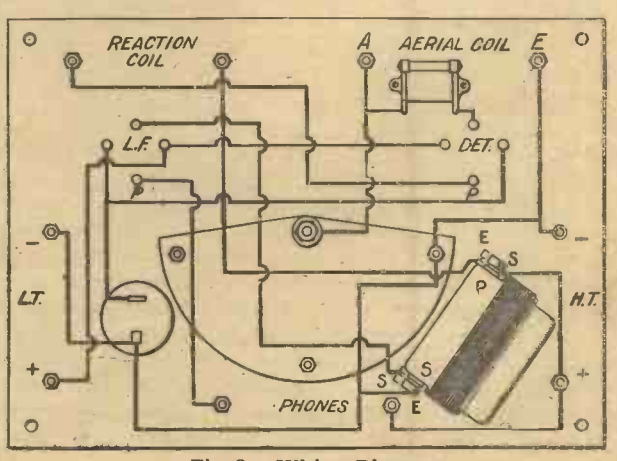


Fig. 3.—Wiring Diagram.

THE ASSEMBLED H.T. BATTERY

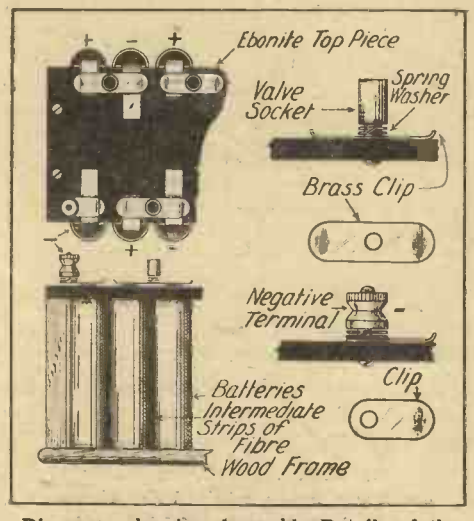
Some Useful Notes on Utilising Flash-lamp Batteries for High-tension Supply

THOSE who use 4½-volt pocket batteries for their H.T. supply will find the suggestion described in this article very useful. It has the advantage of making the assembled batteries neat and compact in appearance, and tappings may easily be taken from any point. Also the existing tags on the battery are not interfered with in any way, nor is it necessary, as is often the case, to bend them over at acute angles, thus bringing about the possibility of tearing them from their connection to the cells inside the battery.

Constructional Details

The diagram shows the main details of construction. The dimensions can easily be found by actually measuring the various distances on the batteries themselves. In the top left-hand corner of the drawing the arrangement is shown from the top, and below is shown the elevation. It will be seen that a wooden frame is first built up having two ends and a base; upon this is screwed the ebonite top piece. The dimensions of this frame and top piece should be in accordance with the number of batteries it is desired to use. Brass clips are placed upon the ebonite top piece so as to secure the negative and positive tags of the adjacent batteries alternatively. These clips are secured by means of a valve socket, as shown in the top right-hand corner of the diagram.

To ensure a good contact between the brass clips and the battery tags, a spring washer is interposed between the clip and



Diagrams showing Assembly Details of the Battery.

the valve socket as shown in each case. The only exception to these details of construction is the negative terminal of the battery board. Here instead of a valve socket is placed a terminal. As this terminal makes contact only with one battery tag, a clip as shown in the bottom right-hand corner will be required. The object of this is to avoid the possibility of misconnection; that is to say, the terminal will take a spade terminal from the negative connection, and for the positive connection a wander-plug will be required. It is advisable to interpose intermediate strips of fibre or waxed paper between each of the batteries to minimise the possibility of leakage. When a battery runs out it is an easy matter to turn the clips round, pull the battery out, slip a new battery in, bend each of the tags over and swing the clips round once more in position.

RADIO.

TERMINAL LEAKAGE

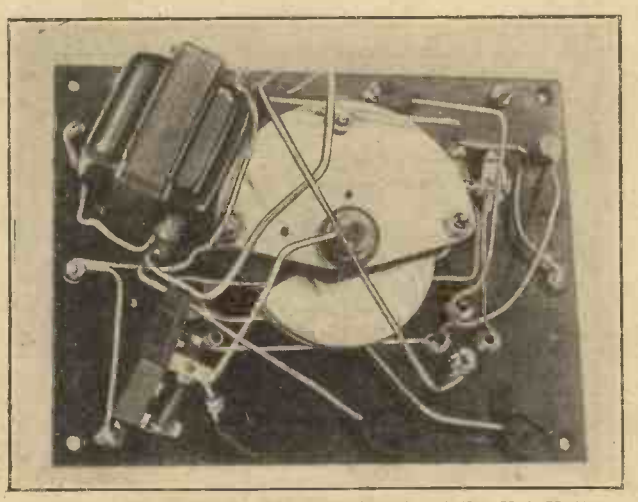
RECEIVERS often give poor results owing to leakage that occurs between the terminals. A fault that is not quite so easy to trace, and yet one that is present in many receivers, is leakage between the terminal shanks and the edges of the wooden cabinet. Care should always be taken when building a set to leave ample space between the components on the panel and the containing cabinet.

P.

"AN INTERESTING V-1 UNIT" (*continued from preceding page*)

The L.F. transformer can then be added. Should the metallic case of the Microstat, when fitted, touch the condenser, it will make no difference to the operation of the set providing the parts in contact are kept at the same potential, that is, both wired to the L.T. negative. For convenience of construction the grid condenser and resistance are suspended by means of the connections.

When the set is being wired (see Fig. 3), the condenser should be occasionally rotated to ensure that sufficient space is allowed for the free movement of the plates. Any form of coil holder or inductance can be used in conjunction with the set, and the method of attaching this is left to the discretion of the constructor.



Another Photograph of the Underside of the V-1 Unit.

For the case, any sheet metal will answer, but a fairly heavy gauge is preferable, as when folded to shape the bottom edges will have a gentle curve. Should the top edges, on completion of the folding, not be in line, they must be levelled off before being covered with cloth. The corners can be soldered if desired. A piece of wood, which comes within a ¼ in. of the top, is screwed in each corner to receive the screws to hold the panel.

After coating the Fabrikoid with adhesive, the case should be placed in the centre, the material pressed against the sides, suitably folded at the corners, and, lastly, pulled tight and turned over the top. Before the final assembly the bottoms of the terminals must be bound with rubber tape to insulate them from the case or its covering. The use of type DE2 valves is recommended.

B. G. C.

WOOD PANELS

GOOD results can be obtained by using wood panels instead of ebonite if attention be paid to the kind of wood used and the method of preparing it. American white wood is very suitable, but it is not easy to obtain in this country. Teak soaked in a suitable wax is found to be very satisfactory.

The writer has made some very good panels by heating Carnauba wax in a big bowl for a fair length of time, to make sure that all moisture is driven off, and then placing seasoned teak (after heating in a warm oven for a few hours) in the bath of melted wax, which is still kept heated. After leaving it for an hour or so, the teak is taken out and dried in a warm dry room.

T. A.

FIVE NOVEL DESIGNS FOR CRYSTAL SETS

Fig. 1.—Set Tuned with a Sliding Spade.

Fig. 5.—Another Variometer Receiver.

IN this article are described and illustrated some crystal sets fitted into the sorts of case which may be found in almost any house, and they are suggestions of what any amateur can do in the way of utilising such knick-knacks.

Spade Tuning

All the illustrations show sets with coils suitable for Daventry only, but it is scarcely necessary to say that smaller coils can be used for lower wavelengths. Fig. 1 shows a small Italian box with a lid of inlaid stone. It measures 7 in. by 5 in. by 2½ in. The aerial and earth terminals are placed at the back and the phone terminals at one side. The crystal detector is inside the box, and a coil of 250 turns or so is screwed down at one end. This is tuned by a copper spade, which consists of a rectangular piece of copper (zinc or aluminium would serve equally well) about the thickness of a postcard, to which a beaded hat-pin has been soldered or riveted to form a handle. The spade slides in the lid of the box, as shown by Fig. 2, and by withdrawing the hat-pin the copper is made to pass over the coil for tuning purposes.

Fig. 3 shows a leather-covered case which once held salt-cellars. It makes a particularly neat-looking wireless case. The aerial and earth terminals are set at each end and the phone terminals in front. This set also is spade-tuned, but in this case the coil is contained in the lid, and the spade (a zinc plate) is fixed permanently in the bottom, from which the bed in which the salt-cellars rested has been removed. The detector—in this case a permanent detector—may be seen close to the phone terminals.

This set is tuned by slightly opening the lid, and thus bringing the coil away from the spade. When once the actual position of the coil has been found a small

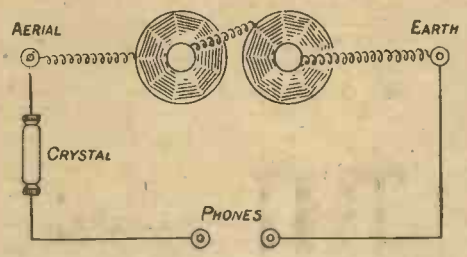


Fig. 6.—The Circuit Diagram for all the Sets.

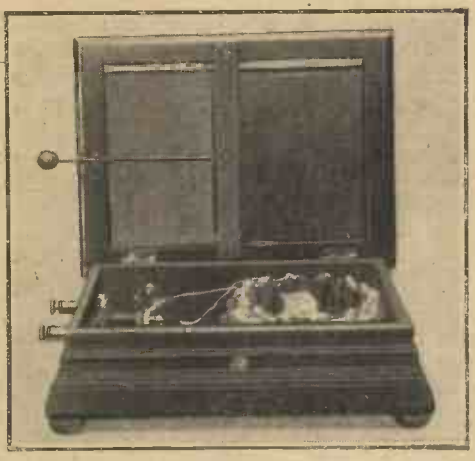


Fig. 2.—Another Set with Sliding Spade.

wedge of wood can be made to fit inside the box to hold the lid in position. Any sort of coil of about 250-300 turns may be used; the one illustrated is a home-made duolateral, made with 3½ oz. of No. 28 d.c.c. wire.

Variometer Tuning

Fig. 4 shows a Japanese box of perfumed wood covered with lacquer. In this case two connected coils are used, one in the box and the other in the lid, the outer end of one being joined to the inner end of the other. The crystal detector, of the semi-permanent type, may be seen on the left of the lower coil. This set is tuned variometer-fashion by opening the lid, and so moving the upper coil away from the lower one, until the exact position is found. On the right will be seen a white rod (a piece of bone knitting-needle, in fact), which is pivoted at its lower end on a screw. This serves to hold the lid open at the correct angle.

Fig. 5 shows an old-fashioned work-box, and this was fitted with two coils, the upper one, contained in the lid, sliding across the lower one. The coils are connected together as in the set just described. The detector is inside the box. The upper coil is fixed to a wooden half-moon shaped piece of wood, to which a long handle is attached. By withdrawing the handle the set can be tuned.

The wiring of the sets is shown in Fig. 6.

INDOOR AERIALS

AN excellent indoor aerial, which is capable of working satisfactorily at a distance of a few miles from a broadcasting station, can be rigged up in the following manner.

Paste a piece of tinfoil about 4 in. square on the corner of an ordinary mirror, allowing about ¼ in. space between the tinfoil and the frame of the glass. To the tinfoil attach the aerial lead (the wire may be held between the foil and the glass if desired) and connect the other end of the receiver in the usual manner. Provided the set is reasonably efficient, quite good signal strength should be obtained. The metallic backing of the mirror is capable of picking up the signal impulses, and these are passed to the receiver by the capacity between the backing and the tinfoil; the two surfaces, in fact, act as the plates of a condenser.

W.

The Japanese Government proposes to erect a high-power station at Tokio.

Fig. 3.—This Receiver is Tuned by Opening or Closing the Lid.

Fig. 4.—A Variometer-tuned Receiver.

THE FUTURE OF WIRELESS DRAMA?

A Consideration of Possibilities

SOME time ago the authorities at Savoy Hill came to the conclusion that radio drama demanded a short play with a quick *dénouement,* either thrilling or humorous. This conviction led to the production of short plays, admirable in themselves, but all much of the same type. The swing of the pendulum was bound to come, and when it did it was manifest in the recent production of Oscar Wilde's Victorian drama *Lady Windermere's Fan.* One of the points of this play is that, like all Wilde's writings, the dialogue is adequate. Nevertheless, nowadays it is considered too Victorian for modern consumption.

Before the wireless production of this play expressions of doubt were heard at Savoy Hill. Some were convinced that it was too long, others that, as listeners would be unable to see Wilde's characters moving across the stage, piquancy would be lost, with the consequent "deadening" of the dialogue. What was the result? The play was broadcast, and produced a greater number of letters than anything that the B.B.C. has done in recent months. Its success can be compared with *The White Château.*

Another very interesting point can be cited. *Lady Windermere's Fan* was produced in London in its film version almost simultaneously with the radio version. Unhappily for the film, it was screened immediately before the broadcast and not afterwards, and received a lukewarm reception. In this case the characters were seen but the dialogue was absent, which would seem to prove that the success of radio drama depends on the imagination of the listener and the brilliancy of the dialogue. Many listeners were familiar with Wilde's characters and had no need of their ocular portrayal. No complaints were received of the length of the transmission.

The success of this broadcast has seriously disconcerted the advocates of brevity. Wilde's play has proved that it is more essential to work on the imagination of listeners than to produce in fifteen minutes one thrill or one laugh.

Control of Composite Productions

The foregoing remarks deal chiefly with what might be termed straightforward plays. A task of great difficulty is the production of plays which demand natural sounds, either close at hand or in the distance. It is obvious that the speakers or originators of far-off sounds cannot, even given expert control, produce the correct effect if acting in the same studio as those players who are doing the close dialogue. At present Savoy Hill does not possess convenient studios or control. Among last year's successes was the "Radio Tattoo," and for the noises and background singing for this production studio passages and stairways were called into use; but the difficulties of control were stupendous. When the "guns" of the tattoo are stationed down a lift well and "horses" along another passage out of sight of everyone the controlling difficulties can be imagined. One of the dramatic producer's assistants on this occasion was stationed outside the studio and was in touch with the main theatre by means of phones. The duty of this individual was "to cue up" his extraneous noises. As luck would have it, the phones broke down, and but for his skill some humorous pandemonium might have ensued.

These incidents are mentioned as illustrations of the need of facilities under which radio drama labours. The B.B.C. is installed in a building unsuited to many of their activities. Radio drama needs a central theatre with minor theatres grouped around, and the all-essential central electrical control erected in a sound-proof glass-fronted cabinet. In each subsidiary studio connected to this central control silence cabinets would be placed, thereby enabling the producer of the play to broadcast the transmission from the central studio to his assistants, who would "cue in" the artistes or noise effects at the right moment.

"Mixing" Control

A further advance should be made by placing in the central control room the apparatus for "mixing," at the necessary strengths, the transmissions from all the theatres in use. From this control room the complete production would be carried to the engineer's control and so to the aerial.

This system would give both artistic and engineer's control. Such a scheme has been the object of the officials at Savoy Hill, but elaborate methods of this kind are expensive.

It must be remembered that when authors and public realise that radio drama will one day be as powerful as the picture play elaborate studios will be constructed.

ROBERT GLENDINING.

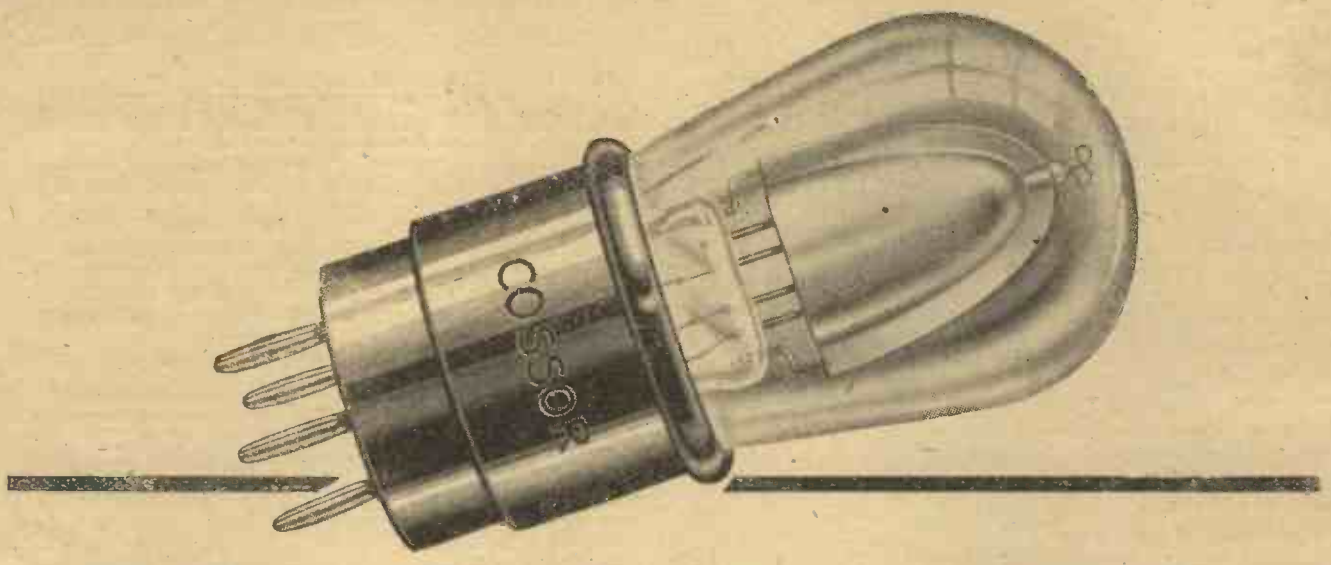
THE DEVELOPMENT OF THE BROADCASTING STUDIO

This is a photograph of the WHT station studio at Chicago, the newest of American studios. Note the corrugated ceiling for the purpose of obtaining the proper sound effects.

The Nijni-Novgorod (Russia) laboratory is making transmissions on wavelengths of 83, 102 and 104 metres.

The new Radiopolis station, installed in the neighbourhood of Santa Cruz (Brazil), has been opened.

In Jugo-Slavia a high-power broadcasting station is being erected by the State in the neighbourhood of Agram (Groatia).



At last the shockproof Valve

THERE is little need to ask "Which is the most vulnerable part of any valve?" Even a man who had never owned a Wireless Set would be able to guess the answer! Ever since Edison ransacked the world for filament material for his first electric lamp, the glowing thread within its crystal globe has been an object of special regard.

The wireless valve is first cousin to the electric lamp—but year by year the relationship is getting more remote. Whereas in the latter, efficiency is measured by the amount of light it gives, the whole resources of Science have been enlisted to obtain in the valve the maximum of efficiency with the minimum of light.

And now that a new Cossor Valve has been evolved with a special filament which operates at a glow almost indiscernible we appear to be within a reasonable distance of a valve which will never wear out.

But filament glow has been only one of the problems which Cossor has faced—and conquered. Another—almost equally as important—has been the perfection of a system of filament suspension which would successfully withstand the thousand and one shocks which every valve must encounter in use.

The Cossor Point One, now being placed on the market, is the first valve in which the new system of Co-axial Mounting has been utilised. For the first time there is available a method which enables the three elements—the Filament, the Grid and the Anode—to be securely united together *at the top* as well as at the bottom.

The new Cossor Point One

—the first Valve in which the filament, grid and anode are secured together at top and bottom in *permanent* alignment.

How this is effected can be readily understood from the illustration above. At the top of the Anode will be seen a seonite insulator which—projecting downward—is firmly secured to the top of the Grid. Through the centre of this seonite tube is threaded a fine wire which acts as the third support to the filament. Thus it has been found possible to evolve a system of construction which will resist without harm the hardest of shocks. Even if the elements in this Cossor Point One should be displaced through an accidental blow they *must* always be in the same relative positions.

Co-axial Mounting is destined to be one of the most important developments of the year. In this brief announcement it is obviously impossible to enlarge in detail upon its many advantages.

Try out this astonishing new Valve now. Remember its current consumption is barely one-tenth of an ampere. One super-heterodyne fitted with seven of them actually takes less current than a single-valve Set using one ordinary valve.

Red Top	Plain Top	Green Top
For H.F. use	For Detector	Power Valve
1·8 volts	1·8 volts	1·8 volts
·1 amp.	·1 amp.	·15 amp.
15/6	15/6	18 6

—fitted with the new ·1 amp. filament

On Your Wavelength!

A Great Test

ONE of the most interesting tests ever carried out in the history of British broadcasting was that which took place the other night when different programmes were transmitted simultaneously from 2 L O and Marconi House. My own observations were made rather less than thirty miles north-west of London. I used two sets for the purpose, the first being a very simple crystal affair with a single-circuit tuner and the A.T.C. in parallel with the A.T.I. The second set was a rather "extra special" three-valver recently completed. It was designed particularly for selectivity, and it certainly achieves this object. The set consists of one stage of neutralised high-frequency amplification followed by a rectifier, between the grid and plate circuits of which is a tiny variable condenser used for providing reaction effects. The third valve is an ordinary transformer-coupled note magnifier.

With the crystal receiver, 2 L O was audible up to rather more than 400 metres, and the gap between him and the "lower fringe" of Marconi House was very small; still, they could be completely separated without any difficulty. 2 L O was slightly stronger than Marconi House, though the latter was obviously over-modulating in order to compensate to some extent for his smaller power. With the valve set Marconi House vanished completely when the set was tuned 2 metres up or down; 2 L O was entirely inaudible 5 metres above or below.

In London

Reports from several friends in London make rather curious reading. Most of those with anything like efficient valve sets were able to separate the two transmissions even though they might be living quite close to one or other of these stations. In some cases, however, either 2 L O or Marconi House was persistent, coming in as a background to the other's transmission despite all efforts at tuning him out. Owners of crystal sets with single-circuit tuners seem to have found it difficult to hear one station only, though separation could be accomplished, as a rule, where an indoor aerial was employed or if some kind of double-circuit tuner was in use.

There is not the least doubt that alternative programmes are wanted in London, and it is certain that we shall have them before very long, for this would be only a natural development of the present service. The coming of the new era in broadcasting will lead undoubtedly to improvements in the design of crystal sets. Up to the present there has been no need with them to trouble much about selectivity, since the average crystal user can hear only his local station or 5 X X—and it would be a pretty hopeless set if it were unable to separate them! The crystal set can never achieve knife-edge tuning owing to the damping which the detector introduces. It can, however, be so designed that even at short range it will separate two transmissions such as those in the recent test.

A Big Difference

One often sees it stated that American receiving sets are on the average much more selective than our own, and several dwellers in London whose sets were unable to separate 2 L O from Marconi House during the recent test have said to me, "An American receiving set would have done it; just think of what happens in New York when there are often four or five stations transmitting at the same time." On the face of it this seems a fairly sound argument, but when you come to investigate the facts you find, as is so often the case, that there is more in the business than meets the eye. Actually New York possesses seventeen authorised broadcasting stations, though it must not be imagined that all of them are transmitting at the same time. It is when we come to examine the power rating of these stations that we find how different conditions are. Twelve of them have an output of .5 kilowatt or less, and only one is rated at more than 1.5 kilowatts.

Now there is all the difference in the world between separating at short range low-power stations and high. Nor must we forget that 2 L O and Marconi House were working within 95 metres of one another, whilst in New York the stations are spaced out over a waveband extending from a good deal over 500 metres to well under 300. New York, too, is full of places which are blind to transmissions from certain directions owing to the presence of high steel-framed buildings, and in most localities several of the broadcasting stations come in so weakly that they do not require a great deal of tuning out. I am not denying for a moment that the American set with two high-frequency stages is exceedingly selective, but I do believe that our own would give a very good account of themselves in any of the large cities of the States.

Strike Sets

Not a few people that I have met lately have told me that they have been badly bitten over receiving sets purchased in a hurry during the general strike, for they find that they have acquired out-of-date or badly-designed receivers which will not give anything like the results that their friends obtain.

My sympathies in the matter are somewhat divided. Many of those who purchased in a hurry had their eyes wide open at the time and knew that they were not getting the latest and the best, but felt that anything was better than nothing. It is hardly fair for them to lift up their voices in lamentation at this stage of the proceedings. Others, however, bought in all good faith receivers which turned out to be "duds." If these sets were actually sold as efficient and reliable, the purchasers should undoubtedly take up the matter with the makers. Good firms will no doubt be only too glad to set matters right, and the only people who really "got left" are those who have disregarded the warning so frequently given in AMATEUR WIRELESS against purchasing sets or components of unknown or doubtful make. A very great deal, however, can be done to improve even the worst set, and those who can obtain no remedy from the makers may find it worth while to spend a little time and trouble in effecting simple improvements that may make all the difference in the world to the results obtainable.

A Vexed Question

By the time this is in print the Postmaster-General will have answered Mr. Harry Day's parliamentary inquiry as to whether, in view of the oscillation nuisance experienced by listeners, the use of reaction direct on the aerial cannot be officially prohibited.

However much Sir William Mitchell-Thomson may sympathise with those who demand relief from the "condenser swinger," I am afraid that the remedy suggested by Mr. Day is somewhat beside the point. Direct aerial reaction was forbidden in the early days of broadcasting, but it was soon realised that this particular form of circuit was by no means the sole cause of the howling nuisance.

As most of my readers know, an ordinary tuned-anode high-frequency amplifier can easily be made to oscillate, particularly on the lower condenser readings, without the use of any reaction coil, whether coupled to the aerial or the anode circuit. The source of the trouble in this case is the electrostatic coupling set up between the aerial and plate circuits across the internal electrodes of the valve. This difficulty is inherent in practically every valve, so that, to be consistent, valve sets as a whole will have to be abolished, unless they can be fitted with some means for preventing reaction of any sort, whether direct or indirect.

I prefer to think that the real solution

On Your Wavelength! (continued)

will be found automatically, in course of time, as listeners learn to handle their sets with moderation and due regard to their neighbours' comfort. There will, I suppose, always be a few "hogs," but special measures can be taken to discipline the worst of these.

Lightning Risks

In spite of repeated assurances that the risk of lightning with an outside aerial is practically negligible, some people are so nervous on this point that they object even to the presence of an indoor aerial. So far as the outside wire is concerned, even the most timid person would hesitate before refusing to install a telephone on the ground that it would "attract lightning." Yet the network of overhead telephone wires is far more extensive, and therefore presumably more likely to be struck, than the ordinary garden aerial.

Similarly one does not hear of householders objecting to the presence of bell-wiring inside a house, or refusing to use picture wires, on the grounds of increased lightning risk. Why, then, should the innocent indoor aerial be viewed with such suspicion? People should be reasonable and fair-minded in these matters, even if they are a little old-fashioned in their general attitude to wireless.

Telephones and the H.T. Battery

Those building a valve receiver for the first time are sometimes in doubt as to whether the telephones should be inserted between the H.T. positive and the plate of the valves, or between the H.T. negative and the filament battery. In a single-valve set the latter position is to be preferred because the phones are then at earth potential and there is no danger of any leakage to earth should the insulation of the telephone cords be faulty.

However, in the case where more than one valve is used, it is necessary to connect the two batteries together so that all the valves can be supplied by the same H.T. source. Here the telephones are at a high potential, and if long leads are used care should be taken to see that the insulation is good.

A Quick Overhaul

If called in to "doctor" a recalcitrant valve set, the following points are worth keeping in mind. See that the aerial and earth leads, and the two batteries, are correctly connected to the set, that all the valves light up, and that there is an energetic response when the H.T. positive plug is removed and replaced.

Next take a pair of telephones and bridge them across the valve-plate pin and H.T. positive on the battery, trying each valve in turn. Start with the detector, of course, if there is a high-frequency stage. This will enable you to locate the particular valve at fault. If the trouble is on the low-frequency side, test each of the transformers by disconnecting the primary and secondary leads and inserting the telephones in series.

If the trouble is located on the high-frequency side of the set, first remove the H.F. plate coil, and then short the plate and grid pins on that valve so that the signals can get straight through to the detector. This will identify the faulty stage as between the H.F. and detector valves. Always switch off the H.T. when making any circuit alterations.

Shocks from Aerials

I was standing near an 80-ft. wireless mast the other day wondering whether the thunder would spoil my evening's tennis, when a flash to earth excited my attention. There was no lightning at the time, and the flash did not take place from the aerial which was connected to earth, but was from one of the insulated metal guys supporting the mast. These guys are insulated at each end, and also broken in the centre to prevent oscillating and radiating harmonics of the main transmitted wave. The flash undoubtedly occurred through the insulated stay slowly becoming charged by atmospheric electricity until it reached a voltage sufficient to break down the insulation of the air, and it made me wonder how many amateurs have trouble from the same cause through using series aerial condensers.

If condensers be inserted in series with the aerial for tuning purposes, the aerial is isolated and will slowly collect electrical charges from the atmosphere under adverse weather conditions. These charges can, in time, produce very high voltages. Indeed, these voltages become great enough to puncture the insulating bushes in variable condensers or to give a nasty shock if the aerial terminal be touched.

The best and easiest way to avoid such trouble is to connect a high resistance (about a megohm) across the aerial and earth terminals. This resistance should be left permanently in position, and performs the useful task of slowly allowing any static charge on the aerial to leak away. Its presence in no way affects the tuning of the circuits, and it will prevent possible shock or the puncture of a favourite condenser.

THE EDITOR SPEAKING FROM 2LO

On Saturday, July 10th

JUST as we go to press, arrangements have been completed for Mr. BERNARD E. JONES, the Editor of *Amateur Wireless*, to speak from 2LO on Saturday, July 10th, at 7.50 p.m.

His subject will be the International Set Competition, and the object of his short "talk" will be to arouse still further interest in the British Elimination Competition.

(*See page 48 of this issue*)

It is hoped that every home constructor with a really good set on his hands will see fit to take part in this competition.

In view of the Editor's "talk" it has been decided **to extend the closing date for completed entrance forms until Friday, July 16th.**

Another Pat on the Back

In the past wireless has received many hard knocks. It has been held responsible for droughts, floods, heat waves, cold spells and all manner of weather freaks; it has been shown conclusively that the presence of an aerial in an orchard produces barren fruit trees and bumper crops; innumerable carrier-pigeons have been decapitated by flying into aerial wires, and there are those who claim that when 2LO switches on, thousands of feathered songsters fall lifeless to the ground; it was universally accepted until the affair of the Dunmow Flitch that receiving sets broke up the happiest homes by creating wireless widows; headmasters have proved that radio prevents boys from doing their homework, and doctors have shown us that it has terrible effects upon the human frame!

Of late there seems to have been a turn in the tide of feeling, and now I am constantly finding kinder things said about it. Only the other day, for instance, no less a person than Sir William Joynson-Hicks, in inaugurating a receiving set at the Borstal Institution at Hounslow, said that wireless had already had a wonderful effect upon the boys in other Borstal homes. There is not the least doubt that if you can lead the minds of the young to appreciate beauty you are going a long way to suppressing any vicious or criminal tendencies that may be present.

Changes in Talks

During the summer the listener does not desire instructional subjects, but rather those pertaining to summer life and its happenings. To hear the voices of the leaders of the athletic world is an undoubted attraction. To cater for this desire, I learn that the talks which follow the two general news bulletins will remain, but will, where previous commitments allow, be topicalised. The change comes at the 7.40 period, which will be given up to light music. But when some subject becomes the topic of the day, the most prominent person connected with this topic will be obtained to broadcast his or her views for the benefit of listeners.

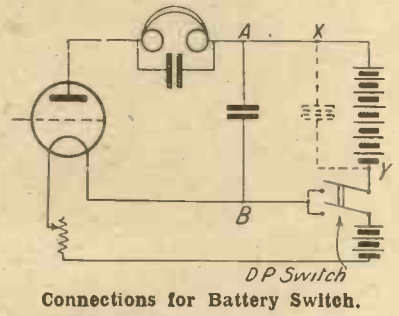
Further, it will be noticed that the 9.40 talk is frequently being curtailed and a short second talk introduced. Listeners will know then that when a 7.40 talk is notified or an extra one introduced after 9.30, they may look forward to hearing one of the great ones of summer activities.

THERMION.

PRACTICAL ODDS AND ENDS

Battery Switching

IT is always advisable to fit a battery switch to the receiver, especially if the valves used require delicate adjustment of the filament potential. When a switch is provided there is no need to touch the rheostat when the best setting has been found. A very convenient method of switching is that shown in the diagram. By arranging the switch as shown, both batteries are automatically cut out when it is opened, and the chances of current leakage when the set is not in use are minimised. Care should be taken to wire the H.T. condenser between the points A and B, as shown in solid lines in the figure. If it is placed as shown by the dotted lines between X and Y its dielectric material is always under the strain of the full high-tension-battery voltage. J. H.



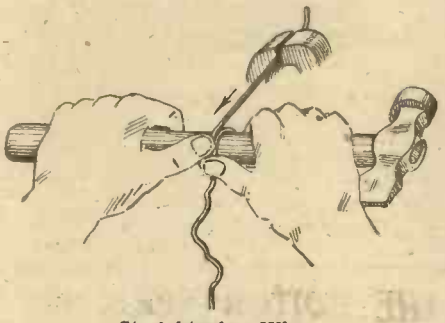
Connections for Battery Switch.

A Drilling Tip

IN order to prevent the drill passing right through a panel when it is desired to tap a hole, the following device may be adopted. Slip the drill through a small brass phone connector (in the form of a tube fitted with two milled-head screws), allowing only just the necessary amount to protrude. The connector, if screwed tightly in position, will prevent the drill going any farther than is desired. P.

Straightening Wire

IN order to get the best results from connecting up the receiver with square-sectioned wire, it is essential that the wire should be absolutely straight. It is not always easy to ensure this being so, for the wire is usually sold in coils, and seems to possess a natural inclination to form kinks and curves. The wire should always be stretched between a vice and the handle of a tool to remove the kinks, and it will also be found that the wire is increased in length by some 10 or 15 per cent. The diagram shows the method of straightening the wire, one end being held in a small vice and the other twisted once or twice round the handle of a hammer so



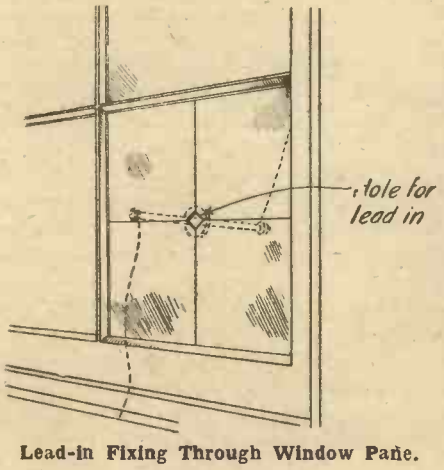
Straightening Wire.

that a strong hold on the wire may be obtained. B. H.

The Lead-in

DIFFICULTY is often experienced, when fixing the lead-in, in drilling a hole through the window pane. Undoubtedly the slight trouble is well worth while, for the wire lead through the glass is much more efficient than a lead-in through the wood surround. Here is a method of cutting the glass which does not necessitate special drills or files, though it is not applicable to large windows.

Remove the entire pane and cut it into four sections. One corner of each should then be cut away as shown in the diagram

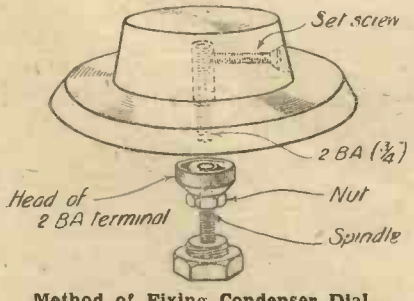


Lead-in Fixing Through Window Pane.

so that a slot will be formed for the leading-in wire when the window is reassembled Finally, an ebonite lead-in tube (of the type incorporating clamps) is fixed in position and the aerial and receiver are connected. G. B.

Fixing Condenser Dials

LARGE-DIAMETER dials, besides improving the appearance of a set, tend to facilitate tuning operations. It sometimes happens, however, that the spindle of a condenser to which it is desired to fix one of these dials is too short to engage the set-screw in the side of the knob. In such a case the head of a 2 B.A. terminal can be screwed on the end of the spindle and locked in position by means of a nut tightened against the terminal head. The latter then acts as a coupler between the spindle and an additional piece of screwed 2 B.A. rod similar to that of the spindle. The length of this rod will, of course, depend on the length of the main spindle and on the distance from the panel at which it is desired to mount the dial. Easiest readings are obtained when the



Method of Fixing Condenser Dial.

dial is close to the panel face, and, generally speaking, the length of the spindle extension is about ¾ in. H. P.

Avoiding Long L.T. Leads

MANY amateurs arrange their accumulators in a corner of the room, bringing the L.T. supply to the receiving set by means of long leads which run to a wall plug. There are two reasons why this method of connecting is unsatisfactory and likely to lead to poor results. First of all, long wires of any kind act as collectors of oscillations and may ruin the selectivity of an otherwise good set. Then the voltage drop when long leads are used, even if the wire is thick, is considerable. It may easily amount to as much as half a volt, an amount which cannot be spared when dull-emitter valves requiring 3.8 volts are worked from a four-volt accumulator. Long L.T. leads should be avoided, and the same applies to very long loud-speaker leads. For outdoor reception it is sometimes necessary to use these, but for normal working in the house they should be kept quite short. H.

The Complete Receiver.

A "ALL-E LOUD-SPE

Details of a five-valve s of all Continental

By J. J. MacKichan

TWO stages of tuned-anode high-frequency amplification, with multiple reaction, one detector, and two stages of low-frequency amplification are employed in the receiver to be described in this article. The receiver is designed expressly for the reception of programmes at any place in this country from any British or Continental broadcasting station at loud-speaker strength, with clarity, freedom from objectionable background, stability, and sufficient selectivity to ensure that all stations, with the exception of those working on wavelengths very close to that of the local station, can be received economically and with ease.

Linked Circuits

In most modern long-range receivers great care is usually taken to dispose the inductances so as to prevent, as far as possible, magnetic and electrostatic coupling between the various tuned circuits associated with high-frequency amplifying valves. In this receiver, on the contrary, all tuned circuits are linked together, magnetically and electrostatically, through the medium of reaction coils, with the following advantages.

(*a*) The application of reaction to each tuned circuit causes a great reduction in the effective resistances of the impedances of the tuned circuits. In consequence, tuning is sharp and selectivity is good.

(*b*) Between the sides of each reaction coil and each coil forming part of a tuned circuit there is electrostatic action, the effect of which is to neutralise the stray capacities of the valves and of the wiring. An auto-neutrodyne effect is thus obtained and the set is perfectly stable.

(*c*) There is remarkable freedom from high-frequency distortion, apparently due to the definite and uniform coupling between all tuned circuits comprised in the receiver.

(*d*) There is no difficulty in constructing the receiver so that it cannot be made to oscillate. In the instructions which follow, the design is such that the receiver cannot be made to oscillate on wavelengths between 250 and 350 metres. It can just be made to oscillate on wavelengths of 350 metres and above; but all stations will normally be tuned-in on the loud-speaker without the slightest necessity for causing the receiver to oscillate.

Special coils of new and original design are employed. They are of the single-layer type, and the wire is wound on a former 4½ in. long by 1 in. wide; the general shape of the coils is rectangular. That coils wound in this rather unusual way are not inefficient as regards their electrical properties and that they are in the "low-loss" category will be seen from the following table, in which particulars are given of measurements taken on coils covering the broadcast waveband.

Coil Number	*True Inductance Microhenries*	*Distributed Capacity Micro-micro-farads*	*Natural Wavelength Metres*	*Maximum wavelength with .0005 microfarad condenser in parallel*
25	56	14	75	310 metres
35	85	13	90	387 ,,
50	102	19	108	430 ,,
75	210	18	130	615 ,,
100	501	22	250	947 ,,

Novel Coupling

In the ordinary way inductance coils are coupled together face to face. These coils, however, are coupled together side to side as illustrated in Fig. 1 (see page 44); three coils are shown coupled together and reacting on each other. In the space E between coils B and C the electromagnetic field is shown, whilst the electrostatic field is shown in space D between coils A and B. Both fields are, of course, present on either side of and around coil B. If it be assumed that B is a tuned coil and that A and C are reaction coils, then A and C would be joined in parallel and so connected in the anode circuit of the detector valve that their electromagnetic fields would assist

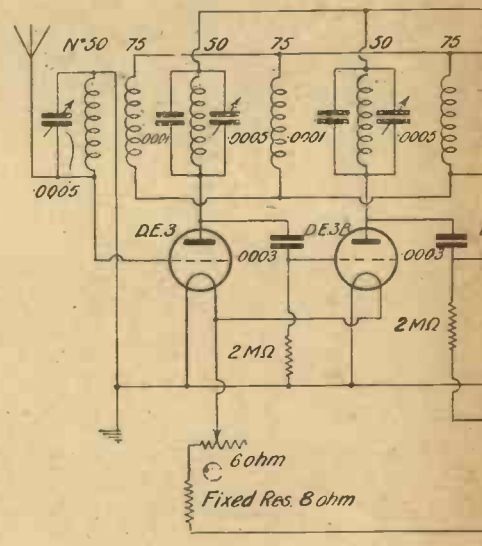
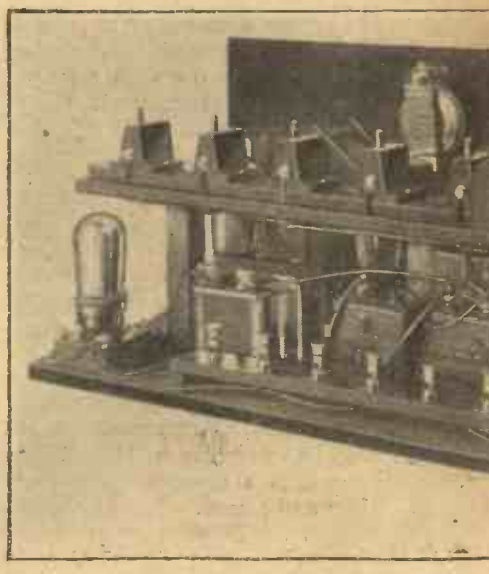


Fig. 2.—The Circuit Diagram of th

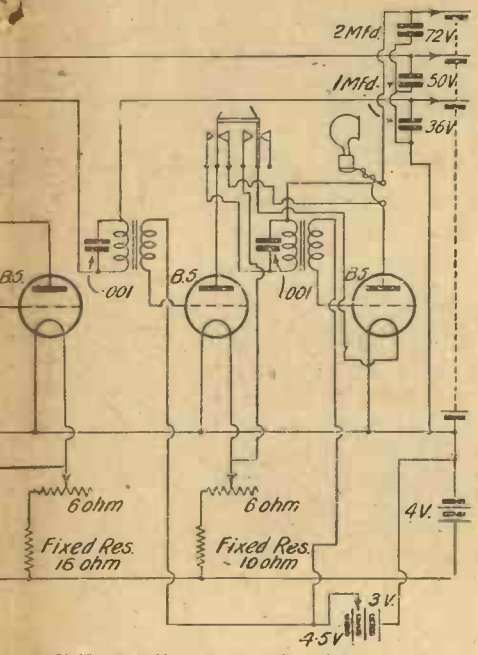


Another Rear View

N
UROPE"
AKER SET

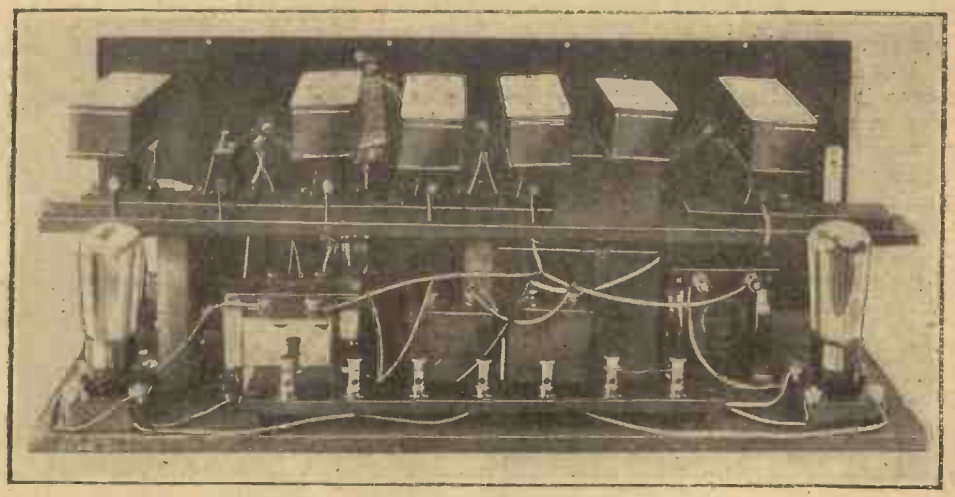
et designed for reception and B.B.C. stations

O.B.E., A.M.I.E.E.



e "All-Europe" Loud-speaker Set.

with Coils Removed.



Rear View (out of case) showing Coils in Position.

the field due to coil B. When this is done it is found that the electrostatic fields due to coils A and C tend to neutralise the interelectrode capacity of the valve whose anode is connected to coil B, provided that the spacing between the coils is such as to suit the type of valve used. In practice it is found that where two stages of high-frequency amplification are used, a fair amount of latitude as regards the type of valve is permissible if the coils are spaced at 2½-in. centres; that is, when the distance between the sides of adjacent coils is 1½ in. The actual measured value of the capacity between the sides of adjacent coils at this spacing is 18 micro-micro-farads.

From an inspection of the direction of the lines of force shown in Fig. 1, it will be apparent that if coil C be brought too close to coil B, the electromagnetic fields will oppose instead of assisting because the coupling will then take place through the interiors of the coils instead of in the space between their sides. This effect is immediately revealed by the flatness of the tuning of the variable condenser connected across coil B, due to the effective resistance of coil B being increased by the opposing fields of coils A and C.

When coils A and C are both assisting coil B and the coupling of the electromagnetic fields is taking place in the space between the coils, the tuning of the condenser connected across coil B is extremely sharp, the whole circuit is perfectly stable, and to cause it to oscillate is a matter of difficulty. In constructing the receiver, no difficulty in connection with the coupling of the coils will be experienced provided that the instructions regarding spacing of coils and other components and the method of wiring the circuit are strictly adhered to.

The Circuit

The circuit of the complete receiver is shown in Fig. 2. The low-frequency amplifier portion of the circuit requires no comment except as regards the method of switching in or out the second low-frequency amplifying valve. This is effected by means of an ordinary telephone switching key so wired as to disconnect the filament circuit of the last valve when the anode of the fourth valve is connected to the loud-speaker. When the key is thrown to the five-valve position, the anode of the fourth valve is transferred to the second transformer and simultaneously the filament circuit of the fifth valve is completed.

Three-volt .06 dull-emitter valves are employed throughout, and the filaments are controlled by three rheostats as shown. A fixed resistance is joined in series with each rheostat to ensure that the specified value of filament current shall not be exceeded.

The H.F. Amplifier

As regards the high-frequency amplifier portion of the receiver, it will be seen that the three reaction coils are joined in parallel in the anode circuit of the detector valve and so spaced as to react on each of the tuned coils. The two anode coils and the three reaction coils are plugged into single-coil holders spaced at 2½-in. centres. The aerial coil is plugged into a movable coil holder which, when in the position of maximum coupling, brings the centre of the aerial coil to within 2½ in. of the centre of the nearest reaction coil. It will thus be seen that the only variation which can be made in the coupling of the coils is that between the aerial coil and one of the reaction coils. In practice this proves to be sufficient.

It is to be carefully noted that the reaction coils are to be so connected in the anode circuit of the detector valve that they assist the rise and fall of the currents in the three tuned coils. This result will be achieved if the coils are connected as shown in the theoretical circuit diagram.

It will be observed that a .0001 fixed condenser is connected in parallel with the variable condensers in the tuned anode circuits (see Fig. 2). Although this is not essential, it is found to be of great benefit, inasmuch as it provides a vernier effect on the condenser tuning, and also causes the dial readings of stations working on wavelengths which are close together to be more widely separated. In ordinary long-range receivers these condensers would be regarded as a source of loss, but in this receiver such losses are more than compensated for by the methods of coupling employed; and the margin of signal strength available from the most distant stations is so great as to enable advantage to be taken of any means whereby the tuning of the receiver may be facilitated irrespective of the minor losses entailed.

A view of the front panel is shown in the photograph, and a dimensioned sketch showing the drilling centres is shown by Fig. 3. The material of the panel is best-quality Mahoganite, and the overall dimensions are 21 in. by 8 in. by $\frac{3}{16}$ in. thick.

The cabinet is of ½-in. mahogany and baseboard and having completed the wiring, to slide the complete assembly into the cabinet. The baseboard should be made from any suitable wood ½ in. thick, 20¾ in. long and 8½ in. wide. This ensures an easy fit.

It will be seen from the photographs that a narrow sub-panel or bridge is employed on which to mount the special coils. This bridge may be of wood ½ in. thick, 1¾ in. wide and 21 in. long, but in the receiver depicted the bridge is formed of two pieces of ebonite ⅜ in. thick. The longer piece of ebonite is 21 in. long by

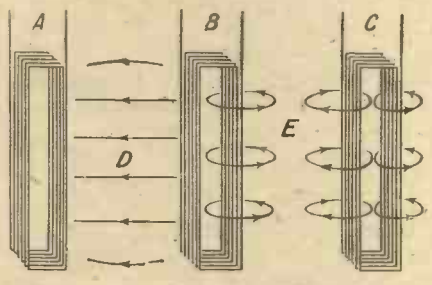


Fig. 1 (above).—Coupling Between Adjacent Coils.

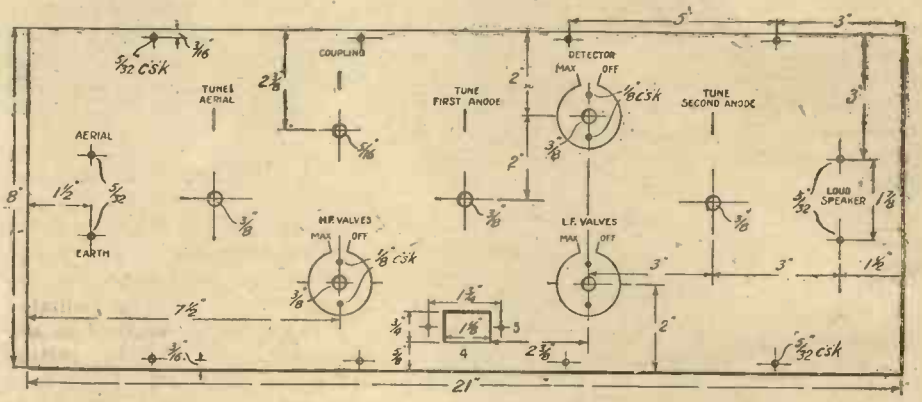


Fig. 3 (right).—Layout of Front Panel.

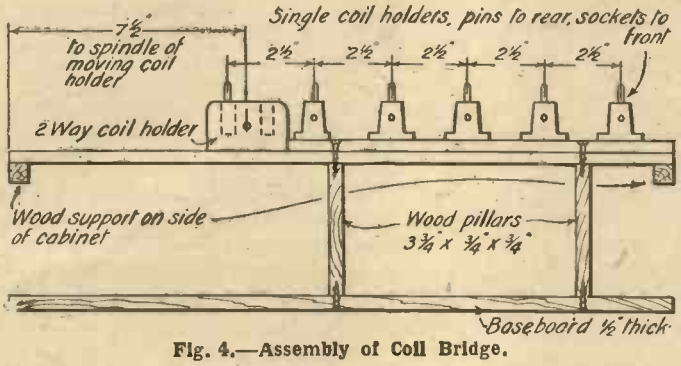


Fig. 4.—Assembly of Coil Bridge.

throughout, and the internal dimensions are as follow: Length, 21 in.; height, 8 in.; width from front to back, 9 in. The method of construction employed is to fit the front panel to a baseboard by means of panel brackets, and after having mounted all components on the panel 1¾ in. wide, and the shorter piece 12½ in. long by 1¼ in. wide. The longer piece extends from side to side of the receiver. The shorter piece is screwed to the top of the longer piece and extends from the extreme right of the long piece to a point 8½ in. from the left end of the long piece. The purpose of this short piece is to raise the tops of the single coil holders to the same level as the moving-coil holder. The assembly of the coil bridge is shown in Fig. 4.

J. J. McK.

(To be concluded)

THE B.B.C.'s THIRD ANNUAL REPORT

THE Third General Meeting of the British Broadcasting Co. is being held at the Hotel Cecil, London, on Thursday, July 8, and in the meantime the Third Annual Report has been issued, according to which the B.B.C.'s income from licences has been limited by the Postmaster-General to £500,000 for the year ending March 31, 1926, but out of this sum it has been possible to set aside the sum of £159,463 to capital and depreciation reserve; in other words, the sum mentioned has gone to the construction and equipment of station and premises, under which heading the total sum of £271,448 has been spent in the history of the company up to March 31. The half-million from licence fees represents all but £9,872 of the entire revenue, the balance consisting of sundry receipts, including net profit on publications. On the true revenue account there is an adverse balance of £4,350, as the expenditure on programmes, operating and administrative expenses and directors' fees have amounted to £514,222. The B.B.C. are, of course, well within their legal rights in giving no analysis of that expenditure, but at the same time we are sorry that they did not realise the extraordinary public interest in the expenditure side of their accounts, and satisfy to some extent a very reasonable curiosity.

The accounts show that an income tax reserve of £14,000, a provision of £4,916 for staff provident fund reserve, a transfer to capital and depreciation reserve of £50,000, together with the adverse balance already mentioned, have been taken from the balance of £79,684 existing on March 31, 1925, leaving of that balance the sum of £6,418, of which £5,307 is absorbed by payment of the maximum allowable dividend of 7½ per cent., the surplus of £1,110 being carried forward. Thus, on the face of them, the B.B.C. accounts show that the Postmaster-General, by restricting their revenue from licences to half a million, has not allowed them sufficient money to carry on with.

TREES AS AERIALS

IT is well to remember when using a portable wireless receiving set out of doors, on picnics, etc., that the nearest tree can sometimes be used in place of an aerial. This dodge was discovered by General Squier years ago. He found that by driving a nail into the trunk of a tree about four or five feet from the ground and connecting the nail to a receiver, very good reception could be obtained. The sap of the tree causes it to be conductive.

AERIALS THAT ARE WRONG

Some pitfalls that should be avoided when erecting aerials

IT is, of course, seldom possible for the amateur to erect an aerial which even approaches the ideal. At the same time, one cannot walk far through the suburbs of any large town without noticing a very large number of aerials which are not only bad, but far worse than they need be.

Now it is not to be supposed that anyone would willingly put up a bad aerial when, by taking little or no extra pains, a much better one could be erected. It must therefore be assumed that these aerials are poor simply and solely because

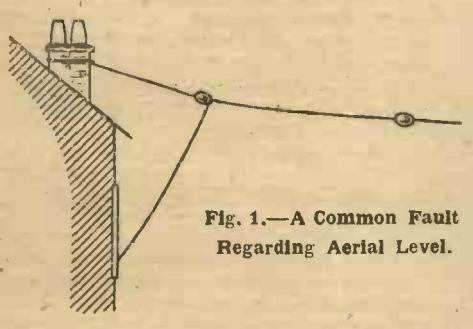


Fig. 1.—A Common Fault Regarding Aerial Level.

the erectors of them are not acquainted with the fundamentals of efficient aerial design.

The first principle that should be grasped is that the ideal aerial would consist of a perfectly straight vertical wire. As, however, the length of such a wire would be very short in the case of most aerials intended for broadcast reception, a "flat top" must usually be added in order to give the aerial the necessary capacity to earth.

Nearly Ideal

At the same time the ideal should be approached as nearly as possible even in the case of the inverted **L** aerial. That is to say, the down-lead should be taken from the lower end of the "flat top." Fig. 1 illustrates a common fault in aerials of this type, in which the down-lead end is higher than the free end. The higher above the surface of the earth that a point in the face of a wireless wave is situated, the greater will be the potential difference between this point and earth. Therefore in Fig. 1 the highest potential produced in the aerial circuit will be at the point where the down-lead joins the flat top. The free end of the aerial and the bottom of the down-lead will both have lower potentials, and therefore current will tend to flow from the point of attachment of the down-lead towards the free end of the aerial and towards the bottom end of the down-lead, or in the reverse directions according to whether the highest point of the aerial is at a positive or negative potential at the moment. In either case the currents in the two portions of the aerial will tend to neutralise each other.

Another mistake often made by amateurs is shown in Fig. 2. Here the down-lead is taken from the end of the flat top farthest from the receiving set. Although in this case the down-lead is attached to the lower end of the aerial, the whole arrangement is nevertheless bad.

How Waves Travel

A wireless wave may be regarded as a succession of positive and negative strains travelling through the ether. In the case of Fig. 2 (an extreme case) the bottom end of the down-lead is situated immediately below the free end of the aerial, so that if the wave front were perfectly vertical they would be at potentials of the same polarity at certain instants. This would result in the induced currents flowing either along both down-lead and flat top towards the point of attachment of the two, or away from this point, and thus again tending to counteract one another. Although in practice the wave front is not always quite vertical, the arrangement shown in Fig. 2 is decidedly bad practice.

We have now arrived at the following conclusions: The down-lead should be taken from the lower end of the flat top

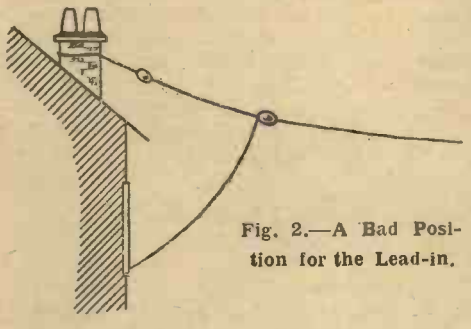


Fig. 2.—A Bad Position for the Lead-in.

portion of an inverted **L** aerial, and this end should also be the end nearer to the receiving instruments.

The error illustrated in Fig. 2 is often committed in an attempt to utilise the directional properties of the aerial. It should be understood that these are so little marked in the case of amateur aerials that they should only be considered after due attention has been paid to the points outlined above. That is to say, if the choice lies between a good aerial which will not be directional towards the desired station and a directional aerial which would be otherwise poor, it will always pay to erect the better aerial and to disregard what little directional properties it may possess.

Electrical Balance

Besides the inverted **L**, the only other type of aerial used by amateurs to any great extent is the **T**. As a matter of fact, only in very few cases can this method of construction be employed with advantage, as for best results it is essential that both arms of the **T** should be exactly balanced in an *electrical sense*.

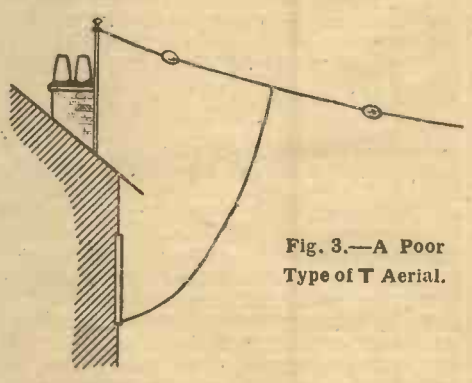


Fig. 3.—A Poor Type of T Aerial.

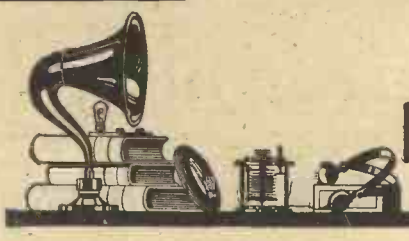
It is quite easy to balance them mechanically, that is, to ensure that they are of the same length, the same height above the surface of the ground, etc., but this is not sufficient. They should each have the same inductance and capacity, and the capacity will be affected by the presence of any conducting or semi-conducting bodies, such as buildings, situated beneath them.

Frequently, however, no attempt is made to balance the arms of the **T** beyond seeing that the down-lead is attached to the exact centre of the flat top. Aerials such as that in Fig. 3 are all too common. That this is not a good aerial will be at once appreciated by those who have read the remarks concerning inverted **L** aerials when it is realised that the **T** consists, to all intents and purposes, of two **L** aerials connected in parallel. In the case of the aerial illustrated both halves are bad. One of the component **L**'s corresponds to that shown in Fig. 1, while the other is like Fig. 2.

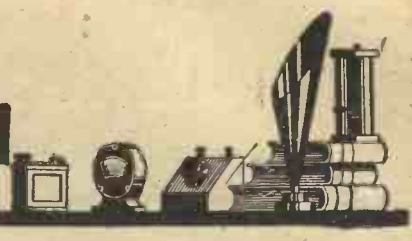
J. J. W.

The wireless club of Strassburg (Alsace-Lorraine) has installed a small telephony transmitter in that city; concerts, news, bulletins and lectures are broadcast twice weekly between 9.15 and 11 p.m. on Tuesdays and Thursdays.

That the wireless licence fee be increased to £1 a year, and that the B.B.C. should spend the extra revenue in paying star artistes adequate fees, is a suggestion made by Dame Clara Butt.



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, layouts, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 56).

Polarity of Mains

Q.—*How can the polarity of D.C. mains be easily determined ?—S. B. (Cheshire).*

A.—Immerse the ends of leads connected to each side of the source of supply in acidulated water, keeping them a few inches apart. Owing to what is known as electrolysis the water will be decomposed and bubbles of hydrogen will be evolved at the negative lead. As each molecule of water contains two atoms of hydrogen to one of oxygen, twice as many bubbles will be given off at the negative lead as appear at the positive lead.—B.

Winding Variometer

Q.—*When winding the stator and rotor of a variometer is it correct to put half the total number of turns required on each former ?—L. C. (Belfast).*

A.—Your aim should be rather to have half the total inductance on each former. As the inductance of a coil, other things being equal, increases with the diameter of the turns, it will be necessary to put a few more turns on the smaller winding than are wound on the larger former. This means that the number of turns put on the rotor should slightly exceed those on the stator.—J. F. J.

Charging Accumulators

Q.—*I have started to charge my accumulators from the lighting mains. How can I tell when a battery is fully charged ?—S. R. (Southampton).*

A.—There are three indications. First, the voltage, read with the charging current still passing, should be about 2.6 volts per cell. This will drop to about 2.2 volts per cell after the battery has been disconnected for a little while. Secondly, the density of the acid, taken with a hydrometer, should be about 1.2 or a little higher when the cells are fully charged. This is the most reliable indication as to when the battery is fully charged but, of course, presupposes that the gravity of the acid was correct to commence with. Thirdly, the cells will "gas" freely when fully charged. This means that the acid will present an almost milky appearance owing to the formation of numerous bubbles of gas.—B.

Range of Morse and Telephony

Q.—*Why is the range of any receiving set much greater for morse signals than for telephony, supposing the transmitting station to be using the same power in either case ?—H. P. (Woolwich).*

A.—In the case of telegraphy the whole of the radiated energy is available for the transmission of the message. That is to say, the whole energy-flow from the transmitting aerial is completely interrupted between each element of the morse characters. As long as the energy received from the station is of an appreciable amount, therefore, the message can be deciphered by anyone acquainted with the morse code. With telephony it is different. A continual stream of energy is emitted by the transmitting station, the amount of which, however, varies in accordance with the sounds being transmitted. As the loudest sounds must not be allowed to interrupt the emission of energy altogether, the average amount of variation (or modulation) will be much less than the total emission and that corresponding to the weaker sounds will be but a small proportion of it. It is necessary, for the reception of intelligible speech, to hear all the sounds, loud, medium, and weak, and the distance at which this can be done will be much less than that at which the mere emission of energy could be detected. In the case of a valve set the difference between telegraphic and telephonic range will be even more marked than when an unaided crystal is used. The fact that the receiver may be oscillating is no bar to successful morse reception and even increases the sensitivity of the receiver.—J. F. J.

OUR WEEKLY NOTE

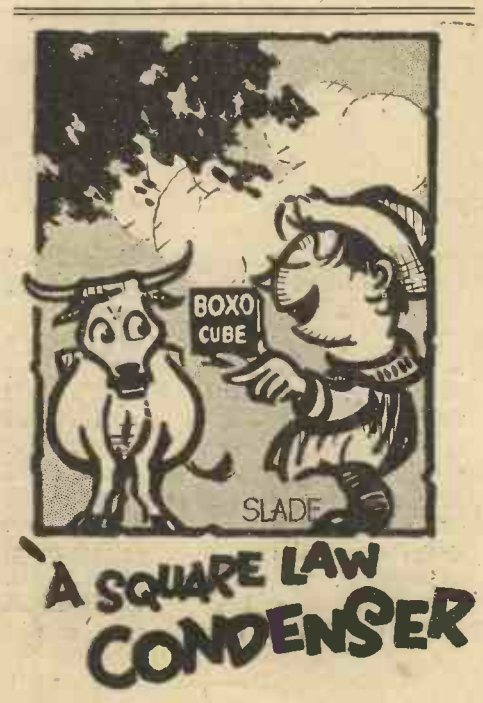
FAILING EMISSION

One seldom fails to recognise the symptoms that indicate it is time to have the L.T. battery recharged. Even if the interior of the valves is so coated with deposit that the brilliancy of the filaments cannot readily be ascertained, the falling off in signal strength and impossibility of obtaining a proper reaction effect soon lead one to suspect the accumulator.

When dull-emitter valves are employed, however, all the usual indications of a failing battery may appear, though the accumulator in fact proves to be in perfect condition and fully charged. When the battery runs down the result is, of course, that the filaments are not raised to the correct temperature and consequently the intensity of the electron stream passing from filament to plate is insufficient.

This reduction of the electronic emission will occur if the emitting properties of filaments deteriorate, even though the normal heating current is flowing through the filaments. The deterioration may be due to the valves having been run at too high a temperature, but in any case will inevitably occur after the valve has been working for a certain considerable length of time, presuming that the filament does not actually break before this point is reached.

THE BUREAU.



QSL

Q.—*What do the letters QSL, sent by a morse station after the transmitting of a message, mean ?—M. R. (Liverpool).*

A.—This is one of a number of internationally-recognised abbreviations and means "Please give a receipt." or "Please acknowledge receipt of the message just transmitted."—R. W.

Condenser Across Loud-speaker

Q.—*Why does the connection of a fixed condenser across the loud-speaker terminals alter the tone of the instrument ?—T. P. (Dublin).*

A.—Varying currents, such as those which operate the loud-speaker diaphragm, can pass through a condenser, but the ease with which they do so depends upon the "impedance" of the condenser with regard to them. This impedance depends not only upon the size of the condenser but also upon the frequency of the current concerned. The higher the frequency the greater will be the impedance. Therefore while the condenser acts as a by-pass across the loud-speaker for varying currents of any frequency the low frequency impulses will be diverted from the loud-speaker to a greater extent than will be the higher frequency impulses. It is to the proportion of the energy at different frequencies being altered that the change of tone mentioned by you is due.—J. F. J.

Using Voltmeter

Q.—*Why is it that when I connect a voltmeter across the filament sockets of an empty valve holder I get a reading nearly equal to the voltage of the L.T. battery while when a valve is inserted the reading is much lower ? Which shows the true voltage across the filament ?—H. R. T. (Eastbourne).*

A.—If you desire to ascertain the exact voltage applied across the ends of the filament, the former method is quite useless. The latter method will give the result required with more or less accuracy depending upon the construction of the meter employed. The actual voltage will be greater than that shown by the meter used as mentioned in the second case, but the difference will be infinitesimal in the case of a really suitable instrument. In order to understand why such different readings are obtained by using the voltmeter in the two ways mentioned it is necessary to remember that the filament circuit comprises a number of resistances in series and that the voltage drop across any one of them will be proportional to the value of this resistance compared with that of the others. The resistances comprise the internal resistance of the L.T. battery, the resistance of the leads to the set and the internal wiring of the latter, the resistance of the used portion of the filament rheostat, and the resistance of the filament wire itself. When placing the meter across the empty valve socket you have substituted the resistance of the meter winding for that of the valve filament. As the resistance of this winding is high the reading shown will be considerably higher than the voltage drop across the resistance of the filament, and to get this the valve must be inserted in the socket.—B.

THE VALVE IN GRAMOPHONE RECORDING

The valve has many uses apart from wireless; this article describes an application to gramophone recording.

DURING the past year or so considerable attention has been paid to the improvement in quality of speech and music as reproduced from loud-speakers. This condition has brought about considerable change in the design of loud-speakers and amplifying devices, the deficiencies of which in the latter are more easily recognised than in the former.

Type of Amplifier

It is, of course, generally recognised that the resistance amplifier predominates where quality is desirable. This statement holds good both as to the frequency characteristic produced by a resistance amplifier and also the wave shape. A well-designed resistance amplifier should have not more than a five per cent. drop in amplification at the lowest frequency on the audible scale, which we might regard as being 60 cycles per second. On the other hand, loud-speakers which reproduce low notes usually fail on the high, and *vice versa*.

With a well-designed amplifier, together with an equally well-designed loud-speaker, wonderful reproduction can be obtained from a receiver, provided the transformer is equally as good. One fact to be borne in mind when receiving broadcast telephony is that the voice or music when being transmitted is amplified many times before being put into the aerial. This distortion encountered during the process of amplification, together with the distortion produced in the receiver, is not at all conducive to perfect reproduction, but considering the tonal quality which can be obtained if sufficient care is exercised in the construction of the amplifier, we may consider that the acoustical problem of broadcasting is nearly settled.

How Wireless Principles are Adopted

Let us now see how wireless principles can be applied to gramophone reproduction. The ordinary gramophone utilising a mica diaphragm actuated by a stylus bar has an exceedingly limited range of reproduction, the range on the low end being limited to about 200 cycles per second. It becomes obvious from this that the low notes of the organ, bassoon, 'cello and other instruments producing low notes would not register on the record. Percussion instruments, such as the cymbals, sleigh bells, drums, etc., usually produced the most raucous noises or did not register at all. With a well-designed amplifier it has been found that, used in conjunction with a microphone of high quality or, better still, a condenser transmitter, all the notes on the audible scale down to about 50 cycles per second would register quite clearly and with a perfectly good wave shape.

Filtering Apparatus

It might occur to the reader that an ordinary resistance amplifier would be suitable for such a purpose. This may be so in many respects, but the other details of the amplifier must not be overlooked.

The instrument designed by the writer for electrical recording of gramophone records possesses many advantages heretofore not met in electrical-recording apparatus and amplifiers. The instrument in question has a network of filters which permits the accentuation or suppression of high, medium or low notes. Any particular band of notes or frequencies can be entirely suppressed, while others can be boosted to an astounding degree.

To the engineer the advantages of such apparatus become apparent immediately upon analysing the output of a record in an oscillograph. A further advantage of electrical recording is that a much greater magnitude of sound can be impressed upon the disc, thereby allowing a greater latitude to the recording engineer so far as cutting is concerned. The instrument in the accompanying photograph will also play the record under the same conditions as it was recorded. By this means any discrepancies in the recording can be immediately checked and rectified.

The apparatus required for electrical recording consists merely of a well-designed speech amplifier utilising a broadcast microphone of high efficiency, together with a suitable recording instrument which may conveniently follow the principles of the reed telephone. Such a unit can be used so as to actuate a crystal or needle to obtain the desired cut on the record. The accompanying photograph depicts an electrical instrument developed by the writer which has achieved success in the United States.

Operation

A row of four keys will be seen at the bottom of the panel. When the left-hand key is pressed down, together with a combined setting of the other keys, the apparatus is ready to record. The switch arm seen on the right of the panel serves to boost the low notes or suppress the high, or *vice versa*. When actuating this control, the effect is almost uncanny, as the high notes or low notes are boosted or suppressed as the operator desires. While a record is being made, the wave shape of the output may be watched continually in an oscillograph. Aural monitoring is also accomplished by switching the second key from the right, which monitors into the first or second stage of amplification. In such an instrument particular care must be paid to detail in design, and the valve must be regarded as a distortion device unless the source and load impedances are suited. At present, for obvious reasons, details of the construction of this instrument cannot be described, but it is hoped in the near future that details will be available so that the experimenter may conduct tests along such lines himself. W. H. F.

The Writer (standing) with his Electrical Gramophone-recording Apparatus.

Memo. to the Reader: I have personally arranged with American authorities for amateur British-built sets to be sent over the Atlantic to compete against American sets.

THE EDITOR, *Amateur Wireless.*

The Editor to The Reader

A Great International Set Competition

When I was in America in April and May, a most interesting challenge was thrown out to me. I was discussing matters with the Secretary of the Radio Manufacturers' Show Association and we were commenting upon the essential differences between American and British sets. He suggested that the American public would like to see a number of representative British receivers, as to which there was much curiosity but little knowledge. Suddenly we alighted upon the idea that there might be very active support for an international competition in which American and most certainly British amateur set-builders would take part, and in which it was hoped that French and German constructors might also be represented.

The upshot was that I expressed my willingness to take the responsibility of organising a British Elimination Competition for the purpose of finding 25 sets to send to New York to represent this country, and I now have pleasure in inviting every skilled home-constructor to take part in such an Elimination Competition.

I want valve sets of every kind, as long as they are well-designed, well-made and representative of thoroughly up-to-date practice. I do not mind what the origin of the set is, whether the design first appeared in the pages of AMATEUR WIRELESS, WIRELESS MAGAZINE or any other periodical, or whether the design has never been published at all. That is quite immaterial. Certainly, I do want readers of this paper to support the competition in great strength, and I want the designs published in this paper and in the WIRELESS MAGAZINE to be well represented too. But I want *every* home-constructor who has produced a set of outstanding quality to enter it for the Elimination Competition.

WHERE AND WHEN

I wish to send the 25 sets to the United States during the first week of August, that is, in not more than four weeks' time. There is, therefore, not a moment to lose. I propose to hold the Elimination Competition just as quickly as it can be organised. I have had prepared a printed entrance form and set of rules (there is nothing irksome in the rules), and what I want qualified readers to do is to send me straightaway an application for the entrance form and rules. These I shall send in duplicate—one entrance form to be returned completed with as little delay as possible, and the other to be retained for the competitor's reference.

Not until I have received the completed entrance form shall I be in a position to send the necessary printed labels, inasmuch as before I can decide where the sets are to be sent I must first form some idea, however approximate, of the number of sets there will be.

I want all the sets entered for the Elimination Competition to be on public view for a short time.

I repeat then: Let the qualified reader write me immediately for entrance form and rules. In due course I will send to him all the necessary information.

PRIZES

Twenty-five sets will be selected to go to the United States. The owner of each will be awarded by us a BRONZE MEDAL. The American organisers will distribute three prizes among the British Competitors, in addition to a certificate to each, and will award

AN INTERNATIONAL CUP OR MEDAL

for the best amateur-built set exhibited; whether by American, British or other nationals.

Should the International Prize be awarded for a British-built set that has passed through our Elimination Competition and been sent by us to the United States, then, in addition to the International Prize, we ourselves will award

A GOLD MEDAL SPECIALLY STRUCK FOR THE PURPOSE

So you see that the prizes are worth having and anybody may be well proud of them. I have great hopes that my readers will seize upon this opportunity of taking part in the first international competition of this sort that has ever been organised.

The rules which will be sent to every applicant will be found to cover, it is hoped, almost every possible contingency, and in themselves they are simple and encouraging, but perhaps there are a few points upon which I may make a public note.

AMATEUR WIRELESS and the WIRELESS MAGAZINE are responsible for the Elimination Competition only. The American authorities are responsible for the organisation and judging of the International Competition in the U.S.A.

No wireless manufacturer or salesman, no employee of any wireless manufacturer or salesman, and no other member of the wireless industry may compete; neither may any employee of the proprietors of AMATEUR WIRELESS and the WIRELESS MAGAZINE.

Do not send me the set until the proper formalities have been complied with; in other words, first apply for the entrance form, upon receiving it complete it, return it to me and await the supply of labels which I will send you.

The 25 sets selected to go to the U.S.A. will be sent and returned free of all expense to the competitors, and will be insured from the moment they leave London until they are returned to the competitors.

No crystal set is eligible.

Please post me immediately the application for entrance form and rules. Address your application to:

INTERNATIONAL COMPETITION,

THE EDITOR,
"Amateur Wireless,"
La Belle Sauvage,
Ludgate Hill, London, E.C.4.

"A.W." TESTS OF APPARATUS

Conducted in the "Amateur Wireless" Research and Test Department

Polarity Indicator

WE have received a very neat polarity indicator from Myers (London), Ltd., of 74 and 75, Fore Street, London, E.C.2. The indicator consists of a glass U tube, hermetically sealed at each end, and partly filled with a liquid which, we believe, consists of a solution of phenolpthalein and sodium sulphate. A terminal is mounted at each end of the tube and is connected to an electrode which dips into the solution.

One lead from the electric source, the polarity of which it is desired to find, is connected to one terminal, and the other lead from the source is applied to the second terminal just long enough until a red coloration appears at one of the immersed electrodes in the indicator.

If the voltage of the source is low a considerable time may elapse before the red coloration appears, but with a high-voltage source the coloration quickly forms. It is essential with a high-voltage source to apply only a brushing contact to the terminal of the indicator. The red coloration takes place at the *negative* electrode.

If the indicator is connected up to an alternating-current source both electrodes will show a red coloration.

Many uses may be found in wireless for this little instrument, among which may be mentioned the determination of the polarity of the output terminals to the phones or loud-speaker, or the polarity of the output terminals of battery-charging devices.

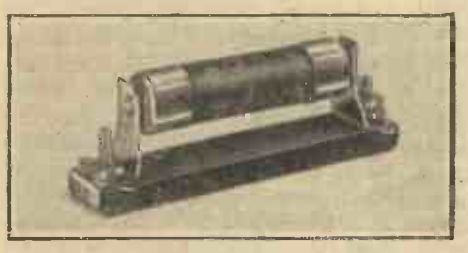
Igranic Tone Control.

Igranic Tone Control

THE IGRANIC ELECTRIC CO., LTD., of 147, Queen Victoria Street, London, E.C., are producing a variable resistance which may be used not only as a tone control, but for a variety of other purposes. In outward appearance the instrument resembles the variable grid leak manufactured by the same firm, the resistance in this case being variable from 0 to 1 megohm.

For use as a tone control the resistance is connected across the secondary of the low-frequency transformer, while for use as a damping resistance to stabilise an H.F. receiver, the resistance is placed across the tuned-anode coil. The conducting parts of the tone control are well separated from the control knob, thus eliminating hand-capacity effects. A single-pole fixing device is incorporated.

On test the variation in resistance was found to be exceptionally smooth between the minimum and maximum values and, when once set in any particular position, the resistance in circuit is very constant in operation.



Amperite Automatic Filament Control.

Amperites

WHERE controls are to be reduced to a minimum the rheostats of amplifying valves will be the first components to be eliminated. Some sort of automatic filament control, however, must be given to these valves if efficiency and economy are to be considered. For this purpose Amperites, obtainable from The Rothermel Radio Corporation of Great Britain, Ltd., of 24 to 26, Maddox Sreet, Regent Street, London, W.1, are to be recommended.

The Amperite works on the thermo-electric principle. In outward appearance the component resembles a fixed grid leak or anode resistance, and is mounted in clips. Each cartridge contains a specially treated filament hermetically sealed in a glass tube and surrounded by an inert gas. This filament possesses the unique property of automatically changing its resistance as the L.T. battery voltage changes, so that a practically constant current passes through the valve filaments. The valves are thus constantly operated at maximum efficiency.

Several types are made, Nos. 1A, 4V199, and 6V199. Type No. 1A is suitable for all 5-volt valves working off a 6-volt accumulator, also for 1.1-volt valves working off a 2-volt accumulator. Type No. 4V199 should be used for all 3-volt .06-ampere valves working off a 4-volt accumulator or 4½-volt dry cells, whilst type No. 6V199 is recommended for 3-volt .06-ampere valves on a 6-volt accumulator.

We have tested these self-adjusting resistances and have found them to be remarkably efficient. Not only are they efficient in themselves, but they also prolong the life of a valve by preventing the filament of the valve from being overrun.

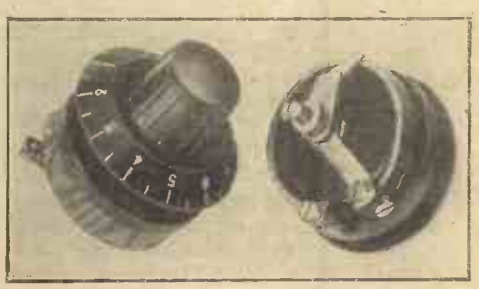
As each amperite is mounted in clips it is an easy matter to change the type should it be subsequently desired to use valves of a different filament voltage and current.

Penton Rheostats

THE Penton filament rheostat, illustrated in the accompanying photograph, is supplied with a very attractive knob and dial moulded in one piece and engraved from 0 to 10 over 300 degrees of the scale. To the dial is attached a spindle which passes through the one-hole fixing screw and operates the contact arm to which it is attached by a grub screw. The contact arm, which is laminated, can be so adjusted that the pressure gives a smooth motion and, at the same time, ensures a positive contact at all settings.

The resistance wire is carefully wound on a heat-proof composition which protects the panel from the heat dissipated by the resistance. Connections to the contact arm and to the resistance wire are brought out to screw terminals mounted on the side of the component. The rheostats are supplied in two resistances, 7 ohms and 30 ohms, and with each type a central one-hole fixing device is employed.

The 7-ohm rheostat is not only suitable for valves taking a heavy filament current, but will act admirably as a master rheostat to control simultaneously the filaments of several valves. The finish of the component is excellent and its sturdy construction is a guarantee of consistent functioning. We can thoroughly recommend the rheostats to our readers.



Penton Filament Rheostat.

On test we have found these rheostats capable of carrying heavy currents without overheating and damaging the insulation. They give a filament current control that is smooth and free from sudden jumps, whilst the maximum resistance of each of the samples submitted for test was well over the rated maximum value. The Penton Engineering Co., of 15, Cromer St., London, W.C.1, are the manufacturers.

Norman Notley

NEXT WEEK AT 2LO

By "THE LISTENER"

In the Programmes

ON Sunday at 3.30 p.m. the Band of H.M. 1st Battalion King's Own Yorkshire Light Infantry is to be relayed from the Granville Gardens Pavilion, Dover. The studio intervals will be provided by Dorothy Bennett and Dale Smith. There are few composers more popular than Liza Lehmann, and Sunday being her birthday anniversary, opportunity will be taken to perform her less familiar song cycle "The Daisy Chain," a cycle of twelve songs of childhood. The artistes are the Vocal Quartet, comprising Dorothy Bennett, Esther Coleman, Eric Green and Dale Smith. Chamber music will be given in the evening by John Barbirolli and his Chenil Players.

A lighter atmosphere prevails on Monday evening, when Mr. T. Sterndale Bennett will sing limericks to his own music. Later follows a short programme by the New Verrey's Orchestra, the soloists being Winifred Davis, soprano, and Arthur Salisbury, violinist. At 10 o'clock Mr. R. E. Jeffrey presents, by arrangement with Sir George Dance, a radio version of the famous old musical comedy *The Chinese Honeymoon*. It is a pity that one or two of the original cast could not have been persuaded to lend their aid.

A brilliant string combination, known as the Geoffrey Goodhart Sextet, under the direction of Alfred Cave, will be heard on Tuesday, supported by Sydney Coltham (tenor) and Leonard Hubbard (baritone). The 10 o'clock feature is a short recital by Salzedo, the famous harpist. Salzedo has written many works for his own instrument, and three will be included.

Another outside relay from the Pavilion, Buxton, is promised for Wednesday, where a big charity concert is taking place. The Manchester Augmented Station Orchestra will be conducted by Mr. T. H. Morrison, the soloists being those two well-known Manchester artistes, Lily Allen and Lee Thistlethwaite. Later follows a variety programme, which includes the vaudeville star Tex McLeod, spinner of ropes and yarns, and Philip Buchel's Trio in syncopated and dance numbers, the combination being saxophone, piano and drum. "Elsa the Wonder" is said to possess two voices, soprano and baritone. Other artistes include Edward Avis, an American bird imitator, Doris Bleach and partner from the Victoria Palace, and Clapham and Dwyer, cross-talk comedians.

Every listener remembers Edward Knoblock's famous play, *Milestones*. Since its first production by Dennis Eadie at the Royalty Theatre it has been revived and filmed, and now on Thursday Mr. R. E. Jeffrey will give a condensed radio version.

Variety turns fill the main bill on Friday, when recitations will be given by Ettie Persy French, syncopated numbers by the Two Bobs, and Datas, the Man of Memory, who was prevented from appearing previously by the strike, will teach us not to "forget to remember," while clever Ray Wallace will be heard again. Later Edward Clark, the musical director of the Newcastle station, will conduct the Wireless Symphony Orchestra.

Another appearance will be made by the new Radio Follies concert party on Saturday night, the artistes being Mamie Watson, Florence Oldham, Reg Palmer, Lawrence Anderson and Harold Kimberley. Later follows a relay from the Dome, Brighton, for the closing festival concert of the Brighton Competitive Musical Festival. The pianist of the week is again Niedzielski, the famous exponent of Chopin, who will continue the nocturnes and mazurkas.

Esther Coleman

WHA WIRELESS HAPPENINGS ABROAD

WITH reference to my recent remarks concerning French wit and German sensibility, Herr Ludwig Kapeller, editor of the well-known Berlin radio magazine *Funk*, has sent me an interesting letter, in which he says (translation): "You are perfectly right in wishing to guard against any over-sensitive national feelings in radio transmissions, nevertheless you must not forget that the word 'Boches,' which is hurled at Germans from France, upsets German feelings even to-day, and the word is still being used at the Parisian stations; as to the anecdote of the goat and the German having been broadcast, it is only to be expected that it would create painful feelings over here, for there is a boundary over which even the best wits should not transgress in radio transmissions, in recognition of international politeness, or, so far as we can see, closer association of the people and the furthering of a common world friendship will not be served." Of course, the Berlin editor's objections are reasonable enough; nevertheless, a joke is its own defence, especially if it is a good one, and, even if it does hit a little bit hard, can usually be taken philosophically. Good humour is an essential component in our natures; it is like a grid leak for the overflow of human passions!

Despite Teutonic admonitions, Radio-Paris continues to fire off smart anecdotes, certainly not all aimed at Germany! The other night a neat little one came over concerning New Yorkers and whisky which even made the imperturbable Parisian announcer laugh himself. Moreover, Georges Delamare in the "Journal Parlé" at the Eiffel Tower station is always "slipping in" to everybody, and certainly the Parisians themselves do not escape from his humorous attacks. After all, are we not often too dull and serious at our English stations? Why not make the people laugh and enjoy themselves?

Between twelve and one o'clock at night the Spanish stations, under good conditions, are simply splendid. What a classical old chime that clock has which sends out the midnight hour under the stars at Madrid! I was one of the lonely nocturnals who sat up to one o'clock the other night to tune-in the special international transmission from Radio-Catalana. It is only a 1-kilowatt station at Barcelona, but the English spoken was quite understandable, and the orchestral music came over very well; the Morse battle from the Spanish Armada in the Bay of Biscay was truly terrific. Very often at a late hour you can pick up some splendid, really romantic opera stuff from the Spanish stations.

(*Concluded in third column of next page*)

Measurement of Signal Strength

SIR,—I notice that Mr. P. D. TYERS in his article on the measurement of signal strength in No. 208 does not mention an expression which may be used to give a value for signal strength in terms of the shunt resistance and the impedance of the phones. The formula is that the signal strength $S = \frac{Rp + Rs}{Rs}$, where Rp = the resistance of the phones and Rs = the shunt resistance just necessary to eliminate the signal. For strict accuracy Rp should be the impedance of the phones at the average audio-frequency. Since, however, anything like the exact determination of Rs is very difficult owing to external noises, etc., the error in taking Rp as the direct-current resistance may be neglected.

On this scale moderate crystal reception gives a strength of about 30. A phone strength of 1,000 will provide comfortable volume on a loud-speaker in a small room.

It would certainly be found that the arbitrary values of signal strength found by the above formula would differ with different persons and different phones. For instance, if an inefficient pair of phones were used it might very well be found that a strength of 250 in these would give perfectly satisfactory volume on an efficient loud-speaker. The method is thus purely relative for a given operator and pair of phones.—P. R. B. (London, W.).

Crystal Purity

SIR,—May I be permitted to criticise your correspondent's observations on "Crystal Purity" in No. 210?

I think P. M. H. is wrong when he says that purity of reception on a crystal is no better than that with a valve, the former appearing better because signals are so much weaker.

Leaving theoretical considerations alone, may I ask P. M. H. if he has ever used a crystal in conjunction with a three- or four-stage amplifier correctly designed for the purpose? I think if he had, his conclusions would be reversed. Using such a receiver, telephony is as loud as on the best three-valve set (this refers to local reception up to twenty-five miles) and purity is unexcelled. I admit that excellent reproduction may be obtained with a valve detector, but not quite so good as with the crystal combination mentioned. Of course, what P. M. H. means by "a detector valve used under suitable conditions" is rather a debatable point, but if he means a high-impedance valve using anode rectification and no reaction, the purity of reproduction falls little below that of the crystal; but the valve is then less sensitive, and the only point in its favour is its constancy.—F. P. (Keighley).

Wireless Tele-duets

SIR,—There is a novel form of wireless entertainment which should, I think, be considered by broadcasting stations.

Vocal or instrumental duets might be sung or played at home or in a concert hall, one performer being at the broadcasting studio, while the other is at the receiving hall or private house.

A youthful violinist might be very glad to be able to say "I have played a duet with Albert Sammons, and a vocalist might take great pains to make himself or herself worthy of joining voices with a great singer.

The other listeners would, of course, hear only one of the parts, but they might be willing to put up with that for the sake of the stimulus given to domestic performances.

Incidentally, it would free broadcasting from the objection that it is reducing the spirit of private devotion to the musical art.—E. E. FOURNIER D'ALBE.

A Novel Catwhisker

SIR,—It is a source of much difficulty to locate the most sensitive part of a crystal with many of the ordinary catwhiskers, as they so easily slip when least expected. I have recently experimented with a piece of electric fuse wire with utmost satisfaction, as it bends easily and once resting on the crystal does not spring away, being very pliable and a first-class conductor.—ANCIENT ONE (Walthamstow).

Transformer Couplings

SIR,—I notice that C. W. S. in No. 211 states that the ideal method of coupling L.F. valves is one transformer stage followed by a number of resistance-capacity stages. I should like to point out that this is incorrect for the following reasons:

(1) Assuming the transformer to distort very slightly and the resistance capacity to be practically perfect, by putting the transformer first the distortion caused by this is being amplified.

(2) A transformer stage following the detector is not so sensitive to weak signals as a resistance-capacity stage.

(3) Smooth control of reaction is found to be easier with a high resistance in the anode circuit of the detector.

The best arrangement is one or more resistance stages followed by one good transformer stage. This has the additional advantage that a sensitive (high impedance) detector valve may be used without distortion.—R. S. (Clapham).

"W H A" (*continued from preceding page*)

Berlin, too, seems to be going in for plenty of opera, some of which is really quite classical and enjoyable. For example, a short while back they gave *Die Verkaüfte Braut,* or *The Bride who was Sold.* The Bohemian composer, Friedrich Smetana, full of the melody of his country, was born at Leitomischl in 1824; he studied at Prague with Liszt, and founded a school of music in that city. In 1856 he was a conductor at Gothenburg, and went on a musical tour through Scandinavia, returning to Prague in 1861, where a year or so later he obtained the position of bandmaster at the National Theatre. But in 1874 poor Smetana became deaf, a terrible thing for a genuine musician, and he died in a madhouse in 1884.

It seems that listeners in the south of France do not get the Paris stations so well as we do in England. A correspondent from Marseilles, writing in the *Haut-Parleur,* says: "I know of nobody in Marseilles who gets either the Petit Parisien or P T T stations. On the other hand, Radio-Paris is received very well. The Eiffel Tower is very difficult to get. I have only got it once very weakly on the phones and with three valves! The stations we hear best are Rome, Spain, Radio-Toulouse, Berne and London. I got Warsaw once, and have got Vienna many times." And he goes on to say it is practically impossible to cut out their local station, and that distant stations have only got a chance on two days a week when the local station is not transmitting. LYONS.

"Camera Work that Pays" is the title of an article appearing in the current issue of "The Amateur Mechanic and Work" (3d.), and gives hints to the amateur photographer so that he can make his hobby show a margin of profit. Other articles appearing in the same number are: "Making a Kitchen Coal-cabinet," "Six Kinks for the Metalworker," "Charging Accumulators from the Mains," "A Use for Sawdust as Fuel," "A Cigar-box Crystal Set," "A Safety Switch for Valve," "An Easy Way of Fixing Wires to Earth Switch," "A Novel Fire-screen," "Sound and Neat Soldering," "The Reflecting Telescope, and How to Use It," "Making Drawers Slide Easy," "Sharpening Scissors with a File," "Further Hints on Pillion-riding."

Datas, the "Memory Man," whose appearance before the microphone was postponed owing to the strike, has been booked for July 16.

THE oscillation evil is growing in the west of Scotland, and it is felt that drastic steps will have to be taken sooner or later by the authorities to check the nuisance.

A specially constructed wireless receiving set has been installed in the hospital at Hamilton (Lanarkshire) Poorhouse. The cost of the installation was over £100.

A microphone has now been installed in the tower of Glasgow University, and the bell is being relayed as an alternative time-signal to the chimes of Big Ben or Greenwich.

Dominion Day programme at Glasgow included a short sketch by Captain R. W. Campbell dealing with Canadian emigration, and a personal message from Sir George McLaren Brown, European general manager of the C.P.R.

The Prussian High School for Physical Development has erected a small transmitter at Spandau, in the neighbourhood of Berlin. It is to be used for scientific experiments in connection with the transmission of heart beats and other biological studies. For the present, transmissions are being effected on every Tuesday evening from 10.30 p.m. onwards on a wavelength of 300 metres.

It is stated that rapid progress is being made with the new high-power experimental station at Daventry. This station, as has been previously explained, is the prelude to the establishment of high-power stations by which it is hoped to provide listeners with a real opportunity of choosing alternative programmes.

The Neuchâtel Observatory daily broadcasts time-signals (through the Berne station) at 13.00, 16.00 and 20.00 B.S.T. The transmissions are made on a wavelength of 434 metres.

The Prague station now concludes its programme at 10 p.m. with a time-signal consisting of a long dash and six dots at one second interval.

Crystal control of the wavelength of transmitting stations is at present in use at six broadcasting stations in Chicago.

A wireless-controlled fog signal has now been permanently established on Rosneath Beacon, a light which marks a dangerous sandbank at the mouth of the Clyde.

The U.S.A. short-wave station 2XAF, which transmits on 32.79 metres, will continue to relay the WGY (Schenectady) programmes on every Tuesday and Saturday evening throughout the summer.

The U.S.A. Interior Department recently recommended that a wavelength of 1,034 metres should be allotted to aviation direction-finding stations, and that the entire band from 983 to 1,052 metres be exclusively set aside for the use of both shipping and aircraft.

On July 10, from 4 to 5.30 p.m., the B.B.C. will relay a programme by the band of the 2nd Bat. North Staffordshire Regiment from the Pavilion, Clacton-on-Sea.

For the "condensed" broadcast version of *Milestones* on July 15, Mr. R. E. Jeffrey has secured the assistance of the author, Mr. Edward Knoblock.

For the eleventh of the series of "Shakespeare's Heroines," to be given at the London studio on July 11, Miss Lilian Braithwaite will take the part of Hermione.

In an Elizabethan programme which was transmitted from the Glasgow station on July 6 was a 'cello solo, entitled "Heart's Ease," by an unknown composer, to which reference is made in Shakespeare's *Romeo and Juliet*.

The oboe d'amore was broadcast for the first time on June 30 from Glasgow. This instrument is now practically obsolete (there being only one known example in Scotland), but was frequently used by Bach and Handel. It was only recently discovered that Bach wrote a concerto for the oboe d'amore, and this work was played in the programme from the Glasgow station.

A novel broadcast from Glasgow took the form of a relay from the assembling point for many hundred children, who took part in a flower procession, headed by massed bands, to a large hospital in the city.

Highgate School is to give a school concert which will be broadcast on July 26.

It has been resolved by the committee for the Halifax appeal for the wireless equipment in local hospitals to aim at getting £2,000, that sum having been deemed necessary. The total received or promised so far is £1,409.

The Japanese Government are concluding arrangements for the erection of a high-power transmitter in the neighbourhood of Tokio.

Lady Forbes-Robertson will play "Katharine of Aragon," from *Henry VIII.*, at the London studio on July 18. This will be relayed by several stations.

Information regarding tests on reception made during the time when the phenomenon of the Aurora Borealis was active has been issued by the American Department of Commerce. In the north-western States a considerable falling off in strength was noticed. On wavelengths below 350 metres, in addition to the reception being weakened, marked interference was caused by prolonged hissing noises.

Over a hundred wireless sets are now in use in the New York wireless police scheme, which should be successful in reducing the number of law-breakers who successfully evade the law. Police reports will be broadcast from the station WNYC, and all police posts will thus be informed simultaneously of crimes, so that the arrest of fugitives will be expedited.

Train telephony is being considerably developed in Germany, and apart from expresses running between Berlin and Hamburg, international trains on the Berlin-Flushing and Berlin-Paris route are being equipped with apparatus for the benefit of travellers.

The eighteenth International Esperanto Congress will take place at Edinburgh between July 31 and August 7, when the members will discuss various ways and means by which the auxiliary language can be utilised for broadcasting.

Admirers of Mr. Albert Sammons will welcome him in a popular violin recital at the London studio on July 22.

The use of wavelength-governing crystals is being seriously considered by German broadcasting authorities, and tests are to be carried out extensively next month to determine whether it is possible by their use to reduce the number of wavelengths in Germany from the present twenty to some nine or ten.

The new Salamanca (Spain) broadcasting station EAJ22 has now resumed transmissions on a wavelength of 405 metres. Concerts are given from 17.00 to 18.00 and 21.00 to 23.00 B.S.T. daily.

Experimental transmissions on a wavelength of 395.8 metres are being made by the Prague station.

WOODEN LOUD-SPEAKER HORNS

THE many advantages in the way of purity of reproduction that are obtained by fitting wooden horns to loud-speakers in place of thin spun-metal horns are described in a free booklet issued by H. Maddison, of 2A, Ronalds Road, Holloway Road, Highbury, N.5. In it are illustrated and described hand-made oak and mahogany bells, flares and horns for loud-speakers. The horns are made in all sizes to fit all standard types of loud-speakers. The table grand Allwoodorn, a concealed-horn model to which any gramophone attachment can be fixed, is worthy of special attention.

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 British Summer Time.

London (2LO), 364 m. 1-2 p.m., con.; 3.15-4 p.m., transmission to schools; 3.30-5.45, con. (Sun.); 4.15 p.m., con.; 5.15-5.55, children; 6 p.m., dance music; 7-8 p.m., time sig., news, music, talk; 8-10 p.m., music; 9.0, news (Sun.); 9.30 p.m., time sig., news, talk; 10 p.m., special feature (Mon., Wed., Fri.). Dance music on Thurs. and Sat. until midnight.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 440 m. **Birmingham** (5IT), 479 m. **Bournemouth** (6BM), 386 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 422 m. **Manchester** (2ZY), 378 m. **Newcastle** (5NO), 404 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 315 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 321.5 m. **Liverpool** (6LV), 331 m. **Nottingham** (5NG), 326 m. **Plymouth** (5PY), 338 m. **Sheffield** (6FL), 306 m. **Stoke-on-Trent** (6ST), 301 m. **Swansea** (5SX), 482 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 4 p.m. onwards, own con. on Mon. Dance music daily (exc. Sun. and Tues.) till midnight; on first Friday in each month until 2 a.m.

IRISH FREE STATE.

Dublin (2RN), 397 m. Daily, 7.30 p.m. Sundays, 8.30 p.m. until 10.30 p.m.

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. B.S.T.

AUSTRIA.

Vienna (Radio Wien), 582.5 m. and 531 m. (temp.) (10 kw.). 11.00, con. (almost daily); 15.30, con.; 19.25, news, weather, time sig.; con., lec., news; 20.00, con.; 22.00, dance (Wed., Sat.).

Graz, 402 m. (1 kw.). Relay from Vienna. Also own con. (Tues., Wed., Fri.), 20.10.

BELGIUM.

Brussels, 487 m. (1½ kw.). 17.00, orch. (Tues., Thurs., Sat. only), news; 20.00, lec., con., news. Relay: Antwerp, 265 m. (100 w.).

DENMARK.

Copenhagen (Radioraadet), 347.5 m. (2 kw.). Sundays: 15.30, lec.; 17.30, children; 20.00, play; 21.15, news, con.; 21.15, news, Esperanto. Weekdays: 20.00, lec., con., news, con.; dance to 24.00 (Thurs., Sat.).

Ryvang, 1,150 m. (1 kw.). Sundays: 09.00, sacred service.

Odense, 810 m. Relays Copenhagen.

Sorö, 1,150 m. (1½ kw.). Relays Copenhagen.

FINLAND.

Helsingfors (Skyddskar), 504 m. (500 w.).

Helsingfors, 440 m. Con., 18.00 (Tues., Thurs., Sat., Sun.).

***Tamafors**, 368 m.

***Jyvaskyla**, 561 m. (200 w.).

***Uleaborg**, 233 m. (200 w.).

* Relay Helsingfors.

GRAND DUCHY OF LUXEMBURG.

Radio Luxemburg (LOAA), 1,200 m. Con.: 14.00 (Sun.), 21.00 (Thurs.).

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 07.15, 08.00, physical exercises; 11.00, markets (exc. Sun. and Mon.); 11.20, time sig., weather; 15.00, 16.45, Stock Ex. (exc. Sun. and Mon.); 18.00, talk, con., news; 19.00 and 23.10, weather; 21.00, con. (daily). Relays PTT, Paris: 07.15, 08.00 (daily).

Radio-Paris (CFR), 1,760 m. (about 3 kw.). Sundays: 12.45, con., news; 16.30, Stock Ex., con.; 20.15, news, con. or dance. Weekdays: 10.40, news; 12.30, con., markets, weather, news; 16.30, markets, con.; 20.15, news, con. or dance.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (800 w.). 07.15, 08.00, physical exercises; 14.00 or 15.00, studio con. or outside relay; 20.30, lec. (almost daily); 21.00, con. (daily).

Le Petit Parisien, 333 m. (1 kw.). 21.15, con. (Tues., Thurs., Sat., Sun.).

Radio L.L. (Paris), 350 m. (250 w.). Con. (Mon., Wed., Thurs.), 20.30.

Radio-Toulouse, 431 m. (2 kw.). 12.30, con., time sig. (daily); 17.30, news (exc. Sun.); 20.45, con.; 21.25, dance (daily).

Radio-Lyon, 280 m. (2 kw.). 20.20, con. (daily). Temporarily closed.

Strassburg, 200 m. (120 w.). 21.15, con. (Tues., Thurs.).

Radio Agen, 318 m. (250 w.). 12.40, weather, Stock Ex.; 20.00, weather, Stock Ex.; 20.30, con. (Tues., Fri.).

***Lyon-la-Doua**, 486 m. Own con., 20.00 (Mon., Wed., Sat.).

***Marseilles**, 351 m. (500 w.).

***Toulouse**, 280 m. (2 kw.).

***Bordeaux**, 411 m.

* Relays of PTT Paris.

Montpelier, 220 m. (1 kw.).

Angers (Radio Anjou), 300 m. (500 w.). Daily: 20.30, news, lec., con.

GERMANY.

Berlin, on both 504 and 571.5 m. (4 kw.). 06.30, con. (Sun.); 09.00, sacred con. (Sun.); 11.00, con. and tests; 12.55, time sig., news, weather; 15.00, educ. hour (Sun.), markets, time sig.; 17.30, orch.; 20.30, con., weather, news, time sig., dance music until 24.00 (Sat., Sun., Thurs). Relayed on 1,300 m. by Königswusterhausen (1,300 m.) and Stettin (241 m.).

Königswusterhausen (LP), 1,300 m. (8 kw.). 11.30-12.50, relays Berlin (Sun.); 15.00, lec. (daily); 18.30, relay of Berlin (Vox Haus) con. (daily). 2,525 m. (5 kw.), Wolff's Buro Press Service: 06.45-20.10. 2,880 m., Telegraphen Union: 08.30-19.45, news. 4,000 m. (10 kw.), 07.00-21.00, news.

Breslau, 417 m. (4 kw.). 12.00, con. (daily), Divine service (Sun.); 12.55, time sig. (Sun.), weather, Stock Ex., news; 16.00, children (Sun.); 17.00, con.; 19.00, lec.; 20.30, con., weather, time sig., news, dance (relays Berlin). Relay: Gleiwitz, 251 m.

Frankfort-on-Main, 470 m. (1½ kw.). 08.00, sacred con. (Sun.); 11.55, time sig., news; 12.55, Nauen time sig.; 16.00, con. (Sun.); 16.30, con.; 18.00, markets, lec.; 20.00, lec., con., weather. Dance: relays Berlin. Relay: Cassel, 273.5 m.

Hamburg, 392 m. (4 kw.). Relayed by Bremen (279 m.), Hanover (297 m.), Kiel (230 m.). Sundays: 07.25, time sig., weather, news, lec.; 09.15, sacred con.; 13.15, con.; 18.00, con.; 19.15, sports, weather, con. or opera, dance. Weekdays: 05.45, time sig., weather; 07.00 and 07.30, news, weather; 12.55, Nauen time sig., news; 14.00, weather, con.; 16.15 and 18.00, con.; 19.00, lec.; 19.55, weather and con.; 22.00, dance (Sun., Thurs., Sat.).

Königsberg, 462 m. (1 kw.). 09.00, sacred con. (Sun.); 12.55, time sig., weather, news; 16.30, con.; 17.00, con. (Sun.); 19.30, lec.; 20.00, con. or opera, weather, news, dance (irr.).

Leipzig, 452 m. (3 kw.). Relayed by Dresden (294 m.). 08.30, sacred con. (Sun.); 11.00, educ. hour (Sun.); 12.00, con. (daily); 12.55, Nauen time sig., news; 16.30, con., children (Wed.); 20.15, con. or opera, weather, news, cabaret or dance (not daily).

Munich, 485 m. (3 kw.). Relayed by Nuremberg (340 m.). 11.30, lec., con. (Sun.); 14.00, time sig., news, weather; 16.00, orch. (Sun.); 16.30, con. (weekdays); 18.30, con. (weekdays); 19.15, lec.; 19.30, con. (Sun.).

Munster, 410 m. (1 kw.). Relayed by Elberfeld (259 m.), Dortmund (283 m.). 11.45, radio talk, Divine service; 12.00, news (Sun.); 12.30, news (weekdays); 12.55, Nauen time sig.; 15.30, news, time sig.; 16.00, con.; 17.00, children (Sat.); 19.40, news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 24.00 and 04.00, weather and news.

Stuttgart, 446 m. (1½ kw.). 11.30, con. (Sun.); 16.30, con. (weekdays); 17.00, con. (Sun.); 18.30, time sig., news, lec., con. (daily); 21.15, time sig., late con. or cabaret.

HOLLAND.

Amsterdam (PCFF), 2,125 m. (1 kw.). Daily: 06.35-15.30 (exc. Mon. and Sat., when 12.30-13.30), news, Stock Ex.

Hilversum (HDO), 1,060 m. (5 kw.). 09.00, sacred service (Sun.); 19.10, con.; 21.00, news, etc.

ITALY.

Rome (IRO), 425 m. (3 kw.). 10.30, sacred con.; 13.15, official communique; 17.00, children; 17.30, relay of orch. from Hotel di Russia; 17.55, news, Stock Ex., jazz band; 20.30, news, weather, con.; 22.15, late news.

Milan, 320 m. (2 kw.). 20.00-23.00, con., jazz band.

NORWAY.

Oslo, 382 m. (1.2 kw.). 11.00, Divine service (Sun.), Stock Ex. (weekdays); 19.15, news, time, lec., con.; 22.00, time, weather, news, dance relayed from Hotel Bristol, Oslo (22.30-24.00, Sun., Wed., Sat.).

Bergen, 358 m. (1½ kw.). 19.30, news, con., etc.

SPAIN.

***Madrid** (EAJ6), 392 m. (1½ kw.). Daily: con. (times vary daily). Closes at 24.00 on Sun., Wed., Sat.

***Madrid** (EAJ7), 373 m. (4½ kw.). 17.30-24.00, con. (almost daily).

***Madrid** (EAJ4), 340 m. (3 kw.). 16.00, con.

*The Madrid stations are again working to a rota, varying time of transmissions daily.

Barcelona (EAJ1), 324 m. (1 kw.). 17.00-21.00, news, lec., con. (Sun.); 18.00-23.00 (daily).

Barcelona (Radio Catalana) (EAJ13), 462 m. (1 kw.). 19.00-23.00, con., weather, news.

Bilbao (EAJ9), 415 m. (1 kw.). 19.00, news, weather, con. Close down 22.00.

Bilbao (Radio Vizcaya) (EAJ11), 418 m. (2 kw.). 22.00-24.00, con. (daily).

Cadiz (EAJ3), 357 m. (550 w.). 19.00-21.00, con., news. Tests daily (exc. Sun.), 24.00.

Cartagena (EAJ15), 335 m. (1 kw.). 20.30-22.00, con. (daily).

Seville (EAJ5), 357 m. (1½ kw.). 21.00, con., news, weather. Close down 23.00.

Seville (EAJ17), 300 m. 19.00-22.00, con. (daily).

San Sebastian (EAJ8), 343 m. (500 w.). 17.00-19.00, 21.00-23.00 (daily).

Salamanca (EAJ22), 405 m. (1 kw.). 17.00 and 21.00, con. (daily). Closes down 23.00.

Saragossa, about 325 m. Testing.

SWEDEN.

Stockholm (SASA), 430 m. (1½ kw.). 11.00, sacred service (Sun.); 12.30, weather; 14.00, con. (Sun.); 17.00, children (Sun.); 18.00, sacred service; 19.00, lec.; 21.15, news, con., weather. Dance (Sat., Sun.), 21.45.

SWITZERLAND.

Lausanne (HB2), 850 m. (1½ kw.) (temp.). 20.00, lec., con. (daily).

Geneva (HB1), 760 m. (2 kw.). 20.15, con. (daily).

Berne, 435 m. (2 kw.). 10.30, organ music (exc. Sat.); 16.00, 20.30, con.

Basle, 1000 m. (1½ kw.), con. daily. 20.30

[*Owing to the demands upon our space a few of the less important stations are not given in this issue.*]

HEADPHONES

. All 4,000 ohms.

N. & K. GENUINE. See name in full on outside cases, new Lightweights, 11/6. Extra quality do., 13/6. . . . DR. NESPER, unapproachable value, adjustable, wonderful tone, 12/11. . . . DO. TELEFUNKEN (20/- model), limited number at 14/11, adjustable, genuine. . . . "BRUNET," stood the test of years, need no boosting, 11/9, 12/11, 14/6, 3 models. . . . ERICSSON EV CONTINENTAL, still as good as ever, exquisite tone, sample pair, 8/1.

BRITISH HEADPHONES

BROWN'S FEATHERWEIGHT, 20/-. BROWN'S A TYPE (Reed), 30/-. B.T.H., 20/-. STERLING, 20/-, 22/6. WESTERN ELECTRIC, 20/-. All makes stocked.

SUNDRIES.

Newey 2-way geared coil stand, 6/6. 4 point condenser, 17/6. 15/-. "B.I." New Type Aerial Tuner, 39/6. Gambrell Neutrovernia, 5/6. Seamark Connode, 19/6. U.S. Super, L.F., 18/6. Voltmeters D'ble rdg. 7/3. H.F. Transformers all wavelengths. Magnum, 7/-. Stradia 6/6, Bowyer-Lowe, 7/-, McMichael, 10/- (A. 7, 12 6). Var. grid Leaks, Bretwood, 3/-. Watmel, 2/6. Anodes B., 3/-. W., 3/6. Woodhall L.F., 23/6. Valve Holder, 2/6.

SETS OF PARTS.
(Well-known Circuits).

ST. 100, 84/-. Twin-valve, Loud Speaker, 80/-. One-Valve Reflex, 41/-. Efficient valve set 30/-. All-Concert De Luxe, 118/-. Simplicity 3, 62/-. Less Box Panel and valves.

LISSEN Coils, 50x, 6/-; 60x, 6/4; 75x, 6/4; 250x, 9/9 for super selective and neutrodyne circuits. All Lissen parts stocked.

"ESSANCO" MOUNTED COILS. —Made under Burndept Licence. Patent No. 168249. No. 25, 35, 50, each 2/-; 75, 2/6; 100, 3/-; 150, 3/-; 200, 250, 300, each 4/-.

IGRANIC - PACENT. Potentiometer, 2/6; 6 or 30 ohms Res., 2/6.

LISSENOLA LOUD-SPEAKER UNIT. 13/6.

VARIABLE CONDENSERS.—Polar Standard, 10/6. Junior, 5/6 each. Bowyer-Lowe Popular, 10/6. Igranic, 24/-, 21/-. Collinson's Low Loss, 21/-, 20/-. Utility, 8/6, 10/9. Vernier 2/6 extra. Utility Low Loss, stocked .0003 and .0005. J.B. (Jackson Bros.). Square Law, .001, 9/6; .0005, 8/-; .0003, 7/-; with vernier, 4/- each extra. Geared, .0005, 15/-; .0003, 13/-; Low Loss, 10/6, 9/-.

FIXED CONDENSERS.—Dubilier, .0001, 2, 3, 4, 5, each 2/6. .001, 2, 3, 4, 5, 6, each 3/-. Grid Leak. 2/6. Edison Bell, .001, .0001, 2, 3, 4, 5, 1/-; .002, 3, 4, 5, 6, 1/6. .0003 and grid leak, 2/-. McMichael with clips, .0001 to .0005, 2/6 each; .001 to .006, 3/- each. Watmel, .0003 and grid leak, 2/6.

MARCONIPHONE.—Auto Series Par. Variometer, 16/-. Sterling Non Pong V.H., 3/6. Velvet Potentiometer, 9/-. Ideal L.F. Transformers, 30/-. (2-7-1, 4-1, 5-1, 8-1). Ideal Junior L.F., 21/-. Var. Res. 40,000 ohms, 8/6; H.F. Choke up to 4,000 metres, 10/6. Sterling Baby L.S. 50/-. Sterling Dinkie, 30/-. "Minikon" S.L.V. Condenser, .00025, 21/-, .0005, 24/-; .001, 30/-.

VALVES.—Cleartron C.08 or C.15, 12/6. Power 6v., C.25, 15/-. Cosmos S.P. 18 Red or Green, 12/6. New Blue Spot, 12/6. All Mullard, Ediswan, Osram, Marconi, Cossor stocked. Bright D.E. and Power, 8/-, 14/-, 15/6, 16/6, 18/6, 22/6, 24/6, 30/-, £2. Mullard P.M.4, 22/6. Do. P.M.3, 16/6. 1 burnt-out valve taken in part exchange for any of above. Unusable valves exchanged.

L.F. TRANSFORMERS. Ferranti A.F.3, 25/-; A.F.4, 17/6; Eureka Concert, 25/-; 2nd Stage, 21/-; Baby-1st or 2nd, 15/-; Reflex, 15/-. Formo shrouded, 10/6. Success (Black), 21/-. Boyal, 20/-. Ormond newest model, 15/6. Wates' Supra, 10/6. Croix 5-1, 3-1, 4/6. Marconi "Ideal," all stages, 30/- each. C.A.V., 15/-. Pye, 22/6. Gambrell 2 stages, 25/6. Ideal Junior, 20/-.

ITEMS OF INTEREST.—Cosmos Blue Spot, 12/6. Dimic Coils, 10/-; Base 2/6 (usual wavelengths). Igranic Pacent .0005, 18/6. Igranic Pacent .0003, 14/6 (new S.L.F. variable). Amplifex Frame Aerials, 70/-.

IN STOCK ALL NEWEST MAKES OF VALVES.

I STOCK EVERYTHING YOU REQUIRE — SPACE LIMITED — MAKE OUT YOUR LISTS AND I WILL QUOTE YOU LOWEST INCLUSIVE PRICES.

WITH VERNIER 1/- each extra. Post 6d.

LOW LOSS SQUARE LAW

This variable Condenser is simply marvellous value. It cannot be equalled in price or quality.

.0005, 4/11 .0003, 4/9

SPECIAL DISTRIBUTOR of

Ormond Products

SQUARE LAW LOW-LOSS, .0005, 9/6; .0003, 8/6 (1/6 each less no vernier). FRICTION GEARED, .0005, 15/-; .0003, 14/6; .00025, 13/6. STRAIGHT LINE FREQUENCY FRICTION GEARED, .0005, 20/-; .00035, 19/6. FILAMENT RHEOSTATS DUAL, 2/6; 6 ohms or 30 ohms, 2/-. POTENTIOMETER, 400 ohms. 2/6. L.F. SHROUDED, latest model, 17/6.

CLUBS AND TRADE SUPPLIED.

KAY-RAY

WONDERFUL VALUE IN STRAIGHT LINE FREQUENCY

CONDENSERS

LATEST MODEL NOW READY

With knob & dial.	Post 6d. set.
·0005 - -	8/11
·0003 - -	8/3

This true Straight Line Frequency Condenser will amazingly improve the selectivity of any set. Sturdily built. Electrically and mechanically right—meeting all requirements of low loss design. Mount this real Straight Line Frequency Condenser in your set NOW and experience the joy of quick, certain tuning.

WILL TAKE ANY SLOW MOTION DIAL. SUPREME SELECTIVITY.

SETS FOR THE MILLION

Sets complete with following accessories—

Long distance 2-valve L.F. and Detector Receiver in handsome polished cabinet; includes set as shown, 1 power, 1.06 D.E. valves, tuning coils, H.T. 60v., L.T. 3, Aerial Equipment, H.T. & L.T. Leads, 2 pairs of 4,000 ohms phones, or LOUD SPEAKER (Marconi Tax Paid).

£4 - 10 - 0

Also new circuit specially adapted for use in flats, etc.

With indoor aerials,

£5 - 10 - 0

Carr. and Packing, 5/-

DUAL VARIABLE CONDENSERS FOR ELSTREE SIX

·0005 - 12/11

ALL PARTS SOLD.

CALLERS COLUMN

Post Orders accepted from same over 10/- in value, 9d. post extra.

ACCUMULATORS.—2 v. 40, 7/11; 2 v. 60, 9/6; 2 v. 80, 12/6; 2 v. 100, 14/6; 4 v. 40, 13/11; 4 v. 60, 17/11; 4 v. 80, 23/6; 6 v. 60, 26/6; 6 v. 80, 35/6. ALSO another good make, 1/6 extra on each of above.

Switch Spade Terminals for H.T., L.T., etc., 1/6 pr. Spade tags, 6 a 1d. Spade screws, 2 for 1½d. Red or Black, 3d. pr. Ins. staples, 5 a 1d. Ormond screws and nuts, 2 a 1d. Switch arms and studs, 1/-. Nickel, 1/4. Wander Plugs, 2d., 3d., 4d. pr. Plug and socket, red and black, 3d. to 1/- pr. Twin Flex, red and black, 12 yds., 1/6. Miniature Silk, 6 yds., 6d. Ins. hooks of egg insulators, 2 for 1½d. Aerial wire, 7/22, 100 ft., 1/11. Extra heavy weight, 2/3. Stranded aerial, 100 feet (49 strands), 1/3. Also "Wonder" aerial multiple strands phosphor bronze, 110 feet, 2/11.

D.C.C. wire per ¼ lb., reel 20 g., 9d.; 22 g., 10d.; 24 g., 11d.; 26 g., 1/-; 28 g., 1/1. Tinned copper, 1/16 sq. Bus bar., 12 feet, 6d. Empire tape, 12 yds., 6d. Earth Tubes, Copper, good value, 1/11. Climax, 2/3, 5/-. Sets of 5 Coils (Dickenson Patent), air spaced, 25/30/50/75/100, 1/9 set. Mounted Coils, very efficient, all makes lowest prices.

EVEREADY 66 v., 12/6; 108 v., 21/-. L.T.3 for D.E. Valves, 7/6. SIEMENS H.T. 60 v., 12/6. Hellessen's 60 v., 14/6. Various 1.5 D.E. Batteries, 1/6 to 2/6.

EBONITE.—"Grade A," cut while you wait, 3/16 at halfpenny per sq. inch. ¼ in. at three farthings. Scrap ebonite on sale.

CRYSTAL DETECTORS (enclosed). —High class, 9d., 1/-, 1/3, 1/6, 1/9.

MICROMETER. Nickel, 1/9. Permanent, 2/6. Mic.-Met., 4/6. All well-known makes stocked. Crystals. SHAW'S GENUINE HERTZITE in a sealed box with signature.

RADIO MICRO. .06 Special, 6/11; Power, 8/11. 2 volt, 6/11. Various .06 valves, 4/11, 5/11. Power valves D.E., 7/11, etc. 1 valve L.F. Amplifier in polished box, beautifully made, 18/11. 2 valve do., 31/11. Handsome crystal sets, variometer tuning, 10/11, 12/11.

BARGAIN DEPT.

Huge quantities of window-soiled and goods which have been taken in exchange for sale at ridiculous prices. Bargains not sent by post.

SPECIAL OFFER in Oak, American Type, hinged lid, Cabinets, with baseboard for 12 x 7 panel, 8 in. back to front, 9/6. Also 12 x 9, 10/11; 16 x 8, 16/11.

Portable Aerials, fix up anywhere, copper, with Ebonite insulators (100 ft. total), length 12 ft., 3/11.

H.T. BATTERIES, 60 v., 5/11; 100 v., 11/6. "Adelco" 60 v., 6/11; 100 v., 12/3. "A B" 60 v., 6/3; 100 v., 11/9.

4.5 Flash Lamp Batteries, 6d. line, 6 for 2/9. "A B," 3 for 1/-; 4 for 1/3. Vario s, per dozen, 3/8, 3/9, 3/11, 4/3.

SUNDRIES.—Adhesive Tape, 4d. 8 drills, 1/3. 5 Spanners, 6d. Taps, 0, 2, 4, 6 B.A., 1/11. Screwdrivers, 8d. Breast Drills, 0-¼ chuck, 3/11. Screw Wander Plugs, 3d. pair. Extra quality, 4½d. and 6d. pr. Valve windows nickel, 4d. and 6d. Basket coil holders, 10½d., 1/-. 6 ft. phone cords, 1/-, 1/3, 1/6. Loud Speaker Cords, 1/6, 1/11. Empire Tape, 12 yds., 6d. Panel brackets, 6 in., 10d. pr. . . . COILS.—Mounted inductance, 25, 1/-; 35, 1/4; 50, 1/9; 75, 2/-; 100, 2/-; 150, 2/4; 200, 2/8; 250, 2/10; 300, 3/2. MOUNTED AIR-SPACED.—25, 1/2; 35, 1/4; 50, 1/8; 75, 1/11; 100, 2/-; 150, 2/6; 200, 2/10; 250, 3/-; 300, 3/3; 400, 3/6.

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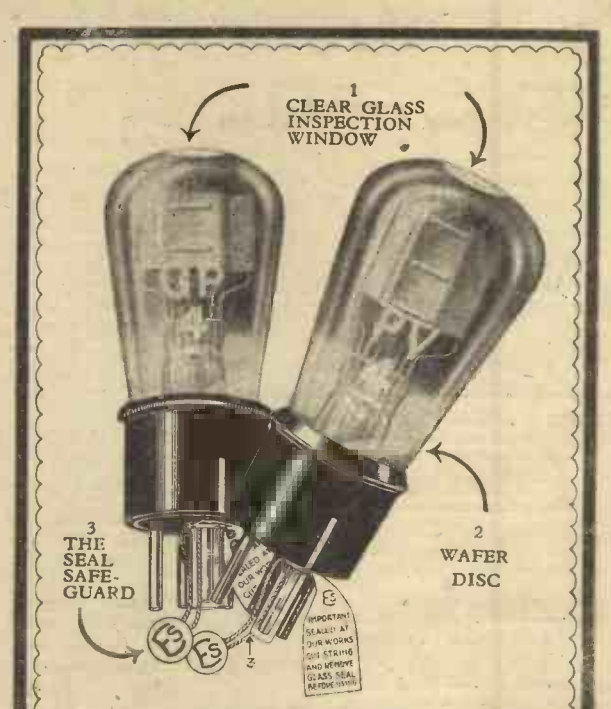


TWO NEW VALVES

G.P 4 GENERAL PURPOSE AND P.V. 4 POWER VALVES— for use with 4-volt accumulator *(or three dry cells).*

The salient features of these ideal companion DULL EMITTERS are, economy of consumption—a longer lasting accumulator charge and high efficiency—clearer, better reception—with louder volume.

You can identify G.P.4 and P.V.4 by:
(1) The clear glass Inspection "Window."
(2) The Wafer Disc—a hallmark.
(3) The Seal—ensuring the valve being unused after final test in the Ediswan laboratories.

SPECIFICATIONS

EDISWAN G.P. 4	EDISWAN P.V. 4
Volts, 3·5–4	Volts, 3·5–4
Amps., ·15	Amps., ·35
Plate Voltage, 60–120	Plate Voltage, 60–120
Amplification Factor, 12	Amplification Factor, 6
Slope, ·55 Ma/v	Slope, ·65 Ma/v
Imped'ce, 22,000 Ohms	Impedance, 9,500 Ohms
G.P. 4.—General Purpose dull emitter. Low current consumption. Long Life. Powerful amplification. Elimination of objectionable microphonic effects.	P. V. 4.—Ideal power valve, companion to G.P. 4. When used for Loud Speaker work: powerful, distortionless amplification. No microphonic effects.
Price 16/6	**Price 22/6**

Obtain from your Dealer the Ediswan Folder—"2 New Valves"

EDISWAN VALVES

Will improve any set

THE EDISON SWAN ELECTRIC CO. LTD

N.V. 2

WIRELESS IN PARLIAMENT

From Our Own Correspondent.

MR. DAY asked the Postmaster-General whether, in view of the oscillation annoyance experienced by wireless listeners, he would consider action to prohibit the use of reaction on the aerial?

Viscount Wolmer, the Assistant Postmaster-General, said: "On the recommendation of the Broadcasting Committee of 1923 a condition was inserted in all wireless receiving licences that 'reaction must not be used to such an extent as to energise any neighbouring aerial.'" He did not think it would be in the general interest to prohibit entirely the use of reaction, which was of considerable advantage in increasing the sensitiveness of wireless sets, and only caused interference when improperly used. The authorities were enforcing the regulation very strictly.

Mr. H. Morrison asked the Postmaster-General whether he would arrange that the British Broadcasting Co. should broadcast weather reports every morning during the hay and corn harvest.

Viscount Wolmer said that weather reports prepared by the Meteorological Office were broadcast every morning at 10.30 from the high-power station at Daventry, in addition to two reports every evening from all broadcasting stations.

According to an answer given by Viscount Wolmer to Mr. Day, a wireless receiving licence entitles the licensee to use more than one set of apparatus on premises wholly in his occupation. A separate licence, however, is necessary for apparatus in each tenement or flat in separate occupation.

CHIEF EVENTS OF THE WEEK

SUNDAY, JULY 11

London	The Band of H.M. 1st Bn. The King's Own Yorkshire Light Infantry.
Birmingham	Requested Classics.
Bournemouth	Concertos and Instrumental and Vocal Feature.
Cardiff	Famous Singers in Famous Arias.
Glasgow	All-British Programme.
Manchester	The Irwell Bank Prize Band.
Newcastle	Orchestral Concert.

MONDAY

London	Humour in Music and Verse.
Aberdeen	Ballad and Instrumental Programme.
Bournemouth	The Municipal Military Band.
Cardiff	Gems from Italian Opera.
Leeds-Bradford	Leeds Tercentenary Celebrations.
Newcastle	Trifles.

TUESDAY

London	The Geoffrey Goodhart Sextet.
Aberdeen	Old Favourites in Music and Song.
Birmingham	Operatic Programme.
Cardiff	Cap and Bells.
Glasgow	Light Chamber Concert.
Leeds-Bradford	*I Pagliacci.*
Manchester	Revusical Moments.

WEDNESDAY

London	Concert on behalf of the National Association of Local Government Officers.
Daventry	Daventry Calling France.
Aberdeen	Scottish Dance Music.
Bournemouth	An Evening at Weymouth.
Edinburgh	*Chatelard*, a one-act Play.
Glasgow	Italian Opera.
Manchester	Special Concert relayed from the Pavilion, Buxton.
Newcastle	A French Night.
Stoke-on-Trent	A Programme of Miniatures.
Swansea	The Afan Valley Silver Band

THURSDAY

London	*Milestones.*
Leeds-Bradford	Tercentenary Concert.

FRIDAY

London	Variety Programme.
Birmingham	Mirth and Melody.
Bournemouth	Choral Works and Orchestral Ballads.
Belfast	A Trip to the Isle of Man.
Glasgow	The S.C.W.S. Prize Brass Band.
Manchester	Schubert and Schumann Programme.

SATURDAY

London	Brighton Competitive Musical Festival.
Aberdeen	Scottish Programme.
Cardiff	A Red Indian Night's Entertainment.
Glasgow	Glasgow Fair.
Manchester	Mirth and Melody.
Newcastle	A Favourite Concert.

ADVERTISEMENT INSTRUCTIONS for "Amateur Wireless" are accepted up to first post on Thursday morning for following week's issue, providing space is available.

PREPAID ADVERTISEMENTS.

Advertisements under this head are charged FOURPENCE PER WORD, minimum charge FOUR SHILLINGS.

DEPOSIT SYSTEM.

As the Publishers cannot accept responsibility for the bona fides of Advertisers in this publication they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The Deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom, double fees are charged.

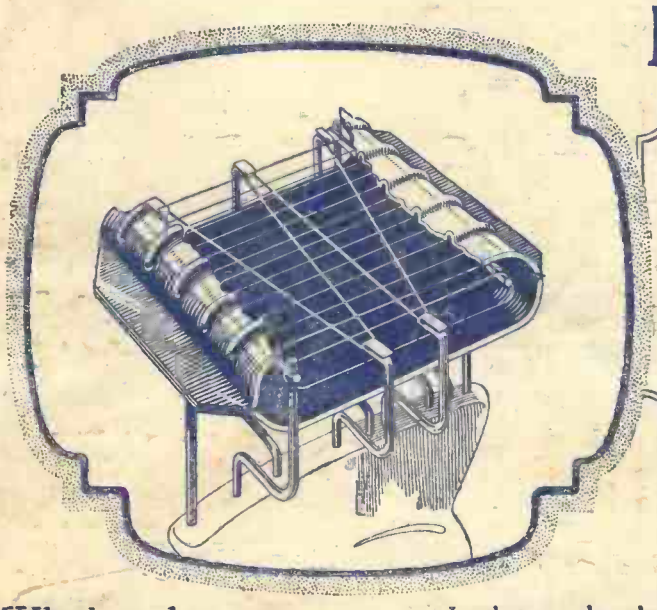
The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to

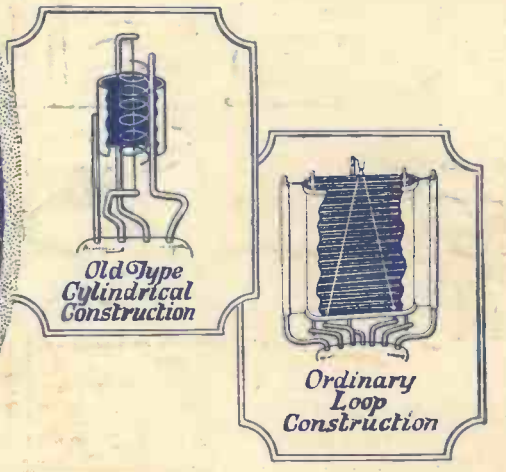
"AMATEUR WIRELESS,"
ADVERTISEMENT DEPARTMENT,
LA BELLE SAUVAGE, LONDON, E.C.4.

WIRELESS.—Capable, trustworthy men with spare time who wish to substantially increase income, required where we are not fully represented. Applicants must have practical knowledge of installation of Set and Aerial, be a Householder or live with parents, and be able to give references. State age and experience.—Address, Dept. 28, General Radio Company, Limited, Radio House, Regent Street, London, W.1.

All Valves

have constructional features but only P.M. Valves have the P.M. Filament—





Which valve construction gives you the most for your money

For 4-volt accumulator or 3 dry cells

THE P.M.3. (General Purpose) 0·1 amp. **16/6**

THE P.M.4 (Power) 0·1 amp. **22/6**

For 6-volt accumulator or 4 dry cells

THE P.M.5 (General Purpose) 0·1 amp. **22/6**

THE P.M.6 (Power) 0·1 amp. **22/6**

For 2-volt accumulator

THE P.M.1 (General Purpose) 0·1 amp. **15/6**

THE P.M.2 (Power) 0·15 amp. **18/6**

These Prices do not apply in the Irish Free State.

Look at the length, thickness and design of the Mullard P.M. Filament and you will appreciate why those who understand valves place its results 33% higher than any other on the market.

This wonderful P.M. Filament

- Is supported by 5 strong but resilient hooks.
- Cannot be broken except by the very roughest handling.
- Has up to 5½ times greater emission surface.
- Requires only one-tenth ampere.
- Has the abundant flow of electrons entirely controlled.
- Remains ductile even after 1,000 hours life.
- Wastes no heat by glowing.
- Is free from microphonic noises.
- Gives majestic volume.

ASK YOUR RADIO DEALER FOR THE VALVES WITH THE P.M. FILAMENT

Mullard

THE·MASTER·VALVE

ADVT. THE MULLARD WIRELESS SERVICE CO., LTD., BALHAM, LONDON, S.W.12

Printed and Published in England by Cassell & Company, Limited, Ludgate Hill, London, E.C.4. Sole Agent for South Africa, Central News Agency Limited, Saturday, July 10, 1926.

A DUAL-STATION CRYSTAL SET

THE BIG COMPETITION CLOSES NEXT TUESDAY (See p. 76)

Amateur Wireless
And Electrics

Vol. IX. No. 214 SATURDAY, JULY 17, 1926 Price 3d

PRINCIPAL CONTENTS

WELL ILLUSTRATED

Registered at G.P.O. as a Newspaper.

WIRELESS AT THE R.A.F. AIR PAGEANT.

The picture shows a battery of loud-speakers by means of which spectators were able to hear the telephony from the aeroplanes and ground stations.

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

Vol. IX. No. 214 — Technical Adviser: SYDNEY BRYDON, D.Sc., M.I.E.E. — JULY 17, 1926

Chief Contents

"Amateur Wireless and Electrics." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. 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 and 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.

MODERNISING AN OLD SET

THE enormous progress made during the last few years in the design of wireless components and receivers was brought home to me very vividly a short time ago when a friend sought my assistance in bringing his early broadcast receiver up to date. A brief description of what was done may well be of interest to owners of out-of-date sets, especially as the renovation was carried out with the minimum of expense.

The set was a four-valve affair purchased early in 1923, and as all the components were the best then obtainable it was desired to "scrap" as few as possible of these, but rather to alter and adapt them wherever possible.

The components were all mounted on a massive ebonite panel, which formed the top of a mahogany box. The circuit was a straight H.F. detector and two transformer-coupled L.Fs. without switches. In its external appearance the set did not look out of the way, only the four sets of valve legs, the four filament resistances, two variable condensers, ten terminals, two tapping switches and the reaction knob being visible.

It was on lifting the panel from the cabinet that the recent progress of design was apparent. All the connecting wires were heavily covered with lengths of insulating tubing, and as the leads had been run parallel and close together wherever possible (probably with a view to neatness), the capacity effects must have been very considerable. The L.F. transformers made one smile — tiny things with small cores, the word "distortion" might have been written in large letters across each of them.

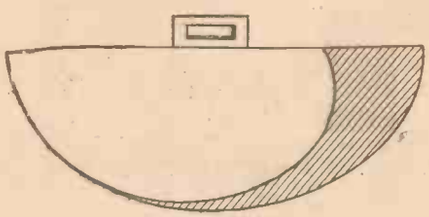


Fig. 2.—Diagram showing Alteration to Condenser Plates.

The circuit originally employed is shown in Fig. 1. All the coils were wound on ebonite formers with very thin wire, the aerial and anode coils being tapped, while the reaction coil was wound on a rotor placed within the anode coil former. The tuning range was supposed to be from about 180 to 4,000 metres.

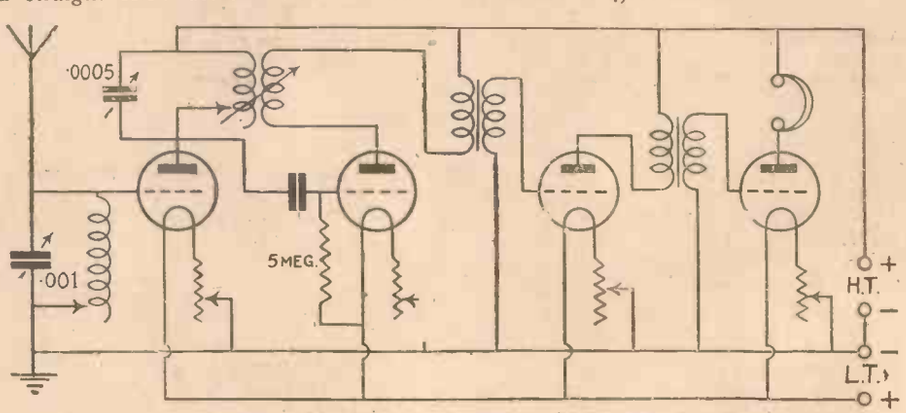


Fig. 1.—The Original Circuit of the Receiver.

The capacity of the original grid condenser was very small and the grid leak had a resistance of 5 megohms. The aerial tuning condenser had a maximum capacity of .001 microfarad and the anode condenser of .0005 microfarad. The filament resistances were of 7 ohms each, and the

set had been used with four bright valves working off a 6-volt accumulator.

A start was made by re-designing the circuit. As the receiver was required for general loud-speaker work, it was decided to retain the original H.F., detector and two L.F. arrangement, but to introduce all the refinements which are nowadays deemed to be essential for the efficient operation of a receiver of this type.

Three new H.T. positive terminals were fitted on the panel so that separate H.T. voltages could be applied to each of the valves, while three more terminals were provided so that an independently variable grid-bias voltage could be applied to each of the L.F. amplifying valves.

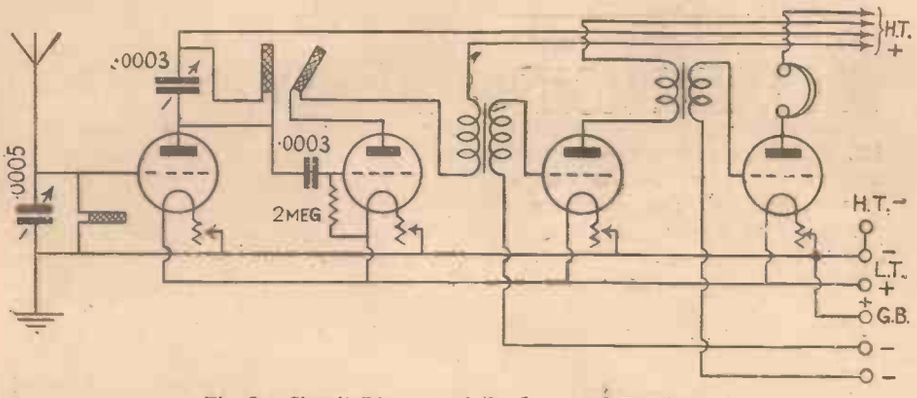


Fig. 3.—Circuit Diagram of the Improved Receiver.

The three coils were removed from the set, as their H.F. resistance must have been terrific. Instead, a single fixed coil holder was mounted on the panel and wired in place of the aerial tuning coil, while a two-way coil holder with geared movement was provided to couple the anode and reaction coils. The two sets of contact studs and their respective switch arms were left *in situ* in order to avoid leaving any blank holes to spoil the appearance of the panel.

Condenser Modifications

Attention was next paid to the two variable condensers. As these were really well-made instruments, it was decided not to replace these by modern low-loss, square-law, slow-motion condensers, but to see what could be done to bring the old condensers into line with modern ideas.

One end-plate was removed from each and the moving spindle and vanes taken out. The vanes were then removed from the spindles and cut roughly to "square-law" shape with a pair of tinsmith's shears. Fig. 2 shows the portion that was cut off each.

After treatment in this way a number of the vanes were clamped up together in a vice and the cut edges trimmed up with a file. The fact that the area of these plates had been reduced would, of course, have reduced the capacity of the condensers in any case, but this was of no importance, as it is now accepted that the capacity of an aerial condenser should not exceed .0005 microfarad, while .0003 microfarad is the best size for anode tuning. In view of this, only about three-quarters of the original numbers of moving vanes were used when reassembling the condensers.

The original grid condenser and its 5-megohm leak were replaced by others of .0003 microfarad and 2 megohms respectively. Not a little thought was given to the question of the L.F. transformers. As such, they were, of course, quite hopeless, and, after pondering a little over the possibility of using them as chokes, it was finally decided to scrap them altogether and substitute modern instruments of first-class manufacture. This involved considerable expense, but the wonderful results obtained later amply justified it.

Different Valves

The filament rheostat raised another question. It was desired to use dull-emitter valves, but as the .06 type were specially favoured, it looked as if the rheostats would have to be scrapped and others having a much higher resistance fitted in their place. As, however, they were well made and in excellent condition, it seemed a great pity to do this, and finally a compromise was effected. The original rheostats were retained, and the three cells of the accumulator were wired in parallel, which reduced its voltage to 2 but at the same time tripled its capacity. It was then possible to use four valves of the 1.8- to 2-volt type, the last one being a power valve.

The re-wiring was carried out with care, using square-section wire of No. 16 gauge, all the leads being kept as short as possible consistent with effective spacing. All joints were well soldered instead of being clamped under terminal nuts. The circuit used finally is shown diagrammatically in Fig. 3, and it is interesting to compare this with the circuit given in Fig. 1.

When the renovated receiver was put on test my friend was highly enthusiastic. Stations he had never heard were tuned in with ease owing to the great reduction in the H.F. losses of the aerial and anode tuning circuits, while the new transformers gave great amplification with a remarkable fidelity of reproduction. The reduction in the capacities of the two variable condensers made the tuning very selective, while the approximate square-law shape of the plates made picking up and separating stations delightfully simple.

J. WOODALL.

BULGARIA AND WIRELESS

UP to the present no broadcasting service has been established in Bulgaria, but a concession has been recently granted to a German private company for the erection of a transmitter at Sofia. In 1914 the Bulgarian Government induced the Germans to construct a wireless station, which was later solely used for military purposes during the war, and taken over at the end of hostilities by the State Posts and Telegraphs Department. This obsolete transmitter is still handling the telegraphy traffic between Bulgaria and Western Europe, but in view of its lack of efficiency most of the messages have to be relayed via Vienna. A proposal is now being made to install small transmitters in various parts of the country, and it is more than likely that the concession will be given to a well-known German company.

In order to arouse public interest in broadcast transmissions, experiments were recently made in the relay of foreign programmes, which were brought within reach of listeners by the public-address system. The present scheme would include the erection of a transmitting station at Sofia, which would first deal with the official services, following which (between 6 p.m. and midnight) it could be placed at the disposal of a private programme company for the broadcast of wireless entertainments.

GRIDDA.

The Czecho-Slovakian Ministry of Railways has installed loud-speakers in the Wilson railway station at Prague in order to inform passengers of the arrival and departure of trains.

RECEPTION IN MOTOR-CARS

IF a receiving set be used in a motor-car whilst the engine is running, interference is experienced through the magneto and ignition system as a whole causing a rapid series of clicks in the telephones. This is due to the sudden voltage rise in ignition leads shock-exciting the receiver oscillatory circuits. The disturbances can be noticed in all kinds of receivers, even down to wavelengths of a few metres. The most effective way of avoiding this trouble is to shield carefully the car ignition leads. This is best done by wrapping copper gauze or braiding around the entire length of the ignition leads and connecting the braiding to the engine.

T. A.

A DUAL-STATION CRYSTAL SET

THE system of loading a crystal set in order to receive the Daventry long-wave station is all right in its way, but one cannot, however, feel that a set working by that method is a "good job." Here is shown a simple method of making a crystal set or converting an existing one, so that separate and suitable coils are used for Daventry and the short-wave stations.

Either of the desired coils is brought into use simply by the movement of a single-pole double-throw switch. In the set shown the switch is a Lissen "push-pull." The aerial, fixed vanes of the tuning condenser, and the crystal side of the detector are permanently connected to the central part of the switch. One end of each of the coils is connected to the earth terminal, to which also the moving vanes of the condenser and one side of the telephones are connected. The other end of each coil is connected to the respective outside contacts of the switch. Thus one coil or the other is "picked up" according to the position in which the double-throw switch is placed.

Photograph of Complete Receiver.

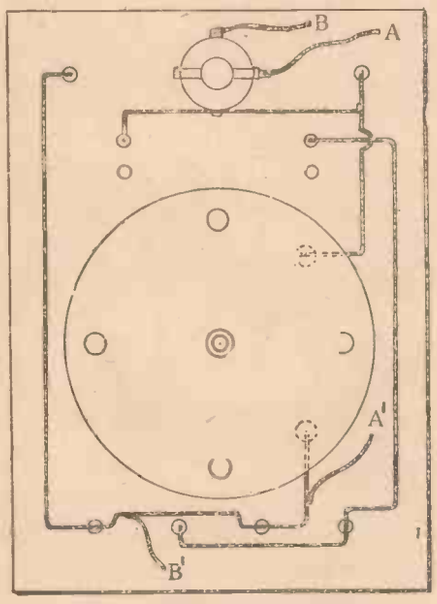


Fig. 2.—The Wiring Diagram.

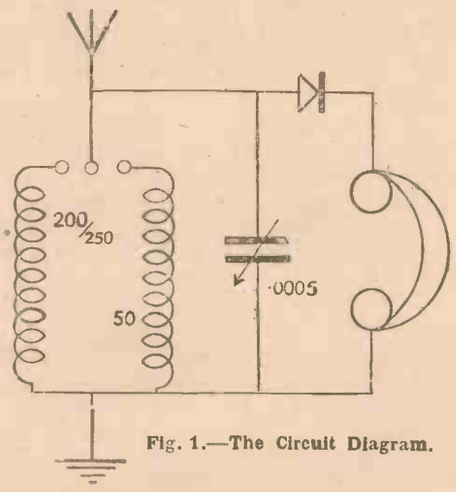
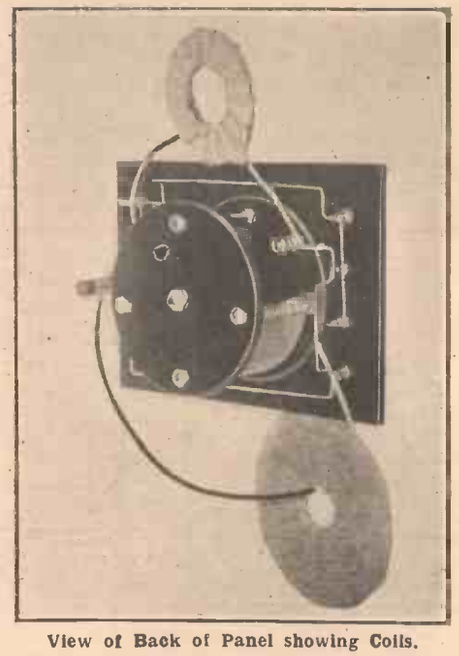


Fig. 1.—The Circuit Diagram.



View of Back of Panel showing Coils.

Circuit Arrangements

Fig. 1 shows the circuit arrangement in the conventional manner, and Fig. 2 the wiring diagram. The two photographs indicate the appearance of the completed set. The lay-out of the panel is shown by Fig. 3. The Daventry coil is made to lie at the bottom of the cabinet and the short-wave coil is at right angles to it, being supported at the side of the cabinet.

With a suitable arrangement of the number of turns on the respective coils it can be arranged that both the local short-wave station and Daventry tune in at the same position on the dial of the condenser. If this is done, a movement of the switch contact brings in one station or the other without the necessity of having to re-tune.

Balancing the Coils

In order to "balance" the coils in this manner it will be necessary to remove turns from the coil that shows the lesser amount of capacity in circuit. As the turns are removed and the inductance of the coil drops, so it will be necessary to apply more capacity to tune the station.

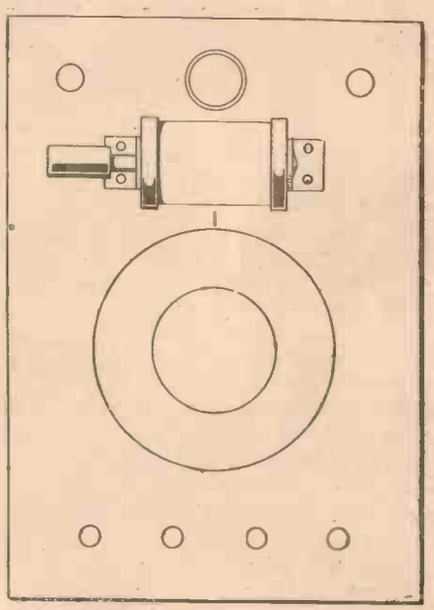


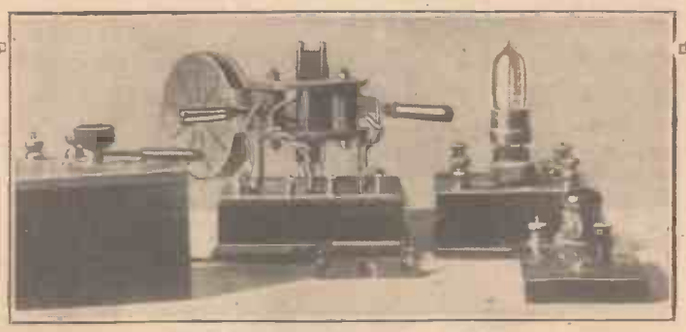
Fig. 3.—Layout of Panel.

The adjustment is thus made purely by trial and error. D. G. O. H.

It is proposed to amalgamate the existing wireless-telephony transmitters in Japan under the title of The Japan Broadcasting Corporation. The power of the Tokio transmitter will be increased to 10 kw., and other stations in the islands will relay their programmes from that city.

Business firms wishing to utilise the broadcast publicity offered by the sixteen stations belonging to the American Telephone and Telegraph Company, may do so at the rate of 2,700 dollars per hour. The cost of such an advertisement varies according to the cities from which it is sent out.

A LOW-POWER C.W. TRANSMITTER



The Transmitter Ready for Wiring.

BEFORE setting out to build a transmitter, it is necessary to know something of the various circuits used. To those about to start activities in the transmitting field, the various circuits must at first be extremely confusing and somewhat misleading. First, let us look into the names of the circuits for valve transmitters. There is the Hartley, the Colpitts, Meissner, reversed feed-back, tuned-output and tuned-input, Reinartz and master or drive-oscillator.

The Hartley, Colpitts and Meissner are circuits which take the name of their designer, while the reversed feed-back is just an ordinary reaction circuit such as is used in a regenerative receiver. The Reinartz is a special circuit for certain purposes and does not concern us at this early stage, while the master oscillator is the best circuit to use for transmission, but unfortunately too tricky to operate and somewhat expensive for the beginner.

Look at the reversed feed-back circuit in Fig. 1. There is a coil across the anode and filament and another coil across the grid and filament, both coils being coupled to each other. Due to the magnetic coupling between the two coils, the valve oscillates and so produces continuous waves. Now look at the Hartley circuit in Fig. 1A. Here we have the same thing as the reversed feed-back but with one coil instead of two. The arrangement may appear confusing at first sight to the beginner, but the easiest way to regard it is to look at the single coil as though it were two coils. We see then that the filament is taken to the middle of the coil, and from this that the top half of the coil is the anode-filament coil as in Fig 1, while the bottom half is the grid-filament coil. Thus we have two coils directly, as well as inductively, coupled.

The Colpitts circuit we will pass over because it is likely to be a little confusing, and despite the wonderful results some amateurs have obtained with it, it possesses no particular advantage. The Meissner system, previously mentioned, is a circuit depending upon magnetic reaction,

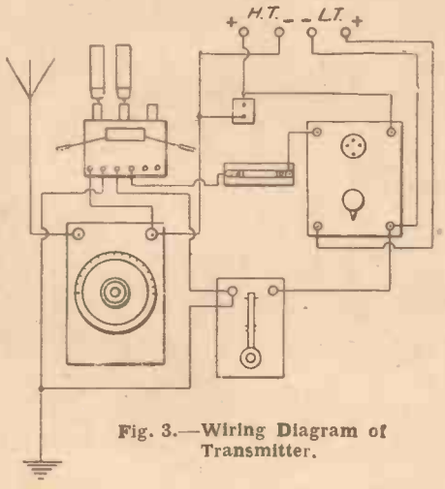


Fig. 3.—Wiring Diagram of Transmitter.

just as the reversed feed-back and the Hartley, only somewhat differently arranged. It is easy to work but very unstable, and is not recommended on this account.

We have, so far, been considering arrangements which depend upon magnetic reaction for the production of oscillations, but we now come to two circuits that operate by capacity reaction. We see that Fig. 2 is very similar to the reversed feed-back but that the grid coil is tuned by a condenser. The grid coil has purposely been drawn on the other side of the valve in order to show that the circuit does not oscillate due to magnetic coupling but capacity coupling. When the grid circuit is in tune with the anode circuit, even if the coils are not coupled to each other, the circuit oscillates because of the capacity between the electrodes of the valve. In this circuit we utilise the valve inter-electrode capacity as a coupling condenser.

The tuned-output or anode circuit works in exactly the same way as the tuned-input or grid, and is shown in Fig. 2A. Of the two, the tuned-input is possibly the better, and is certainly more widely in use.

We now come to the master or drive-oscillator circuit. This is an excellent circuit and is nearly always used in high-power transmitters, but for the beginner it is confusing and is best left alone for the present.

We see from the foregoing that there are two distinct types of oscillators: The reversed feed-back, Hartley and Meissner, depending upon magnetic reaction, and the tuned-input and tuned-output depending upon capacity reaction. Again, these circuits all come under the heading of what is called "self-excited oscillators," while the master or drive circuit is known as an "independently-driven oscillator."

And now to make our final choice for the beginner's transmitter. Of all the circuits, the reversed feed-back is undoubtedly the best with which to make a start in the transmitting field. It is flexible, simple to work, and, what is more,

(Continued at foot of page 62)

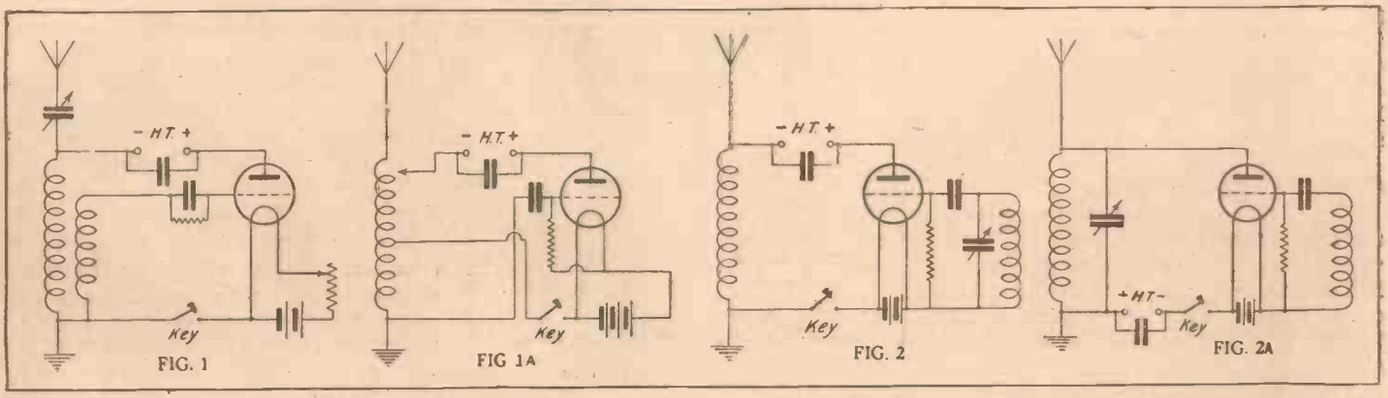
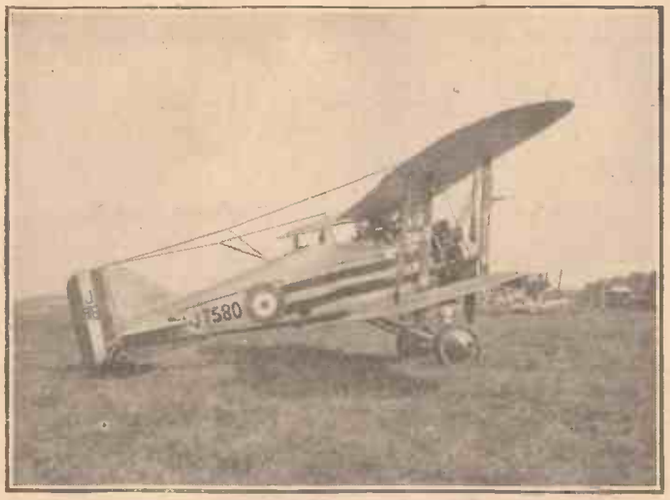
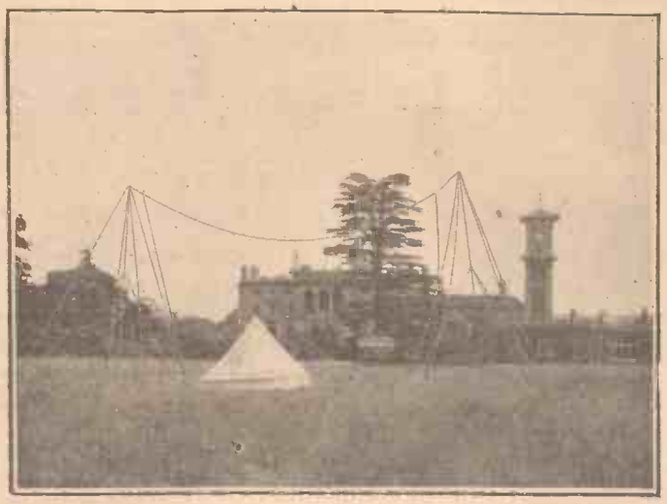


Fig. 1.—Reversed Feed-back Circuit. Fig. 1a.—The Hartley Circuit. Fig. 2.—Tuned-input Circuit. Fig. 2a.—Tuned-output Circuit.



The Grebe fighter from which the transmissions were made by Squadron-Leader Peck. Call sign "Mosquito One."



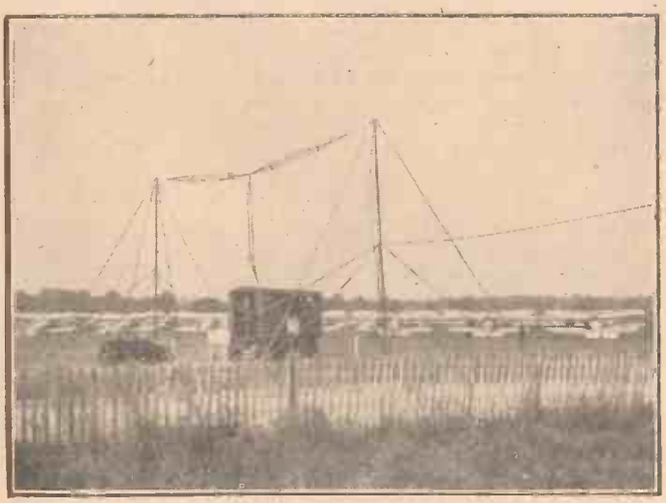
The Marconiphone Co.'s receiving station at Bentley Priory Aerodrome.

One of the many pylons used for Marconiphone loud-speaking apparatus.

WIRELESS AT THE R.A.F. AIR PAGEANT

SIX INTERESTING PHOTOGRAPHS

Marconiphone short-wave aircraft receiver (left), and two-stage line amplifier (right).



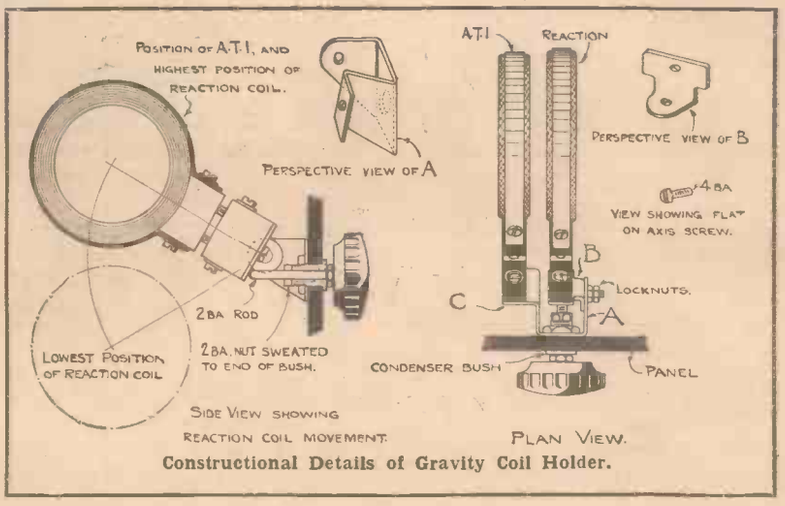
The main R.A.F. transmitting station which transmitted all aeroplane orders.

Amplifier control room with Marconiphone power and control amplifiers.

A SIMPLE GRAVITY COIL HOLDER —AND HOW TO MAKE IT

THERE are many reasons why the tuning coils should be kept inside the cabinet, the chief being that they are immune from dust and damp; but whatever the reason may be, it is usually imperative to allot the minimum of panel space to this fitment. When the necessity arises it is almost always possible to evolve a design to fulfil the given conditions.

When mounting the coils behind the panel it is desirable to arrange the planes of the coils at right-angles to the panel, make one fixed, and then mount the other so that it moves in a parallel plane.



Constructional Details of Gravity Coil Holder.

Natural Motion

As regards operating the moving coil, a very simple construction can be employed if we call in the assistance of gravity to move the coil in one direction. Such an arrangement is shown in the illustration. The main support consists of a bracket A cut out and bent to the shape shown in detail. It must be made from stout brass sheet about $\frac{1}{16}$ in. thick, so that the coils when mounted will be perfectly rigid. The fixed coil is held on platform C by one screw, which is screwed upwards between the plug and socket of the coil holder. The movable coil is first attached to an angle bracket B having a platform similar to that of A, the downward projecting portion containing a hole for an axis screw, which also passes through a corresponding hole in the bracket A.

Method of Operation

The moving coil is operated by the spherical end of a 2 B.A. rod making contact under the platform of the angle bracket B. As this rod is withdrawn, the moving coil falls to the lower position; when it is screwed inwards the coil is caused to rise. A condenser bush is used to form a bearing for the rod, and a 2 B.A. nut is sweated on to the inner end to accommodate the thread so that the rod has a long and substantial bearing. The bracket A is clamped to the panel by the same nut that secures the condenser bush. It is, of course, essential that the coil pivot should work freely in order that the coil can fall easily by its own weight. H.

"A LOW-POWER C.W. TRANSMITTER" (*continued from page* 60)

it will always oscillate, which some of the others will not do just when we want them to. We do not want an inefficient transmitter, of course, but with careful thought and arrangement of components, a set giving excellent results may be built up using the simplest circuit and the best—the reversed feed-back.

Never put the first transmitter in a box or cabinet. It is far better to arrange a board and place the various components thereon than to box the whole set up. A transmitter is not like a receiver, in that all controls, except one tuning condenser and a switch, for example, may be eliminated. In fact, it is the very opposite, and there should be easy access to everything that is variable—condensers, inductances, grid leaks, etc. Again, working a set "bread-board" fashion, as the Americans call it, teaches the beginner more about transmitting in general, since he can easily make a change of circuit at any time should he so desire.

Components

Now the first consideration which governs the kind of components to be used in the set is the amount of power we propose to use. The P.M.G. grants licences to amateurs allowing them to use 10 watts, but very good results, over quite fair distances on short waves, may be achieved with considerably less power. With 10 watts input we really need components designed especially for transmitting purposes, but with the low-power sets there is no reason why receiving components should not be used.

On examining the reversed feed-back circuit, Fig. 1, we see that we require the following components: One variable condenser; two coils; one valve holder; one fixed grid condenser; one H.T. by-pass condenser; one grid leak; one key; one H.T. battery; one accumulator; one coil stand.

The various parts may be placed upon the board and wired up according to Fig. 3. The wavelength on which every beginner should first try his hand is 200 metres. The values of the components for this wavelength may be varied to some extent, but it is advisable to adhere to the values given. The series aerial condenser may have a capacity of .001 microfarad, while the two coils may be of the standard plug-in type, the aerial coil having 25 turns and the grid coil 30 turns or thereabouts. The size of the grid coil is best found by experiment if a number of small coils are available. For instance, a 35 or 40 may be better than a 30 if a very large aerial is in use. The grid condenser and leak may have usual values, namely, .0003 microfarad and 3 megohms.

The valve should preferably be a DE5 with an H.T. voltage of 150 or thereabouts. Smaller valves, such as those of the R or R5v class may be used, but the DE5 will be more satisfactory. Providing the aerial is good, a range of quite fifty miles under favourable conditions should be obtained with the set described. The photograph shows the outfit ready for wiring. D. B.

Daventry, the high-power station, will celebrate its first birthday on July 27 with a special programme fitting to the occasion.

An American auctioneer recently submitted property through the medium of the broadcasting microphone, and the public were asked to make bids, which were transmitted by post. The result is said to have exceeded expectations, and the experiment proved that there is a large public, unable to attend ordinary auctions, but interested in real estate for investment purposes, willing to buy if facilities are offered.

Quality & Distinction

The remarkable clarity and delightfully natural Tone of the World Famous AMPLION Loud Speaker when associated with a suitable Receiving Set render wireless reproduction comparable with the original performance.

With an AMPLION, the unseen speaker, vocalist, or orchestra, as the case may be, is brought right into the Home and the advantages of Radio Broadcast may be enjoyed to the full.

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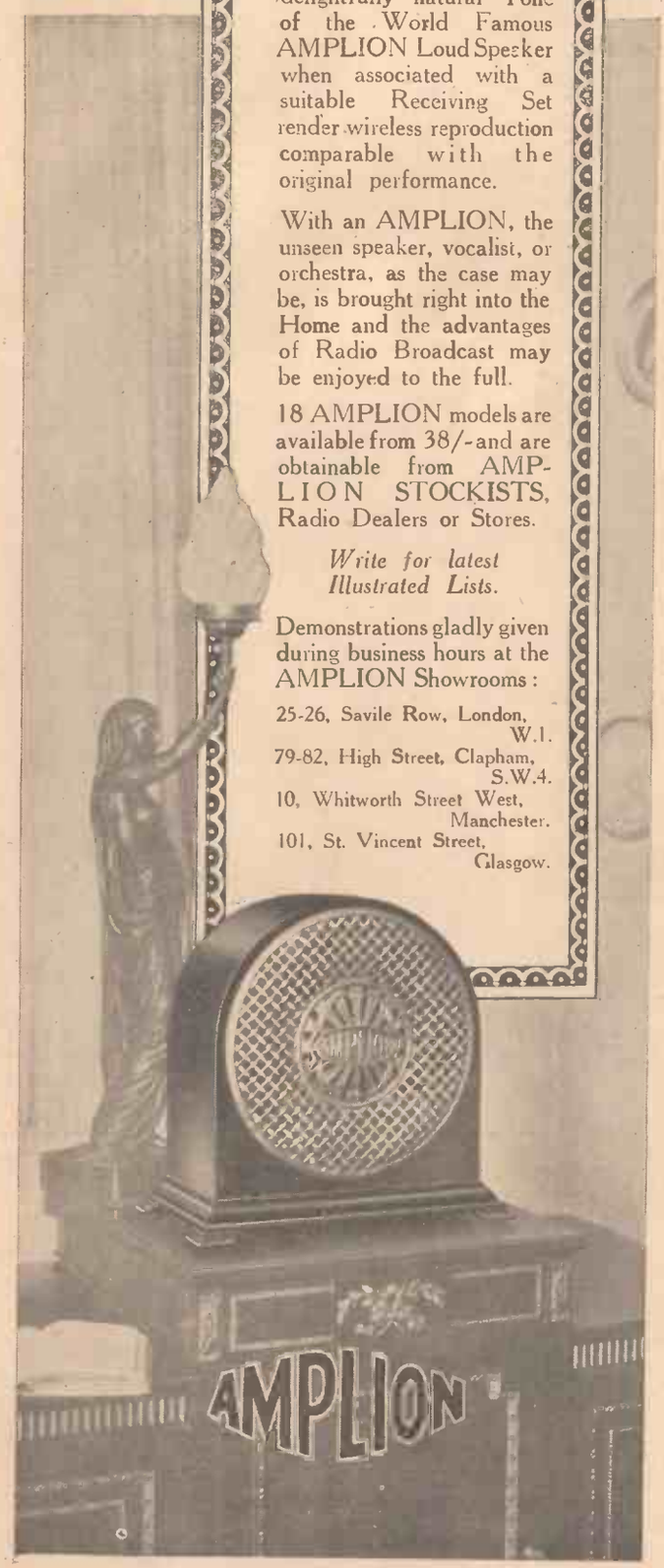
10, Whitworth Street West, Manchester.
101, St. Vincent Street, Glasgow.



Announcement of Alfred Graham & Co. (Exors. of E. A. Graham), Crofton Park, S.E.4.

COMPENSATED SQUARE LAW EFFECT

LOW LOSS

NO BACK LASH

LOW LOSS SQUARE LAW SLOW MOTION

THE "Cosmos" Condenser is a slow motion condenser with absolutely no back lash either when new or after use. This desirable feature is accomplished by the use of a spring belt held in tension, which permits coarse tuning with the large knob, and a 10-1 slow motion with the small knob.

Cone bearings allow for adjustment and the slow motion bracket can be mounted for *remote control* as shown in the lower illustrations.

The Condenser for Fine Tuning.

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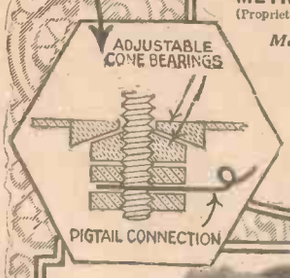
(Proprietors: Metropolitan-Vickers Elec. Co., Ltd.)

Metro-Vick House, 145 Charing Cross Road, LONDON, W.C.2.



PRICES:

Slow Motion	·00025 mfd.		14/9
" "	·0005	"	15/6
Ordinary	·00025	"	12/-
"	·0005	"	13/-

R
P39

COSMOS

A great improvement in Valve design

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

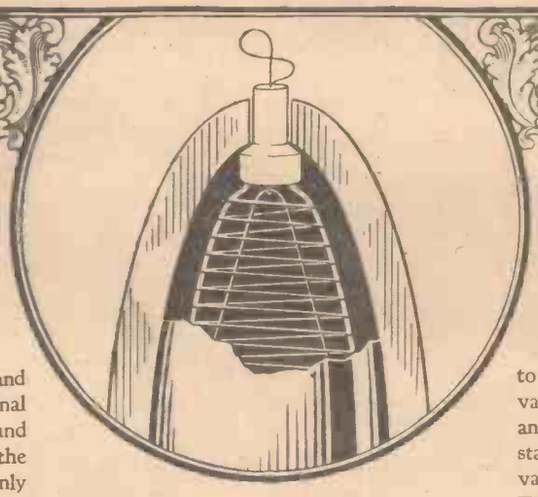
ONCE again Cossor has blazed a trail in Valve design. First in 1922 with an arched filament operating within an electron-retaining hood-shape Anode system—first in 1924 with a triple-coated filament producing a prolific electron stream at a phenomenally low temperature—and now first in 1926 with a constructional system which automatically aligns and secures the filament, grid and anode at the top as well as at the bottom. The only valve in which the elements are fixed in three distinct positions.

The principle of Co-axial Mounting is not new. In fact, it has been the ultimate goal of every valve manufacturer since the invention of the three-electrode valve. But for years the difficulties proved insurmountable until Cossor—by reason of the peculiar advantages afforded by the hood-shaped Anode—was able to perfect a method sufficiently robust and accurate.

Co-axial Mounting ensures greater uniformity

The Cossor system of Concentric Mounting possesses far reaching advantages. In the first place, it ensures absolute uniformity of characteristics for all valves made to a certain specification. Experienced wireless enthusiasts know that in the past—in spite of the most critical manufacturing supervision—it has been difficult to prevent variations between valves of the same class. Two valves—identical to the eye—might give varying performances owing to minute differences in the spacings of the internal elements. Even if complete uniformity were possible in the factory, the wear and tear of everyday use causes changes in the relative positions of the filament, grid and anode. And thus alterations in the working characteristics of a valve become inevitable throughout its life. In the new Cossor Point One, Co-axial Mounting—backed by the most accurate and sensitive machinery and jigs it is possible to devise—is a positive safeguard against variation in performance. Valves made to any specification must be identical and constant throughout the whole period of use—variation is impossible.

The supreme importance of this will be at once obvious to users of Neutrodyne Receivers employing two stages (or more) of *matched* high frequency amplification.



Sectional view of the elements in the new Cossor Point One

In the above illustration a section of the Anode is cut away in order to expose the grid and the filament. Observe the seonite insulator which securely holds in position the grid and the anode. To all intents and purposes this insulator becomes an integral part of these two elements—the slightest individual movement of either of them is quite impossible. Through the centre of the insulator is passed the fine wire which retains the filament in position. Thus—come what may—even the hardest shock cannot disturb the exact relative positions of the filament, grid and anode.

Tests prove a great increase in life.

A further tremendous advantage of this new system of construction lies in its shockproof filament support. Whereas in many valves the filament, being straight, is retained under tension and is therefore subjected to considerable mechanical strain, that used in the new Cossor Point One is arched and retained in position by a fine wire passing through a seonite insulator.

It is not kept under tension and the sole object of the fine wire support is to hold the filament in position and to permit the slight elasticity necessary should the valve be dropped or otherwise subjected to accidental rough usage.

A series of tests—far more rigorous than any conditions under which the Cossor Point One would normally be used—has proved the complete efficacy of this new shockproof filament system. A concussion which caused an immediate fracture of the filament in an ordinary valve was easily and harmlessly absorbed by the filament in the Cossor Point One.

The new Cossor Point One

Red Top: For H.F. use 15/6
(Consumption ·1 amp.)
Plain Top: For Detector 15/6
(Consumption ·1 amp.)

The New Cossor Stentor Two

Green Top: For power use 18/6
(Consumption ·15 amp.)
All operate at 1·8 volts.

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—The new Dull Emitters with the long-life ·1 amp. filament.

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On Your Wavelength!

The Second "Double"

THE second simultaneous test in which alternative programmes were transmitted at the same time from 2 L O and Marconi House was a great success in every way. The first trial took place, if you remember, late at night at the end of the ordinary London programme. It is well known that the amateur *transmitter* never sleeps, but ordinary mortals who merely hold receiving licences make quite a lot of use of their beds, except, of course, in winter at such times as American stations are coming in well. Naturally, then, numbers of those who live in the London area could not take part in a test held at such a late hour, much as they would have liked to do so. The second "double" took place in the early evening, so that everyone was able to participate and to obtain a foretaste of the delights of being able to pick and choose from two transmissions of much the same strength and purity.

Better Results

There seems to have been a great all-round improvement in the results obtained. This is not surprising, for though the first test came at rather short notice, taking many by surprise, the second allowed them ample time to make a few necessary adjustments in their sets. Quite a number of people that I know could not get Marconi House during the first double broadcast because their coils were not big enough to allow them to tune up to 460 metres. By the time that the second attempt was made suitable coils had been provided and no difficulty was experienced.

I would like, by the way, to give one tip to those who find during future tests that they cannot separate the two transmissions owing to the fact that one or the other of them seems to occupy an unconscionable amount of space on the condenser scales. When this happens it is not infrequently a result of what is known as "direct pick up." This means quite simply that the coils and the wiring of the set, especially the former, are acting as collectors on their own account. The coils are, in fact, behaving like miniature frame aerials. It is well known that the frame is strongly directional, and the same applies to a coil when it is doing work that does not belong to it by functioning as a collector. Should you find that either 2 L O or Marconi House is coming in "all over the place," try the effect of turning your set bodily, moving it quite slowly and noting carefully what happens. In many cases it will be found that the offending station is heard over a smaller arc of the dials as movement is continued, and there will probably be a portion in which tuning is so much sharpened that it becomes possible to separate the two transmissions.

One other tip; long leads are apt to flatten tuning. This applies especially to the indoor part of the aerial lead-in, the high- and low-tension leads and to those of the loud-speaker. If you have yards of aerial lead-in lying about on the table in close proximity to the tuning coils it may be very difficult to tune out a strong signal. Moral, keep all the external wiring of the set as short as you possibly can.

America at Midsummer!

Whilst moving my condenser dials idly round on Sunday afternoon I had suddenly the thrill of my young life. Clear and strong came in speech with the accents of the other side of the Herring Pond such as had not been heard for months and months. Leaping to the door, I yelled to Mrs. Thermion. "Come and listen," I cried; "I have got New York in broad daylight at the height of summer." Mrs. Thermion came fleet-flooted and sat listening in mingled admiration and amazement as the loud-speaker poured forth its message. "Wonderful," she said. "And so strong, too; why, it's almost as good as 2 L O. Not so powerful, of course, and the quality is not *quite* so good, but it's marvellous, isn't it?" Just then the talk came to an end and a very English voice said, "2 L O calling. We will conclude our Independence Day programme with the Star Spangled Banner." You have seen those dying duck toys, haven't you? That was exactly what your Thermion felt like. All this somehow reminds me of the ribald story of the beginner who switched on during a violent electrical storm and thought that he was listening to a peace conference at Geneva!

The Great Competition

I am wondering how many amateurs are at the present time feverishly engaged in constructing super sets or in titivating existing ones with a view to entering them for the great competition organised by AMATEUR WIRELESS. The competition is the most original in the history of radio journalism, and its results should be interesting and far-reaching. I have seen a good many sets made by amateurs in other countries and few of them struck me as anything like so good as the products of our own skilled enthusiasts. Where we do score in this country is in the large variety and the excellent quality of the components and small parts available.

If I may make so bold as to prophesy, I would predict that in the competition the British-made sets will show a greater degree of individuality than those constructed in the States. The "kit" idea has caught on so much over there that the majority of home-made U.S. sets are built up from parts of one particular make, exactly on the lines of standard designs. Many of us prefer, if we do not design our own sets, to vary other people's designs a little to suit our own requirements; we make not a few of our small parts, and it is comparatively rare to find a home-made set constructed throughout with the products of a single firm.

But the most interesting part of the competition will be found in the practical tests of the apparatus. It is generally held that America is a little bit ahead of us as regards high-frequency amplification—this includes sensitiveness and selectivity coupled with stability—whilst we have a small superiority on the low-frequency side. Will the test confirm these views? Whatever the results are, one thing is certain—the competition will stimulate interest in the construction of wireless receiving sets, and it will lead to improvements in design, for each country will have a chance of seeing just what amateurs in the other are doing.

From the Seaside

I am thoroughly enjoying the seaside programmes that we are having just now, and I make no doubt that most readers

On Your Wavelength! (continued)

are doing the same. Quite apart from the excellence of the programmes, it is refreshing on a hot evening to hear music and humour from the seaside and to imagine yourself, as you so easily can, upon beach or pier or promenade. These seaside evenings are in fact real little holidays in themselves; that is why they are so popular. It must always be very difficult for the programme people of the B.B.C. to strike the happy mean between acceptable novelties and mere stunts, and they are remarkably successful on the whole in doing so. Amongst stunt items, which I do not think are very popular, I would class such things as the broadcast from the footplate of an express and the concert given from an aeroplane. Things of this kind are no doubt wonderful achievements, but they fall rather into the same category as feats like running up the descending half of a moving staircase or crossing the English Channel in a canoe. On the other hand, novelties which give us good music and genuine entertainment transmitted from some place other than the studio are always welcome.

Distinctly Interesting

The B.B.C.'s annual report, recently published, makes interesting reading. Progress has certainly been retarded by the regulation which limited the income receivable by the company for the year which ended on March 31 to £500,000. Had there been more funds available experimental work of a valuable kind could have been carried out earlier with a view to ascertaining the most satisfactory redistribution of stations and wavelengths in this country. It seems to me that the Post Office has not been too generous, since, as more than two million licences were issued in the period, the total amount paid by listeners was over a million pounds. If and when the B.B.C. is replaced by a Government department, shall we see broadcasting treated in a more lavish manner? Myself, I rather doubt it, and that, amongst other reasons, is why I am not very enthusiastic about the change which will occur unless listeners bestir themselves at the end of this year.

The "Ham" Spirit

The exhibition will be with us in September next, and we shall then all have an opportunity of studying at first hand progress which has been made by manufacturers of wireless sets and component parts during the past year. In the same week will be held the first "ham" convention at the Institute of Electrical Engineers, and there will then be an opportunity for British transmitters to display their enthusiasm and at the same time have a perfect orgy of wireless lectures and discussions. It was a happy thought on the part of the powers that be to arrange for this convention to take place at the same time as the wireless exhibition, for country members will have an opportunity of attending both functions. I already hear of amateurs who intend coming great distances and of others who are arranging for their annual vacation to take place at this period. The convention will undoubtedly be a huge success, and many members will have an opportunity of meeting in the flesh for the first time those voices which they have often heard over vast distances.

Looking Back

I have more than once during the past few weeks heard old experimenters refer to "those good old days when there was no broadcasting." Why it is that these enthusiasts should allow their memories to dwell with apparent fondness upon what now seems a dark age of wireless, I am at a loss to understand. Probably many of my readers can recollect those days when experiments had often to be conducted under the most trying of conditions owing to the fact that there were very few signals on which to test.

In those days, too, the amateur telephony transmitter was the star turn of the evening's work; he was well sought after by we who boasted but mediocre crystal sets, and if we were lucky enough to live within the vicinity of an amateur aerial and he was one of the now despised tinned-music fraternity, we, indeed, considered ourselves fortunate! For hours we sat with the phones in place, twiddling, and hoping that he had got a new record.

Then, again, consider the acquisition of that first thermionic valve. What difficulties we experienced! But there, after all, those were good old days, for we always had something new to try. I think that the main difference between then and now is that if we want new sensations now we have to search for them, whereas in those days they lay at hand ready to use—providing we could find the money to purchase the necessary parts.

About Atmospherics

Those who are new-comers to wireless probably will have experienced those unpleasant sizzlings, crashes or clicks which make themselves so prominent in the phones. These are known as "strays," "atmospherics," "X's," or "statics."

The term "stray" is probably derived from the fact that in the early days of morse inkers mysterious dots and dashes were recorded on the tape which were not a part of the message sent by the transmitter. The term "atmospherics" explains itself to a certain extent. It was a mark or record out of the atmosphere, as it were, not sent by human agency. The term "X's" also probably emanates from the mathematically-inclined individual who, knowing that he was receiving something about which he knew nothing, promptly termed them X—an unknown quantity! The term "static" relates to that form of energy which is stored up; for instance, static electricity is stored in a condenser after a pair of wires having a difference of potential (voltage) have been placed across the two terminals.

Uncertain Origins

Thus do we see that the various terms are more or less descriptive of this bugbear of wireless. Statics are caused by electrical discharges taking place somewhere on the earth. That they often come from a considerable distance is evidenced by the fact that observations made on certain nights at stations two hundred or more miles apart show that, so far as it was possible to take measurements, certain of them were of the same strength. On other nights it has been found that statics received at one station were not apparent a matter of twenty miles away, and those that were measurable were of considerably less strength. Another peculiarity about statics is that just before sunrise and sunset there is a distinct cessation of the usual steady stream. Statics fade about fifteen minutes before sunrise and likewise at sunset until they cease altogether, but about ten minutes afterwards they begin again and settle down for the next twelve hours in a steady stream, only being interrupted and increased to great intensity by the passing of a local thunderstorm.

A Wonderful Feat

All those who went the other day to the R.A.F. pageant at Hendon must have been struck by the perfection to which wireless communication between aeroplane and aeroplane, as well as between pilots and ground stations, has been brought. The exhibition of manœuvres controlled from the ground by wireless telephony was really remarkable. The loud-speakers installed in various parts of the field enabled the spectators to hear clearly the orders transmitted from the ground, as well as those from the squadron leader in the air to the aeroplanes under his command. The programme warned us not to expect too much, pointing out the enormous difficulty of broadcasting from a plane in which the microphone is within 3 ft. of the open exhaust of a 385-h.p. engine. Yet with all these difficulties the transmission was excellent, and provided yet another feather for the cap of the wireless engineer.

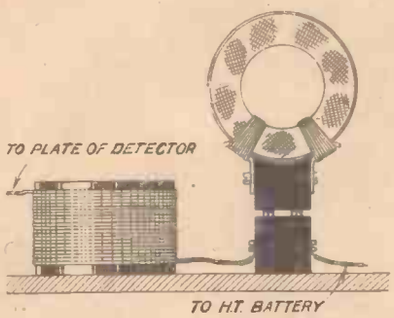
THERMION.

On October 23, 1926, at the Grand Palais des Champs-Elysées, the third wireless exhibition organised by the Syndicat Professionnel des Industries Radio-Electriques will be held. The display of the latest perfections in radio should be of particular interest to amateurs.

PRACTICAL ODDS AND ENDS

An All-wave H.F. Choke

THOSE who have built Reinartz and similar sets for receiving the 20-100-metre and 200-600-metre transmissions will have met with some difficulty regarding the choice of an H.F. choke coil suitable for both wavebands.



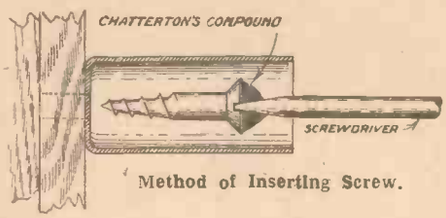
Arrangement of Choke Coils.

One solution of the difficulty is to construct a separate choke coil for the short waves by winding 100 turns of No. 36 d.c.c. copper wire on an ebonite former 3 in. in diameter and 2 in. long. The small choke is then wired permanently in series with a 500-turn plug-in coil, the latter being short-circuited when receiving on the 45-metre band. B. H.

Screw-driving Tip

WHEN constructing a complicated receiver it is sometimes necessary to insert wood screws between adjacent components or in some awkward position where difficulty is encountered in holding the screw until it "bites."

A pilot hole drilled the same diameter and length of the screw is one useful



Method of Inserting Screw.

remedy. A loop of wire could also be used to hold the screw in position, but if the screw head is attached to the end of the screwdriver with a little Chatterton's compound it is not necessary to hold the screw.

After driving the screw home a slight pull will cleanly remove the screwdriver and compound. B. G. R.

Cleaning Crystals

ALTHOUGH a crystal receiver may be suffering from a loss of signal strength, apparently due to the crystal being "worn-out," there is no need to discard the rectifying material as being of no further use. It is more than probable that a slight film of grease on the surface has destroyed the rectifying properties, and washing the crystal in pure methylated spirit will form an effective cure. Care should be taken to handle the crystal as little as possible. K.

Wiring-up Hint

A DIFFICULTY frequently experienced by constructors of multi-valve sets where a large number of wires is used is the gauging of the correct length of wire required for long connections.

The best way out of the difficulty is to keep handy a fairly long piece of, say, No. 20 copper wire and to make a temporary connection with this. When all the necessary bends have been made with this wire it can be straightened out and the correct length found. A piece of tinned copper wire can then be cut off the hank, with the advantage that none will be wasted due to incorrect gauging of the length of wire. V. W. B.

Losses Due to Cabinets

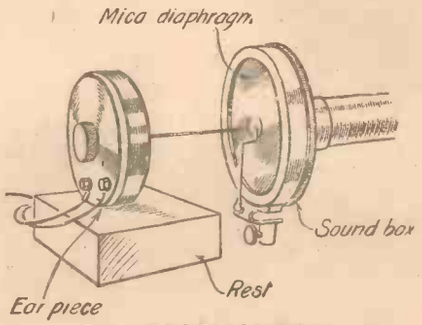
WHEN constructing a short-wave set, a loss in signal strength and stability may quite reasonably be caused by mounting the set in a heavily-varnished cabinet. If poor results are obtained with such a set it is well worth while to try the experiment of removing the set from its cabinet to see whether it improves results.

The effect of the varnished cabinet seems to be to increase the total distributed capacity of the set, thus causing annoying capacity effects, which are particularly noticeable on short waves (below 100 metres). If for the sake of appearance, or to keep dust away from the "works" of the set, a cabinet must be used, let it be one made of thinly varnished or unvarnished wood. S.

Improvised Loud-speaker

THOSE who possess gramophones will find the following hint useful for improvising a loud-speaker. A 3-in. length of No. 18 copper wire is fixed to the reed of a Brown A earphone.

If possible this should be soldered, though this is not absolutely essential. The other end of the wire is filed to a fine point, and the earphone so arranged that the point rests as nearly as possible on the centre of the mica diaphragm of the gramophone. Better results are obtainable using this method than by allowing the

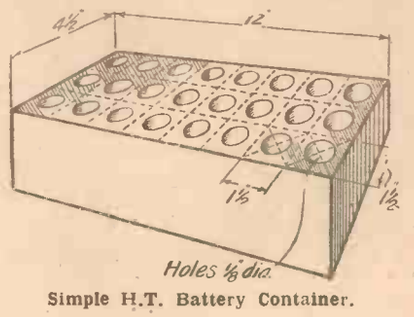


Improvised Loud-speaker.

needle to rest on the vibrating reed of the phone. L. B. H.

H.T. Battery Container

WHEN constructing "wet" H.T. batteries, difficulty is sometimes experienced in obtaining a large number of small glass containers for the cells. A cheap and efficient substitute can be made as follows: A wooden or stout cardboard box 12 in. long by 4½ in. wide and 3½ in. deep has strips of paper pasted on the inside joints. Hot paraffin-wax is then poured into the box until the latter is full. This operation should be performed slowly in order

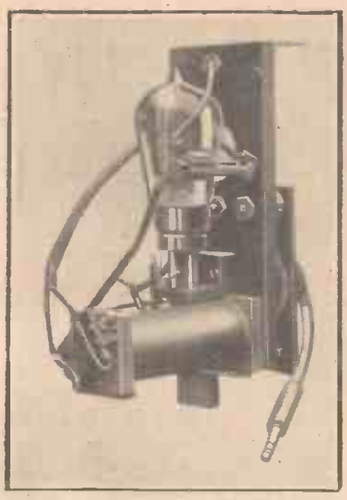


Simple H.T. Battery Container.

to avoid air bubbles. When the wax has set quite hard and cold, its surface is marked out in squares of 1½ in., giving twenty-four squares. With a brace and 1⅛-in. bit the centres of each square are carefully drilled down to a depth of 2½ in. These wax holes can then be used as efficient containers for the sal-ammoniac solution and the elements of the cells.

A. W. E.






These four photographs show front and rear views of units used in the system described below.

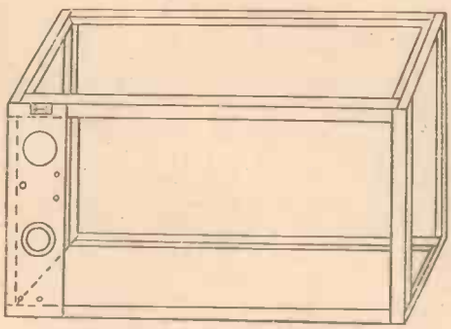
A NOVEL SYSTEM OF SET CONSTRUCTION

Alterations and additions can be made with the minimum of trouble and expense

THE true experimenter is seldom satisfied for long with the results from the set which he has constructed; to his mind it either lacks volume or quality or else it is not selective enough. This is the true experimental spirit, and will ultimately reward the amateur by the extra knowledge gained. The cost of ebonite and cabinet work which is involved in making these continual changes is, however, enormous. In addition to this, a large amount of time is taken up in mechanical details if the usual orthodox methods of erecting sets in polished cabinets is employed, and this time might be better employed in perfecting the electrical details.

As an alternative the unit system can be used; that is to say, the various parts of the set, such as the tuner, the detector, the L.F. and the H.F. amplifiers, can each be built in separate boxes. This is a distinct advantage, as the change of circuit may not involve any alteration to one part of the system. Even with this system the number of small boxes which must be employed if each stage is to be kept distinct from the next soon grows to a large number with a corresponding cost. Furthermore, each stage may not require the same size of box, and the look of a number of boxes each a different size is not pleasing.

A method of overcoming these troubles to a large extent is to build the set on a framework as shown in the photographs and drawing. The wood strips should be about 1½ in. square, and the frame can, of course, be made as long as required. Each small ebonite panel is then cut to the size required and can be fixed to the front of the top strip by means of a small hinge; this will enable the panel to be lifted up and an inspection of the wiring at the back to be made without trouble. If this method is employed the wiring of the unit can be carried out at the back, and the sub-wiring be made from unit to unit at the front. The photographs show the back and fronts of small panels made for this system. Stage to stage connections are made by ordinary plugs and jacks. If a good finish is required, the whole system can be enclosed in the cabinet without losing any of its advantages. A. H. H.



Details of the Framework for Supporting the Units.

LIGHTNING AND RECEPTION

"IS it unsafe to use a receiver when it is lightning?" This question is always cropping up, and much conflict of opinion exists. The following, however, may be considered an unbiased answer to the question. To begin with, general opinion is divided into two camps. Some insist that, provided a lightning discharger is connected across the aerial and earth terminals of the set, no damage can ensue through lightning; others assert that the presence of an aerial actually increases the risk of lightning striking a particular building, and that having struck the aerial it will not necessarily spark across the discharger to earth, but may damage the receiving set.

It has long been a universal practice actually to provide buildings with conductors to safeguard them against damage by lightning; therefore provided precautions are taken in the erection of a wireless aerial similar to those taken in the case of a lightning conductor, there can be no reason to assume that the presence of an aerial causes danger to a building. In the case of a lightning conductor, care is taken that the conductor is as free as possible from any sharp bends, since if lightning does strike it is apt to pierce the ledge or obstacle causing the bend rather than follow the distorted conductor.

It is therefore natural to assume that if a discharge gap be connected across the aerial and earth leads as near the entrance of the aerial as possible, a lightning discharge will prefer this path rather than that via the inductances in the receiving set. See, therefore, that you provide a lightning discharge gap as near the outside of the building as possible. T. A.

The Air Ministry is erecting a number of short-wave stations in the British Empire for communication with aircraft.

The cost of wireless receiving licences in Czecho-Slovakia has been reduced from fifteen to ten kroner, or roughly 1s. 2d. per annum.

"A.W." TESTS OF APPARATUS

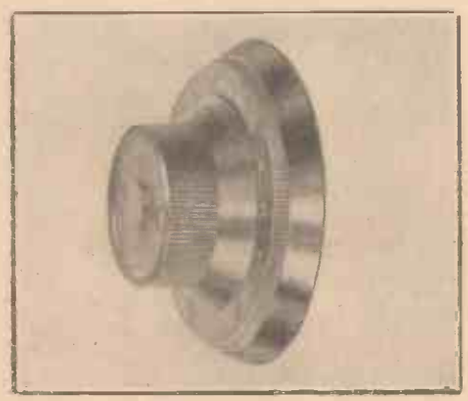
Conducted in the "Amateur Wireless" Research and Test Department

New Vernier Dial

THERE are many vernier dials on the market, all of them incorporating more or less ingenious gearing devices, but few can equal the MH vernier dial in this respect. Use is made of a neat mechanical movement which gives a slow or quick motion of the dial using only one knob. The dial fits any size of condenser spindle, a separate bush being supplied for spindles having a diameter of ¼ in.

The scale is marked from 0 to 180 degrees on the bevelled edge of the dial, while a vernier scale is engraved on the side of the control knob. The latter gives a slow-motion control over 10 degrees of the main scale for a 60-degree movement of the control knob. This gives a gearing ratio of 6 to 1.

Owing to the construction of the slow-motion mechanism, it is impossible for any backlash to occur. Moreover, the knob operates the mechanism through a conical stud which, by reason of its shape, automatically takes up any wear.



MH Vernier Dial.

We have tested this dial and can say without any hesitation that it is one of the best we have tried. The manufacturers are L. McMichael, Ltd., of Hastings House, Norfolk Street, Strand, W.C.2.

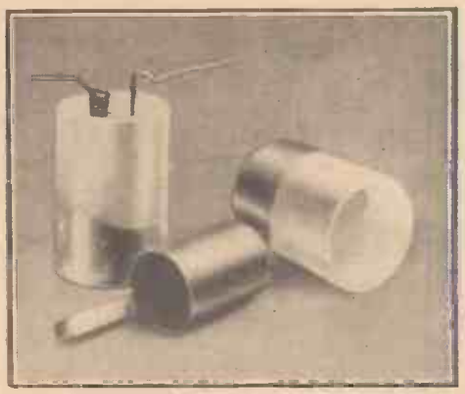
H.P.R. H.T. Battery Cells

WE are glad to note that the H.P.R. Co., of Leyton, are producing small glass cells, together with the necessary electrodes, for the construction of wet H.T. batteries of the Leclanché type.

Each glass container measures 1½ in. in diameter by 2¼ in. long, and is waxed round the rim to prevent creeping of the electrolyte. A zinc electrode of ample proportion is provided and is sufficiently thick to last for a very long time. The carbon electrode is supplied enclosed in a sack containing the necessary depolarising compound.

Connections to the electrodes are brought out to connecting strips which may be easily soldered or clipped together in series.

With these cells a very efficient form of H.T. battery can be constructed, possessing



H.P.R. Leclanche Cells.

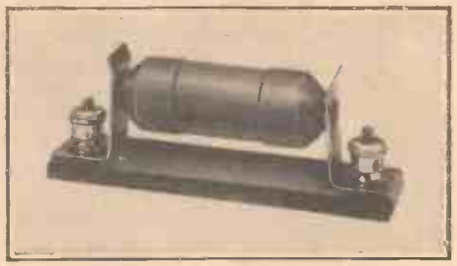
the decided advantage that at any time an inspection of each individual cell can be made and, if found faulty, may be replaced or cut out altogether.

A wet battery of this type is very free from parasitic noises, and if carefully looked after will outlive the usual type of enclosed dry battery.

V.M.C. Anode Resistance

WE have examined and tested samples of the anode resistance manufactured by The Varley Magnet Co., of Woolwich, London, S.E.18. This fixed resistance is wound with a fine gauge of resistance wire, thereby ensuring that the value of the resistance remains absolutely constant in operation, free from the scratching or crackling noises that a resistance composed of paste or powder is apt to create.

The resistance element is contained in the usual form of cartridge case, having a



Varley Anode Resistance.

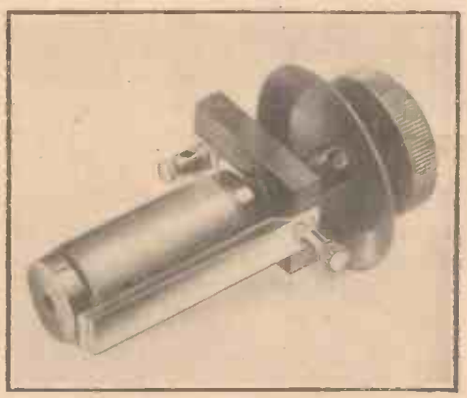
conical metal contact at each end to which the resistance element is connected. The cartridge clips in between two flat metal springs which are bolted to an ebonite base by terminals of ample proportions.

An amplifier consisting of two or three stages of resistance-capacity coupled valves, using wire-wound anode resistances such as those described, will give the purest reproduction obtainable, although the amplification per stage will not equal that of the transformer-coupled amplifier. It is essential, also, that suitable valves are used in conjunction with the resistances, having a fairly high amplification factor and impedance.

In order to overcome the voltage drop across the resistance, the H.T. applied to the valve should be not less than 120 volts. A grid-bias battery is also necessary, applying a negative potential to the grid of the valve through a grid leak that should not exceed .5 megohm in value.

Smoothac Filament Rheostat

WE have received from A. W. Stapleton, of 19A, Lorrimore Buildings, Lorrimore Street, London, S.E.17, a sample of the Smoothac filament rheostat, illustrated in the accompanying photograph.



Smoothac Rheostat.

This component possesses some outstanding features which are worth noting.

The resistance wire, for instance, is wound, over a piece of asbestos cord, in a helical fashion on a cylindrical former. This gives the resistance winding a helical projection, so that when the cylinder is rotated by the control knob each turn of wire on the helical projection makes contact with a stationary flat contact strip.

This method of varying the resistance ensures a very smooth action, and as each turn of the wire comes into contact with the strip in a direction parallel with the axis of the wire, very little wear takes place.

The workmanship and finish of the rheostat is of the highest quality, and is sufficiently substantial to resist the roughest use. The component takes up very little panel space—less than that required by the usual circular rheostat.

TAKE YOUR WIRE

An Appreciative Article on Summer Wi

By Capt. JA

An addition to the charms of the river.

DOES wireless lose its interest during the summer months? Some people say that it does, and give as an explanation the counter attractions of the open road and open-air life generally. Those who live far from a broadcasting station complain of a falling off in signal strength during the summer months due to the light evenings; accordingly they allow their receiving sets to stand idle until the evenings get chilly and dark again and fires and inglenooks are popular. But there are many people who take their phones or loud-speaker out into the garden during the sunny hours and carry on as though it were always "listening time."

So, to whichever group we may belong, whether we are enthusiastic all-the-year-round listeners or not, we are all interested in novel methods of listening. When a friend tells us of an ultra-portable wireless set that he has, which may be moved into the country or to the seashore or used in a drawing-room, our interest is awakened—we sit up and take notice.

An interval in the motor trip.

In the early days of broadcasting the portable set was unknown in its attaché-case form, but a set carried by railway train or motor-car from place to place for entertainment *en route* was certainly known.

It was in the latter end of 1922, when broadcasting in Great Britain was but newly inaugurated, that a train steamed out of a large London railway terminus with a wireless receiving set aboard. The aerial was fixed along the roof of a luggage van with insulated supports, the set reposing in the van beneath. The earth was made to the chassis of the van. The great difficulty in those days was with the aerial. Trouble was also experenced from the lighting dynamo beneath the floor of the van, noises being received due to induction into the aerial wires. One very practical "snag" was the tunnel room above the roof of the coach. Sometimes trains have to pass through tunnels which allow quite a small clearance, and the erection of supports upon the roof to which the bare aerial wires were fixed was therefore a difficult matter. We all know of the unavoidable sag which occurs in aerial wires between supports. This was the trouble. The supports above the roof had to be short and the aerial had to be of the necessary length. This difficulty, however, was soon surmounted. To-day certain trains are equipped with wireless receivers which supply loud-speakers in various coaches.

The motor-car offers great possibilities. Lots of people nowadays take a receiving set in their car and a length of insulated aerial wire so that, on arrival at the picnic ground the aerial can be flung over a convenient tree. A quick earth can be made and listening can be carried on as usual. The disadvantage of this is, of

Suitable Valves for Portable Sets

The valves used in portable receivers must be capable of standing a great deal of rough treatment. The following is a list of valves which may be used in various stages in the receiver.

H.F. Valves.—Marconi and Osram DE8 H.F., Burndept H512, H310, Ediswan AR06, Cossor W2, Mullard D3 H.F., D06 H.F.

Detector Valves.—Marconi and Osram DER, Burndept HL310, B.T.H. B5, Cossor W1, Mullard DE06 (white ring.)

L.F. Valves.—Marconi and Osram DE2 L.F., DE8 L.F., Burndept L525, B.T.H. B7, Ediswan AR06 L.F., Cossor W1, Mullard D3 L.F., D06 L.F.

Portable Receiver Weights

The following is a list of the chief portable receivers and their approximate weights.

B.T.H.	2v.	...	27 lbs.
Climax	1v.	...	13½lbs.
Ediswan	2v.	...	19 lbs.
Gillan	4v.	...	21 lbs.
Halcyon	4v.	...	32 lbs.
Levis	4v.	...	18 lbs.
Magnum	2v.	...	20 lbs.
Marconiphone	2v.	...	24 lbs.
M.P.A.	3v.	...	35 lbs.
Pelican	5v.	...	38 lbs.
Rees-Mace	4v.	...	28 lbs.
Rolls	2v.	...	20 lbs.

ELESS WITH YOU!

reless on Rail and Motor, Sea and River

CK FROST

course, that no listening can be indulged in until a halt is called, and that may be after the news bulletin or some special item has been transmitted. It may be of advantage, therefore, to make some arrangement in the car itself for an aerial and earth system which may be used whilst the car is in motion. The type of aerial that was found to be efficient was one mounted on insulators and inserted in the roof of the car body. It was composed of a sheet of copper and had soldered to it an insulated lead to the receiving set placed in a recess built beneath the driver's seat and forming a cupboard with doors opening at the level of the passenger's feet. The phones and controls were fixed close by the hand of the passenger, together with a switch for operating the high- and low-tension supply. Major adjustments were made to the set itself and the doors of the recess closed and locked if necessary, fine tuning being effected by the passenger without any trouble at all.

The earth for this set was fixed to the chassis of the car beneath the floor of the body. The aerial in the roof was conveniently placed out of sight beneath the car upholstery, and all leads were likewise hidden.

The picnic party finds it invaluable.

One detector and four or more H.F. valves would probably be found to be the best for such an installation. It must be borne in mind that headphone strength only may be possible as, apart from lack of volume, a loud-speaker would hardly be convenient in a moving car. The business man travelling from place to place is the one who is likely to be most interested in this type of car installation, in that news items may be received or entertainment may be enjoyed as a pleasurable relief to the tedium of a long journey. The majority of motorists find that it is sufficient for their requirements to have wireless at the halt, a portable receiver being pressed into service with an insulated wire as aerial.

It must be remembered that, when an aerial is flung over the bough of a convenient tree, screening from surrounding trees which tower above it may be a cause of weak reception. Many people have asked the distance at which reception is possible with this type of "lash-up." It is very difficult indeed to state this with any degree of certainty. If a two- or three-valve set is used, and the listeners are content with reasonable headphone strength, reception should be good on most roads near to a main broadcasting station.

But what of the river and the Broads? A punt or a yacht can be equipped with wireless, and the aerial can be erected between poles fixed at each end of the punt. Its height will, I fear, suffer, and so will signal strength, but with a powerful receiver this snag may be overcome.

(*Concluded at foot of next page*)

There is much for the experimenter out of doors.

Portable Receiver Sizes

That even a multi-valve set can be made very compact is shown by the following table of the dimensions of a number of portable receivers.

Climax	1v.	11 x 12 x 9	in.
Ediswan	2v.	16½ x 12 x 7½	in.
Fellan	4v.	18 x 13 x 7	in.
Halcyon	4v.	15 x 14 x 8½	in.
Levis	4v.	18 x 12 x 6	in.
Magnum	2v.	16 x 6 x 10½	in.
Marconiphone	2v.	15 x 11 x 9	in.
M.P.A.	3v.	12½ x 15 x 9½	in.
Pelican	5v.	17½ x 16 x 9	in.
Rees-Mace	4v.	17½ x 16½ x 8	in.
Rolls	2v.	15 x 11 x 6½	in.

Frame-aerial Windings

Below will be found suitable windings for a square frame aerial, each side measuring 2 ft. No. 22 or 24 S.W.G. copper wire should be used for winding. The turns should be spaced apart about ⅛ in., and a condenser having a maximum capacity of .0005 microfarad used for tuning.

300 metres: 9 turns, using 74 ft. of wire.
600 metres: 15 turns, using 122 ft. of wire.
800 metres: 21 turns, using 170 ft. of wire.

A small loading coil may be placed in series for increasing the tuning range, but the frame itself should always be as large as possible so that the greatest amount of energy may be picked up.

IN one of the Courts of the King's Bench Division an elaborate system of wiring was installed in conjunction with a small amplifier in order that a deaf man, interested in the case being tried, could follow all the evidence by the aid of a pair of headphones.

Successful tests in the direction and operation of goods trains by radio-telephony have been completed by the New York Central Lines. Conversations between engine and guard's van were carried on for five hours during a severe electrical and rain storm, and no interference from steel bridges, power lines, or passing trains was experienced.

One of the clauses in the will of an inhabitant of Wrexham (Denbigh) referred to what is believed to be the first bequest of wireless apparatus.

The B.B.C.'s S O S broadcast recently on behalf of the Metropolitan Hospital for a she ass—perhaps the most curious S O S that has yet been broadcast—was highly successful. Within two hours the services of two she asses were volunteered.

Miss Gertrude Jennings' popular one-act play, *Five Birds in a Cage,* is to be presented to London listeners by Mr. R. E. Jeffrey on July 23.

"TAKE YOUR WIRELESS WITH YOU!" (*continued from preceding page*)

The earth is the simplest thing of all. The water itself is the "earth," and a really efficient one too.

On or near the coast troubles will arise in the shape of interference from ship and shore morse stations. Little can be done about this other than by the use of elaborate and therefore expensive apparatus. But let us take heart, this type of interference is decreasing and will continue to decrease as time passes.

At certain seaside places wireless on the beach is forbidden, but at others bathing tents and huts are equipped. Many a merry holiday party listens to while away the sunny hours.

Reception is always best in the hours of darkness, so don't be disappointed if your signals are somewhat weaker during daylight now that long evenings are with us once more. Watch your aerial and earth and all connections to them. Don't allow joints to become loose. Don't let your aerial sag; keep it tight. In fact, keep everything fit and healthy for the winter months and dark evenings which will be with us again all too soon.

On the occasion of the annual meeting of the British Association at Oxford on August 4, the Prince of Wales's speech in the Sheldonian Main Hall will be simultaneously broadcast by all B.C.C. stations.

The Bells of Croyland Abbey will again be broadcast on August 1.

On July 21 the London station will relay a concert-party performance from the Pier Music Pavilion, Eastbourne.

Germany has produced a new wireless valve which actually consists of two valves in one, but uses a common filament. It is known as the "Pentatron."

Signor Italo Maschi, who claims to be the last of the Troubadours, will give a recital of songs at the 2 L O studio on Wednesday, July 21, to the accompaniment of his own guitar.

Commencing in July, and continuing throughout the holiday months, relays of band and concert-party performances are to be given twice a week from Kelvingrove Park, Glasgow.

At the recent camp-fire broadcast from the shores of Loch Lomond a welcome and unrehearsed feature was the singing of thrushes and other birds. It has been decided to repeat the entertainment, and it is hoped that the feathered vocalists will again co-operate.

The Liége Radio Club now broadcasts a concert twice weekly on a wavelength of 585 metres, but as it is interfering with commercial transmissions, it is stated that another wavelength will have to be adopted.

The American Society of Authors, Composers and Publishers only allow the broadcasting stations to play selections once a week from certain musical shows now being performed in New York in order that the public may not become tired of hearing the music.

A new revue entitled *No Option* will be broadcast from 2 L O on July 24; the scene is supposed to take place in a prison.

The President of the American Broadcasting Association has intimated that he is considering a plan for the organisation of a company of artistes to tour from one broadcasting station to another throughout the United States in the same way as dramatic companies are booked.

The Irish Free State hopes to erect and equip three more broadcasting stations, each with a power equivalent to that of Dublin.

It has been discovered that small pieces of red sandstone, which are to be found in certain parts of the north of Scotland, can be used instead of crystals as detectors with encouraging results.

A 700-watt relay station is in course of construction at Hamar, a small town of some 8,000 inhabitants, on the borders of Lake Mjoesen (Norway). When in operation it will relay the Oslo daily programme.

There are no broadcasting stations in Rumania, but the cost of a wireless-listener's licence is 250 lei for any apparatus using more than two valves, or roughly 5s. per annum.

At Langenberg, near Cologne, what will be the biggest wireless station in Europe, is rapidly approaching completion. The new station, which will have a power of 60 kilowatts, will enable owners of crystal sets to hear everything sent by Langenberg within a radius of about a hundred miles.

The World's Christian Endeavour Convention is to be relayed to 2 L O from the Crystal Palace on Sunday, July 18th, from 8.15 to 8.55 p.m.

Highgate School, one of the best-known educational institutions in North London, is to broadcast a school concert on July 26.

The Radio-Wein broadcasting station near Vienna is to test out the new Karolus system for transmitting photographs over a long range.

Pitlochry (Perthshire) Women's Rural Institute has given a fully equipped four-valve receiving set to the Atholl District Nursing Home for the use of the patients.

Experiments are being carried out by the Post Office, near Cupar, Fifeshire, as part of a comprehensive series of tests designed to determine the relative amount of atmospheric interference with wireless reception in various parts of the country.

In the twelfth and last of the Shakespeare Heroines' series, to be broadcast on Sunday, July 18, Miss Gertrude Elliott (Lady Forbes Robertson) will play the part of Katharine of Arragon from *Henry VIII.*

The Idzerda Radio Company of The Hague has been granted a transmitting licence by the Dutch Administration of Posts and Telegraphs, and will shortly broadcast, using the old call-sign P C G G.

Experiments have recently been made at Nauen (Germany) in the transmission of photographic pictures on a short wavelength of 40 metres. Further tests will be undertaken during this and next month by the Telefunken Company between Berlin-Buenos Aires and Berlin-Rome.

The underground Metropolitan stations in Paris have been equipped with loud-speakers for broadcasting of the times and destinations of electric trains.

Radio Belgique (Brussels) is making experimental transmissions on a wavelength of about 550 metres.

AN "ALL-EUROPE" LOUD-SPEAKER SET

The second and concluding article on the construction of a five-valve receiver for loud-speaker reception of all Continental and B.B.C. stations.

THE centre of the coil bridge should be fixed 5¾ in. behind the rear of the front panel. A moving-coil holder with a long spindle is required. In this receiver the spindle is 5¾ in. long, and the moving-coil holder is on the left-hand side of a two-way coil holder. The fixed-coil holder of this component is not made use of as it is not spaced at the correct distance from the moving-coil holder. In fixing the coil holders care should be taken to see that the pins are all to the rear and that the coil holders are all parallel to each other. If an ebonite bridge is used, the drilling should be in accordance with Fig. 5, which also shows the terminal strip on which the battery leads are terminated.

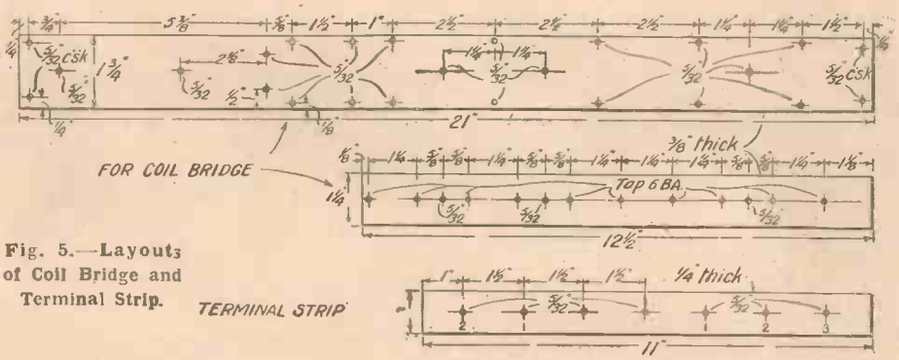


Fig. 5.—Layouts of Coil Bridge and Terminal Strip.

Wiring

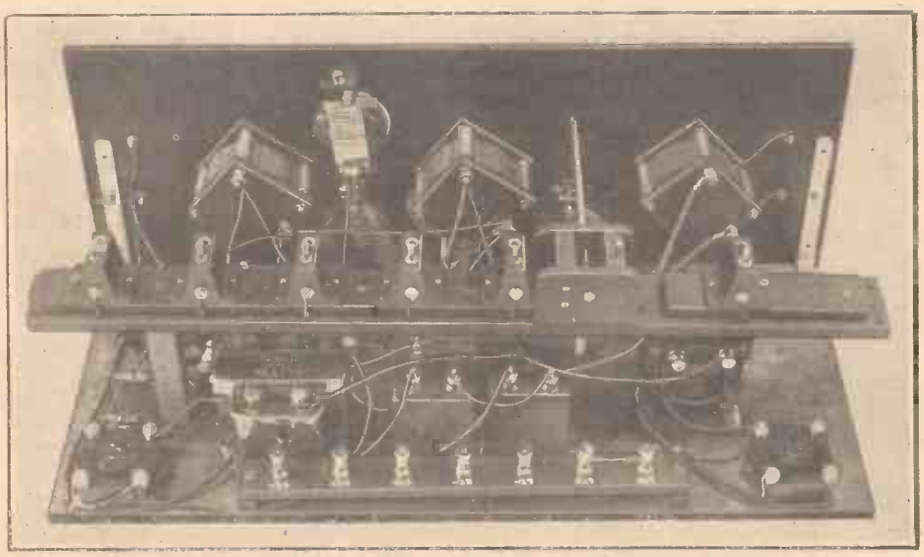
Fig. 6 shows the wiring of the receiver, and it is of great importance that the connections of the high-frequency portion of the receiver be made strictly as shown. No. 22-gauge tinned-copper wire is used throughout, and Systoflex sleeving is used for insulation. Special points to be noted in connection with the wiring are as follows:

(1) The pin of the moving-coil holder is connected to the grid of the first valve, and the anodes of the two high-frequency valves and of the detector valve are connected to the pins of their respective coil holders. When the coils are plugged in to their coil holders the trade names on the top of the coils should all read the same way.

(2) The moving plates of the aerial tuning condenser should be connected to earth and the moving plates of the two anode-tuning condensers should be connected to H.T. +.

(3) The layout of the high-frequency portion of the receiver is designed so as to ensure that the wiring shall be as short and direct as possible. The layout of the components as shown in Fig. 6 should therefore be strictly adhered to.

The following is a list of the components used: One No. 25 Powquip coil; two No. 35 Powquip coils; three No. 50 Powquip coils; three No. 75 Powquip coils (Power Equipment Co., The Hyde, Hendon, N.W.9); three Polar cam-vernier variable condensers, .0005 microfarad; three Igranic rheostats, 6 ohms; three Igranic auxiliary resistances, 25 ohms; one geared two-way coil holder with 5¾-in. handle (A. Munday, Ltd., 59, Watling Street, E.C.4); one mahogany cabinet, 21 in. by 8 in. by 9 in.; one mahoganite panel, 21 in. by 8 in., and panels for coil bridge and terminal panel (S. Marks and Sons, 7, Carthusian Street, Aldersgate Street, E.C.1); five single-coil holders, preferably with square base (E. Gray and Sons, 18, Clerkenwell Road, E.C.1); eleven electroplated terminals; one key, No. 68 (General Electric Co.); two .0001 fixed condensers (Dubilier); two .0003 fixed condensers (Dubilier); two .001 fixed condensers (Dubilier); two grid leaks, 2 megohms (Dubilier); two grid-leak attachments (Dubilier); five Benjamin valve holders; one Powquip Manchester-type transformer; one Powquip Orchestral-type transformer (ratio 4 to 1); one T.C.C. condenser, 2 microfarads; two T.C.C. condensers, 1 microfarad; one grid-bias battery, 4½ volts (Ever Ready).



View of Back of Receiver (out of case) with Coils Removed.

Details of Coils

The special coils used in this set, which are made by the Power Equipment Co., are provided with a loose pin which can be screwed into either of two sockets fitted on the under side of the coils. This is to enable the coils to be readily reversed without altering the wiring to the coil holders. The windings are in the same direction when the name Powquip on the tops of all coils reads in the same direction, and the wiring of the set is so arranged that the coils should all be inserted in the holders with their windings in the same direction.

The following table shows the sizes of coil to use for various wavelengths:

Wav.lengths		Aerial Coil No.	First Anode Coil No.	Second Anode Coil No.	Reaction Coils (Three)
From	To				
200	350	25	35	35	50
350	500	50	50	50	75
500	700	75	75	75	100
700	1500	100	150	150	200
1500	2500	150	200	200	250

(Concluded at foot of next page)

REGIONAL BROADCASTING

FOR the past twelve months the question of a change of policy of transmission has been uppermost in the minds of broadcasting authorities. From the earliest days of broadcasting it was realised that the arrangement of stations which was being developed would in the natural course of events become obsolete.

At the outset, licence holders desired immediate facilities for receiving programmes, with the result that transmitting sets were erected in the centres of population. This satisfied the demands of the public for the time being, but it soon became necessary to increase the area of reception by the addition of relay stations, and this meant increase of personnel and technical equipment. The result has been that the greater portion of England and Wales is now covered by existing arrangements.

Economy

It can be seen that were the country to be divided into regions and, by increase of power, these regions adequately to be covered for crystal reception, not only would a decrease in the total number of stations result, but, owing to the increase in range, a greater choice of programmes would be available to the small set owner. Such an innovation would do away with the need for numerous relay stations.

Alternative Programmes

The next matter for consideration was how the different tastes of listeners could be catered for. In every area there exists a strong local feeling for the possession of a station through which the individuality of a neighbourhood can be expressed. Lancashire, for instance, prides itself on its musical taste, and very naturally demands a station expressive of this advanced musical education, and similar demands exist in other areas.

Now if regional transmitting points were in duplicate, each area could receive the London programme and also radiate a local broadcast. Present ideas point to the early erection of a second London station, so each region by relaying two contrasting London programmes could give to their listeners an alternative Metropolitan broadcast.

Economy in Material

It will be seen that the above scheme would reduce the number of existing stations. Were five areas, excluding London, to be established, the total number of original programmes need be seven only—this against nine or twenty as at present. By duplication of transmitting plant each area would have two programmes within crystal range, excluding Daventry, while the valve-set owner would possess the choice of seven. By reducing the number of original broadcasts an enormous saving in programme material would result, and in addition economy of personnel and equipment.

ROBERT GLENDINING.

AUTUMN WIRELESS EXHIBITIONS

IT is interesting to note that the opening date of the Wireless Exhibition, to be held in London in September, nearly coincides with that of the Grosse Deutsche Funk Austellung (the German Wireless Exhibition) in Berlin, which is to be opened on September 3. However, as the Berlin exhibition is only from September 3 to September 12 and the London exhibition extends from September 4 to September 18, it will still be possible for the keen wireless enthusiast or trader to ascertain by actual inspection exactly what advances have been made in both countries.

For the past two years the Berlin exhibition has been the larger. This year, however, as the London exhibition is now open to a wider field of manufacturers and distributors and more than 130 exhibitors have already taken space. A note regarding the French exhibition, which is to be held in October, appears at bottom of p. 66.

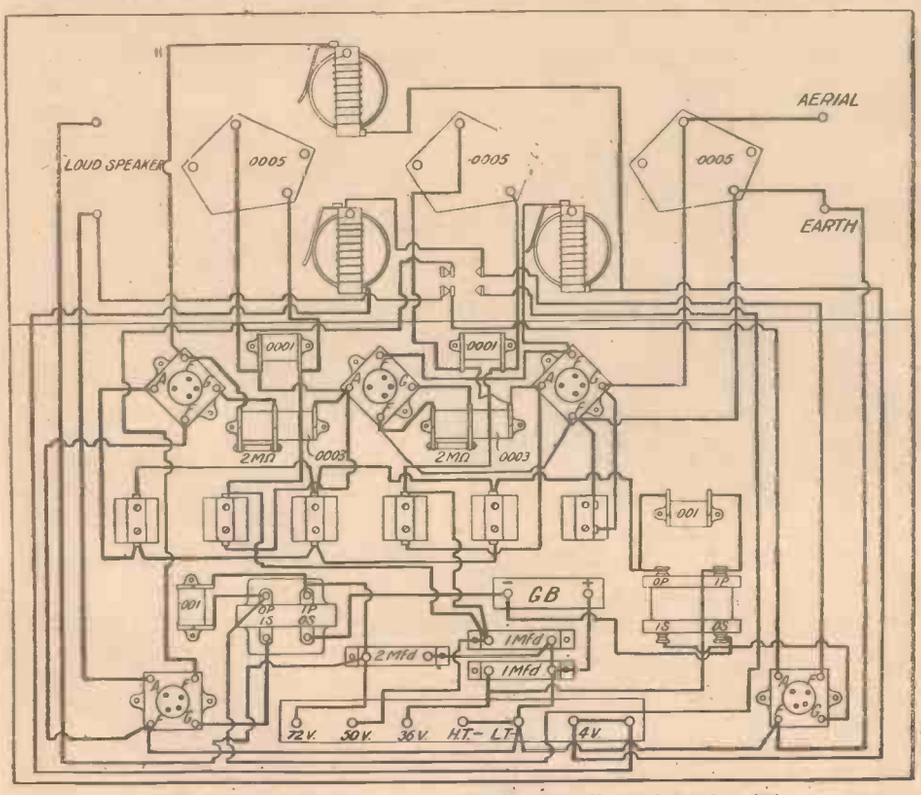


Fig. 6.—Wiring Diagram of the "All-Europe" Loud-speaker Set.

"AN 'ALL-EUROPE' LOUD-SPEAKER SET"
(*continued from preceding page*)

The valves used are as follows: First H.F., DE3; second H.F., DE3B; detector and two L.F.s, B.T.H. B5. Valves having corresponding characteristics may be substituted for this selection if desired.

Tuning

On wavelengths below 350 metres the aerial coil should be closely coupled to the reaction coil. The set will not oscillate on these wavelengths, and the music from all stations can be easily tuned in on the loud-speaker. On wavelengths above 350 metres there will be a tendency for the set to oscillate if the aerial coil is closely coupled to the reaction coil, but by turning the aerial coil away from the reaction coil a few degrees, perfect stability will be maintained and all stations can be tuned in as before.

It should be borne in mind when calibrating the set that the tuning is very sharp. The reading of the two anode-tuning condensers is approximately equal for any given station and the reading of the aerial condenser is only slightly different.

J. McK.

Pouishnoff, the famous pianist, is to give a series of recitals at the end of the month.

Jack Hylton.

NEXT WEEK AT 2LO

By "THE LISTENER"

In the Programmes

A PLEASANT change is promised for Sunday afternoon in the way of a light orchestral programme given by the Wireless Orchestra, the soloists being Cedric Sharpe, the well-known violoncellist, and Mark Raphael, a baritone who created a very favourable impression by his classical recitals at Wigmore Hall, and who will sing on this occasion a rarely heard song cycle, "To Julia," by Roger Quilter.

The orchestral music includes incidental music to *The Merchant of Venice,* which forms a prelude therefore to the last of the series of Shakespeare's heroines, in which Miss Gertrude Elliott (Lady Forbes Robertson) plays the part of Katharine of Arragon from *Henry VIII.*

The Sunday evening service is a relay from the Crystal Palace, where a World's Convention is being held. The evening programme is in the studio and provided by the famous Casano Octet, with Ethel Fenton, contralto, as vocalist.

Mr. George Grossmith appears before the microphone on Monday to read one of F. Anstey's poems, "Juniper Jem." Chamber music follows by the Boris Pecker String Quartet, with Miss Isabel Anson, soprano. Between 10 and 11 p.m. a variety programme includes Fred Rome and Buena Bent, Colleen Clifford, and Scotch humour by the well-known comedian Harry Merrylees.

There are some people who have a taste for listening to debates, and on Tuesday one of musical interest is announced between Sir Landon Ronald, supported by the Wireless Orchestra, and Jack Hylton of jazz fame. These musicians will discuss the merits of classical and jazz music, with illustrations in support of their arguments.

The first half-hour of Wednesday's programme will be provided by the Wireless Orchestra and Italo Meschi, who claims to be the last of the descendants of the Troubadours, the band of wandering minstrels which existed in the Middle Ages. Signor Meschi will sing to his own guitar accompaniments. Another seaside relay follows at 8.30, when "Pier Revels of 1926," under the direction of Mr. Felgate King, will be relayed from the Pier Music Pavilion, Eastbourne. And an orchestral studio programme concludes the day under the ambiguous title, "The Long Day Closes."

The Victor Olof Sextet, with the blind singer Sinclair Logan, provide a programme on Thursday. This is followed by a half-hour of Lawrence Anderson and the Roosters Concert Party with "The Vicar at a Jumble Sale." As a sharp contrast, at 10.5 will be heard the eminent violinist, Albert Sammons.

Most playgoers have seen Gertrude Jennings' one-act play *Five Birds in a Cage,* and for Friday evening Mr. R. E. Jeffrey has prepared it for the microphone. The symphony concert which follows will be conducted by Dr. Adrian Boult. Included in the programme is Vaughan Williams' "Wasps" and "Folk Song Idylls," by George Butterworth, the young composer who was killed in the war.

On Saturday a revue *No Option,* written by Weston Drury, will be given. Later follows a performance by Callender's Band, interspersed with songs by Carmen Hill. Included in the revue *No Option* are Ena Grossmith, Tommy Handley, Eddie Reed, Theo Charlton, Robert Kepple and Miriam Ferris.

Cedric Sharpe.

From Our Own Correspondent.

MR. DAY asked the Postmaster-General if he could state the result of the experimental alternative programmes test made by the British Broadcasting Co., and whether it was likely that such alternative programmes would be made a permanent feature of British broadcasting?

Sir Wm. Mitchell-Thomson replied that authority had been given to the British Broadcasting Co. to conduct a series of tests in the simultaneous transmission of different programmes from two stations in close proximity. The tests were not yet completed, and it was not yet possible to make any statement as to their result.

Sir Harry Brittain inquired whether the appeal by the British Broadcasting Co. to owners of unlicensed wireless sets to pay for their licences had had any noticeable effect, and whether it was intended to reiterate this appeal from time to time?

Sir Wm. Mitchell-Thomson said that the number of wireless licences issued showed a steady increase, but it was impossible to say to what extent the increase is attributable to the practice of broadcasting notices concerning the use of unlicensed wireless sets. These notices were broadcast periodically because the owners of unlicensed sets sometimes profess, when questioned, to be unaware of the legal obligation to obtain a licence, though this was, of course, no excuse in case of a prosecution.

Sir Harry Brittain asked the Postmaster-General whether he could state what number of owners of wireless sets had been prosecuted up to the present for not being in possession of a licence, whether any such owners had been proceeded against on more than one occasion, and what was the maximum penalty which has been inflicted?

Sir W. Mitchell-Thomson said that the number of persons prosecuted for the use of unlicensed wireless apparatus since the passage of the Wireless Telegraphy (Explanation) Act last autumn was 296. Up to the present it had not been necessary to prosecute any person more than once. The maximum penalty imposed was £10, in addition to £10 costs.

On July 27 listeners will hear the first instalment of a serial by Mr. A. E. W. Mason, and the readings will be continued throughout the week.

It is with the deepest regret that we announce the death, which occurred last month, of Mr. F. A. Graham, the respected chief of the House of Graham, manufacturers of the famous Amplion Loudspeakers.

At the request of many readers we are extending the Closing Date for Entry Forms until Tuesday, July 20th . . . .

Apply for Form NOW

A Great International Set Competition

When I was in America in April and May, a most interesting challenge was thrown out to me. I was discussing matters with the Secretary of the Radio Manufacturers' Show Association and we were commenting upon the essential differences between American and British sets. He suggested that the American public would like to see a number of representative British receivers, as to which there was much curiosity but little knowledge. Suddenly we alighted upon the idea that there might be very active support for an international competition in which American and most certainly British amateur set-builders would take part, and in which it was hoped that French and German constructors might also be represented.

The upshot was that I expressed my willingness to take the responsibility of organising a British Elimination Competition for the purpose of finding 25 sets to send to New York to represent this country, and I now have pleasure in inviting every skilled home-constructor to take part in such an Elimination Competition.

I want valve sets of every kind, as long as they are well-designed, well-made and representative of thoroughly up-to-date practice. I do not mind what the origin of the set is, whether the design first appeared in the pages of AMATEUR WIRELESS, WIRELESS MAGAZINE or any other periodical, or whether the design has never been published at all. That is quite immaterial. Certainly, I do want readers of this paper to support the competition in great strength, and I want the designs published in this paper and in the WIRELESS MAGAZINE to be well represented too. But I want *every* home-constructor who has produced a set of outstanding quality to enter it for the Elimination Competition.

WHERE AND WHEN

I wish to send the 25 sets to the United States during the first week of August, that is, in not more than a few weeks' time. There is, therefore, not a moment to lose. I propose to hold the Elimination Competition just as quickly as it can be organised. I have had prepared a printed entrance form and set of rules (there is nothing irksome in the rules), and what I want qualified readers to do is to send me straightaway an application for the entrance form and rules. These I shall send in duplicate—one entrance form to be returned completed with as little delay as possible, and the other to be retained for the competitor's reference.

I want all the sets entered for the Elimination Competition to be on public view for a short time.

I repeat then: Let the qualified reader write me immediately for entrance form and rules. In due course I will send to him all the necessary information.

PRIZES

Twenty-five sets will be selected to go to the United States. The owner of each will be awarded by us a BRONZE MEDAL. The American organisers will distribute three prizes among the British Competitors, in addition to a certificate to each, and will award

AN INTERNATIONAL CUP OR MEDAL

for the best amateur-built set exhibited, whether by American, British or other nationals.

Should the International Prize be awarded for a British-built set that has passed through our Elimination Competition and been sent by us to the United States, then, in addition to the International Prize, we ourselves will award

A GOLD MEDAL SPECIALLY STRUCK FOR THE PURPOSE

So you see that the prizes are worth having and anybody may be well proud of them. I have great hopes that my readers will seize upon this opportunity of taking part in the first international competition of this sort that has ever been organised.

The rules which will be sent to every applicant will be found to cover, it is hoped, almost every possible contingency, and in themselves they are simple and encouraging, but perhaps there are a few points upon which I may make a public note.

AMATEUR WIRELESS and the WIRELESS MAGAZINE are responsible for the Elimination Competition only. The American authorities are responsible for the organisation and judging of the International Competition in the U.S.A.

No wireless manufacturer or salesman, no employee of any wireless manufacturer or salesman, and no other member of the wireless industry may compete; neither may any employee of the proprietors of AMATEUR WIRELESS and the WIRELESS MAGAZINE.

Do not send me the set until the proper formalities have been complied with; in other words, first apply for the entrance form, upon receiving it complete it, return it to me and await the supply of labels which I will send you.

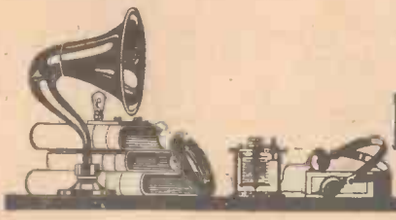
The 25 sets selected to go to the U.S.A. will be sent and returned free of all expense to the competitors, and will be insured from the moment they leave London until they are returned to the competitors.

No crystal set is eligible.

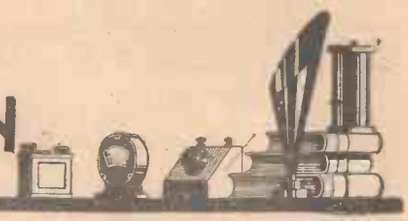
Please post me immediately the application for entrance form and rules. Address your application to:

INTERNATIONAL COMPETITION,
THE EDITOR,
"Amateur Wireless,"
La Belle Sauvage,
Ludgate Hill, London, E.C.4.

Special Note: **WE Pay Return Carriage on ALL Sets**



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, layouts, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 84).

Finding Frequency

Q.—*Knowing the wavelength, how can one find the frequency ?—N. C. (Birkenhead).*

A.—The frequency can be found by dividing 300,000,000 (the velocity of wireless waves in metres per second) by the wavelength in metres.—J. F. J.

Rectification

Q.—*I understand that stronger signals are obtained when the grid-condenser-and-leak method of rectification is used than when the valve is worked on one of the bends of its characteristic curve and adjusted to this point by means of a potentiometer. Why is this ?—W. P. L. (Prestatyn).*

A.—In the latter case the voltage of the grid becomes alternatively positive and negative under the influence of the signal impulses applied to it. In the former case, however, there is a cumulative effect, as the grid cannot become positive during a positive half-cycle owing to the fact that the electrons attracted to it are not free to leak away as quickly as in the former case. Thus, in the former method, there is a build-up of signal strength which is absent in the latter case.—B. W.

Sensitivity of Crystal

Q.—*What causes a crystal to loose its sensitivity after a time ?—D. L. C. (Manchester).*

A.—There are many ways in which a crystal may be caused to become insensitive. If too much heat is employed when the crystal is being mounted in its cup the sensitivity of the crystal may be permanently injured. A comparatively heavy current passed through the crystal contact may have the same effect. Thus a crystal may be found to lose its sensitivity after having been used for the reception of very strong signals, after a heavy atmospheric discharge, or after the current from the H.T. battery has been allowed to pass through it. This last can occur only, of course, when the crystal is used in conjunction with valve amplifiers. Grease on the surface of the crystal, though destroying its sensitivity temporarily, does not seem to have any permanent ill-effect as the crystal is as good as ever when the surface has been properly cleaned.—B.

Softening of Valves

Q.—*What makes a hard valve go soft ? I bought a cheap valve a short time ago and it was so hard that it could be used as an L.F. amplifier with 100 volts on the plate. Now it has gone quite soft and a blue glow appears with a little over 20 volts H.T.—D. L. (Leeds).*

A.—It is comparatively easy to evacuate the bulb of a valve to a high degree of vacuum, but it is much more difficult to make a valve which will retain this vacuum. It is possible, of course, that your valve leaks very slightly, but much more probably the cause is that gas, which was at first retained by the metal of the electrodes, has since been liberated owing to the effect of electronic bombardment. It is a matter of great expense to drive off all such gas from the surfaces of the metal employed in the interior of the valve before the bulb is finally exhausted, and foreign manufacturers often cut down expense in valve production by omitting the process.—J. F. J.

Aircraft Wavelengths

Q.—*What is the wavelength most commonly used by aeroplanes and ground stations communicating with them ?—G. M. (Hastings).*

A.—The wavelength most generally employed for this purpose is 900 metres.—J. F. J.

OUR WEEKLY NOTE

USE OF POWER VALVES

It seems to be a popular fallacy that if one inserts a power valve in the last socket of a receiver, a great increase in signal strength is bound to result. This idea is quite erroneous and has probably arisen owing to the fact that the reason of the term "power valve" is not properly understood.

Such valves have larger electrodes than are used in ordinary receiving valves in order to enable them to handle signals of considerable amplitude without being overloaded. Although power valves are capable of dealing with greater power than are ordinary valves there is absolutely no advantage in using them if they are only to be called upon to deal with comparatively weak signals.

For instance, a power valve is often ideal in the second L.F. stage of a powerful set where the signals passed on by the preceding valve are fairly powerful. But in a small set employing only one L.F. stage it will usually be better to use an ordinary receiving valve in the last stage.

There are, of course, various types of power valve requiring more or less power to be applied to them so that they may work to the best advantage. For instance, when a set is being used for the reception of a nearby station a small power valve might sometimes be used with advantage immediately behind the detector. In most cases, however, an ordinary L.F. valve should precede one of the power type.

THE BUREAU.

Winding Honeycomb Coil

Q.—*What constitutes a "turn" when winding a honeycomb coil on a former with two rows of pins ?—B. C. (Bermondsey).*

A.—Quite immaterial of the manner of winding, one turn is completed when the wire has passed once completely round the former. Crossing the wire over from side to side of the former has very little effect on the inductance of the coil, the main aim of this procedure being to reduce the self-capacity.—B.

FRAME RECEPTION!

Two Leads from One Aerial

Q.—*My aerial is supported at the lead-in end by attachment to my house. The other end is supported by the house of a friend. Would it be possible to take a down-lead from either end of the horizontal portion so that we could both use the same aerial ?—R. D. S. (Denton).*

A.—It is not advised that the suggested arrangement should be used, as the results given by either set are then likely to be poor. If the distance between the two houses is considerable you could break the horizontal portion in the centre and insert insulators. A down-lead could then be taken from the house end of each portion when the whole arrangement would be equivalent to two separate L. aerials arranged with their free ends pointing in opposite directions.—J. F. J.

Components for "Concert Six"

Q.—*I should be obliged if you would let me know the makes of components recommended for constructing the Concert Six receiver described in A.W. Nos. 201, 202, and 204.—L. E. (Coventry).*

A.—Here is a list of the main components required. When more than one maker is quoted the first-mentioned make was that used in the original set. Ebonite panel, 24 by 8 in. (Becol or Peto-Scott); baseboard, 24 by 9 in.; cabinet in fumed oak or polished mahogany (Bowyer-Lowe, Caxton Wood Turnery Co., or Carrington Manufacturing Co.); one .0005 variable square-law condenser (Bowyer-Lowe); two .0003 variable square-law condensers (Bowyer-Lowe); one potentiometer (Radio Instruments); six rheostats (Polar); two variable anode resistances, 50,000 to 250,000 ohms (Watmel); two double closed-circuit jacks (Burne-Jones); one single open circuit jack (Burne-Jones); one plug (Burne-Jones); 6 valve holders (Burne-Jones); two fixed condensers, .0003 microfarad (Dubilier); one fixed condenser, .006 microfarad; two fixed condensers, .0015 microfarad; three fixed condensers, .001 microfarad; two fixed condensers, one microfarad (T.M.C.); two grid leaks, one megohm (Dubilier); two grid leaks, .5 megohm; one Ideal transformer, 2.7 to 1 (Marconi); two L.F. chokes (Lissen); one L.T. switch; three single-coil holders (Burne-Jones); eleven terminals; one piece of ebonite, 2 in. by 2 in. (for aerial and earth terminals); two dozen lengths of square tinned rod, or an equivalent quantity of Glazite, for wiring; three dozen round-headed brass wood-screws; two dozen 4 B.A. ½-in. countersunk brass screws; one pair of brackets for fixing panel.—J. H. R.

Licences

Q.—*If one desires to transmit, are two licences necessary, one for transmitting and one for receiving ?—P. D. (Glasgow).*

A.—No. In all cases where a transmitting permit is granted this also covers reception.—J. F. J.

A Novel Indoor Aerial

SIR,—Some few weeks ago there appeared in the "Practical Odds and Ends" page a note of an indoor aerial, the wire of which was wound round the electric-light flex lead and then taken straight to the set.

The other day, whilst my outdoor aerial was undergoing repairs, I decided to use this type of aerial as a makeshift, although I did not anticipate great success.

The results, however, exceeded my greatest hopes, for I received Birmingham at very good phone strength and Daventry on my loud-speaker. I also received London, Manchester and Cardiff at phone strength, and Radio-Paris came through very faintly at about 9.45 in the evening. The set is only a two-valver.—M. D. (Worcester).

Marconi House Transmissions

SIR,—I noticed with interest B. D.'s letter *re* the strength of the Marconi House transmission in No. 212. I would like to add that my experience was similar in the recent experimental transmission.

The Marconi House transmission was easily 15 per cent. more powerful than the new Oxford Street station using three valves (H.F., detector and L.F.), which would seem to point out that the reception to the south-east of Oxford Street is still inferior to the old station.—J. C. S. (Westcliff).

Low-power Transmission

SIR,—The following notes on low-power transmission on 45 metres may be of interest to your readers.

My transmitting circuit is a loose-coupled Hartley, parallel feed, with an aerial 70 ft. long and 30 ft. high. This aerial is in the front of the house, whereas the counterpoise, which is a single wire 70 ft. long and 10 ft. high, is at the back of the house. I have tried a counterpoise in the orthodox position, but after many tests I came to the conclusion that the other way was more efficient both as regards transmission and reception. I find results are better from the point of steadiness of wave when the aerial coil is about 3 in. from the secondary coil, and with low power a steady wave is essential. The valve used for transmission is a Cleartron power valve designed for transformer coupling (CT25) and is worked from a 6-volt accumulator.

Several low-power tests have been made, but the following have been my best contacts to date: On June 13 I established contact with G 6 O H at Lichfield (96 miles away), and after reducing power considerably I found I was able to work him when using .008 watt (8 volts at 1 m.a.). This works out at something like 12,000 miles per watt.

Again, on June 18 I worked G 2 S W at Southport (180 miles away), and on reducing power I found I was audible at his station when using .009 watt (9 volts at 1 m.a.). This represents 20,000 miles per watt.

This miles-per-watt contact was done over a comparatively large distance (180 miles), and I should be very interested to hear from anybody who has set up a bigger miles-per-watt figure at a similar or greater distance.

I should be very glad to fix up tests with anybody who would care to carry out some low-power tests on 45 metres.—G 2 C S.

The Power of 2 L O

SIR,—I, too, noticed Thermion's remarks in No. 210. I also note a correspondent's remarks in No. 212. I am in south-east London. After experimenting with various types of crystal set, I managed to get Marconi House on the loud-speaker comfortably heard in a quiet room. When the change was made to Oxford Street it was a mere whisper. I set about experimenting again; nothing made any improvement. And I have now given it up. If I want loud-speaker reception I have to switch on the valve set. After Oxford Street had been working for a few weeks it was stated that something was going to be done in the matter, and really on one or two evenings I thought there was an improvement; but it soon wore off, and certainly in this neighbourhood the old Marconi House transmission was much better. I am only 1½ miles from Marconi House and 2¼ miles from the Oxford Street station, and considering the extra power of Oxford Street three-quarters of a mile should not make all that difference.—A. H. (London, S.E.).

Home-made H.T. Accumulator

SIR,—Having made up a very large accumulator H.T. battery, giving 250 volts, according to the instructions given in No. 193, I think it necessary to write and inform you how delighted I am. I required a very high plate voltage, as I wished to use the battery with resistance-capacity coupled L.F. valves.

A great improvement I find is as follows: Obtain some $\frac{1}{16}$-in. sheet ebonite and cut sufficient 1-in. discs (according to number of cells in use) to take the lugs of the positive and negative plates, the holes to take these can be easily cut out with the aid of a small fret-saw. In the centre of each disc is drilled a small hole for the vent. Plug the vent hole for the time being, afterwards filling in the top of each cell with either pitch or paraffin-wax; the plug can be easily withdrawn just before the wax sets.

I get seven week' use from each charge (four valves), which to my mind is exceedingly good.—H. W. T. (London, N.).

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 British Summer Time.

London (2LO), 364 m. 1-2 p.m., con.; 3.15-4 p.m., transmission to schools; 3.30-5.45, con. (Sun.); 4.15 p.m., con.; 5.15-5.55, children; 6 p.m., dance music; 7-8 p.m., time sig., news, music, talk; 8-10 p.m., music; 9.0, news (Sun.); 9.30 p.m., time sig., news, talk; 10 p.m., special feature (Mon., Wed., Fri.). Dance music on Thurs. and Sat. until midnight.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 440 m. **Birmingham** (5IT), 479 m. **Bournemouth** (6BM), 386 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 422 m. **Manchester** (2ZY), 378 m. **Newcastle** (5NO), 404 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 315 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 321.5 m. **Liverpool** (6LV), 331 m. **Nottingham** (5NG), 326 m. **Plymouth** (5PY), 338 m. **Sheffield** (6FL), 306 m. **Stoke-on-Trent** (6ST), 301 m. **Swansea** (5SX), 482 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 4 p.m. onwards, own con. on Mon. Dance music daily (exc. Sun. and Tues.) till midnight; on first Friday in each month until 2 a.m.

IRISH FREE STATE.

Dublin (2RN), 397 m. Daily, 7.30 p.m. Sundays, 8.30 p.m. until 10.30 p.m.

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. B.S.T.

AUSTRIA.

Vienna (Radio Wien), 582.5 m. and 531 m. (temp.) (10 kw.). 11.00, con. (almost daily); 15.30, con.; 19.25, news, weather, time sig.; con., lec., news; 20.00, con.; 22.00, dance (Wed., Sat.).

Graz, 402 m. (1 kw.). Relay from Vienna. Also own con. (Tues., Wed., Fri.), 20.10.

BELGIUM.

Brussels, 487 m. (2½ kw.). 17.00, orch. (Tues., Thurs., Sat. only), news; 20.00, lec., con., news. Relay: Antwerp, 265 m. (100 w.). Liege (Radio Club). 585 m.

CZECHO-SLOVAKIA.

Prague, 372 m. (5 kw.). Con., 20.00-23.00, daily.

Brunn (OKB), 521 m. (2.4 kw.). 10.00, con., news (Sun.); 19.00, lec., con. or dance (daily).

DENMARK.

Copenhagen (Radioraadet), 347.5 m. (2 kw.). Sundays: 15.30, lec.; 17.30, children; 20.00, play; 21.15, news, con.; 21.15, news, Esperanto. Weekdays: 20.00, lec., con., news, con.; dance to 24.00 (Thurs., Sat.).

Ryvang, 1,150 m. (1 kw.). Sundays: 09.00, sacred service.

Odense, 810 m. Relays Copenhagen.

Sorö, 1,150 m. (1½ kw.). Relays Copenhagen.

FINLAND.

Helsingfors (Skyddskar), 504 m. (500 w.).

Helsingfors, 440 m. Con., 18.00 (Tues., Thurs., Sat., Sun.).

***Tamafors,** 368 m.
***Jyvaskyla,** 561 m. (200 w.).
***Uleaborg,** 233 m. (200 w.).
* Relay Helsingfors.

GRAND DUCHY OF LUXEMBURG.

Radio Luxemburg (LOAA), 1,200 m. Con. 14.00 (Sun.), 21.00 (Thurs.).

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 07.15, 08.00, physical exercises; 11.00, markets (exc. Sun. and Mon.); 11.20, time sig., weather; 15.00, 16.45, Stock Ex. (exc. Sun. and Mon.); 18.00, talk, con., news; 19.00 and 23.10, weather; 21.00, con. (daily). Relays PTT, Paris: 07.15, 08.00 (daily).

Radio-Paris (CFR), 1,760 m. (about 3 kw.). Sundays: 12.45, con., news; 16.30, Stock Ex., con.; 20.15, news, con. or dance. Weekdays: 10.40, news; 12.30, con., markets, weather, news; 16.30, markets, con.; 20.15, news, con. or dance.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (800 w.). 07.15, 08.00, physical exercises (except Sun.); 20.30, lec. (almost daily); 21.00, con. (daily).

Le Petit Parisien, 333 m. (1 kw.). 21.15, con. (Tues., Thurs., Sat., Sun.).

Radio L.L. (Paris), 350 m. (250 w.). Con. (Mon., Wed., Thurs.), 20.30.

Radio-Toulouse, 431 m. (2 kw.). 12.30, con., time sig. (daily); 17.30, news (exc. Sun.); 20.45, con.; 21.25, dance (daily).

Radio-Lyon, 280 m. (2 kw.). 20.20, con. (daily). Temporarily closed.

Strassburg, 20 m. (100 w.). 21.15, con. (Tues., Thurs.).

Radio Agen, 318 m. (250 w.). 12.40, weather, Stock Ex.; 20.00, weather, Stock Ex.; 20.30, con. (Tues., Fri.).

***Lyon-la-Doua,** 480 m. Own con., 20.00 (Mon., Wed., Sat.).

***Marseilles,** 351 m. (500 w.).

***Toulouse,** 280 m. (2 kw.).

***Bordeaux,** 411 m.
* Relays of PTT Paris.

Montpellier, 220 m. (1 kw.). 20.45 (weekdays only).

Angers (Radio Anjou), 300 m. (500 w.). Daily: 20.30, news, lec., con.

Bordeaux (Radio Sud-Ouest), 330 m. Con. 21.00 (Mon., Fri.).

Mont de Marsan, 390 m. (300 w.). Con (weekdays only), 20.30.

Algiers (N. Afr.) (PTT), 310 m. (100 w.). 21.45, con. (Mon., Thurs.).

GERMANY.

Berlin, on both 504 and 571 m. (4 kw.). 06.30, con. Phys. Exer. (Sun.); 09.00, sacred con. (Sun.); 11.00, con. and tests; 12.55, time sig., news, weather; 15.00, educ. hour (Sun.), markets, time sig.; 17.30, orch.; 20.30, con., weather, news, time sig., dance music until 24.00 (Sat., Sun., Thurs.). Relayed on 1,300 m. by Königswusterhausen (1,300 m.) and Stettin (241 m.).

Königswusterhausen (LP), 1,300 m. (8 kw.). 11.30-12.50, relays Berlin (Sun.); 15.00, lec. (daily); 18.30, relay of Berlin (Vox Haus) con. (daily). 2,525 m. (5 kw.), Wolff's Buro Press Service: 06.45-20.10. 2,880 m., Telegraphen Union: 08.30-19.45, news. 4,000 m. (10 kw.), 07.00-21.00, news.

Breslau, 418 m. (4 kw.). 12.00, con. (daily), Divine service (Sun.); 12.55, time sig. (Sun.), weather, Stock Ex., news; 16.00, children (Sun.); 17.00, con.; 19.00, lec.; 20.30, con., weather, time sig., news, dance (relays Berlin). Relay: Gleiwitz, 251 m.

Frankfort-on-Main, 470 m. (1½ kw.). 08.00, sacred con. (Sun.); 11.55, time sig., news; 12.55, Nauen time sig.; 16.00, con. (Sun.); 16.30, con.; 18.00, markets, lec.; 20.00, lec., con., weather. Dance: relays Berlin. Relay: Cassel, 273.5 m.

Hamburg, 392 m. (4 kw.). Relayed by Bremen (279 m.), Hanover (297 m.), Kiel (230 m.). Sundays: 07.25, time sig., weather, news, lec.; 09.15, sacred con.; 13.15, con.; 18.00,

(*Continued on page* 82)

"BROADCAST TELEPHONY" (*cont. from page 80*)

con.; 19.15, sports, weather, con. or opera, dance. Weekdays: 05.45, time sig., weather; 07.00 and 07.30, news, weather; 12.55, Nauen time sig., news; 14.00, weather, con.; 16.15 con; 18.00, relays Berlin; 19.00, lec.; 19.55, weather and con.; 22.00, dance (Sun., Thurs., Sat.).

Königsberg, 463 m. (1 kw.). 09.00, sacred con. (Sun.); 12.55, time sig., weather, news; 16.30, con.; 17.00, con. (Sun.); 19.30, lec.; 20.00, con. or opera, weather, news, dance (irr.).

Leipzig, 452 m. (3 kw.). Relayed by Dresden (294 m.). 08.30, sacred con. (Sun.); 11.00, educ. hour (Sun.); 12.00, con. (daily); 12.55, Nauen time sig., news; 16.30, con., children (Wed.); 20.15, con. or opera, weather, news, cabaret or dance (not daily).

Munich, 485 m. (3 kw.). Relayed by Nuremberg (340 m.). 11.30, lec., con. (Sun.); 14.00, time sig., news, weather; 16.00, orch. (Sun.); 16.30, con. (weekdays); 18.30, con. (weekdays); 19.15, lec.; 19.30, con. (Sun.).

Munster, 410 m. (1 kw.). Relayed by Elberfeld (259 m.), Dortmund (283 m.). 11.45, radio talk, Divine service; 12.00, news (Sun.); 12.30, news (weekdays); 12.55, Nauen time sig.; 15.30, news, time sig.; 16.00, con.; 17.00, children (Sat.); 19.40, news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 24.00 and 04.00, weather and news.

Stuttgart, 446 m. (1½ kw.). 11.30, con. (Sun.); 16.30, con. (weekdays); 17.00, con. (Sun.); 18.30, time sig., news, lec., con. (daily); 21.15, time sig., late con. or cabaret.

HOLLAND.

Amsterdam (PCFF), 2,125 m. (1 kw.). Daily: 06.35-15.30 (exc. Mon. and Sat., when 12.30-13.30), news, Stock Ex.

Hilversum (HDO), 1,060 m. (5 kw.). 09.00, sacred service (Sun.); 19.10, con.; 21.00, news, etc.

HUNGARY.

Buda-Pesth (Csepel), 560 m. (2 kw.). 09.30, news; 12.00 and 15.00, weather, news; 17.00, dance music; 20.00, con. or opera; dance nightly.

Kosice, 2,020 m. (2½ kw.). 19.00, con.

ICELAND.

Reykjavik, 327 m. (700 w.). Tests: 22.30, 24.30.

ITALY.

Rome (IRO), 425 m. (3 kw.). 10.30, sacred con.; 13.15, official communique; 17.00, children; 17.30, relay of orch. from Hotel di Russia; 17.55, news, Stock Ex., jazz band; 20.30, news, weather, con.; 22.15, late news.

Milan, 320 m. (2 kw.). 20.00-23.00, con., jazz band.

JUGO-SLAVIA.

Belgrade (Rakovitza) (HFF), 1,650 m. (2 kw.). 17.00, news (daily), con. (Tues., Thurs., Sat.).

Agram (Zagreb), 350 m. (500 w.).

LETTLAND.

Riga, 475 m. (2 kw.). Con. daily, 21.00-22.00.

NORWAY.

Oslo, 382 m. (1.2 kw.). 11.00, Divine service (Sun.), Stock Ex. (weekdays); 19.15, news, time, lec., con.; 22.00, time, weather, news, dance relayed from Hotel Bristol, Oslo (22.30-24.00, Sun., Wed., Sat.).

Bergen, 358 m. (1½ kw.). 19.30, news, con., etc.

POLAND.

Warsaw, 480 m. (6 kw.). Daily: con., 11.00-13.00; 15.00-23.00, daily.

RUSSIA.

Moscow (RDW), 1,450 m. (12 kw.). Weekdays: 12.30 and 17.55, news and con.; 23.00, chimes from Kremlin.

(Popoff Station), 1,010 m. (2 kw.). 10.00, 11.00, lec.; 13.00, 19.00, con. (Tues., Thurs., Fri.).

Radio Peredacha, 410 m. (6 kw.).

Trades Union Council Station, 450 m. (2 kw.). 18.00, con. (Mon., Wed.).

Leningrad, 940 m. (2 kw.). Weekdays: 16.00.

Nijni Novgorod, 860 m. (1.2 kw.). 17.0 (Tues., Fri., Sun.), con.

Astrakhan, 650 m. (1 kw.).

Kieff, 780 m. (1 kw.). 18.00, con. (daily).

SPAIN.

***Madrid** (EAJ6), 392 m. (1½ kw.). Daily con. (times vary daily). Closes at 24.00 o Sun., Wed., Sat.

***Madrid** (EAJ7), 373 m. (4½ kw.). 17.30 24.00, con. (almost daily).

***Madrid** (EAJ4), 340 m. (3 kw.). 16.0 con.

*The Madrid stations are again working t a rota, varying time of transmissions daily.

Barcelona (EAJ1), 325 m. (1 kw.). 17.00 21.00, news, lec., con. (Sun.); 18.00-23.0 (daily).

Barcelona (Radio Catalana) (EAJ13), 462 m (1 kw.). 19.00-23.00, con., weather, news.

Bilbao (EAJ9), 415 m. (1 kw.). 19.00, news weather, con. Close down 22.00.

Bilbao (Radio Vizcaya) (EAJ11), 418 m (2 kw.). 22.00-24.00, con. (daily).

Cadiz (EAJ3), 357 m. (550 w.). 19.00-21.00 con., news. Tests daily (exc. Sun.), 24.00.

Cartagena (EAJ15), 335 m. (1 kw.). 20.30 22.00, con. (daily).

Seville (EAJ5), 357 m. (1½ kw.). 21.00, con. news, weather. Close down 23.00.

Seville (EAJ17), 300 m. 19.00-22.00, con (daily).

San Sebastian (EAJ8), 343 m. (500 w.) 17.00-19.00, 21.00-23.00 (daily).

Salamanca (EAJ22), 355 m. (1 kw.). 17.00 and 21.00, con. (daily). Closes down 23.00.

Saragossa, about 325 m. Testing.

SWEDEN.

Stockholm (SASA), 430 m. (1½ kw.). 11.00 sacred service (Sun.); 12.30, weather; 14.00, con. (Sun.); 17.00, children (Sun.); 18.00, sacred service; 19.00, lec.; 21.15, news, con., weather. Dance (Sat., Sun.), 21.45.

Relays.—Boden (SASE), 1,200 m.; Eskilstuna, 250 m.; Falun (SMZK), 370 m.; Gothenburg (SASB), 288 m.; Gefle, 208 m.; Joenkoeping (SMZD), 199 m.; Kalmar, 253 m.; Karlsborg (SAJ), 1,350 m.; Karlscrona (SMSM), 19(m.; Kristinehamm (SMTY), 292 m.; Karlstad (SMXG), 221 m.; Linkoeping, 467 m.; Malmo (SASC), 270 m.; Norrkoeping (SMVV), 260 m. Orebro, 237 m.; Ostersund, 720 m.; Säffle (SMTS), 245 m.; Sundsvall (SASD), 550 m. Trollhattan (SMXQ), 322 m.; Umea, 215 m. Varborg, 385 m.

SWITZERLAND.

Lausanne (HB2), 850 m. (1½ kw.) (temp.). 20.00, lec., con. (daily).

Zurich (Hongg), 515 m. (temp.) (500 w.). 11.00, con. (Sun.); 12.00, weather; 12.55, Nauen time sig., weather, news, Stock Ex.; 13.30, piano solo; 17.00, con. (exc. Sun.); 18.15, children, women; 19.00, news, weather; 20.15, lec., con., dance (Fri.).

Geneva (HB1), 760 m. (2 kw.). 20.15, con. (daily).

Berne, 435 m. (2 kw.). 10.30, organ music (exc. Sat.); 16.00, 20.30, con.

Basle, 1000 m. (1½ k.w.), con. daily. 20.30

Sliding Trays for Storing Fruit is the subject of a well-illustrated article appearing in the current issue of "The Amateur Mechanic and Work" (3d.), and should prove of great use to many readers. Other articles appearing in the same number are: "Hints and Kinks Illustrated," "Artistic Inlaying for the Home-worker," "What Things Can I Patent?" "Clearing Drains and Sinks," "A Combined Earthing Switch and Lightning Arrestor," "Making a Bugle Violin," "A Garden Swing," "Leather-work Cushions for Chair Seats," "Camera Work That Pays," "Overhauling the Motor-cycle for the Summer Tour."

CHIEF EVENTS OF THE WEEK

SUNDAY, JULY 18

London	Shakespeare's Heroines.
Aberdeen	Recital of Psalm Tunes.
Birmingham	Symphony Programme.
Bournemouth	Handel Programme.
Glasgow	Band of 1st Btn. H.M. Cameronians.
Manchester	Songs and Chamber Music.

MONDAY

London	Chamber Music.
Birmingham	Musical Comedy.
Bournemouth	Popular Light Music and Ballads.
Cardiff	The Merrymakers.
Newcastle	"The Novos."

TUESDAY

London	Popular Orchestral Concert.
Aberdeen	Instrumental and Vocal Concert.
Cardiff	"A Day's Coaching."

WEDNESDAY

London	"The Pier Revels of 1926."
Aberdeen	An Hour of Burns.
Bournemouth	Popular Light String Music.
Belfast	Ballad Concert.
Manchester	Australian Bush Songs.
Nottingham	The Nottingham City Police Band.
Sheffield	The Soho Syncopaters.
Swansea	The Tawe Glee Singers.

THURSDAY

London	"The Vicar at the Jumble Sale."
Aberdeen	Operatic Programme.
Cardiff	Old and New Music.
Glasgow	Variety.
Newcastle	Arias—Light Orchestral Music.

FRIDAY

London	*Five Birds in a Cage.*
Aberdeen	Mirth and Melody.
Birmingham	Light Classics.
Bournemouth	Operatic Night.
Glasgow	The City of Glasgow Police Military Band.
Manchester	A Seaside Concert.

SATURDAY

London	*No Option.*
Birmingham	The City of Birmingham Police Band.
Bournemouth	"A Merry-Go-Round."
Belfast	Popular Songs and Duets.
Manchester	Request Programme.

TRADE NOTES AND CATALOGUES

FOUR very attractive showcards have just been issued by Messrs. Igranic Electric Co., Ltd., of 147, Queen Victoria Street, London. They illustrate the Pacent S.L.F. variable condenser, transformer, filament rheostats and series of plugs and jacks.

A four-page catalogue dealing with a variety of terminals has been issued by The M.A.P. Co., of 246, Gt. Lister Street, Birmingham. In addition to terminals, there are shown switch arms, lead-in tubes and other small accessories.

An interesting and informative sixteen-page booklet dealing with the Dimic coils, made by L. McMichael, Ltd., of Hastings House, Norfolk Street, Strand, W.C.2, has been sent us by that firm. Users of these coils will find many useful circuits in the publication, which incorporate Dimic coils to their best advantage. Other literature which is available from this firm deals with their Supersonic receiver, vernier dials, and balancing condenser.

An interesting range of the smaller accessories used in radio work are illustrated in a six-page catalogue issued by Messrs. J. J. Eastich and Sons, of Eelex House, 118, Bunhill Row, E.C. A device of particular interest to the constructor is the low-loss coil holder which is suitable for mounting home-made basket coils.

ADVERTISEMENT INSTRUCTIONS for "Amateur Wireless" are accepted up to first post on Thursday morning for following week's issue, providing space is available.

PREPAID ADVERTISEMENTS.

Advertisements under this head are charged FOURPENCE PER WORD, minimum charge FOUR SHILLINGS.

DEPOSIT SYSTEM.

As the Publishers cannot accept responsibility for the bona fides of Advertisers in this publication they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The Deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom, double fees are charged.

The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to

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WIRELESS.—Capable, trustworthy men with spare time who wish to substantially increase income, required where we are not fully represented. Applicants must have practical knowledge of installation of Set and Aerial, be a Householder or live with parents, and be able to give references. State age and experience.—Address, Dept. 28, General Radio Company, Limited, Radio House, Regent Street, London, W.1.

PATENTS.—Trade Marks. Advice Handbook free.—B. T. King, Regd. Patent Agent, 146a, Queen Victoria Street, London.

PATENTS and Trade Marks obtained.—H. T. P. Gee, Patent Agent, Member R.S.G.B., A.M.I.R.E., 51/52, Chancery Lane, London, W.C.2. Phone Holborn, 1525.

BARGAIN.—Three transformers for Superhet, nearly new, cost £5 5s., sell £3 10s.—Evans, Danygraig, Penclawdd, Swansea. [14

GREEN DRAGON DIAPHRAGM PAPER, ready for use, splendid results, 12 in. diam., 1s. 6d.—F. J. Eastoe, 29, Prince's Parade London, N.3. [13

7 P.M. advantages

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P.M. Filaments have up to 31 times greater emission surface than ordinary filaments ensuring a much wider range of power for economical operation; in fact these new filaments are so conservatively rated that they give ample results at lower voltages than marked & will stand up to a reasonable overload.

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Every P.M. Valve is a master valve in its own class, designed to give you

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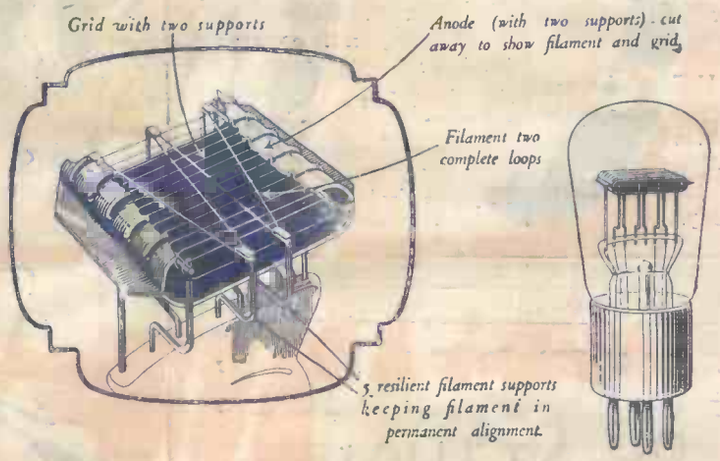

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MAKING THE CRYSTAL SET SELECTIVE

THE SIMPLEST PORTABLE SET

Amateur Wireless
And Electrics

Vol. IX. No. 215 SATURDAY, JULY 24, 1926 Price 3d

PRINCIPAL CONTENTS

WELL ILLUSTRATED

Registered at G.P.O. as a Newspaper.

THE NEWEST LOUD-SPEAKER

SEE PAGE 98

The photograph shows the McLachlan Loud-speaker, which is fully described by the inventor in this issue.

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

Technical Adviser: SYDNEY BRYDON, D.Sc., M.I.E.E.

Vol. IX. No. 215 — JULY 24, 1926

Chief Contents

"Amateur Wireless and Electrics." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. 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 and 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.

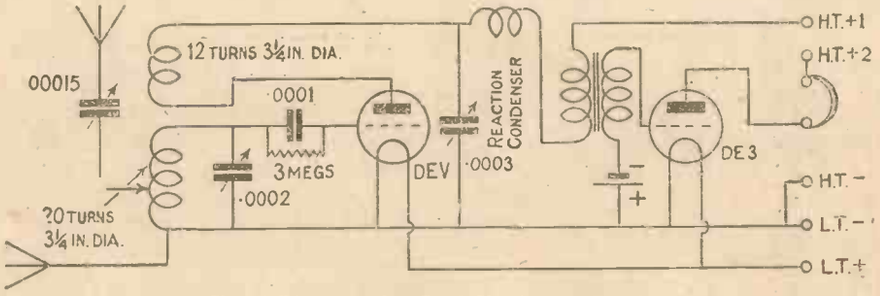
Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed.

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.

HOW *YOU* CAN RECEIVE SHORT-WAVE TELEPHONY

THE test of a short-wave set is its ability to receive telephony. Generally speaking, any short-wave set that will receive telephony will be admirable for the reception of morse signals, because, if it will take in telephony transmissions, it must have been adjusted to "the last notch" so to speak.

I know that many folk have been tempted to build themselves short-wave sets with the idea of getting American and Continental broadcasting on wavelengths of from 35 metres to 100 metres, and have been very disappointed to find that though there was not much difficulty about receiving KDKA, the other more interesting transmissions on the lower wavelengths could only be tuned in with the greatest difficulty.



Circuit Diagram of a Good Short-wave Receiver.

Smooth Reaction Control

Presumably the reader is aware of the necessity for carefully choosing a fixed grid leak of the right resistance to assist, with other necessary adjustments, in getting a smooth reaction control. A smooth control of reaction is absolutely necessary, but it is not all. The reaction control must be very gradual as well as smooth. If it is too quick in rising from very little to the point of oscillation, it will usually be found quite impossible to get the set into that delicate state, just before oscillation, in which telephony from a distance comes in full and strong, without any distortion that makes speech unreadable.

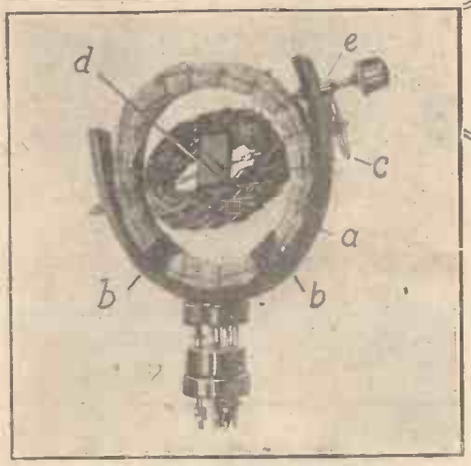
Most short-wave sets are constructed with some circuit which provides for a fixed reaction coil, with control provided by a variable condenser. These are really the only possible circuits for short-wave working. Sets with variable magnetic reaction can be used, and are used, but usually their manipulation is far too ticklish a business for the average listener.

Considering, then, a set with a fixed reaction coil and a variable condenser control, it is obvious, for smooth and gradual application of reaction, that the smallest possible coil that will give reaction over the desired wavelength band should be used, in conjunction with a good variable condenser of low maximum capacity. On short waves it is better to aim at getting really efficient control over a short wavelength band than to try to have the reaction work over all the settings of the grid-tuning condenser for any given coil.

To take a concrete example: My own short-wave set is built to the circuit shown by the illustration. For working over the wavelength band which is most interesting just now, namely, from 35 to 60 metres, I use coils of No. 12 wire 3¼ in. in diameter and 3½ in. long. The grid coil, which is tuned with a .0002-microfarad square-law Gecophone condenser, consists

(Concluded at foot of next page)

A NOVEL TUNING UNIT



Photograph of Novel Tuning Unit.

MANY amateurs will be interested to hear of a method for dispensing with the ordinary two-way coil holder and the flexible wires connected with it. The photograph shows an arrangement by means of which this may be accomplished.

The following materials are required: A valve plug from an old valve; one coil (75 turns) wound on a 3-in. former; one coil (40 turns) wound on a 2-in. former; one strip of $\frac{3}{16}$-in. ebonite 9 in. long 1 in. wide; one strip of ¼-in. ebonite 2 in. long ½ in. wide; three pieces of 6 B.A. rod 2½ in. long; four 6 B.A. nuts; one 6 B.A. ebonite knob; one pinion wheel with 10 teeth and one cog-wheel with about 60 teeth (these may be taken from an old clock); two brass bushes for 6 B.A. rod; one ¾-in. bolt, nut and washer (No. 4 or 6 B.A.).

A hole is drilled in the centre of the valve plug. The 9-in. strip of ebonite (a) is placed in hot water, and when pliable is bent round a jam jar (which should be of the same circumference as the 75-turn coil) and allowed to cool. A hole is drilled through the centre (for fixing ebonite to valve plug); this hole should be the same size as the hole drilled in the valve plug. Two holes should be drilled through the ebonite so as to allow two of the pieces of 6 B.A. rod (when the 75-turn coil is placed inside the ebonite) to pass through the coil to meet in the centre. These holes should be large enough to take the two brass bushes, to each of which should be soldered a wire. These two wires are connected to the filament pins of the valve plug. Two further holes are drilled (one on each side of the hole for fixing the ebonite to the valve plug) through which the ends of the 75-turn coil pass to be connected to the grid and anode pins respectively. The ¾-in. bolt should now be put through the ebonite and valve plug and the nut screwed on so as to make the ebonite firm. The 75-turn coil is held in position by binding in two places with silk or cotton (b).

A $\frac{3}{32}$-in. hole is then drilled in the centre thickness of the 2-in. strip of ¼-in. ebonite and tapped 6 B.A. The large cogwheel (c) is soldered to one piece of 6 B.A. rod in such a position that, when passed through the outside ebonite (a) and coils and screwed into the 2-in. strip (d) inside the 40-turn coil, it will fit tightly to the brass bush. The small pinion wheel (e) is soldered to the other piece of the 6 B.A. rod in such a position as to allow it to pass through a hole drilled in the ebonite. Two 6 B.A. nuts lock it. The remaining piece of 6 B.A. rod is passed through the opposite hole and screwed into the ebonite (d), and two locking nuts are put on the outside of the brass bush. The ends of the 40-turn coil are soldered to the two pieces of 6 B.A. rod which meet in the ebonite (d).

The 40-turn coil is fixed to the 2-in. strip of ebonite (d) by putting a small screw through the coil into the ebonite at each end. It will be found now that the inner coil will rotate inside the larger coil and at the same time be connected to the valve pins.

By using the 75-turn coil for reactance and the 40-turn coil for the aerial inductance, and rotating the inner coil, very sharp tuning may be obtained, while there is no difficulty with regard to reversing the coils to make them react. For high-frequency work, by using the 75-turn coil for anode tuning the 40-turn may be used for reactance. For crystal reception or any other case where a variometer is required, this is made possible by shorting two of the terminals. W. T. J. J.

BATTERIES IN THE PORTABLE SET

HIGH- and low-tension batteries form a large portion of the load that has to be carried about with the portable receiver. H.T. batteries can, under certain circumstances, be dispensed with if four-electrode valves are used, but the L.T. battery, either of the dry cell or accumulator type, is absolutely necessary.

Dry cells are quite satisfactory provided they are not required to work a large number of valves. Small non-spillable accumulators, although, perhaps, slightly heavier than dry cells of similar current capacity, take up less space and are certainly more economical. Only a very small accumulator is needed to supply the filament current for a multi-valve receiver provided dull-emitter valves are used. The weight of the H.T. battery can be reduced by using one having small cells, which, although not having a great length of life, provide sufficient current at the required potential. These batteries are cheaper, too, than the larger types used for the receiver at home, which is another point in their favour. K. U.

Telephony tests which were being carried out at the Rugby high-power station have had to be curtailed owing to the coal strike. It is hoped to resume the tests with America as soon as conditions are normal.

"HOW *YOU* CAN RECEIVE SHORT-WAVE TELEPHONY" (*cont. from preceding page*)

of twenty turns. This combination of capacity and inductance has the advantage of bringing the desired wavelength band on to the lower part of the condenser dial settings, where the scale is most open. It should be realised that a square-law condenser only gives straight-line tuning over a portion of its scale and that the degree of bend at the lower part will depend on the coil used. It is advantageous to use such a combination that the scale is as open as possible. In my case I get 10 metres covered by the first thirty degrees of the condenser scale. This is a great advantage in the crowded state of the ether on this band.

Reaction

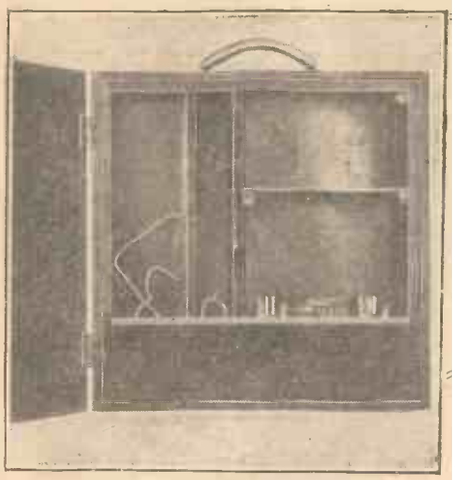
The reaction coil consists of only twelve turns of wire. It is tuned with a .0003-microfarad condenser. With a DEV detector valve, 3-megohm leak, .0001 grid condenser and 15 volts plate potential, this gives a control of reaction which is so gradual that it is impossible, on a quiet day, to tell whether the set is oscillating or not without touching the aerial terminal with the finger. The choice of the right values for leak, condenser and H.T. is a matter of experiment, but modern valves will not usually be found very critical. The most important point is the relation of the reaction coil to the grid coil, and of the tuning condensers to their respective coils. If these are chosen rightly there should be no difficulty at all about tuning in telephony.

Usually in a short-wave set it is not advisable to have the reaction coil bigger than the main tuning coil. If the set will not oscillate without a big reaction coil, the fault will generally be found in the design and layout of the set, and reconstruction in the direction of getting rid of stray capacities is indicated. In the circuit indicated in the figure the position of the aerial tapping will make a difference. Bringing it towards the filament end of the coil will usually help oscillation and will also reduce static interference.

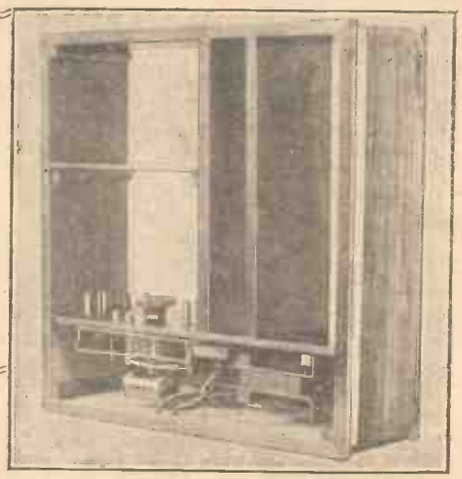
In building a short-wave set, always aim at using a smaller reaction coil than grid coil. 5 Y M.

THE SIMPLEST OF PORTABLE SETS

Economical :: Self-contained



View of Interior of Receiver.



View of Components, Framework and Aerial.

THE set described in this article is the result of a series of experiments undertaken with the idea of producing a reliable and simple portable receiver. With a straight circuit it is undoubtedly advisable to use the best possible outside aerial that can be erected, but where circumstances do not permit of other than a loop aerial, as in the case of certain flats, furnished apartments, etc., then the portable receiver with self-contained aerial is invaluable.

Although under exceptionally favourable conditions long distances have been covered with the receiver to be described, the design is only intended for reception from the local station.

The circuit (see Fig. 1) is novel in that the loop acts as the collecting agent in the place of the more usual aerial and earth, and in addition it combines the duties of the A.T.I. and reaction coils in the simplest possible form, thus eliminating a number of controls and components.

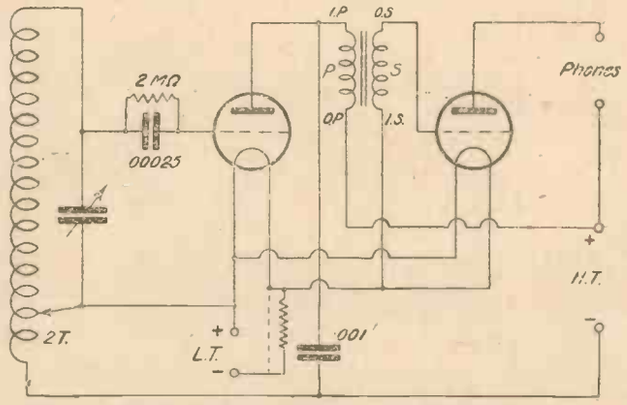


Fig. 1.—Circuit Diagram of Two-valve Portable Receiver.

As so many portable sets are very heavy, the reader will be interested to learn that the weight, excluding batteries and outside case, is only 6 lb.

The parts required are as follows:

Wood (A), two pieces 13½ in. by 4¼ in. by ¼ in.; (B), two pieces 13 in. by 4¼ in. by ¼ in.; (C), four pieces 14 in. by ¼ in. by ¼ in.; (D), four pieces 13½ in. by ¼ in. by ¼ in.; (E), one piece 13 in. by $2\frac{3}{16}$ in. by ¼ in.; (F), one piece 10 in. by 4¼ in. by ⅜ in.; (G), one piece 7¼ in. by 4¼ in. by $\frac{3}{16}$ in.; (H), six pieces 4 in. by ½ in. by ½ in.

Radion panel, 13 in. by 4¼ in. by $\frac{3}{16}$ in.; one R.I. L.F. transformer; one Ormond ordinary variable condenser, .0005 (without dial); one Trix 60-volt high-tension battery; one Osram DE2 H.F. valve; one Osram DE2 L.F. valve; one Worthmore 2-volt accumulator; 100 ft. Callender's 1005 MC4MM flex; 9 ft. connecting wire; one small L.T. S.P.D.T. switch (Trix); one Dubilier condenser, .001 microfarad; one Dubilier .00025 microfarad condenser with 2-megohm resistance; six telephone terminals; six valve legs; screws, etc.

After drilling the panel according to the diagram Fig. 2, the two pieces of wood F (see Fig. 3) should be screwed in their respective positions on the top, and a short piece of wood H (to which the R.I. transformer has already been attached) secured underneath; after this the valve legs, terminals, variable condenser and switch should be bolted in place. As the fixed condensers are retained in position by their connections only, they are inserted in any convenient space during wiring, which should be carried out with exceptional care and strictly in accordance with the diagram, as it should be remembered that once placed in the frame the connections are inaccessible. The connections for the batteries and loop can be of the same kind of wire as that used for the loop.

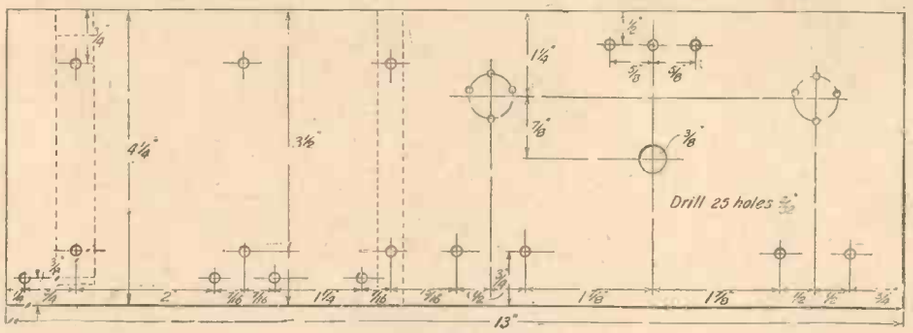


Fig. 2.—Layout of Panel.

By reference to the drawing Fig. 3 and the photographs, which are self-explanatory, the frame can be built up, and when completed the panel inserted and screwed in place.

To allow for the passage of the connections from the set to the loop, three holes should be drilled in suitable positions in the bottom of the frame. One end of the rubber-covered wire to be used for the loop should be joined to an 8-in. length of wire provided for this purpose from the connection between the variable and grid condensers, and when 18 turns have been wound in the groove on the outside and the surplus cut off, the other should be connected to the wire from the .001 fixed condenser and H.T. −. The third wire from the set to the loop, that is, the one from the variable condenser and L.T. +, is now temporarily fixed to the sixteenth and seventeenth turn, the best position being found by experiment.

After connecting the H.T. and L.T. batteries to their correct leads, place them in their respective divisions and make the final adjustment by moving the last connection made to the loop, as this controls regeneration. When the best position has been decided upon, the joint can be permanently soldered. Remember the farther it is from the grid the greater the signal strength,

(Concluded at foot of next page)

A NEW SELENIUM-CELL DISCOVERY

Possibilities of Increasing the Working Speed of Light-sensitive Cells

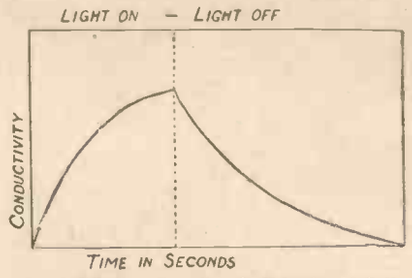
SELENIUM, that remarkable element, half metal, half non-metal, which may be described as the "father" of the light-sensitive substances which heralded wireless pictures and television, has for years been looked upon with disfavour owing to its sluggish action. The effect of throwing light on a selenium cell is seen in the diagram, where the conductivity is shown by the height of the curve at any point and the time or duration of the illumination by the length of the horizontal axis. It is seen that an appreciable time is taken for the conductivity to rise to a maximum, and that after the light has been switched off the return to its normal "dark" conductivity is very gradual, and that it does not return to zero for a considerable time in seconds.

Present Applications

To light up a buoy at sunset by the action of a relay through the intervention of selenium and to extinguish it at dawn are simple operations that have been successfully accomplished long since by the French coastal authorities and others. For the purposes of photo-telegraphy and television, however, it is not a matter of just two signals a day, at dawn and sunset, but of many thousands per second!

A discovery recently made by the writer, and described a week or two back in *Nature*, has opened up important new possibilities for the selenium cell. It is that by passing alternating current through the cell instead of direct, the change in conductivity caused by changes in the amount of light illuminating the cell is almost instantaneous, and the lag or sluggish return to zero is eliminated.

Experiments are now being conducted to ascertain whether the selenium cell can, when used under these conditions, replace the photo-electric cell, the great advantage being that one can obtain with the variations in light and shade of the image to be transmitted a current variation of 2 or 3 milliamperes, whereas with the vacuum type of photo-electric cell under similar conditions the current produced is in the neighbourhood of only a ten-millionth of a milli-microampere (10^{-16} amp.), and requires enormous amplification before it can be made to control a carrier wave.



Conductivity Graph of Selenium Cell.

A suitable selenium cell used as a grid leak will, if illuminated by the light of a match a dozen feet away, so affect the output that a mechanical relay can be operated. It will thus be seen that the selenium cell worked with alternating instead of direct current may prove to be a powerful light-sensitive element suitable for television purposes. T. T. B.

ABOUT SILICON

SILICON is one of the non-metallic chemical elements; although it does not occur in a free state in nature, it is in its compound silica one of the most abundant of all the elements. In colour it is a metallic grey. It is the main component of sandstone, felspar and many other rocks. White sand is nearly pure silica, and rock crystal is another form, which is also nearly pure. Silicon carbide is carborundum. This crystal is usually used in the form of a perikon detector, in conjunction with zincite or tellurium, and it may also be used with copper, antimony, bismuth, gold or steel.

A common form of silicon detector consists of a gold or brass contact resting lightly on the silicon crystal. The crystal is very uneven as regards sensitivity. One or two highly sensitive spots are usually to be found, while the rest of the surface is somewhat unresponsive. Its compound carborundum, however, is one of the best of crystals for detection, although this also is not popular.

"THE SIMPLEST OF PORTABLE SETS" (*continued from preceding page*)

and the minimum of reaction is required.

No details concerning the external case are necessary, as this is a matter for the individual taste of the builder, but the type shown in the first photograph is recommended, and it can be either polished or covered with imitation leather.

Photograph of Framework of Receiver.

It is of considerable importance that the preliminary adjustments should be carried out with the type of valve intended to be used. Much depends, in a receiver of this description, upon the choice of valves. In practice, highly satisfactory results coupled with low anode and filament consumption have been obtained with an Osram DE2 H.F. as detector and DE2 L.F. as amplifier.

B. G. CALVER.

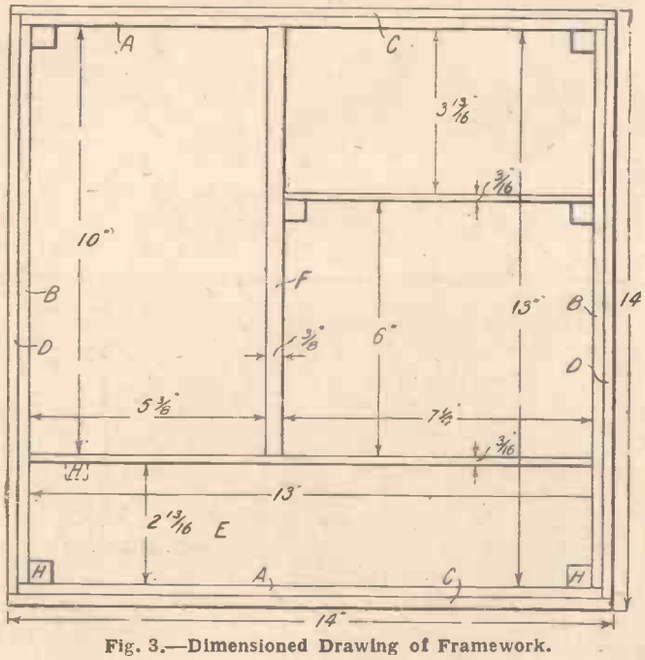


Fig. 3.—Dimensioned Drawing of Framework.

MACHINE-MADE HIGH-TENSION

Full constructional details of a rotary transformer for eliminating the high-tension battery

A Special Article by A. H. AVERY, A.M.I.E.E.

Fig. 1.—The Complete Rotary Transformer.

THE problem of the high-tension battery and its shortcomings has become sufficiently acute to justify a very serious attempt being made to overcome its numerous objections by the substitution of some form of apparatus of a more reliable nature. Many years' experience in the design of small motors and generators has led the writer to the conclusion that some of the weak points associated with high-tension current derived from the usual dry battery may be successfully eliminated by the use of a rotary transformer, which, if carefully designed, is extremely reliable in operation and exhibits a constancy of performance and flexibility in point of adjustment that no primary battery can ever hope to possess.

Lest it should be said that the substitution of untried devices, possibly attended by troubles of their own which may be worse than the ills we already know of, is not an attractive proposition, an assurance can be given that the high-tension battery eliminator now described for the first time, although of an original design, has been fully tested out, and has passed far beyond the experimental stage.

Of the troubles incident to its development the less said the better; they have taken many months to overcome, but the end has, it is hoped, justified the means. Weight, dimensions and efficiency have all to receive their due attention, while the finished apparatus must be at least as portable and robust as the high-tension battery of to-day that it is intended to dislodge. The difficulties which presented themselves so formidably during the stages of development, however, need not discourage any reader who feels a desire to construct rather than to purchase, provided he has the necessary workshop equipment, enthusiasm and skill.

A rotary transformer is a single-unit d.c. motor generator combining the functions of both motor and dynamo in one frame. One field-magnet is common to both armature windings, the windings occupying the same slots in the armature, but being electrically separate, and each with their own commutator and set of brush gear, arranged at opposite ends of the frame. The advantages of this construction are many as compared with separate motor and separate generator coupled together. In the first place, the two-unit set has four bearings and a coupling, so that the frictional losses must necessarily be larger. It has also two field-magnets with two sets of field coils, each requiring a certain expenditure of watts for excitation. Both the copper and the iron losses are therefore higher than with one field and one field winding. Lastly, the over-all dimensions and total weight of the double-unit set are all considerably more than those of the single-unit set, a point to be taken into consideration when space and portability are concerned.

If efficiency is a consideration, likewise the single-unit set has always the advantage, as it has only one set of losses instead of two, and although this would be a small matter if running expense alone were concerned, it is a very big point if the current supply is to be provided by an accumulator, since the less the input current required for a given output the longer will the battery last on one charge.

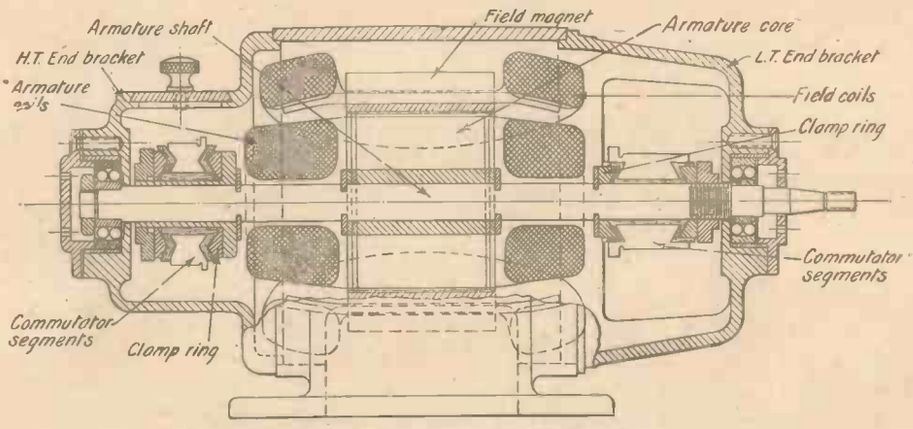


Fig. 3.—Vertical Section of Rotary Transformer.

The set which it is proposed to describe was designed for an output capacity of 25 watts, sufficient for all ordinary receiving and small-power transmitting stations. The following are its chief characteristics:

Input, 6 volts d.c.; output, 1,000 volts 0.025 ampere (or equivalent) d.c.; speed, 3,000 r.p.m.; over-all dimensions, 10¾ in. long, 4¾ in. wide, 5¼ in. high; inclusive weight, 9 lb.; type, totally enclosed; rating, continuous.

For small-power transmitting sets the rotary would need to be wound for 500 to 1,000 volts on the high-tension terminals, whereas for detector circuits and for amplifying 60, 150 or 300 volts is advisable. The exact adjustment of output is very simply and easily obtained by a small series variable resistance in circuit with the low-voltage terminals between the rotary and the accumulator, which enables the speed to be adjusted, upon which the H.T. output depends. In certain cases it might even be necessary to supply current at two different

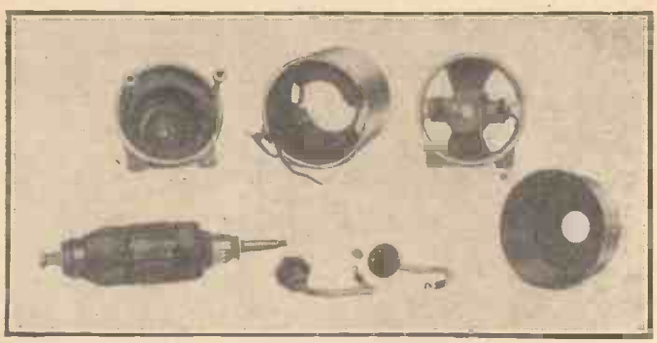


Fig. 2.—The Component Parts of the Rotary Transformer.

voltages simultaneously, and this condition can also be met by connecting an inductively-wound resistance in series with the H.T. terminals on full voltage, and providing it with tapping points or a slider, from which intermediate values of potential difference can be taken, as with any potentiometer-connected resistance. A multiple-contact switch connected with a good number of tapping points will serve as a coarse adjustment, while any fine adjustment necessary to suit the valve characteristics is obtainable from the low-tension side simply by adjusting the speed-controlling rheostat. This latter should be of the slider type and not a stud contact, as this provides much finer graduations in the speed.

Usually it is more convenient to take the low-voltage supply current for driving the rotary transformer from the same accumulator that supplies current to the valve filaments. But in the case of dull-emitter valves this would be hardly practicable, on account of the low voltages used; it is best therefore to work on a standard 6-volt low-tension winding, using, if necessary, a separate accumulator for the rotary when this voltage does not suit the valves. In the large majority of cases where 6 volts is suitable for the valves as well as the rotary, the same battery will serve for the double purpose; but the precaution should be taken of inserting a low-tension choke in each of the L.T. leads to prevent any ripple being impressed upon the battery voltage, and hence on the grid potential, where one and the same battery is utilised for filament supply as well. A suitable smoothing circuit is also arranged for on the H.T. side, consisting of a choke coil and large-capacity condenser, values for which will depend, of course, on individual working conditions.

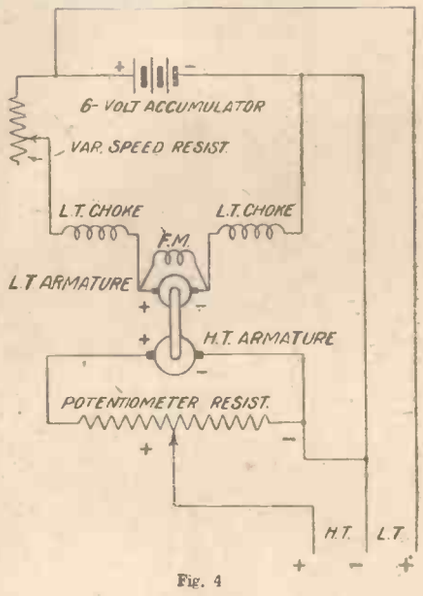


Fig. 4

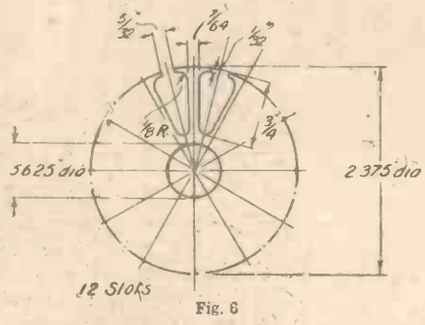


Fig. 6

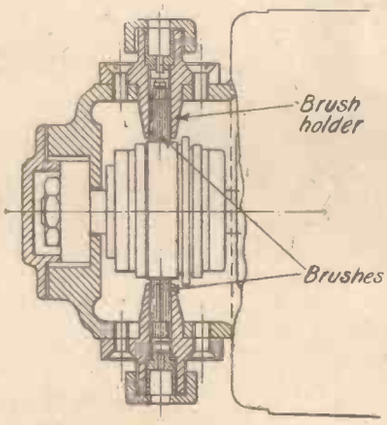


Fig. 5

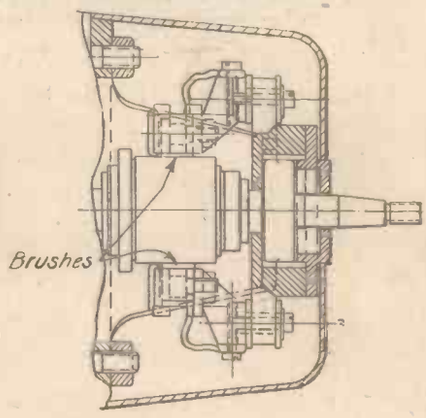


Fig. 4.—The Electrical Circuit of the Rotary Transformer.

Fig. 5.—Horizontal Sections of Ends of Converter showing Brush Gear.

Figs. 6 and 7.—Armature and Field-magnet Stampings.

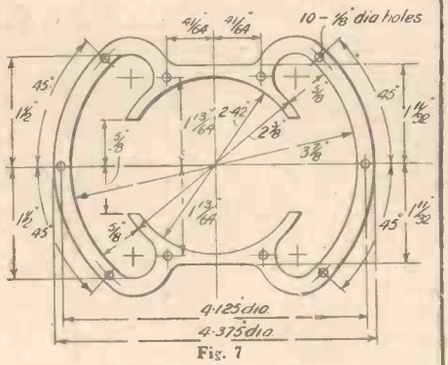


Fig. 7

Mechanical noises in running will be very slight if the work is carefully executed and the armature carefully balanced on knife edges after it is completed and wound. What little noise still exists, and which is due to the ball bearings and the friction between brushes and commutator, can be muffled by enclosing the rotary in a small cabinet lined with felt, and suspending the machine from the top with two stout rubber bands, if necessary providing a third band at the bottom to restrain the set from swinging.

The Circuit Connections

The electrical circuit, showing the L.T. battery common to both rotary and valve filaments, including L.T. choke, speed-regulating resistance (for control of H.T. volts), and also the H.T. terminals with potentiometer-connected resistance for the supply of two values of high-tension current, are shown in Fig. 4.

A photograph of the completed rotary ready for service is shown in Fig. 1, and the component parts are shown in Fig. 2. In conjunction with the scale sectional drawing (Fig. 3) and the drawings (Fig. 5), the photographs should provide sufficient information for construction.

Separate drawings of the field and armature stampings are shown by Figs. 6 and 7, and these being the most important parts have been fully dimensioned. Particular attention is directed to the utmost saving of weight these embody; in the ordinary field-magnet a very considerable amount of iron is only partially made use of, namely, that region between the limbs on either side where they merge into one common pole-piece. In the present design one may imagine the natural course of the magnetic lines curving from pole to pole in the shortest possible path, free from any restraint imposed by awkward contours in the iron, the lines finding their way through equal iron section throughout, and offering a minimum of reluctance as well as calling for minimum exciting power. As all iron parts have to be worked to a high flux density, if the utmost use is to be made of the material, the iron paths have to be very carefully proportioned.

A. H. A.

(To be concluded)

The Oslo programmes are now being simultaneously broadcast through two small relay stations, namely, Riukan, 445 metres (50 watts), and Porsgrund, 405 metres (100 watts). Three further relays are being erected at Frederikstad (700 watts), Notodden (50 watts), and Hamar (700 watts); when these are completed the power of the Porsgrund station will also be increased to 700 watts.

Lester Wolfe, an American broadcast announcer, was electrocuted at Chicago Beach Hotel while attempting to replace a blown-out fuse in the battery-room. He omitted to disconnect the electric power, and was killed instantly.

"Cosmos" SHORTPATH S.P. 18 Valves are recommended for use as shown below with alternative H.T. values:—

Stage	Coupling	Recommended Valves H.T. 20-80 v.	80-120 v.
H.F. Amplifier	Tuned Anode (neutrodyne) ..	Green	Blue
	Tuned Anode (not neutrodyne)	Green	—
	Transformer (loose coupled) ..	Red	—
	Transformer (tight coupled) ..	Green	—
Dual or Reflex	All Couplings	Red	Red
Detector (Grid Leak)	Resistance Coupling	—	Blue
	L.F. Transformer or Choke ..	Green	Blue
Detector (Anode Bend)	All Couplings	—	Blue
L.F. Stages ..	Resistance	Green	Blue
	L.F. Transformer or Choke .	Green	Green
Last Stage ..	All Couplings	Red	Red

Another SHORTPATH Valve

S.P. 18/B (BLUE SPOT)

This new S.P. 18 Valve supplements the well-known S.P. 18 Red Spot and Green Spot Valves. It is designed especially for use in resistance-capacity coupled sets, and for use as a Detector and in H.F. neutrodyne tuned anode stages using 80-120 Volts H.T., so that where this H.T. is employed in the last stage the difficulty of two H.T. supplies is avoided.

In addition, it gives still more amplification and consumes very little H.T. current.

The S.P./B (Blue Spot) is an excellent valve for anode bend detection.

Designed to work in parallel with the S.P. 18 Red Spot and Green Spot Valves, it operates from a 2-volt accumulator and consumes only 0·09 amp. filament current.

PRICES OF "COSMOS" SHORTPATH S.P. 18 VALVES.

RED SPOT	GREEN SPOT	BLUE SPOT
12/6	12/6	12/6

METRO-VICK SUPPLIES, LTD.

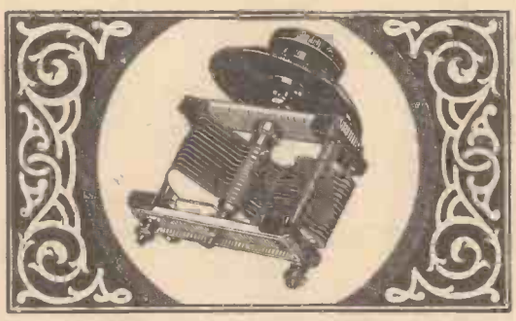
(Proprietors: Metropolitan-Vickers Electrical Co., Ltd.),

METRO-VICK HOUSE, 145, Charing Cross Road, LONDON, W.C.2.

Cosmos

RADIO VALVES

R
V 33



Wonderful

THE popular price of this new condenser of unrivalled precision presents to the amateur the ideal instrument for his experimental set. The construction executed for mechanical perfection has been achieved by the use of a ball bearing rotor, eliminating harshness and unreliability of tuning.

Electrical efficiency and exceptional range of wavelength together with full dial availability for tuning, is combined in its low loss square law design.

If at any time the Bowyer-Lowe Condenser develops a fault during the twelve months after purchase, the article will be replaced free of charge.

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

Bowyer-Lowe

ANNOUNCEMENT BY THE BOWYER-LOWE Co. Ltd. LETCHWORTH HERTS

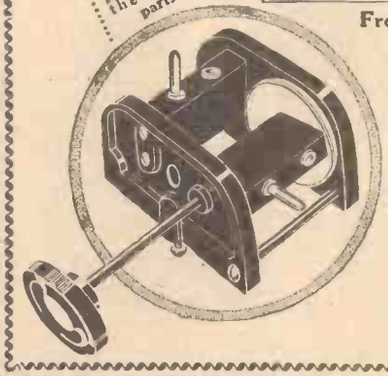
No unnecessary handling with the "Lotus"

The fewer adjustments, the easier it is to get accuracy. The "Lotus" is designed and proved in actual tests to respond to the most delicate operation without the exasperation caused by ordinary coil holders.

Moving block cannot fall

The moving block remains rigidly in position with the heaviest coil and no screws are needed to tighten it. It also moves in the same direction as the knob, which prevents any confusion. Three sets of enclosed precision machine cut gears ensure this.

Bakelite mouldings for the side plates, coil blocks and knobs; heavy nickel plating for the metal parts.



LOTUS

VERNIER COIL HOLDERS

From all Radio Dealers

Two Types:

For outside panel mounting:
Two-way 7/-
Three-way 10/6

For inside baseboard mounting, with 6 in. handle:
Two-way 8/-
Three-way 12/6

Garnett, Whiteley & Co., Ltd.,

Lotus Works, Broadgreen Rd., Liverpool

Makers of the new improved "LOTUS" VALVE-HOLDER.

According to Homer, Stentor was the name of a Greek herald in the Trojan War whose voice was as loud as that of 50 other men combined. As the name for a new Cossor Power Valve it is, therefore, peculiarly appropriate.

The new Stentor Two

described by "Popular Wireless" as a wonderful little power valve with a punch out of all proportion to its diminutive wattage.

FOR more than 20 years automobile engineers have been waging a ceaseless struggle in an effort to produce engines of more power with less weight. So successful have they been that to-day motor-car engines develop more than twice the horse-power of engines of equal weight constructed a decade or so ago.

And with the reduction in weight naturally follows a tremendous economy in upkeep. Less petrol, less oil, lighter moving parts with less wear. In fact cheaper motoring all round.

This lesson has been taken seriously to heart by wireless engineers. Everyone realises that to obtain really good loud speaker results a power valve is essential. The ordinary valve cannot give the volume necessary because it has little or no reserve of output. But in the past power valves have suffered from two main disadvantages: (*a*) they have been expensive to buy and (*b*) they have been costly to maintain both in filament and anode current.

Takes only ·15 of an ampere

At last, however, there is available a real power valve—entirely redesigned and utilising principles of construction never before found in any valve—which finally overcomes both of these serious disadvantages. It is the new Stentor Two—manufactured under a group of Cossor Patents.

Its superb fidelity of tone and unparalleled grandeur of reproduction has astonished even the most critical of radio technicians. They have readily admitted that never before has a 2-volt dull emitter consuming so little as ·15 of an ampere been able to produce such magnificent results.

Get acquainted with this wonderful new power Cossor Valve now—your dealer can supply from stock. Ask him also for our descriptive literature explaining the Cossor method of Co-axial Mounting and its far-reaching advantages.

COSSOR "POINT ONE" SERIES

Black Band: For Detector or L.F. 15/6
(Consumption ·1 amp.)

Red Band: For H.F. use 15/6
(Consumption ·1 amp.)

STENTOR TWO

Green Band: For power use 18/6
(Consumption ·15 amp.)

All operate at 1·8 volts.

A·C·Cossor·Ltd.
Highbury Grove
London : N.5

Cossor Point One

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On Your Wavelength!

Quality and Quantity

I NOTE with interest that the controversy regarding modulation shows no signs of abating. During the strike, in order to overcome oscillation and increase the range of reception, all news was amplified beyond the normal amount. London listeners may have found little alteration except that their batteries appeared to be giving their best. The innovation was felt further afield, and listeners living on the fringe of 2LO's range got their news in increased volume. Once having tasted this strength, they are still demanding that the B.B.C. should make a practice of sending out all news on the same power as that employed during the strike.

This demand is being steadfastly refused. The view is held by the B.B.C. engineers that they should cater for the average set, which normally is fairly efficient. They argue that if over-modulation be permanently employed, distortion will be experienced on the majority of sets possessing a factor of safety. Also such an innovation, as far as this country is concerned, would affect adversely the listener residing inside a station's accepted "field," while benefiting the few who live on the limits of range of that station.

Another point arises. First-class sets are not necessarily the expensive sets. Many people now realise that cash will not always buy efficient reception. Before the plea for over-modulation is made the listener should strive to erect a really first-class aerial, and frequently he will find that his set moves from the third-class into the first-class category. Over-modulation will always find support among the backwoodsman, but its general effect on broadcasting, I fear, would be to retard improvement in receivers.

The Importance of the Heterodyne

It is difficult to assess the order of merit of what might be termed "basic" inventions in wireless, but Dr. Eccles has stated that he considers the invention of the heterodyne method of receiving C.W. signals as one of the three or four outstanding discoveries in the art of wireless telegraphy.

The point was raised quite recently, before the Royal Commission on Awards to Inventors, in connection with the terms of an agreement between the owners of the patent covering the heterodyne principle and the Admiralty respecting the royalties to be paid for the past and future use of this method of reception in the navy. The sum agreed upon was £10,000, which does not, perhaps, at first sight appear an excessive amount, in view of the importance of the invention. At the same time it would be a handsome prize for any amateur lucky enough to have hit upon the discovery, for it is essentially an invention that might have come from such a source.

The original idea of combining two frequencies in order to secure a "beat" effect was, in fact, first suggested in 1907 by Fessenden. He only applied it, however, to the rectified signals after they had passed through the detecting device, the rectified signals and the local frequency being combined in the magnet windings of the receiving telephone.

The modern system, in which both the signal and local frequencies are applied to the receiving aerial, resulting in the beat frequency being detected by the valve or crystal, was patented in 1912 by J. W. Lee and J. L. Hogan, two American inventors. They subsequently disposed of their patent rights to the Metropolitan Vickers Co., to whom the Admiralty are now paying the sum above mentioned. This will, of course, be only a small fraction of the total amount of patent royalties due from other users of heterodyne reception.

The Old and the New B.B.C.

At the last—and actually the final—annual meeting of the B.B.C. as now constituted, certain prominent firms in the wireless industry entered a protest against the changes in policy that may follow the "taking over" of the B.B.C. at the end of the present year.

The existing directors of the company are being urged to get into immediate touch with the Government in order to secure a definite decision as to the lines which future developments might be expected to take. The manufacturers apparently desire the Government to bring in legislation at once so that the industry may know where it stands, and suggest that the Government might guarantee the *status quo* for at least twelve months. This is very unlikely to happen, but it would certainly appear reasonable that any drastic alterations in the present system, such as the replacement of numerous relay stations by a relatively small number of high-powered centres, or any wholesale alteration in the existing scale of wavelengths, should be notified to the industry and Press well in advance of the actual event. In this way manufacturers would have ample time to adapt the standard design of their sets or to take whatever other steps might be necessary to meet the new situation.

Winter Plans

I learn that plans for next winter's broadcast programmes are rapidly maturing. The musical side will again be particularly strong. This will include a series of celebrity symphony concerts of the same calibre as was given in Covent Garden. The world's famous conductors will wield the baton, and soloists of the highest standard will be engaged. The B.B.C. has announced its own opera programmes, a step in the right direction, for opera, when broadcast from the studio, is to be preferred to excerpts from opera performed in the theatre.

In addition, it is understood that an outside company may contribute to the opera programme during the winter season. The studio symphony productions will round off the musical bill, so that the music-loving listener has a great deal to which he may look forward.

Variety

A great advance has been made in the variety section. On many nights 2LO's variety bill would grace the hoardings of any music-hall. The winter will see a further advance, and listeners will reap the benefit of this close liaison between broadcasting and the variety stage. It would appear that many artistes have increased their box office value by their popularity before the microphone.

Drama

A great deal of spade work is being done in regard to drama. Leading artistes are realising the value of broadcasting and appreciating its demands on the art of acting. The winter will usher in the era of more elaborate dramatic productions in which the imagination of the listener will play a greater part. This applies more to serious drama.

Next season also will see the inclusion of more theatre excerpts, while a larger number of people, well known in the lighter musical productions, will be recruited to radio. Altogether, the listener will have fare in abundance, and granted its freedom, radio will display more vigorous driving power than in any previous period.

A Birthday

It is at the end of this month, on July 27 to be exact, that Daventry celebrates its first birthday, so naturally an extra special programme is to be given on that date. During its short history the present 5XX (the original one, if you remember, was at Chelmsford) has helped enormously to popularise wireless, for it has brought first-rate programmes within the range of crystal users over a very large part of this country. Our own 5XX was the first high-powered broadcasting station in the world. Its success has

On Your Wavelength! (continued)

naturally brought many others into the field, both in Europe and in America. In the latter country Bound Brook is rated at about fifty kilowatts, whilst in Europe Germany has already a ten kilowatt station at Hamburg and one of fifty kilowatts projected for Cologne. Sweden is building a twenty-five kilowatt station, Hilversum is shortly to raise its power to at least twenty kilowatts, and several other giants are in course of construction. There is little doubt, I think, that the future will see a small number of high-powered stations, rated possibly up to a hundred kilowatts or even more, instead of the multiplicity of low-powered transmitting posts we have at the present time.

—and Another

It was not until I happened to notice the number of the issue of AMATEUR WIRELESS which lies before me as I write that I realised that we were already four years old. Actually our fourth birthday occurred when No. 209 was published, rather more than a month ago. How quickly time seems to have passed since wireless first became a popular hobby—and what changes we have seen in this short period. AMATEUR WIRELESS may well be proud of its record. It has always stood for up-to-date and reliable information without stunts or scares.

Phew!

As I write it is rather more than hot, though, owing to the delightful vagaries of this funny climate of ours, it is quite possible that it will be snowing when you read these lines. It seems likely, however, that we are in for a warm spell, and if this is the case it behoves the wireless man to attend to one or two little points of importance. In the first place keep an eye on your telephones. When these are worn for any length of time in hot weather, moisture is apt to condense inside the earpieces, with rather surprising results later on.

Not long ago a friend showed me a pair of phones, complaining that they had almost entirely ceased to function. Upon removing the caps, I found that there were signs of rust on the outer surface of the diaphragms, and when these were turned over it was found that rust had almost filled up the tiny space between their undersides and the pole pieces of the magnets. They had become insensitive just because the diaphragms were unable to vibrate. If you want to keep your phones in good condition during the summer you should remove the diaphragms every now and then and wipe them over, so as to get rid of all traces of moisture or rust. Do not forget, too, to cast an eye from time to time upon your accumulator, and to replace any of the electrolyte lost by evaporation with enough distilled water to bring the level of the solution above the plates.

Earths

Heaps of people put down the loss of range that they experience in summer-time entirely to the longer hours of daylight. This, of course, has a big effect upon range, but in many cases inability to receive distant stations is due in no small measure to the unsuitability of the earth connection for work in summer-time. In winter almost any kind of earth will do; I have had excellent results, for instance, when using nothing better than a small poker thrust a few inches into the soil. But in summer-time it is a very different business.

If your home happens to be situated in a district where the upper soil is light or gravelly, much of the falling off in range and signal strength you experience may be due to a high resistance between your earth contact and the soil surrounding it. If you find that a couple of buckets of water improves matters, you may feel pretty sure that your earth is a bad one for summer use. The only way of making sure of having a really efficient earth at all times of the year is either to dig down until you are well below the gravel or to use a water-pipe connection. Often the counterpoise will give better results than any kind of earth—but for Heaven's sake do not use a counterpoise unless your set is quite stable, for if you do you will probably howl the place down.

A Queer Mishap

When my high-tension accumulator came back the other day from the charging station my set seemed to be behaving in rather a queer way. Though no alterations had been made in it during the absence of the battery, there was a distinct tendency, of which there had previously been no sign, to instability on the note-magnifying side; in fact, when a strong signal was tuned in, a low moan soon developed, which built up gradually until it became a super howl. A howl of this kind does not cause radiation, since it is confined to the low-frequency stages, but it *does* cause exasperation, I can assure you.

The Problem Solved

I spent a long time searching for the cause of the trouble without any success. Then a day or two later I thought I would remove the high-tension battery units from their box just to see that all was well. When I had done so the solution of the mystery was apparent. I had asked the people at the charging station to put new electrolyte into the cells. They had emptied out the old stuff, but on refilling had overlooked one cell. The result was a high resistance just where it was least wanted, the misbehaviour of my note-mags (the unit which contained this cell was up at the high-voltage end of the battery, and therefore did not affect the other valves), and one cell ruined for ever.

A Catastrophe

I am really wondering what to do about my new valves, which are so dull that they ought to be called dark emitters. I am not worrying about their efficiency, for that is remarkable; in fact, a three-valve set that I am using just now requires rather less current for filament-heating purposes than that needed to illuminate a single pocket flashlamp. I know that this is so, because I have made the test with an ammeter. My signals are clear and strong—at least, they used to be before the catastrophe occurred which I am about to relate.

Here is just what happened to me. The other night when I was listening to Oslo with the telephones, I was told that a friend had come to see me about something or other. Thinking that I would not be kept for more than a few minutes, I just put the phones down and went into the other room to him. As a matter of fact, he stayed some time, and I forgot all about the receiving set. Before going to bed I remembered it and duly turned over the earthing switch. The next day I was away, but on the following evening I went to switch on again. To my horror I found that the set was switched on, and had been so for two nights and two days. With never a glow from the dark emitters to catch my eye or anybody else's, both high- and low-tension batteries had been pouring forth juice for forty-eight hours on end, with dire results to each of them. I am trying to think out an automatic filament switch which will go on when I sit down in my chair at the wireless table and off when I rise from it.

Splendid Conditions

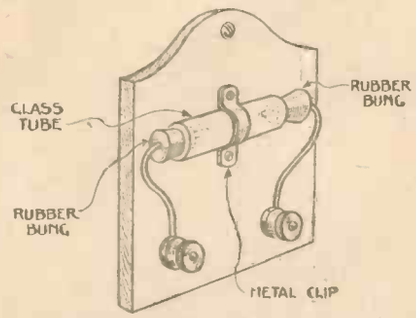
This has been the most weirdly patchy summer that I can remember in a good many years' wireless work. So far we have had the most amazing ups and downs from week to week and even from day to day. One of the best weeks that I can remember was that which included the first few days of the present month. The nights were mainly overcast, and though atmospherics were troublesome at times, long-distance reception was sheer joy, stations that had not been heard for a considerable time were coming in on some of the evenings with almost winter strength.

I do not think that I have ever had better reception from some of the shorter-wave stations; it was possible to put on to the loud-speaker many whose signal strength never exceeds the telephone standard in ordinary circumstances at this time of year. By the time that these notes appear in print a bad patch may have come round once more, but if there is a cloudy (not thundery) sky on any evening in the near future you may find it worth while to try a little trip abroad. THERMION.

PRACTICAL ODDS AND ENDS

Ever-ready Polarity Indicator

A USEFUL addition to the experimenter's radio equipment is the polarity indicator shown in the sketch. It will be seen that the actual indicator is



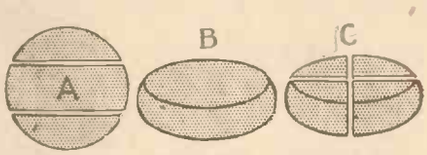
A Simple Polarity Indicator.

mounted on a wooden base, which can be conveniently hung on the wall in the radio den. A small piece of glass tubing contains the indicating liquid, which is simply a strong salt-water solution. A rubber bung is fitted at each end of the tube, and through small holes in each bung are led the two thick copper wires which dip into the solution. The free ends of these wires are taken to two terminals mounted below the indicator as shown. When connected across a D.C. source bubbles will form at that end of the indicator which is connected to the negative pole of the source. A.

Simple Shock Absorbers

USERS of crystal sets which have delicate crystal-detector adjustments, and who are troubled with undue vibration from external sources, may find the following hint a useful remedy. The remarks also apply to those valve-set owners who have trouble with microphonic valves.

A sorbo ball, one about 2¼ in. in diameter, has the top and bottom of it sliced off, leaving a disc of spongy rubber about ¾ in. thick. This is then cut into quarters so that each quarter can be used, one at each corner of the cabinet of the receiver. To fix the shock-absorbers to the cabinet securely either small nails may be used or else the absorbers may be glued into position with Seccotine. Of course, the squared edges of the sections of rubber are arranged to fit flush with the cabinet edges. C. H. W.

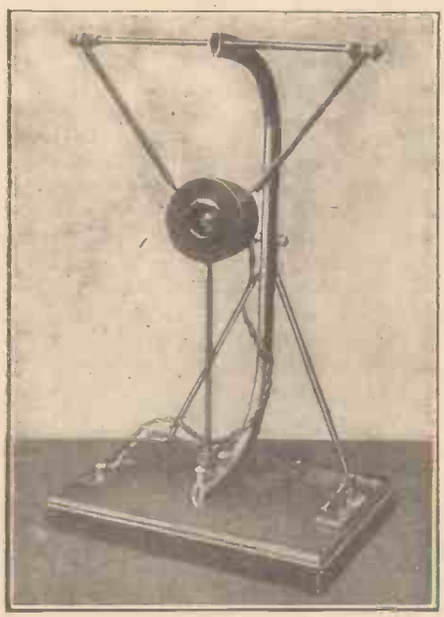


Method of Making Shock Absorber.

Microphone Suspension

THOSE who have had but little experience in radio-telephony transmission must often be at a loss to know how to suspend the microphone.

The device shown in the photograph has given very satisfactory results. A hack-saw frame is suitably mounted on a varnished wooden block, such as is used for



Photograph showing Method of Suspending Microphone.

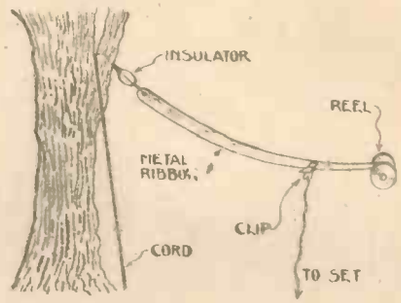
electric-light switches. As the photograph clearly shows the scheme of construction a detailed description should be unnecessary. It is desirable to explain, however, that the microphone is suspended by means of metallic springs covered with rubber tubing. H. J. H.

Portable Aerial

WHEN no enclosed aerial is used in a portable set it is necessary to improvise one wherever the set happens to be. To simplify this task, the following type of portable aerial is worth assembling.

A large cotton reel has secured to it one end of an 80-ft. strip of copper ribbon. This may be done with two small tacks. Then the ribbon is wound upon the reel and the other end attached to a small insulator.

To use this aerial it is necessary first to



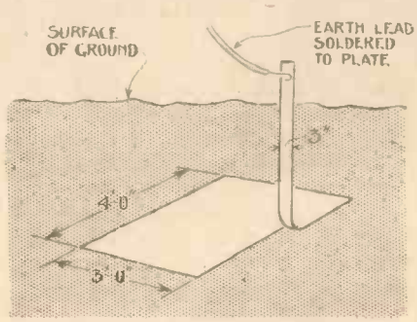
A Useful Portable Aerial.

sling a weighted string over, say, a branch of a tree, and then to tie to the free end of it the insulator attached to the aerial. The aerial can then be hoisted up as shown in the sketch. When finished with it is then a simple matter to lower the string and consequently the aerial, and the latter can be wound up again. A. S. H.

Efficient Earth System

A PROBLEM often encountered by the amateur is the method of securing the earth wire to the buried metal plate. In the case of the earth connection illustrated, it will be seen that the difficulty is overcome by using the metal itself as part of the earth lead.

A piece of sheet zinc or copper is obtained having the dimensions shown. A 3-in. strip of this is then cut along about



Details of Efficient Earth.

three-quarters the length of the sheet and bent upwards, as seen in the sketch, until it projects above the surface of the ground. The remainder of the earth lead can then be either soldered to the top of the strip or attached to a terminal. W. J. S.

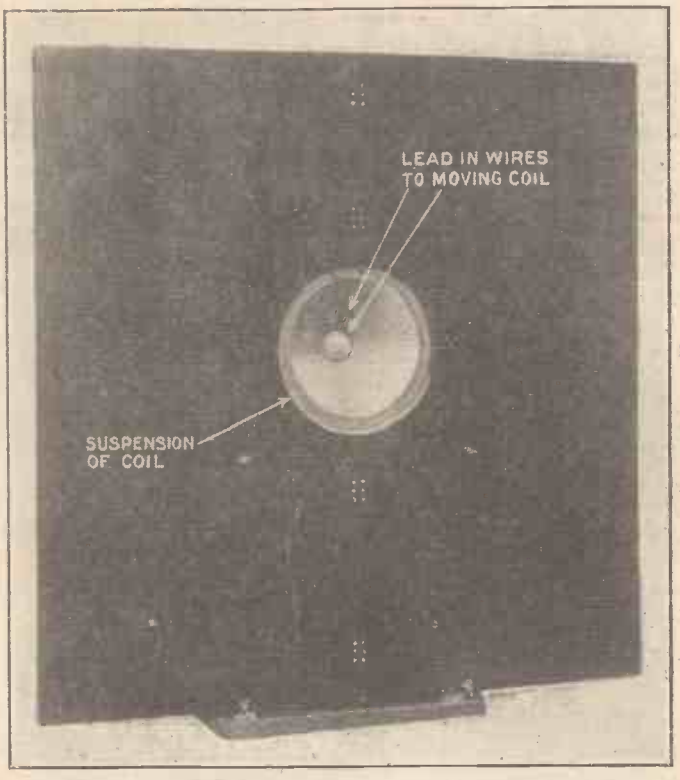


Fig. 3.—Front of McLachlan Loud-speaker with Wooden Board in position.

THE McLACHLA

A new departure described especi
inventor, Dr. N. W.

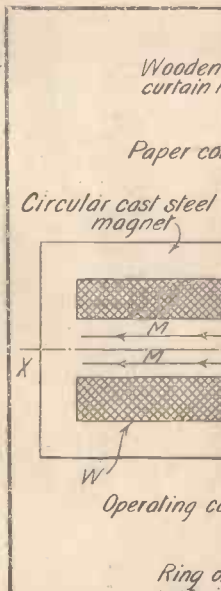


Fig. 1.—Diagramma of Coil-driven Co

SOME time ago I decided to try to improve upon the existing types of loud-speaker. The chief items which seemed to require attention were horn resonance and the absence of low tones in reproduction. For example, in the case of the loud-speaker in my possession, the low notes of the piano sounded weak, the pedal notes of the organ and the double bass could not be heard at all.

A Reliable Amplifier

Now the first thing I did was to get an amplifier on whose performance I could rely absolutely. This was accomplished by building an amplifier and measuring its output at various frequencies covering the pianoforte register from 20 to 4,000 cycles. The performance of the amplifier was found to be very nearly equal at all frequencies. In addition, by the use of very simple appliances, I was able to vary the performance of the amplifier in several ways as follows: (1) To cut off the bass, (2) to cut off the treble, (3) to give equal prominence throughout the piano scale, (4) to accentuate the treble. With a flexible instrument of this kind it is possible to form a good estimate of the performance of any loud-speaker, especially if the listener has a good musical ear.

Having got an amplifier of satisfactory design, it was used to test some horn-type loud-speakers. The results were certainly better than those obtained before, but the faults mentioned previously still remained.

The next step was an endeavour to produce an instrument in which these defects were absent.

Various diaphragm types of loud-speaker using a reed instrument (Brown telephone earpiece or loud-speaker movement) were constructed for test purposes. I do not propose to enter into the details of the construction of all these instruments because it would be rather beyond the scope of this article. Instead it will be more interesting to describe the best instrument of them all and indicate some of the more important principles which govern its design.

In Fig. 1 we have a diagrammatic sketch of what may be termed a coil-driven cone-type loud-speaker. There is a large electromagnet which can be energised from a battery or from the D.C. electric-light mains, the latter proposition being very much the cheaper of the two. The energy consumption is about the same as that of a small electric lamp (30 watts) and costs about one-sixth of a penny per hour. The current which flows in the winding W causes a very strong magnetic field in the air gap A A. The paths of the lines of force are indicated by the arrows M M. The magnetic lines flow radially across the air gap. Situated in the air gap is a coil of wire whose resistance is only a few ohms. This coil is securely fixed to a cone of stiff paper, the largest diameter being about 8½ in. The cone is supported at its outer edge by some flexible material such as stockinette, thin rubber, or anything which will stretch but will prevent the cone shifting its position and bringing the coil of wire out of the magnetic field. There is also another small cone at the centre of the larger one. This is merely a constructional artifice to keep the point of the large cone out of the way of the centre pole of the magnet. The paper is treated with aeroplane dope to protect it from climatic conditions.

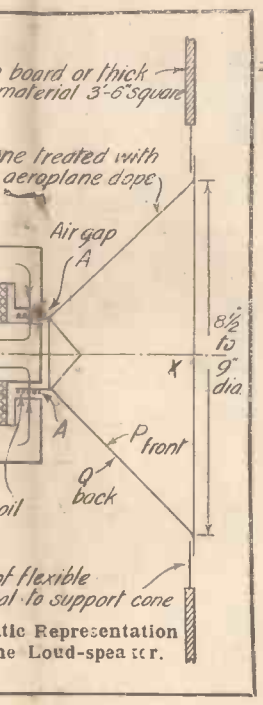
Lastly, there is a very important member in the form of a large wooden board, a thick screen of curtain material or cardboard, which surrounds the cone. This board is about 3 ft. 6 in. square, and its function will be described later. The photograph, Fig. 2, shows a rear view with the board in position. The magnet and cone rest on the top of the box which contains the output transformer and magnet control. The board is fixed to the front of the box and held in position by screws.

The back of the

Fig. 4.—The Field Magnet a

N LOUD-SPEAKER

ally for "Amateur Wireless" by the
McLachlan, M.I.E.



tic Representation
he Loud-speaker.

cone is shown by the white portion at the centre. Fig. 3 shows the front of the instrument from which the suspension material outside the cone and the connecting wires to the moving coil are seen. When the instrument is used in the open air, the magnet and coil, which are mounted on a cradle, can be pushed into the box. The magnet, cradle and diaphragm are shown in Fig. 4. The board is not used in this case, since the box fulfils a necessary function which is explained later. When electric currents due to speech or music are passed through the coil on the cone they create magnetic fields. These magnetic fields either act with or against the main magnetic field due to the winding W. The results of the interaction of these magnetic fields is a motion of the coil on the axis X X, such motion corresponding to the electrical currents due to speech or music. The coil being rigidly attached to the paper cone causes it to move also. The result is that the electrical currents are now transformed into sound waves. This means that the arrangement operates as a loud-speaker.

nd Diaphragm mounted on Cradle.

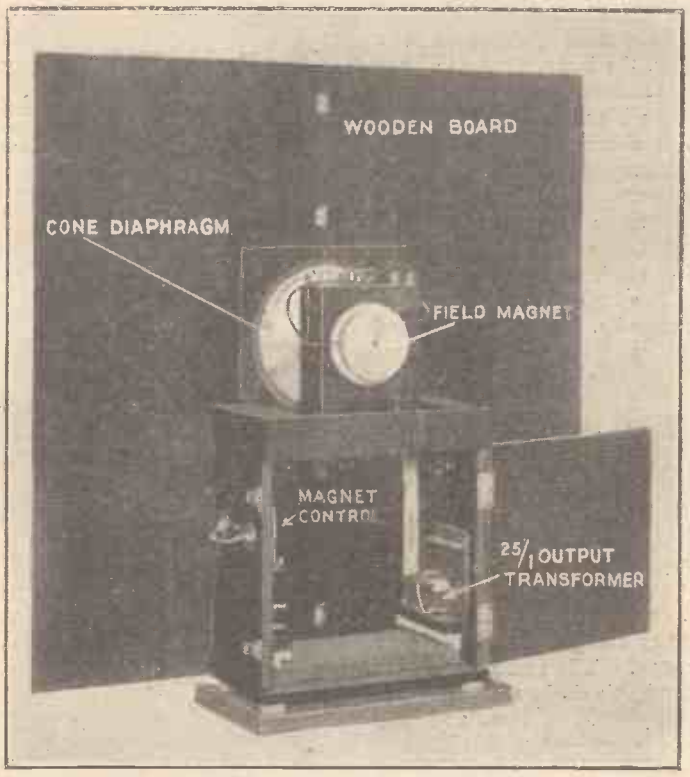


Fig. 2.—Rear of Loud-speaker with Wooden Board in place to Isolate the Two Sides of the Diaphragm.

Now we come to the part played by the large wooden board. Suppose the cone to move suddenly to the right. The air pressure at the front P will be increased, whilst that at the back Q will be decreased. Thus the air at the back and the front will be at different pressures. But air always flows from a region of higher pressure to one of lower pressure, as we all know from the air draught of the chimneys which operate our household fires. Now the intensity of the sound depends on preserving the pressure difference in the air. The removal of the board would mean a flow of air from P to Q round the edge of the cone in order to equalise the pressure. This would be a mild form of draught. But to get the sound as loud as possible, pressure equalisation must be prevented. The board fulfils this purpose admirably, and serves to isolate the two sides of the cone. Its influence is felt most on the low frequencies. This is due to the fact that at low frequencies the pressure changes on each side of the diaphragm occur slowly. In the absence of the board the air would have plenty of time to rush round and cause neutralisation, thereby cutting out the low tones. The influence of the board is very noticeable, especially on orchestral or organ music where low tones abound. When it is removed the overall loudness is reduced considerably and the low tones disappear almost entirely.

Salient Features

At this stage it might perhaps be useful to summarise the salient features of the above design of loud-speaker and its associated amplifier: (1) Equal voltage to the grid of the power valve at all frequencies; (2) a small paper cone driven by a coil of wire fixed at the vertex of the cone; (3) the free suspension of the cone at its outer edge so that its axial movements are unrestricted; (4) the isolation of the two sides of the cone by a large board, thereby preserving the low tones; (5) the absence of any resonating component, such as reed, metal diaphragm, or horn.

The reader will observe the absence of resonating parts. Furthermore, it is possible to calculate—in a degree—the performance of the coil-drive type at various frequencies. This cannot be done readily with the reed type of drive. In addition, the moving coil itself can be designed to accentuate either the upper or the lower register to an extent. Thus there is some flexibility. Different results can be attained without resonance and the musical scale can be reproduced fairly well from top to bottom.

The intensity can be varied from a whisper to a magnitude readily and comfortably audible 100 yards away; that is,

speech is distinct at this distance. Any instrument or orchestra can, with the aid of an adequate valve circuit, be reproduced at the same intensity as the original. Moreover, the instrument can be used in a private residence, a hall, or for public-address work or other purposes in the open air. For household use on ordinary sets (uniform amplification is necessary) with a resistance-capacity amplifier and a DE5a or LS5a valve (these having a low impedance), a 20 or a 25 to 1 step-down transformer is used. This latter is indicated in Fig. 5. The high-tension voltage should be about 200 volts. For greater intensities the high-tension voltage is increased and several LS5a valves are joined in parallel. To get good audibility at 100 yd. eight LS5a valves are connected in parallel, the H.T. being 400 volts and the negative grid bias about 120 volts. Putting one's head near the cone with such an output is extremely unpleasant.

To sum up, the coil-driven cone loud-speaker can be designed to give reasonably natural effects over a wide band of musical frequencies using an amplifier giving uniform output. The performance is equally good from pianissimo to fortissimo. It will reproduce the low- and high-toned musical instruments, such as drums, double bass, pedal notes of grand organ and high harmonics of the violin, which are barely audible on other loud-speakers. It can be used in a private residence or in the open air for propagating sound to a distance.

N. W. McL.

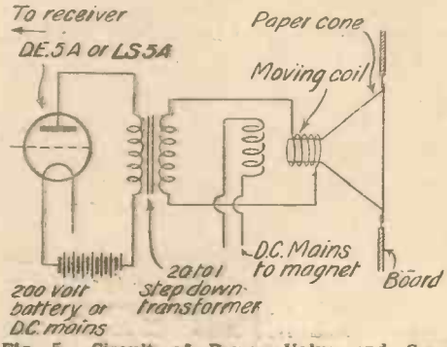


Fig. 5.—Circuit of Power Valve and Connections from Mains for Operating Loud-speaker.

Within the next two months the Julianehaab (Greenland) wireless telegraphy station will initiate a regular daily broadcast of weather forecasts and reports. The times fixed for these transmissions are midday and midnight, G.M.T., and the messages will be sent out in the accepted English code.

GRID BIAS FROM THE H.T.

IN almost every multi-valve receiver it is essential to provide the grids of the valves with a certain bias voltage, either positive or negative. Positive bias is necessary to damp the grid circuits of H.F. valves, and to the grids of L.F. amplifiers a negative bias should be applied to ensure that the grid-volt swings occur only on the straight portion of the valve characteristic curve.

The current passed in the grid circuit is minute, and there is practically no drain on the grid-bias cells. For this reason the H.T. battery can be made to do double duty and to supply both plate and grid potentials. The accumulator is then not connected to the negative end of the H.T. battery, but to a point a certain distance up (say the nine-volt tapping) which will give the required bias. The grid return lead, if connected to the negative end of the battery, will have a negative potential with respect to the filament, and the same effect will be obtained as if a separate bias battery were fitted.

P.

Preliminary tests of the new broadcasting station in course of installation at Danzig will start towards the end of August.

***A Musical Tourney.**—A debate upon the respective merits of classical and syncopated music was recently broadcast from 2LO. Sir Landon Ronald took up the cause of classical music, whilst Mr. Jack Hylton, assisted by his band, debated upon the merits of jazz.*

W G Y—THE STATION WITH THE 50-KILOWATT VOICE

W G Y celebrated its fourth birthday on February 20, 1926.

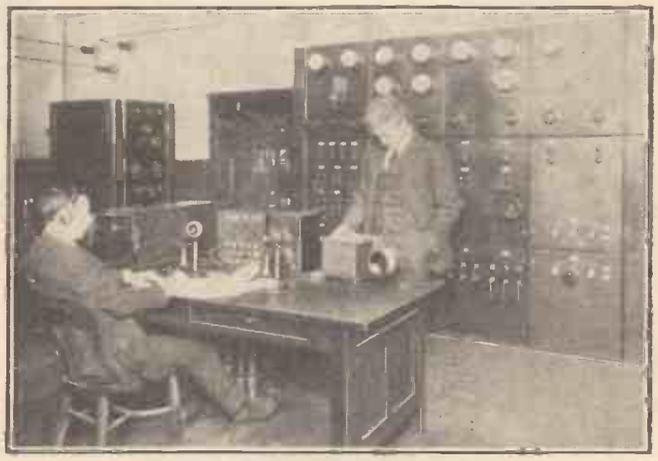
In four years these three letters have found their way into many countries and languages, but wherever found they mean the same thing, the broadcasting station of the General Electric Company at Schenectady, N.Y.

When W G Y first went on the air it had a power of 1,000 watts. To-day it is licensed to speak regularly with 5,000 watts, and on Saturdays and Sundays the station may express itself with ten times greater power — 50,000 watts. Further, W G Y sometimes speaks with four different voices simultaneously, for its words and music may be picked up on 32.79 metres, 109 metres, 1,560 metres and 379.5 metres.

It was through the Schenectady station that the experiments of the great developmental station at South Schenectady were carried on; it was W G Y that broadcast for the first time in any country on 50 kilowatts; it was W G Y that conducted a series of experiments using alternately horizontal and vertical radiation; it was W G Y that perfected successful 250-mile radio relay on 1,560 metres wavelength.

At South Schenectady special transmitters operating on 32.79, 109, 1,560 and 379.5 metres have been erected, and almost nightly are on the air with programmes of W G Y, while at near-by and remote stations on land and on sea, in the tropics and in the far north, observers are obtaining transmission data on the various wavelengths. W G Y is thus not only a source of entertainment and information for many thousands of people, but is the instrument by means of which pioneer work is being carried out.

From the very first Mr. Martin P. Rice, the manager of broadcasting for the General Electric Co., foresaw that progress in programme development would be seriously handicapped if the station were dependent upon programmes originating in the studio. Within a year W G Y's engineers began the development of remote-control stations wire-connected to the studio. Now the Schenectady station has one of the most elaborate systems of remote control of any broadcasting station. Through its affiliation with W J Z, W G Y has the advantages of tapping into the remote control system of the New York station, which includes wires to Washington and to station W R C. During the past year W G Y extended its lines westward, and is now connected to W F B L in Syracuse, W H A M in Rochester and W M A K in Buffalo.



The Main Transmitter of W G Y.

Simultaneously with the development of the wire system, engineers have been engaged in the development of radio relay. Two years ago a 50-watt portable broadcasting station was tried out. The station, fitted up on a truck, was transported to church or theatre and directly connected to the amplifiers and microphone. The output of the microphone was then broadcast on 100 metres, picked up by W G Y, and re-broadcast on the station's wavelength. Later work has resulted in the development of 1,560 metres as the ideal wavelength for re-broadcast relay service within a distance of 250 miles.

Within a few weeks after W G Y took to the air, four years ago, the local station established itself among three or four leading stations in the country in the quality of the programmes offered, and it has maintained that position. National sporting events, including baseball, football, addresses by educators, legislators and religious leaders are made available to all listeners. The W G Y Players, the Minstrel Group, the W G Y Orchestra and the Radio Four are always popular features.

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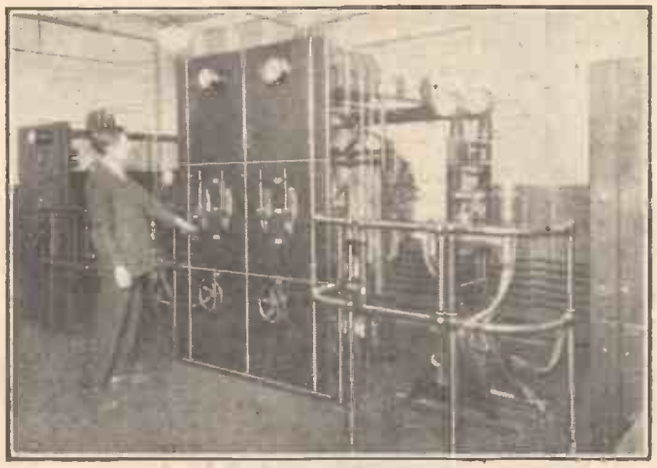
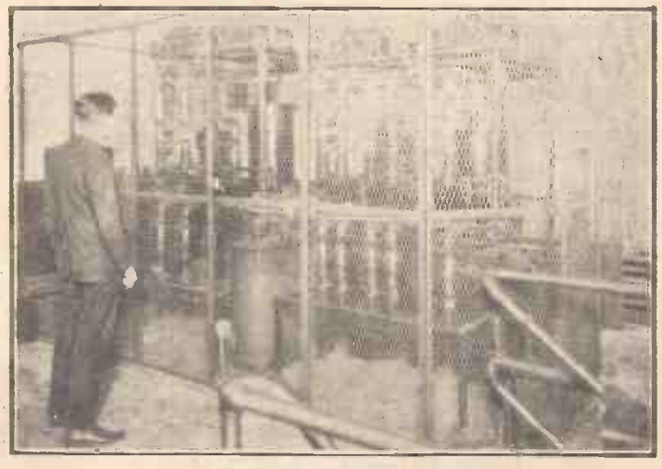
Paris concerts from the Ecole Supérieure des P T T are now being relayed nightly by the Bordeaux-La Fayette wireless telegraphy station, in which a telephony transmitter has been installed.

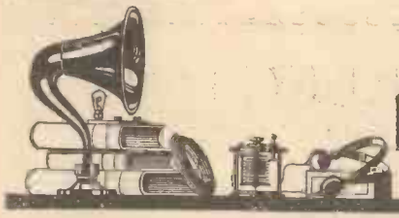


Panel in the Power House.

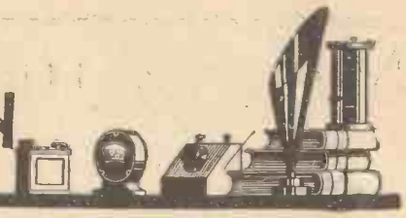


The Kenotron Rectifier Assembly.

The Reading Town Council has passed a by-law to the effect that "No person shall in any street or public place operate any loud-speaker in such a manner as to cause annoyance to or disturbance of residents or passengers."



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, layouts, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 112).

Reception of Daventry

Q.—*Is there any advantage to be gained from using "low-loss" construction when building a crystal set for the reception of 5 X X ?—P. S. (Berks.).*

A.—There is certainly some advantage to be gained, but nothing like so much as when reception is to be carried out on lower wavelengths. The losses eliminated become less serious as the frequency of the oscillations to be dealt with become lower, or, in other words, as the wavelength is increased.—J. F. J.

Altering L.F. Coupling

Q.—*I have a three-valve set consisting of a detector, a transformer-coupled L.F. stage and a resistance-capacity coupled L.F. stage. I am desirous of using a transformer instead of resistance-coupling between the last two valves. Can you tell me how to make the conversion ?—N.B. (Dundee).*

A.—This will not be at all difficult provided that there is sufficient room in your set for the second transformer. First of all remove the anode resistance, coupling condenser and grid leak which at present form the coupling between the last two valves. Then connect the transformer primary in the place in the circuit previously occupied by the anode resistance. Join one end of the transformer secondary to the grid of the last valve and join the other end of the secondary to L.T. or G.B. negative as the case may be.—J. F. J.

Phone Connections

Q.—*Is it really important always to connect the phones so that the positive tag is connected to the positive terminal ?—J. R. J. (E.2.).*

A.—Care should always be taken to see that the phones are connected in the correct manner. You do not say whether the phones are used with a crystal or a valve receiver. In a crystal set the matter is not of great importance (though it is advisable to have some standard method of connecting up), but in a valve receiver the phones will be damaged if wrongly connected for any considerable length of time. Phones are marked as regards polarity so that the current passing through the windings strengthens the field of the permanent magnets. When the tags are reversed the current will tend to demagnetise the phones.—J.

Adding a Valve

Q.—*I get only moderate loud-speaker results from the Manchester station at a distance of about twenty miles. My set comprises a detector valve with reaction and two L.F. stages, both being coupled by transformers. In order to get really good loud-speaker strength would you advise me to add another transformer-coupled L.F. valve ?—L. C. (Cheshire).*

A.—The proposed addition is not likely to give satisfactory results. Even if the best quality transformers are employed throughout, it will be very difficult to prevent some considerable distortion when three are used in the same set. More than likely the set would be unworkable owing to L.F. oscillation caused by interaction between the various transformers. Unless your aerial is very poor indeed it should be possible to get all the volume you require from the local station with your present set, and we advise you to try to improve the efficiency of set and aerial with this object in view. If your poor results are due to the conditions under which the set must necessarily be worked, we suggest that you add another valve as an H.F. amplifier.—B.

OUR WEEKLY NOTE

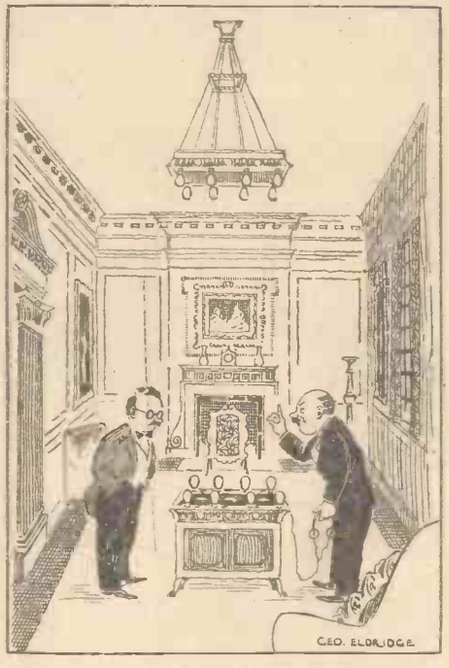
STORING ACCUMULATORS

Now that the holiday season is here again many people are wondering what to do with their accumulators while away. Of course, in order to keep it in good condition, an accumulator should be kept in constant use, charged as soon as it runs down and put to work soon after it comes back from the charging station. Nothing ruins an accumulator so readily as prolonged idleness.

If it is only going to be left for a fortnight it may be given a good charge and left for that period, when it will usually take little harm. For any longer period, however, special steps should be taken with regard to the storing of the battery. It should first be fully charged and the acid poured out to be stored separately in an earthenware or glass jar. The cells should then be filled with distilled water. The opportunity can be taken at this time to rinse out the cells thoroughly to get rid of any sediment. In this state the accumulator may be safely left for many months.

When put into use again the water should be emptied out, the cells filled with the original acid, and the battery put on charge at a low rate until the cells gas freely.

THE BUREAU.



"What are your last four valves doing?"

"Nothing much, old boy! Just met the wife halfway in the panel arrangement—made the valves match the electric-light fitting!"

Filament Rheostats

Q.—*I have some seven-ohm filament rheostats which have been used to control the flow of L.T. current to "bright" valves used in conjunction with a six-volt accumulator. Will they be suitable for valves requiring .25 amp. at 1·8 volts ?—H. N. (Birmingham).*

A.—These rheostats will be quite suitable for your purpose provided, of course, that the three cells of the accumulator are connected in parallel instead of in series as at present. The accumulator will then give 2 volts only, but will have triple its present ampere-hour capacity. The rheostats would have far too low a resistance if the accumulator were to be used with the suggested valves in its six-volt form, but if rheostats of sufficient resistance to cut down the 6 volts to that required across the filaments were used the energy wasted in the rheostats would be approximately twice that consumed by the valves, so we advise you to alter the accumulator connections.—J. F. J.

Reversing L.T. Connections

Q.—*Why does reversing the connections from the accumulator to the set make a great difference to the reception ?—G. D. (Uxbridge).*

A.—This is only natural when it is considered that reversing the connections mentioned will greatly alter the operating points of all the valves. If you examine the wiring of your receiver or the circuit diagram, you will observe that the grids of all the valves are eventually connected to one side of the filament circuit. By reversing the accumulator connections you alter the mean potentials of all the grids by an amount equal to the voltage of the L.T. battery.—B.

Properties of Frame Aerial

Q.—*I had been given to understand that a frame aerial has very marked directional properties, and yet one which I use inside the house appears to receive almost equally well from the local station in whichever direction the frame is pointing. Can you explain why this is so ?—G. T. (Birmingham).*

A.—You have been correctly informed so far as the marked directional properties of frame aerials are concerned. However, these properties are only effective in indicating the direction from which the received waves actually reach the frame, and do not necessarily point out the direction of the station transmitting the waves. A considerable discrepancy between these two directions often arises owing to the fact that the direction of travel of wireless waves can be greatly diverted under certain conditions. In your case it would seem that various conductors around the receiver, such as water-pipes, gas-pipes, or electric-light wiring (which may be embedded in the walls of the house), are acting as aerials in receiving the energy from the transmitting station and re-transmitting it. If it so happens that these conductors are fairly evenly distributed around the frame aerial, it may easily be that almost the same amount of energy is reaching the frame from each point of the compass. Under such conditions the frame might appear to be almost non-directional, as the waves are not reacting it from any *particular* direction.—R. W.

MAKING THE CRYSTAL SET SELECTIVE

THE test recently carried out in London by the B.B.C., when different programmes were broadcast simultaneously from 2 L O and from the old plant at Marconi House, showed that very large numbers

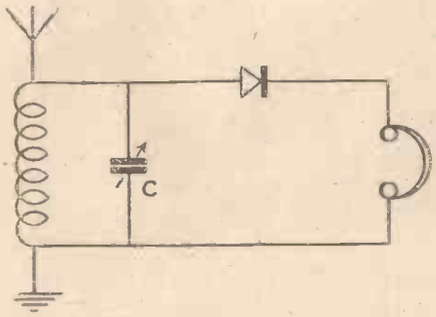


Fig. 1.—The Most Common Type of Crystal Circuit.

of crystal users in various parts of the Metropolis found it impossible to separate the two transmissions, though their wavelengths differed by 95 metres. This was not very surprising, for hitherto there has really been no need to design crystal sets with a view to obtaining selectivity. The average owner of such a receiving apparatus has been limited to two stations, the local station and 5 X X, and it would be a phenomenally bad set if it were incapable of separating them!

The success of the recent experiment shows that the B.B.C. has advanced a step towards the realisation of one of its most cherished ambitions, which is to provide every owner of every wireless set, crystal or valve, with alternative programmes. It is natural to suppose that further experiments upon the same lines will be conducted, as a result of which it may before long be within the power of every crystal user to make his choice of programmes—provided that his set is sufficiently selective to enable him to tune out the one which he does not want and to tune in that which he does. In the near future we shall probably see a considerable amount of attention paid to the question of making crystal sets more selective.

It is impossible to obtain anything like knife-edge tuning with a plain crystal set, for the crystal itself introduces an amount of damping which renders such a degree of selectivity as can be obtained with a carefully designed valve set out of the question. Exceedingly sharp tuning, however, is not necessary, for we may feel sure that there will always be a big difference between the wavelengths upon which the alternative programmes within range of the receiving set are transmitted.

The problem, then, is simply to improve the selectivity of the crystal set to such a degree that it will be capable of silencing a near-by transmission when the tuning is 60 or 70 metres above or below its wavelength. Here are one or two ways in which a good deal can be done at very small expense and without making extensive alterations in the set.

Fig. 1 shows one of the commonest types of crystal circuit, in which a single coil L and a variable condenser C are employed, the condenser being in parallel with the inductance. The whole of the coil is common to both the aerial and detector circuits. Perhaps the simplest alteration, which produces an improvement in many cases, is to insert, as shown in Fig. 2, a fixed condenser with a capacity of .0001 microfarad in series with the aerial lead-in. The effect of using such a condenser can be tried out quite easily before it is incorporated in the set by placing a fixed condenser upon the table which supports the wireless set and attaching the aerial lead-in to one of its terminals, the other being connected to the aerial terminal of the set. The presence of this small condenser will alter the setting of C1 needed to bring in a given station.

The best way of seeing whether you are obtaining improved selectivity is first of all to tune in your local station *without* C2 and to make a careful note of the number of degrees increase and decrease in the setting that are required to reduce it to silence. If the portion of the scale of C1 over which the station can be heard is

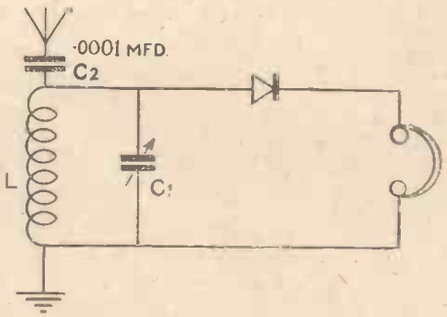


Fig. 2.—A Small Fixed Condenser in Series with the Aerial will Improve Matters.

smaller with C2 in position, then there is an improvement.

Selectivity is nearly always increased by placing the A.T.C. in series with the A.T.I. as shown in Fig. 3. This alteration is, as a rule, quite easy to make in an existing crystal receiver. The simplest way of carrying it out will be seen from an examination of Fig. 3. Disconnect the aerial terminal from the coil holder, but not from the detector or the variable condenser. Disconnect the aerial terminal from the top of the coil holder and from the detector, but not from the A.T.C. Disconnect the second contact of the A.T.C. from the telephones and earth, and connect this to the top of the A.T.I. and to the detector.

A very great improvement in selectivity, without undue loss of signal strength, can be effected without making a single alteration in the internal wiring of the set. Fig. 4 shows how this may be done. Substitute for the existing A.T.I. a Lissen X coil. Instead of attaching the aerial to its own terminal, connect it to one of the

(*Concluded on page* 112)

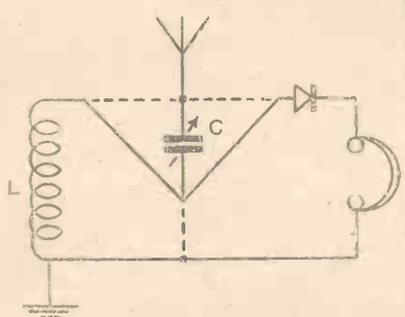


Fig. 3.—Placing the A.T.C. in Series Usually Improves Selectivity (original parallel connections are shown dotted).

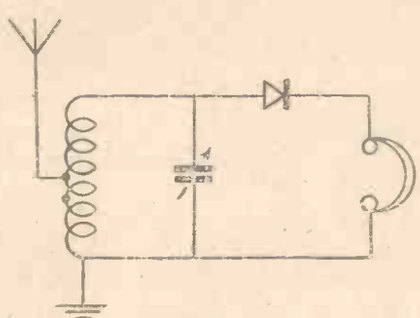


Fig. 4.—The Use of an "X" Coil will Also Improve Results without Altering the Wiring of the Set.

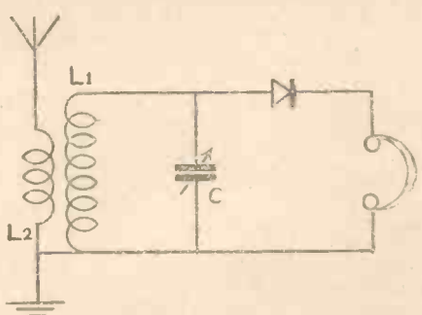


Fig. 5.—In this Circuit a Double-circuit Tuner is Used, the Aerial Being Aperiodic.

"A.W." TESTS OF APPARATUS

Conducted in the "Amateur Wireless" Research and Test Department

Brown's A2 Type Phones

THE A2 type of phones, manufactured by S. G. Brown, Ltd., of Victoria Road, North Acton, London, W.3, is an improvement over the better-known A type.

The new type is obtainable in two values

Brown A2 Type Phones.

of resistance, of 2,000 or 4,000 ohms total. Although the thin conical aluminium diaphragm is retained, the reed to which the diaphragm is attached is made lighter, and thus more sensitive, by the removal of superfluous metal. The distance between reed and magnets is adjustable by means of the milled aluminium knob situated at the centre of the earpiece. Each earpiece is smaller and lighter in weight than the A type, and, generally speaking, more comfortable to wear. Exceptionally long phone cords are provided, while the polarity of each phone tag is clearly indicated by the covering of the flex and by a small cross stamped on the positive tag.

We have found these phones to be extremely sensitive and to give a very clear and even reproduction of speech and music at all frequencies.

Detex Vermo-Dial.

The Detex Vermo-Dial

A SLOW-MOTION dial having a handsome appearance is made by Detex Distributors, Ltd., of 110, Victoria Street, London, S.W.1. The dial is made in three distinct parts, namely, the engraved ebonite scale, which remains stationary, the polished nickel-plated friction disc and pointer which is attached to the spindle of the condenser, and lastly the control knob.

The edge of the friction disc is clamped between two small metal washers fitted to the spindle of the control knob, the amount of friction between the washers and the disc being regulated by a strong spring. When the control knob is turned, the rotating washers cause the disc clamped between them to turn. A pointer is fitted on the disc, which travels over the engraved scale on the bevelled edge of the dial.

Owing to the simple but remarkably efficient friction device employed there is not the slightest trace of backlash in the control. The action is very smooth, and the gearing ratio (about 6½ to 1) gives a fine degree of tuning. The large friction disc also acts as a screen, preventing hand-capacity effects.

The dial will fit any size of spindle if the split washer and grub screw supplied are used.

Ediswan PV4 Power Valves

A LOW-FREQUENCY power-amplifying valve that we have tested and that we can recommend is the new Ediswan PV4 made by The Edison Swan Electric Co., Ltd., of Ponders End, Middlesex. The valve is neat in appearance, with its silvered pipless glass bulb and black insulating cap. There are several features by which the valve may be recognised, chief among these being the clear inspection window on the top of the bulb, enabling one to inspect the three vertical electrodes. Inside the bulb is to be seen a wafer disc which is unattached and is free to move about inside the bulb. This disc is evidently used to protect the small inspection window during the silvering process of the bulb.

Designed as a power amplifier to work off a 4-volt accumulator, the valve takes a filament current of .35 ampere. As with all good power amplifiers the amplification factor is fairly low in value, being approximately 6, while the characteristic curve has a slope of .65 milliampere per grid volt. The average working impedance is 9,500 ohms.

On tests this valve has given a very good account of itself as a distortionless amplifier, having about 120 volts on the plate and 4½ to 6 volts negative grid bias. Microphonic noises are practically absent. In this respect we may mention that if the valve is flicked sharply with the finger only a slight "ping" is heard in the phones.

Bowyer-Lowe Plugs and Jacks

WE have received for test samples of some well-made jacks from The Bowyer-Lowe Co., Ltd., of Letchworth. The jacks, of which there are six types available for various purposes, possess a girder frame which gives great rigidity, while the contact strips are made of tinned phosphor-bronze springs. Pure silver contacts, accurately positioned on the contact strips, give a steady and positive contact.

The contact strips are clamped between small rectangular pieces of ebonite, having a high insulation, and are bolted to the girder frame by two nuts and bolts.

Bowyer-Lowe Plug and Jack.

Each contact strip ends in a wide fan-tail contact, having a hole which will take any wire up to $\frac{1}{16}$ in. square. A one-hole fixing device is incorporated.

Among the many uses of these jacks which might be mentioned are the following: Jack No. 1 is used for connecting phones or loud-speaker in the plate circuit of the last valve. To permit of listening-in to each stage of amplification, or for switching the loud-speaker into the last stage as the plug is withdrawn, jack No. 2 is used.

Ediswan PV4 Power Valve.

The plug is made of brass, having a body turned out of solid ebonite and then polished. Two clamping screws are provided which will take phone tags or flexible wires

IN Switzerland the cost of a wireless listener's licence has now been fixed at 12 Swiss francs per annum, but the various broadcasting stations are only granted an income from the licences sold in their respective areas.

The Danish Posts and Telegraphs are considering plans for the erection of a broadcasting station at Kallundborg, in the north-west of the island of Zealand. The proposed power is 5 to 6 kilowatts, and it is probable that the station will operate on a wavelength of 1,000 to 1,250 metres.

In order to obtain an increased working capital, Radio Toulouse is resorting to various original methods, including a general canvass of the city by the local police force armed with subscription lists.

The operating staff of WAAM, Newark (U.S.A.), has opened a summer camp in the neighbourhood of the city. For the purpose of publicity the members wear white sailor suits and straw hats with the initials WAAM in gold letters on the hat band.

It is reported from Stockholm that the erection of new broadcasting stations at Kalmar, Karlskrona, and Helsingborg, to work in conjunction with the station at Malmö, has stimulated Swedish interest in radio. It is stated that at the end of last March there were about 182,000 licensed receiving sets in Sweden, an increase of approximately 63,000 during the preceding five months.

Tommy Handley, the popular broadcast light comedian, made a great hit when he appeared in an individual show at the Glasgow station. He is to take the lead in *No Option*, a forthcoming B.B.C. show.

The first instalment of a "serial"—an adaptation of A. E. W. Mason's novel "The Villa Rose"—will be broadcast from London on Tuesday, July 27, at 7.40. Readings will be continued each evening throughout the week until the whole story is completed, in five instalments.

Band and concert party relays from Glasgow public parks are proving a popular light feature with Scottish listeners. In the course of the season, some of the best bands in the Kingdom will be heard.

On July 27, Mr. Henry Ainley will present *The Passing of Talma*, a dramatic picture of the death of the great French actor, so closely associated with Danton, Robespierre and other leading Revolutionary figures. In the performance Mr. Ainley will himself take the part of Talma.

In a performance at the London studio of *Lionel and Clarissa* to be broadcast on August 9, by arrangement with Mr. Nigel Playfair, practically the entire original cast will take part in the entertainment.

When a man was fined £5 at Glasgow for having a wireless set without a licence, it was stated that, following a previous prosecution, 220 persons took out licences within two days.

THE INTERNATIONAL SET COMPETITION

Elimination Competition

ENTRIES for this competition are now closed. Competitors have been asked to send in their sets not later than Monday, July 26, and these will be on public view on Thursday, Friday and Saturday, July 29, 30 and 31, from 10 a.m. to 5 p.m., at the offices (ground floor) of Messrs. Cassell & Co., Ltd. (the Proprietors of AMATEUR WIRELESS), La Belle Sauvage, Ludgate Hill, London, E.C.4.

For the benefit of readers who are not familiar with the City of London we may say that La Belle Sauvage is a few yards from Ludgate Circus and about 250 yards west of St. Paul's Cathedral.

It is unlikely that the result of the Elimination Competition can be announced in less than a fortnight from the date of this issue. Competitors, readers and indeed the public generally are given a very hearty invitation to come to La Belle Sauvage and see the sets.

In the States, British sets will be in competition with American, French, Belgian, Spanish, Australian and other sets at the Radio World's Fair, Madison Square Garden, New York, where they will be on view from September 13 to 18 inclusive, and further, the winning sets will be given a place of honour at the Fifth Annual Radio Show, in Chicago.

The new wireless-controlled fog signal now in operation on the Clyde is located on a sandbank in the channel at the entrance to the river. The receiving apparatus on the beacon has a transmitting set synchronized with it at Gourock Pier, 1¼ miles distant, the synchronization rendering the installations immune from atmospheric and other interference. The receiver is self-contained and requires attention only once in three months.

Mr. Elliott O'Donnell, the expert on supernatural matters, will broadcast a talk from London on July 22 on "Sea Mysteries."

Mr. Rudy Wiedoeft, the world's greatest saxophonist, will contribute to a variety programme from the London station on July 29.

A regular service of wireless pictures across the Atlantic has now been established, and several pictures are being transmitted daily from London to New York.

The Department of Commerce in Washington is deeply concerned over the radio broadcasting situation. Over 600 applications for licences from new stations have been received, and it has been impossible to find wavelengths enough to go round.

During some recent tests between the naval stations at Bellevue, D.C., and Mare Island, California, regular messages were exchanged on a wavelength of 13.1 metres, in full daylight. Further tests included the 13.4 metre channel. It is believed to be the first time the successful transmission of such low waves has been accomplished for distances of 3,000 miles in daylight.

A new departure is noted in ship installations with the fitting of wireless telephone sets on eight whalers. Experience has proved that this type of installation can be operated by unskilled hands, and they will, without doubt, prove of great assistance in the management of the whaler fleet, which, in addition to intercommunication, will be able to get into telephonic communication with the shore staff.

Mr. Eric Megaw, of Fortwilliam Drive, Belfast, is crossing from Dublin to Montreal in the steamer Lord Antrim to make experiments in short-wave radio communication. Mr. Megaw is using the call GX6MU on a wave of 45 metres.

North Wales is petitioning for the erection of another Welsh station owing to the limited and puzzling range of Cardiff. Birmingham has been ministering to the needs of North Wales recently, but even the efforts of 5IT fall short of the desires of Welsh listeners.

In the Irish Free State Senate recently Mr. J. J. Walsh, Minister of Posts and Telegraphs, announced that a high-powered broadcasting station was likely to be erected in the centre of Ireland. Further, low-powered stations will be established at Cork, Galway, and probably Bundoran during the next few months.

Radio exhibitions will be held in London and Berlin simultaneously early in the autumn, and negotiations are in hand with a view to having the more important German radio works thrown open for inspection by British visitors during exhibition period.

Portions of the programmes given by the bands of the Irish and Welsh Guards and the Royal Marines at the Shrewsbury Great Floral Fête, to be held on August 18 and 19, are to be broadcast.

On August 3, *Force, Wits and a Woman*, by Julius Hare, a play dealing with the days of Cromwell and his Roundheads, will be broadcast from 2LO.

NEXT WEEK AT 2LO

By "THE LISTENER"

L. Salisbury

In the Programmes

THE Hyde Park bands have proved exceedingly popular "over the ether," and on Sunday next Mr. Charles Godfrey will again conduct a programme, which will include the "Military Overture" by John Ansell. The soloists are Miss Ellis Burford (soprano) and Glyn Eastman (bass). The evening programme will be relayed from the Piccadilly Hotel, where De Groot and his orchestra are playing; May Huxley, a clever young coloratura singer, will be the vocalist.

Generally speaking, school concerts are only of interest to the parents whose offspring are making themselves heard, more or less successfully, and why they should be broadcast is rather a problem. However, on Monday evening part of the school concert from Highgate School will be broadcast to the world at large. An interesting concert of chamber music follows, by the Kutcher String Quartet, assisted by Elsie Suddaby (soprano). Included in the scheme is Joseph Holbrooke's Suite "The Pickwick Club." Listeners with extremely vivid imagination will possibly be able to hear in the section entitled "A Field Day" Snodgrass and Winkle on the two violins, the latter represented by the viola and 'cello. The Fat Boy and Mr. Tupman also appear. A welcome variety is provided for 10 p.m., the artists including the variety star Daisy James, and James Stuart and Partner.

On Tuesday the vocalists will include two broadcast favourites in Lily Allen and Robert Chignell. Announced also is a dramatic sketch, *The Passing of Talma,* dealing with the death of the French actor. The chief part will be taken, it is hoped, by Henry Ainley. He will be assisted by Clare Harris and Howard Rose.

The defeat of the Spanish Armada was about the end of the month of July in 1588; in commemoration it is a good idea to give us some sea music. On Wednesday, therefore, we shall hear Parry's famous Cantata, "The Chivalry of the Sea," Stanford's "Songs of the Sea," interpreted by the famous Australian bass-baritone, Horace Stevens, and excerpts from Vaughan Williams' Sea Symphony. Interspersed between this and the Bach anniversary programme, which follows from 10 to 11, Jack Smith, the American singer of syncopated songs, who has taken the title of the "Whispering Baritone," will appear. The Bach programme marks the anniversary of his death in 1750, and some of the chorales from the St. Matthew Passion will be included.

Lovers of part songs will listen on Thursday to the Salisbury Singers, with flute solos from Miss Edith Penville. Later follows a popular favourite of the variety halls in Wilson Hallett, noted for his child impersonations, also Violet Field and Frances Buckland at the piano.

Julius Harrison

In the Programmes

Mr. Julius Harrison, the famous conductor, makes a welcome reappearance on Friday night as conductor of the Wireless Symphony Orchestra. He will include a "Midsummer Night's Dream Overture," Mozart's Symphony in C, as well as works of Dvorak, Sibelius and Rimsky-Korsakov. Eispah Goodacre (contralto) is the vocalist. The 10 o'clock feature takes the form of a series of dramatic incidents associated with famous melodies, such as the "Marseillaise," France, 1792; "The Girl I Left Behind Me," The Peninsula, 1810; "John Brown's Body," America, 1859; "Marching Through Georgia," America, 1864; "Dolly Grey," England, 1899. These sketches have been arranged by Amayas Young.

The pianist of the week is Hilda Dederich, who will play Schumann's works.

An experiment, from Tuesday to Saturday inclusive, will be made by the transmission of a serial story. The first book is A. E. W. Mason's crime novel, "At the Villa Rose." With the assistance of the author himself, each nightly episode has been made complete in itself, so that if anyone who listens is obliged to miss any one night the series will not be spoilt as a whole.

THE NEW B.B.C.

ROYAL CHARTER TO BE GRANTED

IN the House of Commons on Wednesday night, July 14, the Postmaster-General, Sir William Mitchell-Thomson, said that the Government had accepted in general the recommendations made by the Committee under the chairmanship of Lord Cranford, which were, briefly, that the broadcasting service should be taken over by a public corporation, acting as trustee for the national interest; that the corporation should be licensed by the Postmaster-General for a period of not less than ten years; that the undertaking of the British Broadcasting Company should be taken over as a going concern; and that the receiving licence should be retained at 10s. There would be no interruption whatever in the continuity of the service. The intention was that on December 31 the service at present conducted by the British Broadcasting Co. should pass over as a going concern—plant, assets and a large part of the staff—to the control of the new authority.

As to the constitution of the new authority, the Government felt that to set up a body by statute would prejudice its position from the start, by introducing into the minds of the public the idea that, in some way or other, it was the creature of Parliament and connected with political activity. If broadcasting was to live in this country, he was perfectly certain that its vitality would be increased directly as they succeeded in divorcing it from political activity. They also found insuperable objections to setting up a new body under the Companies Acts, and they therefore proposed to move the Crown to be pleased to grant a Royal Charter for an incorporated body to hold a licence from the Postmaster-General and to conduct this service.

The actual regulation of the functions of the new body would have to be made by the House of Commons, either by legislation in the autumn or by way of supplementary estimates. Whichever way was chosen, there would be further opportunity for discussion of details, and before that discussion the draft of the petition and any relative papers would be issued. The new body would be called the British Broadcasting Corporation, rather to emphasise the fact that it existed by Royal Charter. He had the financial arrangements in hand, under which he hoped it would be possible for the new body to start with a clean sheet, free from all liabilities.

Valve Couplings

SIR,—With reference to the criticism of R. S., in No. 213, of my letter on couplings, I would like to say that your correspondent has rather missed the point of my remarks.

I pointed out the wonderful quality to be obtained by using a combined transformer and resistance-coupled amplifier, and did not go into the much raised question whether the transformer should follow the detector or a stage of resistance-coupling? His letter has further amplified my statement that distortion is bound to occur if two or more stages of transformer-coupling are used.—C. S. (Cheltenham).

Mahoganite

SIR,—In No. 213 of AMATEUR WIRELESS, on page 44, mention is made of "best quality Mahoganite," which might rather give your readers the impression that there are several houses in a position to market Mahoganite. The word Mahoganite is our trade name for a brand of ebonite which we market and supply in one quality only, and it is an infringement for any house to sell under this name any insulating material not manufactured by the American Hard Rubber Co. (Britain), Ltd.—AMERICAN HARD RUBBER CO. (BRITAIN), LTD. (London, E.C.).

Coupling L.F. Valves

SIR,—I should like to refer to certain letters on the above-mentioned subject which have appeared in your two recent issues, No. 211 and No. 212, and on which comment and correction in certain cases are necessary.

There is no doubt whatever that the amplification when using resistance-capacity coupling does actually fall off at the bottom end of the scale and rise to a degree at the top end, as a rule, to a somewhat greater extent than published data indicates. Curves which the writer has seen showing the performance of ordinary resistance coupling have been based almost without exception on calculated values which, whilst reasonably correct, tend to minimise the weaknesses of this method of amplification.

A point which is often overlooked is that if one uses one stage of low-frequency amplification, the difference between the amplification of the notes round about 100 cycles and at 500 cycles is, when using the best components, in the neighbourhood of 20 per cent. If one uses two stages the discrepancy is a much larger percentage, and it may be shown that if one employs a sufficient number of resistance-coupled stages to get volume equal to that obtainable by the use of two nearly perfect transformer-coupled stages, the difference in the resulting purity of amplification is not such as may be detected by ear.

Your correspondent, F. P., has fallen into a common error of thinking that the connection of a resistance unit and condenser across the primary of a transformer gives the purity of resistance coupling with the step-up of transformer coupling. It is easy to see that the connection of a resistance and condenser as indicated merely reduces the total impedance by providing a parallel path in the plate circuit of the valve, and since the proportion of the valve amplification factor of which use is made depends on the value of the external impedance, the total amplification must be reduced. With poor transformers which have pronounced peaks in their amplification curves, the effect of connecting such a resistance is to reduce the total height of the curve and consequently in certain instances to improve somewhat the reproduction.

Your correspondent R. G. T. is quite wrong, since in any case the amplification which takes place between L.F. valves is, at least with the exception of the valve which supplies the loud-speaker, potential amplification, and this must be so, since for pure reproduction in the case of transformer couplings no current should flow in the secondary windings.

The impedance of the valve comprises a practically non-inductive resistance in series, with which is connected an anode resistance. The variation of current through the valve, caused by the variation of grid potential, produces an alternating voltage variation across the whole system, this potential being divided between the valve impedance and the external impedance, according to their relative values, so that if the two impedances are equal, the alternating impulses across the anode resistance are equal to the signal impressed on the grid of the valve, multiplied by half its amplification factor.—J. B. (Moston).

Appreciation

SIR,—As a colonial reader of AMATEUR WIRELESS, I request the privilege of recording through your columns my appreciation of the Mullard Valve Co.

I purchased two valves (Mullard) which developed faults, and on communicating with the Mullard Valve Co. they immediately instructed their Capetown agent to replace same free of charge.

This, sir, is a very generous action, and (as far as is known to me) it is the only firm who have instructed their agent "to use their discretion" in these matters in South Africa.—F. W. (Capetown, S. Africa).

CHIEF EVENTS OF THE WEEK

SUNDAY, JULY 25

London	The Royal Parks Band.
Birmingham	Symphony Programme.
Glasgow	The Band of H.M. Scots Guards.

MONDAY

London	Chamber Music, Poetry and Variety.
Bournemouth	Popular Overtures.
Belfast	Mirth and Melody.
Cardiff	*The W terman.*
Glasgow	"Whiffs," No. 2.
Manchester	The Art of Syncopation.
Newcastle	Music from the Seaside—Whitby.

TUESDAY

London	"At the Villa Rose"—Serial Story continued throughout the week.
Daventry	Daventry Birthday Programme.
Aberdeen	Shakespeare Programme.
Cardiff	Music of the Masters.
Edinburgh	Holiday Programme relayed from Portobello.
Manchester	Summer Scenes from Shakespeare.
Plymouth	The Band of H.M. Royal Marines (Plymouth Division).
Sheffield	The Chesterfield Musical Union Choir.

WEDNESDAY

London	Armada Programme.
Bournemouth	Light String Programme.
Dundee	Dramatic Evening.
Glasgow	The Clydebank Burgh Band.
Newcastle	"The Electric Sparks" Concert Party.

THURSDAY

London	Variety Programme.
Birmingham	Dance and Song Through the Ages.
Cardiff	Duets and Diversions.
Manchester	The Far East—Thro' Western Gates.

FRIDAY

London	Songs of History.
Daventry	Daventry Pool.
Birmingham	Light Classics.
Bournemouth	The Weymouth Municipal Orchestra.
Cardiff	*What He Won.*
Glasgow	Empire Slogans, No. 1—A Competition on Acrostic Lines.

SATURDAY

London	A Seaside Concert Party.
Glasgow	Light Opera and Musical Comedy.
Manchester	Lancashire Leisure.
Bournemouth	Military Band Night.

"DETAILS COUNT IN VALVE DEVELOPMENT"

Correction

WITH reference to the article appearing under the above title in AMATEUR WIRELESS No. 212, dated July 3, two correspondents—Mr. Thornton H. Bridgewater, of Sutton, Surrey, and Mr. P. J. Donelly, of Ryde, I.O.W.—point out one or two errors in connection with the mutual conductance of the Cossor valves. Both correspondents show that the total amplification obtained from a valve is proportional to the amplification factor and to the *anode* conductance.

They also point out that the value of the mutual conductance of each valve is incorrect.

The writer of the article thanks his correspondents and apologises for the errors. The correct mutual conductance values for the Red Top, Plain Top and Stentor Two types of Cossor valves are approximately 300, 350 and 1,000 microhms respectively.

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 British Summer Time.

London (2LO), 362 m. 1-2 p.m., con.; 3.15-4 p.m., transmission to schools; 3.30-5.45, con. (Sun.); 4.15 p.m., con.; 5.15-5.55, children; 6 p.m., dance music; 7-8 p.m., time sig., news, music, talk; 8-10 p.m., music; 9.0, news (Sun.); 9.30 p.m., time sig., news, talk; 10 p.m., special feature (Mon., Wed., Fri.). Dance music on Thurs. and Sat. until midnight.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 440 m. **Birmingham** (5IT), 479 m. **Bournemouth** (6BM), 386 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 422 m. **Manchester** (2ZY), 378 m. **Newcastle** (5NO), 404 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 315 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 321.5 m. **Liverpool** (6LV), 331 m. **Nottingham** (5NG), 326 m. **Plymouth** (5PY), 338 m. **Sheffield** (6FL), 306 m. **Stoke-on-Trent** (6ST), 301 m. **Swansea** (5SX), 482 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 4 p.m. onwards, own con. on Mon. Dance music daily (exc. Sun. and Tues.) till midnight; on first Friday in each month until 2 a.m.

IRISH FREE STATE.

Dublin (2RN), 397 m. Daily, 7.30 p.m. Sundays, 8.30 p.m. until 10.30 p.m.

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. B.S.T.

AUSTRIA.

Vienna (Radio Wien), 582.5 m. and 531 m. (temp.) (10 kw.). 11.00, con. (almost daily); 15.30, con.; 19.25, news, weather, time sig.; con., lec., news; 20.00, con.; 22.00, dance (Wed., Sat.).

Graz, 402 m. (1 kw.). Relay from Vienna. Also own con. (Tues., Wed., Fri.), 20.10.

BELGIUM.

Brussels, 487 m. (2½ kw.). 17.00, orch. (Tues., Thurs., Sat. only), news; 20.00, lec., con., news. Relay: Antwerp, 265 m. (100 w.).

Liége (Radio Club), 585 m.

CZECHO-SLOVAKIA.

Prague, 372 m. (5 kw.). Con., 20.00-23.00, daily.

Brunn (OKB), 521 m. (2.4 kw.). 10.00, con., news (Sun.); 19.00, lec., con. or dance (daily).

Kbely, 397 m. (500 w.).

DENMARK.

Copenhagen (Radioraadet), 347.5 m. (2 kw.). Sundays: 10.00, sacred service; 16.00, con.; 20.00 dance. Weekdays: 20.00, lec., con., news, con.; dance to 24.00 (Thurs., Sat.).

Ryvang, 1,150 m. (1 kw.). Sundays: 09.00, sacred service.

Odense, 810 m. Relays Copenhagen.

Sorö, 1,150 m. (1½ kw.). Relays Copenhagen.

FINLAND.

Helsingfors (Skyddskar), 504 m. (500 w.).

Helsingfors, 440 m. Con., 18.00 (Tues., Thurs., Sat., Sun.).

***Tamafors**, 368 m.

***Jyvaskyla**, 561 m. (200 w.).

***Ulenborg**, 233 m. (200 w.).

* Relay Helsingfors.

GRAND DUCHY OF LUXEMBURG.

Radio Luxemburg (LOAA), 1,200 m. Con.: 14.00 (Sun.), 21.00 (Thurs.).

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 07.15, 08.00, physical exercises; 11.00, markets (exc. Sun. and Mon.); 11.20, time sig., weather; 15.00, 16.45, Stock Ex. (exc. Sun. and Mon.); 18.00, talk, con., news; 19.00 and 23.10, weather; 21.00, con. (daily). Relays PTT, Paris: 07.15, 08.00 (daily).

Radio-Paris (CFR), 1,760 m. (about 3 kw.). Sundays: 12.45, con., news; 16.30, Stock Ex., con.; 20.15, news, con. or dance. Weekdays: 10.40, news; 12.30, con., markets, weather, news; 16.30, markets, con.; 20.15, news, con. or dance.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (800 w.). 07.15, 08.00, physical exercises (except Sun.); 20.30, lec. (almost daily); 21.00, con. (daily).

Le Petit Parisien, 333 m. (1 kw.). 21.15, con. (Tues., Thurs., Sat., Sun.).

Radio L.L. (Paris), 350 m. (250 w.). Con. (Mon., Wed., Thurs.), 20.30.

Radio-Toulouse, 431 m. (2 kw.). 12.30, con., time sig. (daily); 17.30, news (exc. Sun.); 20.45, con.; 21.25, dance (daily).

Radio-Lyon, 280 m. (2 kw.). 20.20, con. (daily). Temporarily closed.

Strassburg, 205 m. (100 w.). 21.15, con. (Tues., Thurs.).

Radio Agen, 318 m. (250 w.). 12.40, weather, Stock Ex.; 20.00, weather, Stock Ex.; 20.30, con. (Tues., Fri.).

***Lyon-la-Doua**, 480 m. Own con., 20.00 (Mon., Wed., Sat.).

***Marseilles**, 351 m. (500 w.).

***Toulouse**, 280 m. (2 kw.).

***Bordeaux**, 411 m.

* Relays of PTT Paris.

Montpellier, 220 m. (1 kw.). 20.45 (weekdays only).

Angers (Radio Anjou), 300 m. (500 w.). Daily: 20.30, news, lec., con.

Bordeaux (Radio Sud-Ouest), 330 m. Con., 21.00 (Mon., Fri.).

Mont de Marsan, 390 m. (300 w.). Con. (weekdays only), 20.30.

Algiers (N. Afr.) (PTT), 310 m. (100 w.). 21.45, con. (Mon., Thurs.).

GERMANY.

Berlin, on both 504 and 571 m. (4 kw.). 06.30, con. Phys. Exer. (Sun.); 09.00, sacred con. (Sun.); 11.00, con. and tests; 12.55, time sig., news, weather; 15.00, educ. hour (Sun.), markets, time sig.; 17.30, orch.; 20.30, con., weather, news, time sig., dance music until 24.00 (Sat., Sun., Thurs.). Relayed on 1,300 m. by Königswusterhausen (1,300 m.) and Stettin (241 m.).

Königswusterhausen (LP), 1,300 m. (8 kw.). 11.30-12.50, relays Berlin (Sun.); 15.00, lec. (daily); 18.30, relay of Berlin (Vox Haus) con. (daily). 2,525 m. (5 kw.), Wolff's Buro Press Service: 06.45-20.10. 2,880 m., Telegraphen Union: 08.30-19.45, news. 4,000 m. (10 kw.), 07.00-21.00, news.

Breslau, 418 m. (4 kw.). 12.00, con. (daily), Divine service (Sun.); 12.55, time sig. (Sun.), weather, Stock Ex., news; 16.00, children (Sun.); 17.00, con.; 19.00, lec.; 20.30, con., weather, time sig., news, dance (relays Berlin). Relay: Gleiwitz, 251 m.

Frankfort-on-Main, 470 m. (1½ kw.). 08.00, sacred con. (Sun.); 11.55, time sig., news; 12.55, Nauen time sig.; 16.00, con. (Sun.); 16.30, con.; 18.00, markets, lec.; 20.00, lec., con., weather. Dance: relays Berlin. Relay: Cassel, 273.5 m.

Hamburg, 392 m. (4 kw.). Relayed by Bremen (279 m.), Hanover (297 m.), Kiel (230 m.). Sundays: 07.25, time sig., weather, news, lec.; 09.15, sacred con.; 13.15, con.; 18.00, con.; 19.15, sports, weather, con. or opera, dance. Weekdays: 05.45, time sig., weather; 07.00 and 07.30, news, weather; 12.55, Nauen time sig., news; 14.00, weather, con.; 16.15 con; 18.00, relays Berlin; 19.00, lec.; 19.55, weather and con.; 22.00, dance (Sun., Thurs., Sat.).

Königsberg, 463 m. (1 kw.). 09.00, sacred con. (Sun.); 12.55, time sig., weather, news; 16.30, con.; 17.00, con. (Sun.); 19.30, lec.; 20.00, con. or opera, weather, news, dance (irr.).

Leipzig, 452 m. (3 kw.). Relayed by Dresden (294 m.). 08.30, sacred con. (Sun.); 11.00, educ. hour (Sun.); 12.00, con. (daily); 12.55, Nauen time sig., news; 16.30, con., children (Wed.); 20.15, con. or opera, weather, news, cabaret or dance (not daily).

Munich, 485 m. (3 kw.) and 204 m. (1½ kw.). Relayed by Nuremberg (340 m.). 11.30, lec., con. (Sun.); 14.00, time sig., news, weather; 16.00, orch. (Sun.); 16.30, con. (weekdays); 18.30, con. (weekdays); 19.15, lec.; 19.30, con. (Sun.).

Munster, 410 m. (1 kw.). Relayed by Elberfeld (259 m.), Dortmund (283 m.). 11.45, radio talk, Divine service; 12.00, news (Sun.); 12.30, news (weekdays); 12.55, Nauen time sig.; 15.30, news, time sig.; 16.00, con.; 17.00, children (Sat.); 19.40, news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 24.00 and 04.00, weather and news.

Stuttgart, 446 m. (1½ kw.). 11.30, con. (Sun.); 16.30, con. (weekdays); 17.00, con. (Sun.); 18.30, time sig., news, lec., con. (daily); 21.15, time sig., late con. or cabaret.

HOLLAND.

Amsterdam (PCFF), 2,125 m. (1 kw.). Daily: 06.35-15.30 (exc. Mon. and Sat., when 12.30-13.30), news, Stock Ex.

Hilversum (HDO), 1,060 m. (5 kw.). 09.00, sacred service (Sun.); 19.10, con.; 21.00, news, etc.

HUNGARY.

Buda-Pesth (Csepel), 560 m. (2 kw.). 09.30, news; 12.00 and 15.00, weather, news; 17.00, dance music; 20.00, con. or opera; dance nightly.

Kosice, 2,020 m. (2½ kw.). 19.00, con.

ICELAND.

Reykjavik, 327 m. (700 w.). Tests: 22.30, 24.30.

ITALY.

Rome (IRO), 425 m. (3 kw.). 10.30, sacred con.; 13.15, official communique; 17.00, children; 17.30, relay of orch. from Hotel di Russia; 17.55, news, Stock Ex., jazz band; 20.30, news, weather, con.; 22.15, late news.

Milan, 320 m. (2 kw.). 20.00-23.00, con., jazz band.

JUGO-SLAVIA.

Belgrade (Rakovitza) (HFF), 1,650 m. (2 kw.). 17.00, news (daily), con. (Tues., Thurs., Sat.).

Agram (Zagreb), 350 m. (500 w.).

LETTLAND.

Riga, 475 m. (2 kw.). Con. daily, 21.00-22.00.

NORWAY.

Oslo, 382 m. (1.2 kw.). 11.00, Divine service (Sun.), Stock Ex. (weekdays); 19.15, news, time, lec., con.; 22.00, time, weather, news, dance relayed from Hotel Bristol, Oslo (22.30-24.00, Sun., Wed., Sat.).

Bergen, 358 m. (1½ kw.). 19.30, news, con., etc.

***Riukan**, 445 m. (50 w.).

***Porsgrund**, 405 m. (100 w.).

* Relays Oslo.

POLAND.

Warsaw, 480 m. (6 kw.). Daily: con., 11.00-13.00; 15.00-23.00, daily.

RUSSIA.

Moscow (RDW), 1,450 m. (12 kw.). Weekdays: 12.30 and 17.55, news and con.; 23.00, chimes from Kremlin.

(Popoff Station), 1,010 m. (2 kw.). 10.00, 11.00, lec.; 13.00, 19.00, con. (Tues., Thurs., Fri.).

Radio Peredacha, 410 m. (6 kw.).

Trades Union Council Station, 450 m. (2 kw.). 18.00, con. (Mon., Wed.).

Leningrad, 940 m. (2 kw.). Weekdays: 16.00.

Nijni Novgorod, 860 m. (1.2 kw.). 17.00 (Tues., Fri., Sun.), con.

Astrakhan, 650 m. (1 kw.).

Kieff, 780 m. (1 kw.). 18.00, con. (daily).

SPAIN.

***Madrid** (EAJ6), 392 m. (1½ kw.). Daily: con. (times vary daily). Closes at 24.00 on Sun., Wed., Sat.

***Madrid** (EAJ7), 373 m. (4½ kw.). 17.30-24.00, con. (almost daily).

***Madrid** (EAJ4), 340 m. (3 kw.). 16.00, con.

*The Madrid stations are again working to a rota, varying time of transmissions daily.

Barcelona (EAJ1), 325 m. (1 kw.). 17.00-21.00, news, lec., con. (Sun.); 18.00-23.00 (daily).

Barcelona (Radio Catalana) (EAJ13), 462 m. (1 kw.). 19.00-23.00, con., weather, news.

Bilbao (EAJ9), 415 m. (1 kw.). 19.00, news, weather, con. Close down 22.00.

Bilbao (Radio Vizcaya) (EAJ11), 418 m. (2 kw.). 22.00-24.00, con. (daily).

Cadiz (EAJ3), 357 m. (550 w.). 19.00-21.00, con., news. Tests daily (exc. Sun.), 24.00.

Cartagena (EAJ15), 335 m. (1 kw.). 20.30-22.00, con. (daily).

Seville (EAJ5), 357 m. (1½ kw.). 21.00, con., news, weather. Close down 23.00.

Seville (EAJ17), 300 m. 19.00-22.00, con, (daily).

San Sebastian (EAJ8), 343 m. (500 w.). 17.00-19.00, 21.00-23.00 (daily).

Salamanca (EAJ22), 355 m. (1 kw.). 17.00 and 21.00, con. (daily). Closes down 23.00.

Saragossa, about 325 m. Testing.

SWEDEN.

Stockholm (SASA), 430 m. (1½ kw.). 11.00, sacred service (Sun.); 12.30, weather; 14.00, con. (Sun.); 17.00, children (Sun.); 18.00, sacred service; 19.00, lec.; 21.15, news, con., weather. Dance (Sat., Sun.), 21.45.

Relays.—Boden (SASE), 1,200 m.; Eskilstuna, 250 m.; Falun (SMZK), 370 m.; Gothenburg (SASB), 288 m.; Gefle, 208 m.; Joenkoeping (SMZD), 199 m.; Kalmar, 253 m.; Karlsborg (SAJ), 1,350 m.; Karlscrona (SMSM), 196 m.; Kristinehamm (SMTY), 292 m.; Karlstadt (SMXG), 221 m.; Linkoeping, 467 m.; Malmo (SASC), 270 m.; Norrkoeping (SMVV), 260 m.; Orebro, 237 m.; Ostersund, 720 m.; Säffle (SMTS), 245 m.; Sundsvall (SASD), 550 m.; Trollhattan (SMXQ), 322 m.; Umea, 215 m.; Varborg, 385 m.

SWITZERLAND.

Lausanne (HB2), 850 m. (1½ kw.) (temp.). 20.00, lec., con. (daily).

Zurich (Hongg), 515 m. (temp.) (500 w.). 11.00, con. (Sun.); 12.00, weather; 12.55, Nauen time sig., weather, news, Stock Ex.; 13.30, piano solo; 17.00, con. (exc. Sun.); 18.15, children, women; 19.00, news, weather; 20.15, lec., con., dance (Fri.).

Geneva (HB1), 760 m. (2 kw.). 20.15, con. (daily).

Berne, 435 m. (2 kw.). 10.30, organ music (exc. Sat.); 16.00, 20.30, con.

Basle. 1000 m. (1½ k.w.), con. daily. 20.30

Re-stringing Your Racket is the title of a seasonable article appearing in the current issue of THE AMATEUR MECHANIC AND WORK (3d.). Other articles appearing in the same number are: "Modelling in Clay and Wax: How Relief Work is Done"; "The Reflecting Telescope and How to Use It"; "Hints and Kinks Illustrated"; "Overhauling the Motor-cycle for the Summer Tour"; "A Hook-up Wireless Crystal Set"; "Finishing Wireless Cabinets"; "A Garden Swing on Strong, Simple Lines"; "Home-made Knife-switches"; "Practical Photography Pars."

TRADE NOTES AND CATALOGUES

IN the 48-page summer issue of the Radio Catalogue just issued by Ward and Goldstone, Ltd., of Frederick Road, Pendleton, Manchester, is well illustrated every conceivable radio accessory which the constructor is likely to require. In addition, this interesting booklet contains particulars of high-tension battery eliminators, Goltone "Enhansa" indoor and outdoor aerials, and components for making superheterodyne receivers.

A four-page booklet describing the "De Luxe" 4-valve portable receiver is issued by the Electradio Co., of 25, Westbourne Grove, Bayswater, London, W.2.

Envelope folders Nos. 4117/3 and 4117/6, describing Cosmos valves and components, have been sent to us by Metro Vick Supplies, Ltd., of Trafford Park, Manchester. The components folder contains particulars of the Cosmos slow motion condenser, which has the wide tuning range of 200 to over 700 metres. The valve folder contains specially interesting announcements concerning the new S.P. 18/B Blue Spot Valve, which has an amplification factor of 35.

Particulars of the new Osram valves for rectification purposes can be obtained from the General Electric Co., of Magnet House, Kingsway, London, W.C.2.

Twenty-volt H.T. accumulator units are the subject of a pamphlet issued by the Ever-Ready Co., Ltd., of Hercules Place, Holloway, London, N.7.

Information relative to the price reduction of all B.T.H. radio apparatus is given in a leaflet which will be supplied on application to the British Thomson-Houston Company, Ltd., of Crown House, Aldwych, London, W.C.2.

Directions for constructing "wet" H.T. batteries are given in a leaflet published by the H.R.P. Co., of 46, St. Mary's Road, Leyton, E.10. This firm manufacture glass containers and zinc plates for the amateur desirous of making up Leclanché cells for H.T.-battery purposes.

An attractively coloured poster has been issued to illustrate the Xllos short-wave and triple honeycomb coils made by Igranic Electric Co., Ltd., of 147, Queen Victoria Street, London.

Owing to a fire breaking out at the Sylverex factory at Hatton Garden, stocks of Sylverex crystal and permanent detectors carried there were destroyed. Ample stocks for present demands are, however, held at the head office at 41, High Holborn, W.C.1, where all direct orders can be dealt with immediately.

The B.B.C. announces that in response to requests which have been received from time to time on behalf of hospital patients, steps have been taken to provide a weekly religious service, as distinct from the usual Sunday evening transmission.

WIRELESS IN PARLIAMENT

From Our Own Correspondent.

SIR W. MITCHELL-THOMSON, Postmaster-General, in presenting the Post Office Estimates, said that the number of licences actually in force was 2,076,000, as compared with 1,387,000 a year ago. There was an idea that the rate of progress in the issue of wireless licences had fallen off, but the number of licences issued last June was 57,512, which was very satisfactory. He hoped that no one would imagine that the Post Office would relax its efforts to prosecute any people who failed in their duty as citizens and as honest people to take out wireless licences. It was the cheapest form of entertainment ever offered.

Sir W. Mitchell-Thomson informed Sir H. Brittain that the whole of the revenue from wireless licence fees was paid into the exchequer. The sum payable to the British Broadcasting Co. was provided by Parliament and was charged upon the Post Office vote, which also bore the cost of the issue and renewal of licences, the detection and prosecution of defaulters and general administrative control and accounting. The British Broadcasting Co. had recently been authorised to make certain alterations in the wavelengths of several of their stations to meet the changing conditions caused by the extension of broadcasting in neighbouring countries. They had also been given authority to conduct certain experiments, but no material alteration in their system of stations had yet been decided upon.

"MAKING THE CRYSTAL SET SELECTIVE"—(*continued from page* 103)

tappings of the coil. This is a simple business, since terminals are provided for the tapping points. A brief test will show which of the two tapping points gives the better results. It may be found that one of them gives a high degree of selectivity but leads to reduced signal strength. With the other, tuning will not be quite so sharp, but signal strength will be considerably improved. The X coil forms an exceedingly handy fitting, since when selectivity is not important, the aerial may be connected up in the ordinary way to its own terminal, and tuning can always be sharpened at will by connecting it to one of the tappings of the coil.

In Fig. 5 is seen a method of increasing selectivity by employing a double-circuit tuner with an aperiodic aerial. This alteration is very easily carried out by fitting in the receiving set a second fixed coil holder, so placed that L2 is tightly coupled to the existing coil L1. Instead of being connected to its own terminal, the aerial is attached to one of those on the new coil holder. By using quite a small coil for L2 the selectivity of the receiving set may be considerably increased.

A last point concerns the aerial itself. The majority of those that one sees in and around towns which are broadcasting centres contain far too much wire. The long aerial with parallel wires is much less selective than the short one with a single wire, and as a rule the short single-wire aerial gives just as good signal strength as the other. Many people who live in London and other towns in which main broadcasting stations are situated do not realise that excellent crystal reception can be obtained with an indoor aerial consisting of a single wire.

J. H. R.

ADVERTISEMENT INSTRUCTIONS for "Amateur Wireless" are accepted up to first post on Thursday morning for following week's issue, providing space is available.

PREPAID ADVERTISEMENTS.

Advertisements under this head are charged FOURPENCE PER WORD, minimum charge FOUR SHILLINGS.

DEPOSIT SYSTEM.

As the Publishers cannot accept responsibility for the bona fides of Advertisers in this publication they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The Deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom, double fees are charged.

The amount of the Deposit and Fee must be remitted by Postal Order or Registered Letter (Cheques cannot be accepted), addressed to

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ADVERTISEMENT DEPARTMENT,
LA BELLE SAUVAGE, LONDON, E.C.4.

WIRELESS.—Capable, trustworthy men with spare time who wish to substantially increase income, required where we are not fully represented. Applicants must have practical knowledge of installation of Set and Aerial, be a Householder or live with parents, and be able to give references. State age and experience.—Address, Dept. 28, General Radio Company, Limited, Radio House, Regent Street, London, W.1.

GREEN DRAGON DIAPHRAGM PAPER, ready for use, splendid results, 12 in. diam., 1s. 6d.—F. J. Eastoe, 29, Prince's Parade London, N.3. [13

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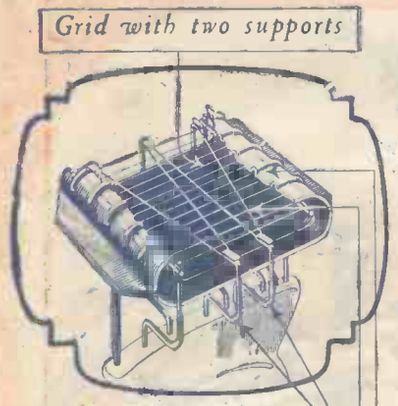

at this P.M. Filament and you will understand why P.M. Valves are the best value on the market.

THESE

seven P.M. advantages reduce your maintenance costs and give you better results—

1 **GREATER EMISSION SERVICE.** P.M. Filaments have up to 5½ times greater emission surface than ordinary filaments ensuring a much wider range of power for economical operation ; in fact, these new filaments are so conservatively rated that they give ample results at lower voltages than marked and will stand up to a reasonable overload.

2 **LONGER VALVE LIFE.** The special alloy of rare metals that forms the heavy covering of P.M. Filaments is prepared by a patented process that secures a copious flow of electrons and the operating temperature is so low that this precious alloy cannot be discharged, a definite proof of long useful life.

3 **UNBREAKABLE FILAMENT.** P.M. Filaments are longer than ordinary filaments, and retain their ductility even after 1,000 hours life, so that it is possible to tie them in a knot. At no time does the low operating temperature cause sag, and these filaments are specially set round the five strong resilient hooks so that they are free from tension and cannot be broken except by the very roughest handling.

4 **NO VISIBLE GLOW.** The extreme economy in heat of P.M. Filaments can be judged by the fact that no sign of glow can be discerned during operation.

5 **REDUCED CURRENT CONSUMPTION.** P.M. Filaments only require one-tenth ampere filament current, giving up to seven times the life of each accumulator charge, a reduction to one-seventh in your cost of accumulator maintenance.

6 **NO MICROPHONIC NOISES.** The unique method of mounting the filament within the field of the grid and anode, so that the filament lies without tension or sag in its correct position, and all the electrons are utilised and controlled, completely eliminates all microphonic noises, leaving an effective background of silence to emphasise faithful reception.

7 **MAJESTIC VOLUME.** Every P.M. Valve is a master valve in its own class, designed to give you

Perfect Radio Reception

It is the filament that counts and this is what you pay for.

For 4-volt accumulator or 3 dry cells	
THE P.M.3. (General Purpose)	0·1 amp. 16/6
THE P.M.4 (Power)	0·1 amp. 22/6
For 6-volt accumulator or 4 dry cells	
THE P.M.5 (General Purpose)	0·1 amp. 22/6
THE P.M.6 (Power)	0·1 amp. 22/6
For 2-volt accumulator	
THE P.M.1 H.F.	0·1 amp. 15/6
THE P.M.1 L.F.	0·1 amp. 15/6
THE P.M.2 (Power)	0·15 amp. 18/6

These prices do not apply in Irish Free State

ASK YOUR DEALER FOR THE VALVES WITH THE P.M. FILAMENT

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THE · MASTER · VALVE

ADVT. THE MULLARD WIRELESS SERVICE CO., LTD., BALHAM, LONDON, S.W.12

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METHODS OF PROVIDING H.T. CURRENT

A "POCKET" ONE-VALVE SET

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And Electrics

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PRINCIPAL CONTENTS

WELL ILLUSTRATED

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SERIOUS EXPERIMENTERS, ALL.

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

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Chief Contents

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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.

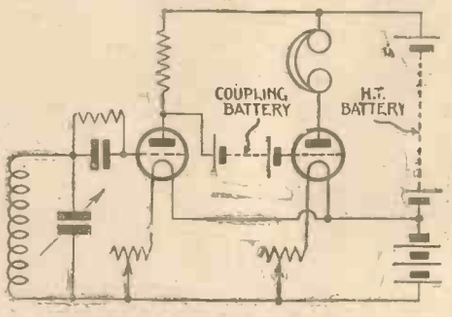
Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or The Publisher, "Amateur Wireless," La Belle Sauvage, London, E.C.4.

A REALLY DISTORTIONLESS INTERVALVE COUPLING

THE word "distortionless," as applied to the amplification of wireless signals, may justifiably be used in two senses. It may mean that, after the amplification has been carried out, the reproduction is free from any *noticeably* unpleasant distortion, or it may mean that the wave form of the varying currents in the last plate circuit of the amplifier corresponds *exactly* to the wave form of the currents introduced into the first grid circuit.

TRANSMISSION is now well-nigh perfect but reception lags behind. Although transformer design has vastly improved, and also resistance-capacity coupling is widely used, the problem of conquering distortion cannot be said to have been completely solved. Why the system of coupling amplifying valves described in this article, which is practically free from distortion of any kind, has been almost totally neglected by experimenters remains a mystery.

The word is used in its first sense by the manufacturers of high-class intervalve transformers in their advertisements. It is quite easy to prove that any and every transformer (unless it has such very high resistance windings as would render it practically useless) must have one or more "resonance peaks." That is to say, however much care is bestowed on the design, every intervalve transformer will accentuate one or more particular frequencies. Thus no transformer can be truly "distortionless," using the word now in its exact scientific sense.



Circuit showing Detector Valve followed by Battery-coupled L.F. Amplifier.

In the days before transformers for use in wireless receivers reached their present high level of excellency, resistance-capacity couplings were credited with making distortionless amplification possible. This reputation seems to cling to them still, though it is now easily possible to build a transformer-coupled amplifier which gives as good reproduction as one in which resistance-capacity couplings are used.

It is very strange that, in connection with resistance-capacity coupling, a certain feature has often been picked out from which to argue that the coupling is incapable of introducing distortion, while another feature, equally important, and which makes distortionless amplification *impossible* in such circuits, is nearly always ignored.

Time and again it has been pointed out that as a non-inductive resistance has no natural frequency, it will treat all currents, whatever their frequency, in the same way. This is perfectly true, but the anode resistance is only one component of the couplings. The condenser and grid leak cannot be ignored, and it is these which make a certain amount of distortion inevitable.

The impedance of the coupling condenser will vary with the frequency of the currents which it has to pass. It will offer less obstruction to the higher frequencies than it does to the lower frequencies. This in itself is sufficient to blast for ever the distortionless reputation of resistance-capacity couplings, but there is still the effect of the grid leak to consider.

The action of this has often been dealt with. It allows the electrons reaching the grid to get back to the filament just

(*Concluded next page*)

sufficiently easily to keep the mean grid potential at the same value. A suitable resistance could readily be determined were the amplitude of the currents applied to the grid constant. But they are not, and so the value of the grid leak must be a compromise, and the mean grid potential will fluctuate, thus introducing still another kind of distortion.

It will be clear that the aperiodicity of the non-inductive resistance is a great advantage, and it seems a pity that this should be counteracted by the condenser and grid leak. The grid leak, of course, would be unnecessary if the condenser were not used, and if the condenser could be done away with there would be nothing left to cause distortion.

Is the condenser really essential? Its only purpose is to separate the grid of the amplifying valve from the positive end of the H.T. battery, which would otherwise make the grid so positive that the action of the valve would be arrested. Is there no other way of keeping the grid at a suitable potential when resistance coupling is employed other than by the use of a condenser and grid leak? There is!

The condenser and leak may be omitted and the effect of the H.T. battery on the grid counteracted by another battery connected between the grid and the preceding plate. This system is known as battery coupling, and a circuit showing a detector valve followed by a stage of battery coupled L.F. amplification is given in the diagram.

Suppose the H.T. battery to have a potential of, say, sixty volts, and suppose that there is a drop of twenty volts across the anode resistance, then the actual voltage applied to the plate of the detector valve will be forty volts.

If the coupling battery had also a voltage of forty, the grid of the second valve would be at the same potential as the negative end of the filament. If the voltage of the coupling battery were increased, the potential of the second grid would be negative with respect to the negative end of the filament; in other words, negative grid bias would have been applied.

There are no theoretical disadvantages in this system of L.F. coupling, though in H.F. stages the capacity of the coupling battery to earth would result in capacity losses. Practically, of course, it is a disadvantage to use a fairly high voltage battery between each of the amplifying valves, but surely there are occasions when distortionless amplification is desired almost "at any price." G. N.

BROADCASTING IN SPAIN

A MEETING recently took place at Madrid of all the directors of broadcasting stations now working in the Iberic Peninsula, with a view to an amalgamation of the individual concerns. It was openly stated that fusion of the various companies interested in broadcast transmissions could alone place these concerns on a sound financial basis.

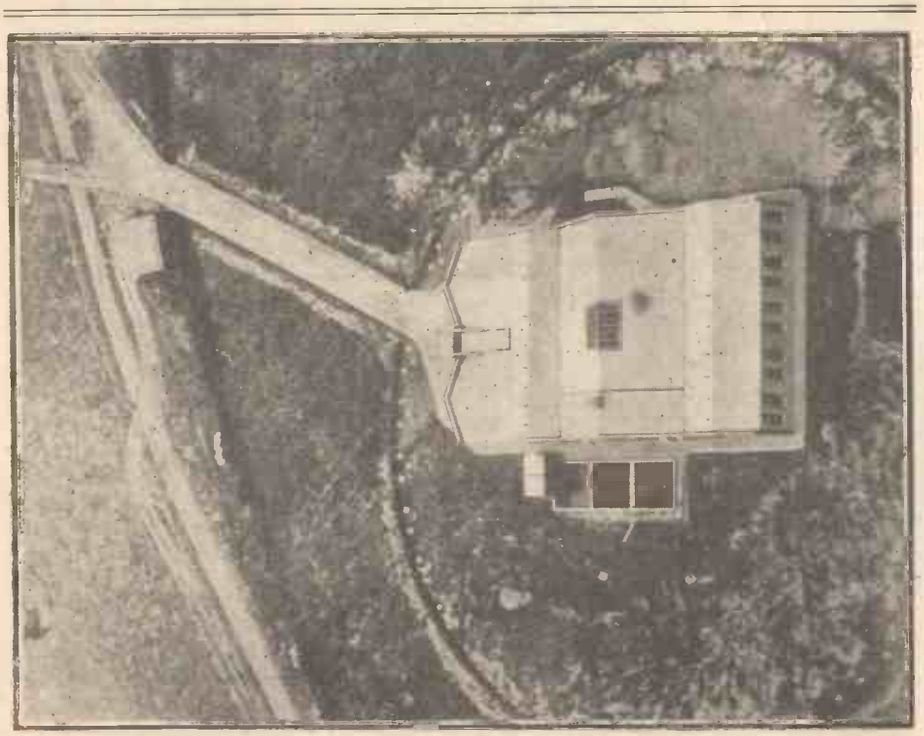
Such a statement sums up in a few words the conditions of broadcasting in Spain, which, although a late arrival in the field of wireless telephony, endeavoured to catch up the progress made in other European countries. Many different organisations lodged requests for transmitting licences, with a view to erecting stations all over the country, and the post and telegraph authorities granted these concessions, irrespective of the fact that in many instances competitive companies would be working in the same cities. Up to the present, roughly, thirty public transmitting licences have been conceded. In the space of a few months fifteen broadcasting stations have been erected, of which five alone were installed at Madrid, but of the latter only three are now working.

Receiving sets are subject to a small charge payable to the Spanish Posts and Telegraphs, but no portion of this income is payable to the broadcasting concerns. The stations derive their revenue from (a) royalties collected on the sale of wireless components, etc., manufactured by affiliated concerns; (b) from sums paid for broadcast publicity; (c) from the sale of technical and programme journals published under their control, and from advertisements in these periodicals. On the other hand, some of these installations are operated by local wireless associations.

The revenue derived from such sources has been found totally insufficient to cover even bare working expenses, and several stations, after operating for a short period, have been compelled to close down. On the other hand, the Spanish Government is seriously considering the possibility of adapting the high-power wireless telephony station of Prado del Rey, in the vicinity of Madrid, for national broadcasting. In order to avoid interference with the present private transmitters a high wavelength may be adopted.

The broadcasting stations which at present are transmitting a regular daily programme will be found on our Broadcast Telephony page.

The installation of further stations is under consideration, and others are already in the course of erection at Oviedo, Pampeluna, etc., but it is doubtful whether these plans will mature unless the Government Posts and Telegraphs assist the organisers by enforcing effective regulations. J. G. A.



JULY 27—DAVENTRY'S FIRST BIRTHDAY

A bird's-eye view of the station taken from one of the aerial masts.

A "POCKET" ONE-VALVE SET

Probably the receiver described in this article is the smallest possible when real efficiency is a consideration

THE one-valve set described in this article was designed to incorporate the following features: (1) It was to be as small as was consistent with efficiency so that it could be used as a portable set. (The set only measures 3½ in. by 3 in. by 4⅞ in.) (2) The set with B.B.C. coils was not to cost more than 30s. The necessary valves and batteries also must not exceed 30s. in price.

The ordinary type of variable condenser and coil holder would make the set bulky and expensive. At last the right components were found. These were the Polar Junior condenser and the Polar coil unit. Both of these are exceedingly compact and cheap, and despite the low price are really efficient.

The Circuit

The circuit used is shown by Fig. 1. It will be noticed that there is no filament rheostat; this component was not incorporated in the set because it is not necessary. Many people use their filament resistances for the final adjustment of reaction; but this practice is not to be recommended, as the valve is most efficient at one definite filament voltage, and there is always the risk that the valve will be burnt too brightly, thereby reducing its life. It was decided, therefore, that a fixed filament resistance was best. It has been found that very fine reaction control can be obtained with the Polar coil unit.

Another point which requires explanation is the fact that only six terminals are used on the set instead of the usual eight. The terminals on this set are aerial, L.T. −, H.T. +, phones, and one for H.T. −, L.T. + and earth.

It will be noticed from the photographs that the Junior condenser is mounted on the front wooden panel. Efficiency is not lost by doing this, as the metal case is at earth potential. One of the terminals on the condenser passes through a hole in the case. This terminal, which is insulated from the case, should be connected to the grid end of the aerial coil. The other terminal of the condenser is fixed on to the metal case and should be connected to the earth end of the aerial coil. If these connections are adhered to, hand-capacity effects will not be noticeable.

Case and Components

The wooden case is screwed together, and the sides of this are not shown in the photographs so that the internal arrangements may be seen. The dimensions of the sides are 4⅞ in. by 3½ in. by ¼ in.

The Complete Pocket One-valver.

Details of the case are given in Fig. 2. The following is a list of the components required for building the set: One .0003 condenser with 3-megohm leak (Dubilier); one .001 condenser (Dubilier); six terminals, 4 B.A. (Raymond); eight countersink valve legs (Raymond); 1 yd. of No. 30 d.c.c. Eureka wire; one .001 Polar Junior condenser; one ebonite panel, 4⅞ in. by 3 in.; one piece of ½-in. mahogany 3 in. by 4⅛ in.; two pieces of ⅜-in. mahogany 3 in. by 3¼ in.; two pieces of ¼-in. mahogany 4⅞ in. by 3¼ in.; one Polar coil unit with Nos. 300 and 850 coils; one PM2 valve; one Exide D.T.G. accumulator; one 36-volt H.T. battery.

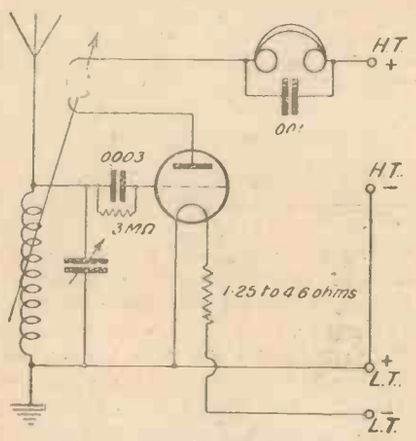


Fig. 1.—The Circuit Diagram.

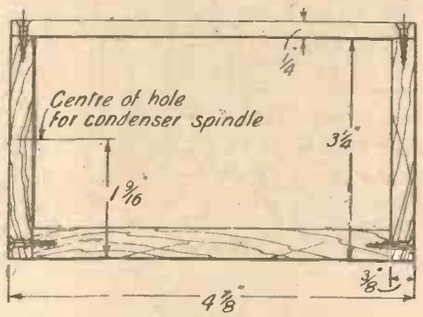


Fig. 2.—Details of Case.

The Mullard PM2 valve used in the set only consumes .16 amp. at 1.8 volts, and may therefore be used with a 2-volt accumulator.

A good value for the fixed resistance is 1.8 ohms. The resistance wire must be covered (silk or cotton), about 1 yd. of No. 30 d.c.c. Eureka being required. One end of the wire is fastened under the terminal nut, and the rest is wound evenly round the terminal shank (L.T. − terminal).

Any type of valve may be used in the set providing the resistance is altered, which is a very simple matter. The best way of adjusting the resistance is as follows: Wind on to the shank more resistance wire than is likely to be needed. The free end of the wire is then temporarily fixed under the valve nut, the accumulator is connected, and the valve put into the set. The filament voltage can then be measured by connecting a voltmeter across the filament valve legs. It is useless to measure the voltage across the valve legs without having the valve in position. The voltage, if an excess of resistance wire had been used, will be found to be too low, so about ½ in. is cut off the free end of the wire, which is then secured under the valve-leg nut and the voltage again measured. This procedure is repeated until the correct voltage is shown on the voltmeter.

Wiring and Assembling

The panel layout is shown by Fig. 3, and this should be wired first of all.

In assembling, the front (this has the hole for the spindle of the Junior condenser) and bottom wooden panels are screwed together. The .001 Dubilier condenser is screwed on to the base so that it is just under the telephone terminals. Then the Junior condenser is mounted on to the front panel. The frame is turned on to its side with the .001 Dubilier condenser upwards, and the ebonite panel is placed into position and screwed to the front wooden panel. The connections to the Junior condenser should now be made; these are securely fixed under the terminal nuts. Next the connections to the .001 Dubilier are soldered, and the set completed by fixing the back wooden panel.

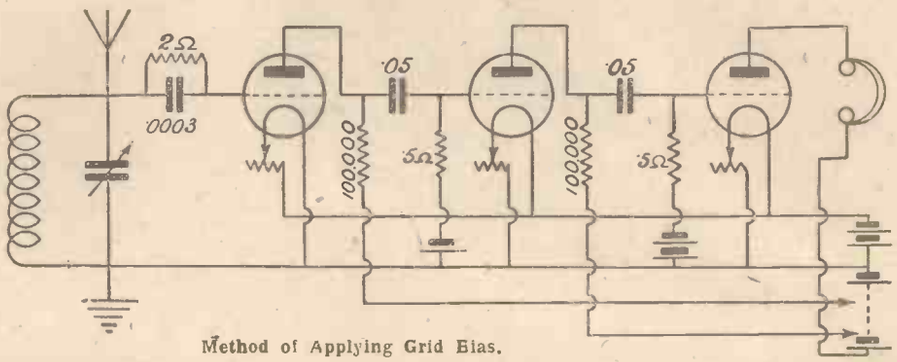
(*Concluded at foot of next page*)

THE ESSENTIALS FOR GOOD LOUD-SPEAKER REPRODUCTION

LOUD-SPEAKER results which are unsatisfactory are sometimes due partly to the loud-speaker itself, but more often to the set.

The trouble is that distortion is apt to creep in at almost every point. For instance, the detector valve may not be able to handle its load of current properly; if too great a burden is placed upon it, it is sure to give distorted signals. Too much reaction is very often the cause of woolliness; it is a fatal mistake to try to "force" louder signals by increasing the reaction. An unsuitable grid leak gives rise to serious distortion and a peculiar buzzing effect.

But by far the greater part of distortion comes from the L.F. stages. The iron-cored transformers are the chief culprits. Even if carefully designed and wound with thick wire there will always be a certain amount of distortion owing to the uneven amplification of various frequencies. Many of the transformers on the market are far from being well designed, and the result is harsh and tinny reproduction. Therefore the amateur should buy the best transformers he can afford, and should apply the right negative bias to the grid to keep the valve working on the straight portion of its characteristic curve as shown in the diagram.



Method of Applying Grid Bias.

Although the transformer method of coupling low-frequency valves is extremely popular, it has now a serious rival in the resistance-capacity amplifier, as shown in the diagram. The resistance-capacity method does not give the same degree of amplification as the transformer coupling, but the quality of the reproduction is incomparably superior. Consequently it is better to use resistance-capacity coupling in order to obtain purity of reception, and to have an extra stage of L.F. to make up the requisite volume.

Excellent loud-speakers can be made at home by buying one of the loud-speaker "movements" now on the market (such as the Brown, Lissenola, etc.), and by trying various horns and paper diaphragms. Probably the most successful results will be obtained by having two loud-speakers in opposite corners of the room. If the horns are arranged in such a way that the sound is reflected off the ceiling, really fine reproduction is possible.

Finally, do not be content until the reception is all that can be wished for. Strive after a pure and mellow tone, and never attempt to force the set to get louder signals, for this is the cause of most of the distortion that is so frequently noticed.

G. J. M.

"A 'POCKET' ONE-VALVE SET" (*continued from preceding page*)

The coils used for the short wavelength (300 to 500 metres) broadcasting stations are a No. 300 Polar coil for the aerial circuit (this is the bottom coil on the unit) and a No. 850 for reaction. The range obtainable with a .001 Junior condenser in parallel is approximately 270 to 450 metres.

The coils for the Daventry station are a No. 1,450 for the aerial circuit with a No. 1,100 for reaction. The approximate range covered with these coils is 1,350 to 2,100 metres.

The results obtained from the set about twelve miles from 2 L O are most satisfactory. On an aerial of moderate efficiency, which is badly screened by trees, the following stations are heard: London and Daventry, of course, loudly; Birmingham and Newcastle, Radio-Paris, Radio-Toulouse, and two other Continental stations which were not identified—these stations were received clearly, although weakly. On a very small indoor aerial 2 L O was received well.

H. C.

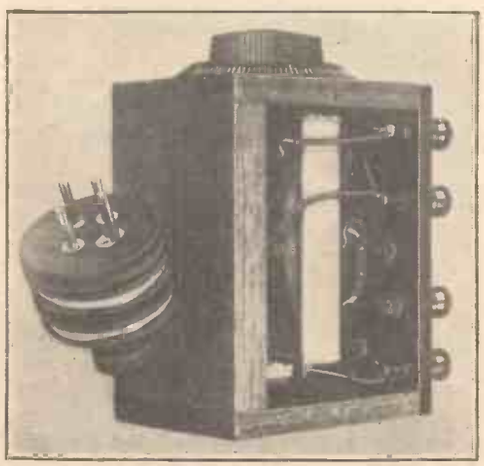


Fig. 3.—View showing Under Side of Panel.

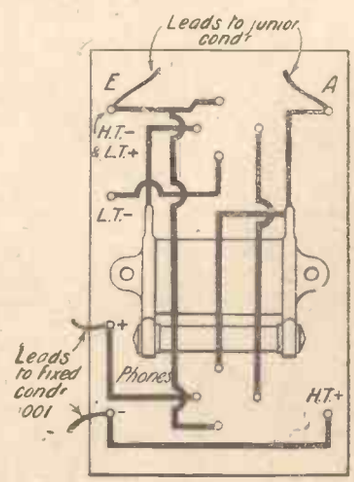


Fig. 4.—Wiring Diagram.

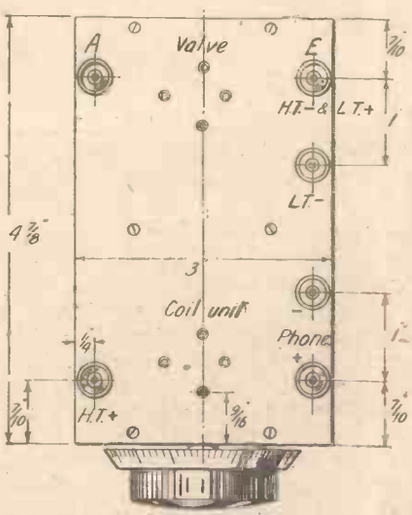


Fig. 3.—Plan showing Layout of Panel.

SIX WAYS OF GETTING H.T.

A Brief Review of possible Sources of High-tension Supply

ONE of the fundamental requirements of any valve receiving set is a means of impressing a suitable positive potential on the plates of the valves. The potential usually necessary for efficient working varies from about 40 to 200 or 300 volts. The current required, however, is very small, and probably never approaches one-twentieth of an ampere even in the case of the largest receivers. Ordinary broadcast sets employing three or four valves very rarely take more than one-hundredth of an ampere when correctly adjusted.

There are several ways in which this small current at a high voltage may be obtained. Which of these methods is the most suitable in a particular case depends upon circumstances, but so many considerations are usually involved that it is no simple matter to decide upon the point. Although the final decision must, of course, always rest with the owner of the set, the following general survey of the methods now available will prove of assistance in pointing out the lines along which this choice should be made

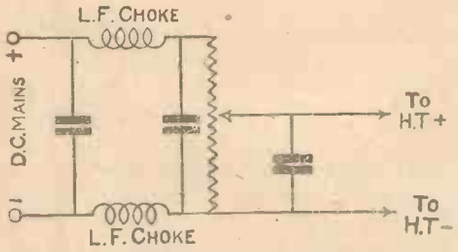


Fig. 4.—Circuit Arrangements for Obtaining H.T. from D.C. Mains.

The dry battery has many advantages. It is the cheapest method of obtaining the H.T. supply as regards first cost. It is small, compact and neat in appearance, and this type of battery, if of good make, will give a fairly satisfactory service for a considerable period when used well within its capacity.

Disadvantages of Dry Batteries

On the other hand, when looked at critically, the H.T. battery made up of a number of small dry cells connected in series has many and serious drawbacks. If, as is often the case, the battery is

Fig. 1.—Helleson Dry High-tension Battery.

merely provided with two external connections and no tappings, its life is only that of the most short-lived cell it contains. If one of its cells becomes "dud," the battery is of no further use whatever until the defective cell is removed or short-circuited.

It is not a simple matter to locate the position of the troublesome cell when there are no tappings, and in any case it is a messy job to remove the layer of insulating material with which the cells are covered, and if this is done the neat appearance of the battery is gone for ever. When tappings are provided, the pair between which the "dud" cell is connected may readily be found and short-circuited. As the tappings, however, are not made after each cell, this will mean that one or more good cells must be sacrificed.

Nothing better than this type of battery is, however, required in the case of a single-valve set, and it is quite suitable for general use with two or three valves, provided that one is prepared to replace it immediately it shows signs of giving trouble. But supplying current to three valves is about its limit if it is to be entirely satisfactory. It should be understood that doubling the current taken from a dry battery reduces the life of the battery to very much less than half. The current required by a large multi-valve set, while small when expressed in fractions of an ampere, is sufficient to cause serious trouble owing to polarisation and other effects after the battery has been in use for a very short period. It is now possible to obtain dry-cell H.T. batteries made up of cells of considerable size, one of which is illustrated in Fig. 1. These are naturally rather expensive, but are capable of supplying current to a six- or eight-valve superheterodyne receiver and at the same time giving as satisfactory a service as does the smaller battery when used with a two-valve set.

Wet Primary-cell Batteries

Although the cells used in the batteries just mentioned are termed "dry," a certain amount of moisture is essential for their working. As the cells become really dry, as they must eventually do, their internal resistance increases with very marked adverse effects upon reception. This disadvantage is almost entirely overcome in those H.T. batteries which are made up of a number of small Leclanché cells. More costly than dry batteries in the first case, it is very doubtful if they are so in the long run, as their life, when they are properly looked after, is almost indefinitely long. They require to have water added to their electrolyte as evaporation takes place, and fresh sal-ammoniac is needed at long intervals, but their internal resistance is low, their capacity for supplying current comparatively high, and their freedom from para-

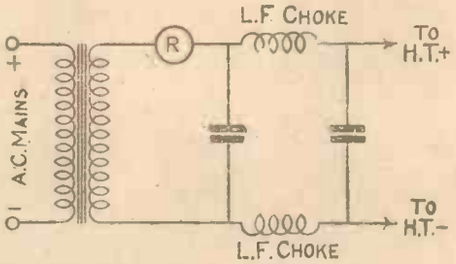


Fig. 5.—Circuit Arrangements for Obtaining H.T. from A.C. Mains.

sitic noises almost complete. Such batteries are manufactured by several firms.

Admittedly they require more space than a dry battery with a similar voltage, and do not present so neat an appearance, but these disadvantages, if they are such, will weigh little against their virtues with those people who put performance before everything. Their only real disadvantage, from a wireless point of view, is that after being freshly charged the voltage of the

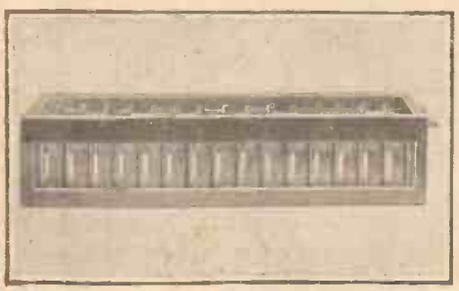


Fig. 2.—Tudor Accumulator High-tension Battery.

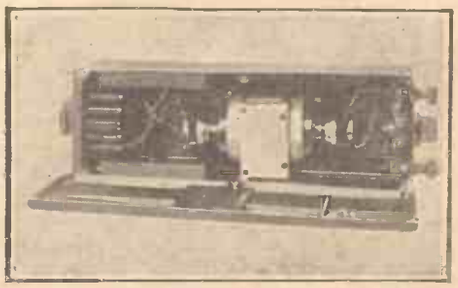


Fig. 3.—Interior View of M.L. Anode Convertor.

battery drops continuously until the time for renewing the electrolyte and the zinc elements is reached.

Accumulator H.T. Batteries

Less trouble to look after and not using any parts which require renewing, the accumulator H.T. battery possesses all the advantages of the Leclanché battery, with the added merit that its voltage remains practically constant until it is almost completely exhausted. It must, of course, be charged at fairly frequent intervals, and so may not appeal greatly to those whose charging facilities leave much to be desired. When the house is lighted by electricity, however, these batteries can be charged at home, and the current they consume during the process is negligible. They can be obtained with any desired capacity, which will determine the maximum number of valves with which they can satisfactorily be used. Fig. 2 is a photograph of an excellent accumulator H.T. battery.

Convertors

The requisite current at a sufficiently high voltage may be obtained by other methods than using a number of primary or secondary cells connected in series. For instance, a motor-generator, driven by the accumulator which lights the filaments, may be employed. This, of course, consists of a 4- or 6-volt motor directly coupled to a high-tension generator. An excellent example of this type of machine is the M.L. Anode Convertor, a photograph of which appears in Fig. 3.

The particular instrument illustrated gives a choice of two voltages, so that power valves may be used without having to put an excessive voltage on the plates of the other valves used in the set. The speed of the motor (and also, of course, of the generator which is directly coupled to it) is controlled by a variable resistance in series with the input. This enables the actual voltages obtained to be regulated within fairly wide limits. Of course, in order to obtain satisfactory results with a multi-valve set and one of these motor-generators, a large-capacity low-tension accumulator is essential.

Probably the most satisfactory method of obtaining the H.T. supply for a wireless set when the house is lighted by electricity is directly from the mains. When once the necessary apparatus has been installed, there need be no further worry about the H.T. supply and very little expense. What this apparatus consists of will depend upon the nature of the supply, whether A.C. or D.C., and its voltage.

H.T. from D.C. Mains

The simplest case will be when the lighting supply is D.C. and the voltage approximately that required by the valves. All that is then necessary are suitable L.F. choke coils connected in series with each of the mains and condensers connected across the mains, both before and after the chokes. When the positive main happens to be earthed, it will be necessary, however, carefully to insulate the set and all accessories from earth and to place a condenser in series with the earth lead.

Usually the lighting supply will have a higher voltage than is required for the set, in which case resistances must be used to cut down the voltage actually applied to the plates to the proper value. The arrangement may be as shown in Fig. 4. A suitable resistance is connected across the mains, and the voltage drop across this resistance will then be the full mains voltage. The connection to H.T. negative may be taken from the negative end of this resistance and the positive connection to the set from some point along it. The nearer the tapping point is to the other end of the resistance, the greater will be the difference in potential between the H.T. positive and negative connections. The smoothing arrangements should preferably be placed on the mains side of the resistance, when any ripple not eliminated by the chokes and condensers will be reduced in the same proportion as the voltage applied to the valves is reduced. A large condenser should, at the same time, be placed across the leads to the set in order to provide a path of low impedance for the signal currents, which would otherwise have to traverse a portion of the resistance.

A.C. Mains Supply

When the supply is A.C., the reduction in voltage may be carried out more efficiently, as it is then possible to use a suitable step-down transformer. Some kind of rectifier will be necessary in order to obtain the D.C. supply required by the valves from the A.C. delivered by the transformer secondary. Various forms of rectifier are available. Once the current is rectified it may be treated in the same way as current obtained directly from D.C. mains, with the exception that the smoothing arrangements must be very efficient indeed. Fig. 5 illustrates the principle to be adopted in obtaining H.T. from A.C. mains.

J. F. JOHNSTON.

JOINING LEAD-IN WIRES

IN cases when multi-wire aerials are used, or single aerials of stranded wire, it is important to see that the wires are well connected at the lead-in point and that all the strands in the cable make good electrial connection. A good way of ensuring that a sound connection has been made is to solder the wires into the end of a short length of copper tube, one end of which is hammered out flat and held under the terminal on the end of the lead-in tube.

The wires should be well cleaned before inserting them into the tube (it is advisable to clean out the inside of the tube itself with emery-cloth), and a little non-corrosive flux should be placed on the cleaned surfaces. A blowpipe is really necessary to make a good joint, as the open end of the tube may be filled with flux and solder, and the wires simply nipped in after playing on the tube with a blowpipe flame.

P.

An official notice which has been issued to mariners, announces that an unattended fog signal has been permanently established on Rosneath Beacon, in the Firth of Clyde.

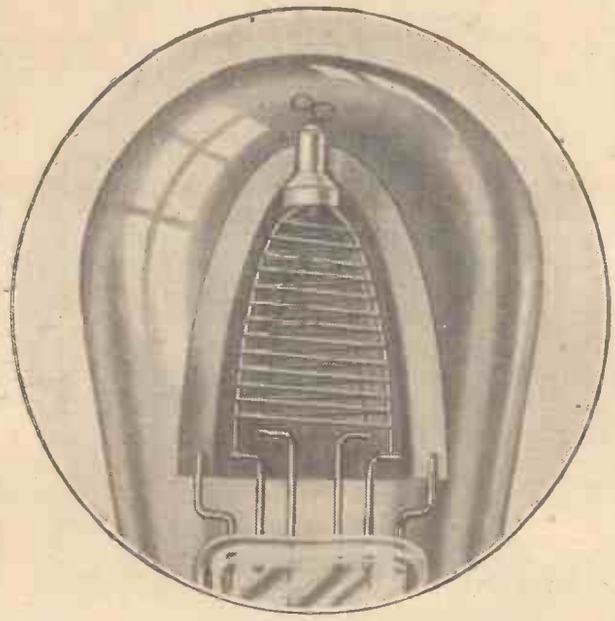
CHEMICAL RECTIFIERS

MANY amateurs have experienced a certain amount of trouble with chemical rectifiers, usually made up for supplying direct current from the mains for the H.T., owing to the use of poor materials and impure chemicals. Aluminium of the best quality must be used, or difficulty will be experienced in obtaining the formation of a rectifying film on the surface of the electrode.

A simple test for the chemical purity of the aluminium is to place a small piece of the metal in a hot lye solution. If the aluminium has a matted silvery appearance it is of good quality, while if there are any chemical impurities present, black streaks will form. For an accurate test, of course, it is essential to use a container for the solution which is absolutely clean, while the metal must not be handled any more than is necessary.

P.

Mr. W. A. Oldfield, the Australian cricketer, will give a topical talk to all stations from 2 L O on July 29. On the same evening Mr. Stenson Cooke, secretary of the Automobile Association, will discuss the speed limit.



Co-axial Mounting

—described by the Technical Press as "one of the greatest developments in Valve construction during recent years."

AS the old adage says, "Necessity is the Mother of Invention." The congested traffic conditions of to-day necessitated the invention of four-wheel brakes to ensure the greatest possible measure of safety. And in like manner to-day's wireless conditions have forced the successful development of Co-axial Mounting in order to ensure the greatest possible uniformity between valves of the same type. This in turn obviously means a big increase in efficiency in any Receiving Set using two or more stages of high frequency amplification. Greater sensitiveness—improved stability—better tone.

Co-axial Mounting introduced a few weeks ago by Cossor will exert a far reaching influence upon Valve design. For the first time there is available a method of construction which during the whole life of the valve automatically ensures perfect alignment between the filament, the grid and the anode. All three of these elements are permanently secured to each other at the top of the valve by means of a seonite insulator. Not even the hardest knock can displace their relative positions.

Co-axial Mounting permits a far higher degree of uniformity being attained than ever before. The importance of this will be instantly realised by all those using such multi-valve sets as Neutrodynes and Super-Heterodynes where the exact matching of valves makes all the difference between success and failure.

It is safe to prophesy that the forthcoming season will witness —with the aid of these new Cossor Point One Valves—the shattering of all records for long distance reception.

Three reasons for the amazing efficiency of the new Cossor "Point One" series of Valves

1. Absolute Uniformity

If a number of valves were made with identical filaments, grids and anodes without due regard to the exact spacing of these elements, considerable variations in performance would result. True uniformity in Cossor Point One Valves is achieved through Co-axial Mounting—a method which secures the three elements to each other at the top and infallibly holds them in exact alignment for all time.

2. A Shockproof Filament Suspension System

The filament in the Cossor Point One is arched and retained in position by a fine wire which is secured to the seonite insulator immediately above it. It is not held under tension. The fine wire provides just that degree of elasticity which enables the filament to withstand the sharp blow which would shatter the filament in an ordinary valve.

3. Current Consumption Cut to One Third

The new Cossor Point One sets a new record for economy. It requires only one tenth of an ampere at 1.8 volts. That means that a Super Heterodyne using seven of them would still consume less current than a little single-valve set using one Bright Emitter. A Cossor Point One will work satisfactorily as low as 1.2 volts with a current consumption of .07 amp.—thus being suitable for use with dry cells when required.

Available in three types :

COSSOR POINT ONE

Black Band: For Detector or L.F. - - - 15/6
(Consumption '1 amp.)

Red Band: For H.F. use - 15/6
(Consumptiom '1 amp.)

STENTOR TWO

Green Band: For power use - - - - 18/6
(Consumption '15 amp.)

All operate at 1'8 volts.

Cossor Point One

Issued by A. C. Cossor, Ltd., Highbury Grove, London, N.5.

Gilbert Ad. 5536

Don't Forget to Say That You Saw it in "A.W."

On Your Wavelength!

How the Rich Live!

FOR a very brief period last week your Thermion lived at the rate of something like £500,000,000 a year. This is how it came about. I was experimenting with a new circuit the other night when there was a sudden firework display and three new PM4's went up in blue flames in about a fifth of a second. No, I did not connect H.T. + to the L.T. — terminal or anything of that kind; in fact, it was not my fault at all. What had taken place was really the most curious short that I have ever come across, a short so mysterious that it took me hours to find the exact spot at which it had occurred, though I was able fairly soon to track it down to one small area.

In this particular set the plate coil of the high-frequency valve fits inside the grid coil of the rectifier, both being wound on tubular formers. The contacts of the bigger coil consist of valve pins, the shanks of which protrude a little way inside the tube. There was a minute defect in the double-cotton covering of the wire on the inner coil which came into contact with one of the valve pins. The result—a disastrous short which besides burning out the valves did the high-tension accumulator no particular good. This just shows how careful one ought to be about coupling coils when one is carrying high-tension current and the other low-tension. Do not forget, too, that you can get exactly the same type of short with a neutrodyne condenser if the plates happen to touch.

A "Super Heterodyne"

This note has nothing to do with a certain type of receiving set. Its purpose is to show the kind of thing that can happen at times on the broadcast waveband, overcrowded as it is under the present wavelength system—or, perhaps, one should say lack of system. When I tried to tune in Munich the other night I was greeted with the most amazing noise that ever issued from the spout of my loud-speaker. Music was there, far too much music in fact; a classical orchestra, a jazz band and a singer were all performing at the same moment, accompanied by continuous whistles on two different notes. By sharpening up the tuning I could separate out the various performers, though I could not get rid of the whistles. Actually there were three stations all heterodyning each other as hard as they could go, and I am not quite sure that there was not a fourth, for at times I seemed to detect yet another faint whistle.

The "Stepney"

Whilst searching round the other night after 2 L O had closed down I happened to get on to his wavelength, and was surprised for the moment to find a powerful transmission taking place there. Realising that some sort of experiment was in progress, I held on waiting for an announcement. At last it came: "The 2 L O stand-by transmitter testing." This was excellent news, for though interruptions in the programmes due to breakdowns may be shown mathematically to amount only to some minute fraction per second of the total hours of broadcasting, they are a most confounded nuisance when they do occur, as they have done rather frequently during the last two months. Now that 2 L O apparently has an emergency plant, no fault should cause a breakdown of more than a few moments in any transmission. To judge from what I have heard, the "Stepney" has about the same power as the main plant, which means that we shall not be treated to a chorus of howls when the main station goes out of action due to people thinking that there is something wrong with their receiving sets and putting in overtime at the reaction controls.

Announcers at School

I was very interested to see that the B.B.C. has appointed an advisory committee to deal with vexed questions of pronunciation. There is no doubt that the English spoken by our announcers is having an enormous effect upon the pronunciation of the language in all parts of the country; in fact it is quite on the cards that as a result of wireless we may eventually find one type of English spoken in the country instead of a large number of local dialects as at the present time. There are scores and scores of English words over whose pronunciation there is considerable doubt. Do you, for example, say in*com*parable or incompa*r*able? Either of these is probably equally correct, but it would be just as well if one or the other could be adopted as standard. In France they have an academy which regulates all questions of grammar, pronunciation and so on. We have nothing of the kind in this country, and possibly the B.B.C.'s committee, consisting as it does of people who ought to know, will take its place to some extent with us.

The New Wavelengths

Captain Eckersley made the other day the long-expected announcement about the wavelength changes which are to take place in the early days of the coming autumn. An agreement has at last been reached by the majority of European broadcasting authorities which follows the general lines mentioned in these notes a good many months ago. Each country is to be allotted a definite number of wavelengths in proportion to its population. Great Britain, for example, is to have nine or ten instead of twenty-one as at the present time. This does not mean that the B.B.C. will close down more than half its stations. They will continue to operate as heretofore, but the relays will work mainly upon a common wavelength. Provided that all are exactly upon this wavelength, no trouble of any kind should be experienced, and it is possible that some remarkable reception results will be obtained upon this wavelength when the relays are putting out their united power upon it. Once Europe has settled down to its new wavelengths we should find the ether vastly less congested than is the case now.

Saturdays!

I have often seen surprise expressed that the portable receiving set is not as popular in this country as it is on the other side of the Atlantic. The reason why, I believe, is not really very far to seek. Portable sets would obviously be used chiefly on Saturday and Sunday afternoons, when all the world makes for the great open spaces with the help of car, motor-bike or push-bike. About the Sunday programmes I shall say nothing, for Sunday is a special day. But what of those given on Saturday afternoons? Looking at random through official Saturday afternoon programmes, I find that the first which falls under my eye consists of the relaying of speeches on the occasion of the celebration of its charter day by some town or other from three o'clock to three-thirty. At four o'clock there is a short concert by a soprano and a baritone. There is nothing then till six, when there is a talk on gardens, and then follows the Children's Hour. The second is very much the same, and so are all the others. I think that on the whole the programmes are excellent, but I do quarrel with the Saturday afternoon transmissions, for on these occasions I think that those who are spending their time in the open air should be catered for with dance music and other cheerful noises. If this were done I am quite sure we should see a large increase in the number of portable sets and in the all-round growth of wireless as an entertainer.

The Turning Year

Conditions for long-distance work have seldom been very bad this summer, though there have been patches when one noticed signs of that unpleasant deadness in the ether which reduces one's range to but a fraction of what it should be. Looking back at my records for a good many years

On Your Wavelength! (continued)

I notice that an improvement generally sets in almost as soon as Midsummer Day is past. Sometimes it is gradual, but as a rule it takes the form of what I call "jumps." What I mean is that you find suddenly that stations that you have not heard for some time are appearing once more in your log, whilst the signal strength of old stagers is better than it has been. Conditions continue much the same for days or possibly for weeks; then comes another jump, with more stations and still better signal strength.

The first signs of improvement occurred this year on July 16, a day which, curiously enough, was the only peaceful one in a period of thunderstorms. On that evening I logged a greater number of Continental broadcasting stations than I have ever previously recorded anything like so early in the season. Another surprising point was that many of our own relay stations came in extraordinarily well, some of them being easily worked up to loud-speaker strength without pressing reaction effects. If the happenings of previous years are repeated, conditions for long-distance work are likely to remain pretty good for some time, though there will, of course, be occasional bad patches, and a further big improvement should set in about the middle of August. Meantime you will find it well worth while to try an occasional run round Europe. One station that I particularly recommend to you is Kiel on 233 metres, if you can get down so low.

A Nuisance—

Speaking of foreign stations brings to mind a point about which all those who go in for long-distance work at any time of the year will agree. Some of these foreign stations simply will not give their call signs. You cannot trust absolutely to your wavemeter, no matter how accurate it is, for you can never be sure as things are at present that a station has not wandered several metres above or below its nominal wavelength in order to avoid a heterodyne; nor can you go by the language, should you be a linguist enough to recognise it, when a talk is in progress, since not a few foreign stations broadcast talks in languages other than that of their own country.

Here is the sort of thing that happens. The other night I picked up a station which was transmitting dance music. Being particularly anxious to identify it, I listened carefully when the first item came to an end. There was an interval of over three minutes, during which not a word was spoken by the announcer, and then the band suddenly got busy again. At the end of the second item the silent interval was repeated, but this time it was rather longer. Actually I had to wait twenty-five minutes before an announcement was made that the station was now closing down and the call-sign was at last given. I believe I am right in saying that there is an international agreement that call signs should be given frequently, though in some cases it seems to be honoured more in the breach than in the observance. I cannot see why, for most stations welcome reports of reception of their transmissions in distant places; they can hardly expect to get them if they do not say who they are. This is a question that might well be taken up by the International Wireless Bureau.

—and Another

Whilst I have got a grousing fit on, may I be permitted to voice yet another grievance? This concerns you, dear reader. Not a few of you write to me at times, usually gilding the pill that you have to administer by beginning with some flattering remarks about myself, and then proceeding to tell me politely that of all the chuckle-headed, lop-eared, cross-eyed brainless ignorant idiots that you have ever come across I am the prize specimen. I do not mind *this* in the least, in fact I rather like it, for one of the joys about wireless as a hobby is that it contains so many thorny problems upon which there are widely different opinions. But what I do find a little trying at times is that quite a number of you who thirst for information omit to send a stamped envelope for the reply and when you get it fail to send a line of thanks for one's trouble. Well, I will not labour the point.

Amateur Difficulties

The amateur transmitter has his little difficulties in the ether just the same as the broadcasting companies. I was present at a meeting a few weeks ago, when a heated discussion took place concerning the interference caused by French amateurs using raw unrectified A.C. I have often heard these Frenchmen filling the phones with huge chunks of grunting noise, which at a distance must be very difficult to read, especially if static is pronounced. I cannot understand why it is that the Frenchman is a particular offender in this respect, but the fact remains that French amateurs are the last to recognise the value of using pure direct current as a source of power for the transmitter. It is always the man with the purest signal who gets the distance, and on short waves it has been very noticeable in the past that the pure C.W. morse transmitter on very low power will reach greater distances than the A.C. user with high power who does not trouble to smooth and rectify his anode power supply.

Raw A.C. creates havoc in the ether; it takes up a very wide band of wavelengths no matter how sharply tuned the transmitter, and the stations in the immediate vicinity of a station working this system are unlikely to be able to do any long-distance reception.

"Graded" Broadcast

According to Captain Eckersley, the B.B.C. are busily engaged in developing a scheme for replacing the present "mixed" type of programme by a system in which carefully classified items will be transmitted on separate wavelengths. For instance, it is proposed to radiate a continuous programme of jazz music on one definite carrier-wave, whilst a separate service of classical music is provided on an entirely different frequency. Possibly a third wavelength will be devoted entirely to instructive and educational fare.

In this way listeners will be able to select the kind of entertainment they prefer, or to switch over from one grade of programme to another at will.

It is probable that three super-power centres would be selected to radiate the different grades of programme, one on a wavelength of 300, the second on 400, and the third on 500 metres. Each of these centres would be linked up to its own individual network of relay stations, one network working on 300, the other on 400, and the third on 500 metres. Each network would be arranged to cover the entire country independently of the others, the different stations being synchronised either by piezo-crystal or tuning-fork control—so as to avoid trouble from heterodyning.

As there would then be only three different wavelengths in use throughout the whole system, the selections of any particular type of programme at will should easily be possible, without interference or overlap, on the simplest type of receiving set.

The Small Fellow

We have all heard and spoken ourselves a good deal about crystal purity. It occurred to me a week or two ago that it would be a good idea for receiving the local station to rig up a foolproof family set consisting of a crystal detector and a couple of note-mags. The only high-ratio transformer I possessed was a very small fellow, described by its makers as being especially suitable for following a crystal. I wired him up, completed the rest of the set, and switched on, expecting to hear strains of entrancing beauty. But did I? I did not. What came through on the loud-speaker was a large volume of sound, but oh the quality! Everything was thin and reedy. The piano sounded almost like a harp, whilst the violin was like nothing on earth.

What had happened was that this little transformer was utterly incapable of dealing with anything but the upper notes. When I changed it for a good fat instrument, I got my crystal purity combined with excellent strength.

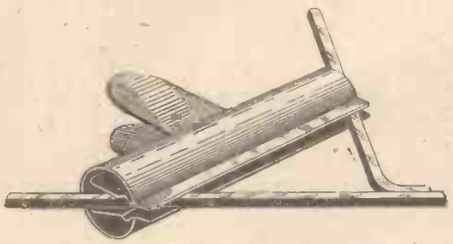
THERMION.

PRACTICAL ODDS AND ENDS

Soldering Square-section Wire

THOSE who find it difficult to hold connections together and apply solder and soldering iron at the same time, should obtain a large, strong paper clip of the type shown in the sketch.

During the process of wiring up a receiver it will be found nearly as useful as a third hand. The sketch illustrates

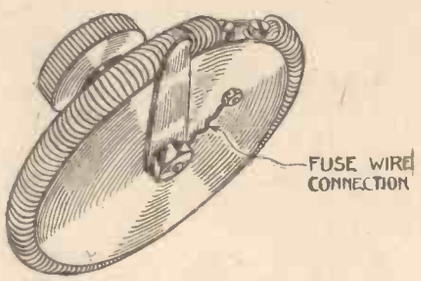


Use of Paper Clip when Soldering.

one of the ways in which it can be employed to hold two pieces of 16-gauge square wire together ready for soldering. This by no means exhausts its usefulness, as the constructor will find, but its adaptability is apparent and requires no further description. B. H.

A Valve-protection Hint

NO matter what type of valve is employed, it is always advisable to include a fuse in some position in the filament circuit so that an excess of current cannot burn the valve out or cause any



An Efficient Safety Device.

other damage except the "blowing" of the fuse itself.

A very convenient position for the fuse is as illustrated in the diagram, between the moving arm on the rheostat and the terminal on the component.

This connection, which is usually made by means of a copper strip or a short length of copper wire, should be removed, and the fuse wire connected in its place. The fuse wire will immediately burn out should a short-circuit take place, thus protecting the valve filament. Protection is also afforded to the accumulator by this means, and there is no risk of buckling the plates by an excessive discharge. K. U.

Position of Grid Leak

AMATEURS are sometimes in doubt as to which is the correct position of the grid leak, whether across the grid condenser or between grid and L.T. positive. This will depend upon whether the grid-return wire (the connection from earth to filament) is connected to L.T. positive or L.T. negative. If the grid return goes to L.T. positive, then it is immaterial whether the grid leak is connected across the grid condenser or between grid and L.T. positive, because the grid is positively biased in either case. If, however, the grid return is connected to L.T. negative, then the grid leak *must*, for best results, be connected between grid and L.T. positive, otherwise the grid will be negatively biased. A. H.

A Valve Note

IT is not generally known that many valves of the 3 volt .06 amp. class can be worked quite successfully from a 2-volt accumulator.

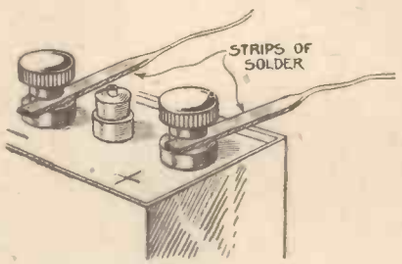
When your dry battery has run out, or the normal 4-volt accumulator is being charged, there is sure to be an item in the programme that you do not want to miss. If you have a 2-volt cell handy, connect it up and turn on the rheostat as far as it will go, using an anode voltage of about 30-40.

The "single valver" who lives within easy range of a station may find no advantage is gained by using a 4-volt accumulator at any time.

As the filament can never be over-run, the life of the valve should be considerably increased by this treatment. G. M.

Battery-lead Corrosion

CORROSION of the filament-battery leads, and also those of an H.T. accumulator, is a trouble met with by most amateurs. It is due, as a rule, to acid "creeping," which first affects the terminals, if these are of brass, and then extends to the actual leads. Now the metal lead is chemically unaffected by the acid, and hence terminals on accumulators should always be made of lead. Even this provision does not stop the leads corroding, but one remedy for this is that seen in the sketch. It will be seen that short thin strips of solder are either clamped or soldered to the battery terminals. Then to the ends of these strips are soldered the ordinary battery leads. Unless the user is very careless it will be almost impossible for the acid to reach the leads. The strips



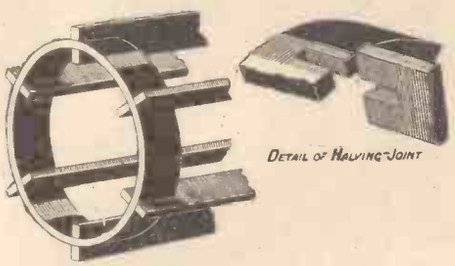
Non-corroding Battery Leads.

of solder need only be about ½ in. in length—in fact, if they are any longer they are apt to get in the way. H. D.

A Low-loss Coil Former

TWO ½-in. wide rings of 3-in. diameter ebonite tube and six strips of ebonite ¼ in. thick by ½ in. wide are all that is required to make this particular former, whose special virtue, in addition to its simplicity, is that it will support a tightly wound coil without sagging.

Six equally spaced slots ¼ in. wide by ¼ in. deep are cut on one side of each ebonite ring, and similar slots ¼ in. deep



Construction of Low-loss Coil Former.

and equal in width to the thickness of the rings are cut centrally down each end of the strips. The slots should be made just under size, so that the resulting halving-joints are a tight fit and require no further fixing. The sketch shows one end of the former and an unassembled joint in detail. Grooves can be filed on the top edge of the strips, or spacing holes drilled to carry the wire as desired, the former method being the simpler. B. H.

EXTENSIBLE SET CONSTRUCTION FOR THE LIVE EXPERIMENTER

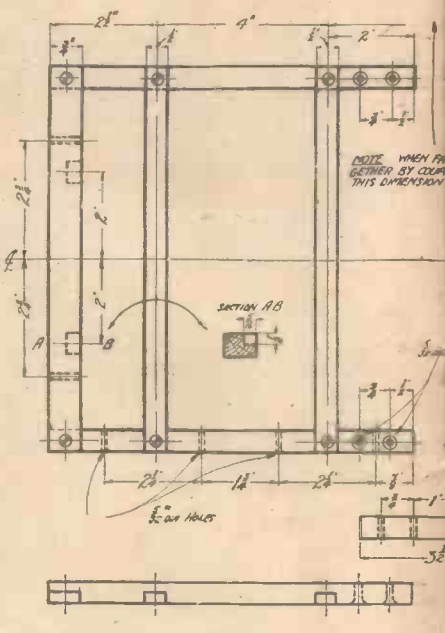
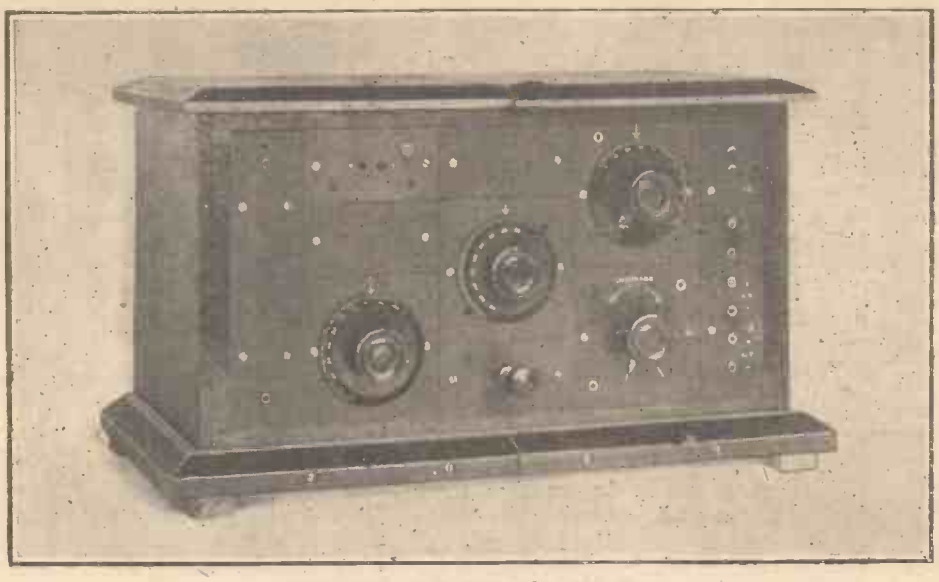


Fig. 1.—Constructional

ALTHOUGH broadcasting has only been instituted a comparatively short time, yet many changes have taken place in receiver design and circuits during that period. To quote a few, on the H.F. side there was first the old untuned transformer type of intervalve coupling, then tuned-transformer and tuned-anode, and more recently the neutrodyne method in its many forms.

On the L.F. side there has been the transformer, choke and resistance-capacity methods of coupling. Also, in the quest for selectivity, the old tight simple-tuned aerial circuit has given way to the so-called aperiodic aerial arrangement, or the use of some sort of wave trap.

Now every "live" wireless enthusiast feels the need of keeping abreast of all the latest developments, and likes to try out the various arrangements even if he does not adopt them permanently. With the usual type of finished receiver it is very often a difficult matter to effect these modifications in a neat and efficient manner. The general procedure is either to rebuild the receiver, with the inevitable monetary loss of scrapped ebonite and often the cabinet as well, or else the bench "hook-up" method, which is unsatisfactory with its untidy mass of scattered small components and tangled leads. There is always the danger too in this method of a wrong connection, with the consequent loss of a valve or two or else a burnt-out transformer. A further disadvantage also is that a spare set of components is necessary, or else one has to do without a receiver part of the time.



Photograph of an Extensible Receiver.

The writer some twelve months ago designed the receiver described in this article as a solution of the problem of a wireless receiver capable of (1) being rebuilt for a new circuit, with a rearrangement of the necessary components without involving the expenses of new ebonite panels or a new cabinet; (2) a receiver in which the owner could extend the number of valves without scrapping the existing set.

The American type of cabinet was

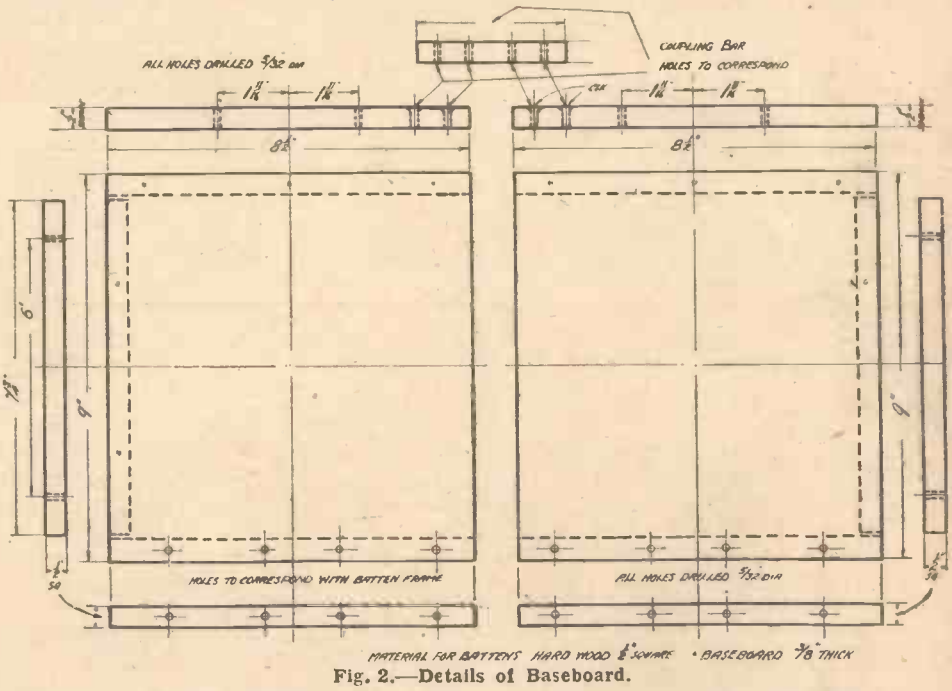
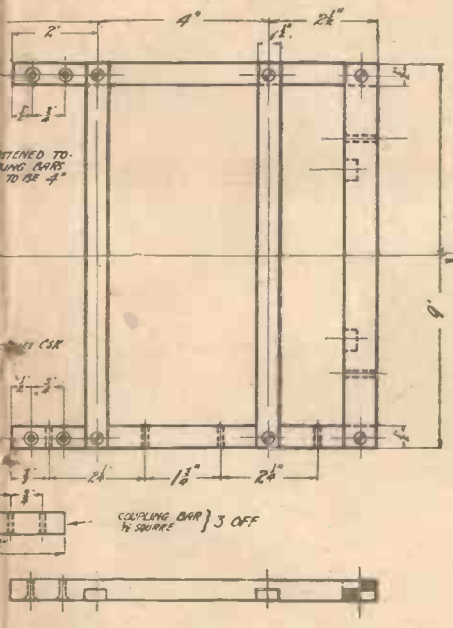


Fig. 2.—Details of Baseboard.

Every keen experimenter likes to keep abreast of the times, and this means making constant modifications to the receiver. By the system here described alterations may be accomplished with the minimum of trouble, and yet the set is always complete although—like a well-known bookcase—"never finished"

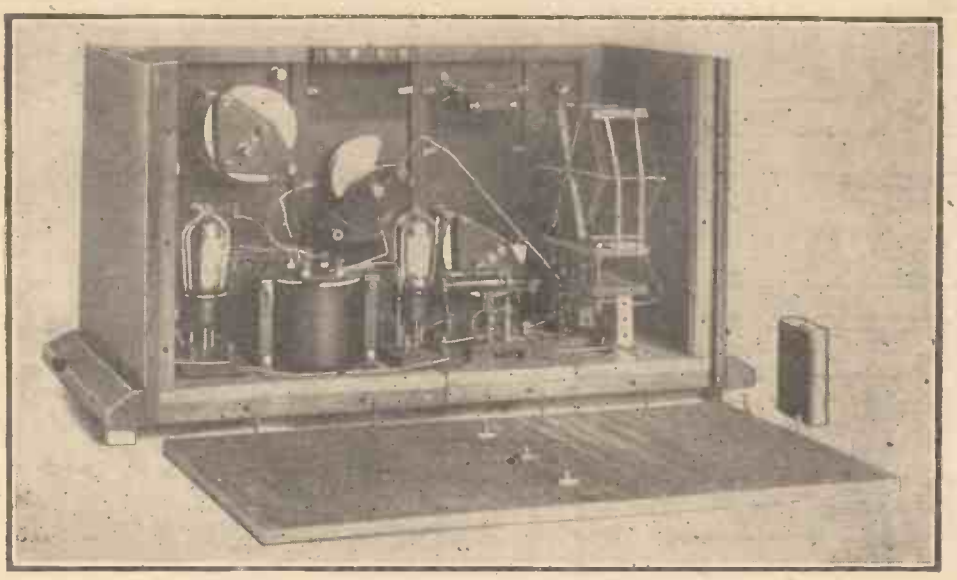


Details of Grill Front.

chosen, possessing as it does the advantage that valves are hidden and protected, while various components which do not require further insulation (L.F. transformers, the modern type of valve holders, etc.) can be mounted direct on the wooden baseboard, thus saving the cost of the more expensive ebonite. Moreover, only those components which have to be handled during the operation of the receiver are mounted on the front.

The cabinet is so constructed that it is in two halves, thus enabling further sections to be added in the middle when a larger size is required. Each section of the baseboard is fitted with a grill front (see Figs. 1 and 2), to which the various components required on the front of the receiver are fastened in the following simple manner about to be described.

Each component is mounted on a separate piece of ebonite ¼ in. thick, the horizontal side of which always measures 4 in., while the vertical side measures either 2, 4, 6 or 8 in., according to the size of the components. The various components are arranged on the grill so that the total vertical height is always 8 in.; spaces can, of course, be filled up with blank pieces of ebonite or ebonised wood as desired.



Rear View of Extensible Receiver with Back Removed.

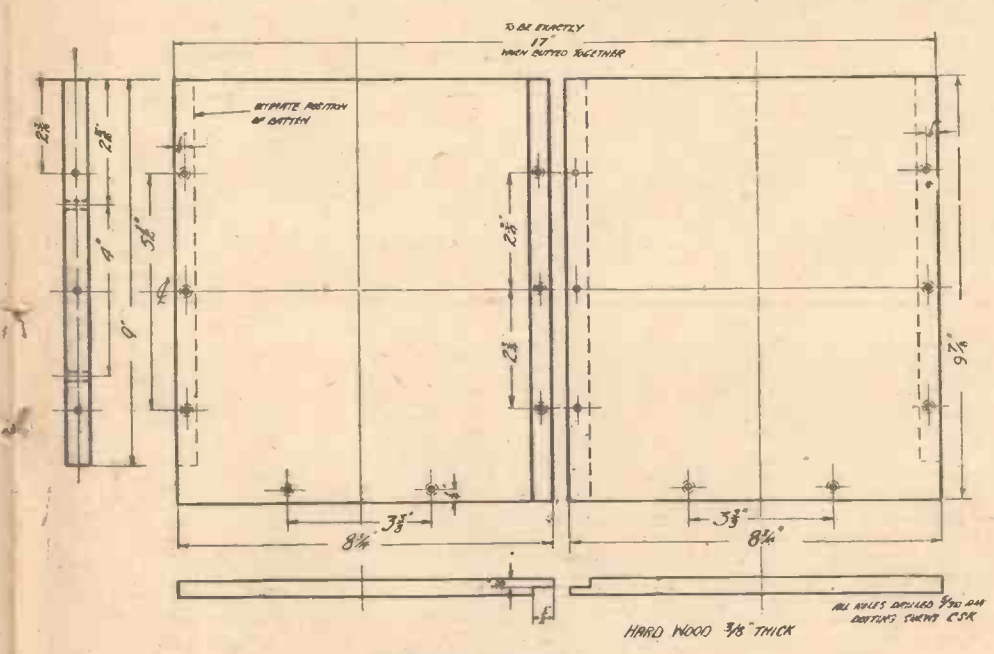


Fig. 3.—Details of Back.

These sizes were found to be standard sizes of the manufacturers, and when received the panels were found to be accurate and truly square, an obviously important point. Each piece of ebonite is held to the grill by means of two or four screws and small tapped pieces of bent brass strip (see Fig. 4), the horizontal fixing centres being 3¼ in. Thus it is a simple matter to assemble any required arrangement of components on the grill. The two halves of the baseboard and the grill are coupled together by means of the coupling bars (Figs. 1 and 2) and 4 B.A. screws and nuts of suitable length.

The sides and each half back and half top are just plain square pieces of wood (see Figs. 3, 5 and 6), which are fastened to the baseboard by means of screws and nuts which pass through battens per-

manently attached to the baseboard by wood screws.

Sides and backs are also held together by batten corner posts, whilst the tops are left loose to facilitate inspection, changing coils, valves, etc., but locating battens screwed on the inside serve to hold the top in position.

one is required. It is, of course, obvious that these additional sections should measure 4 in. or multiples of 4 in. No waste is incurred, and one can start with a small set and extend to a multi-valve arrangement in progressive steps.

It is not recommended that any smaller size be first constructed than a cabinet to the dimensions given. The cabinet can, of course, be made sufficiently large to take batteries as well, and the blanks in the grill filled in with wood. In the writer's arrangement a terminal strip is provided at each end, one for aerial and earth and the other for H.T. and L.T. battery connections; these remain permanently in the position shown in the photograph.

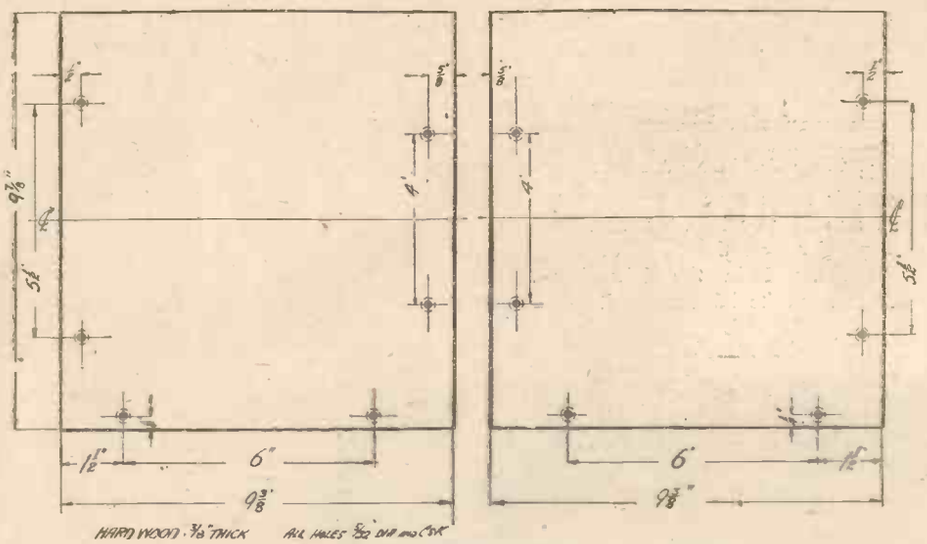


Fig. 5.—Details of Sides.

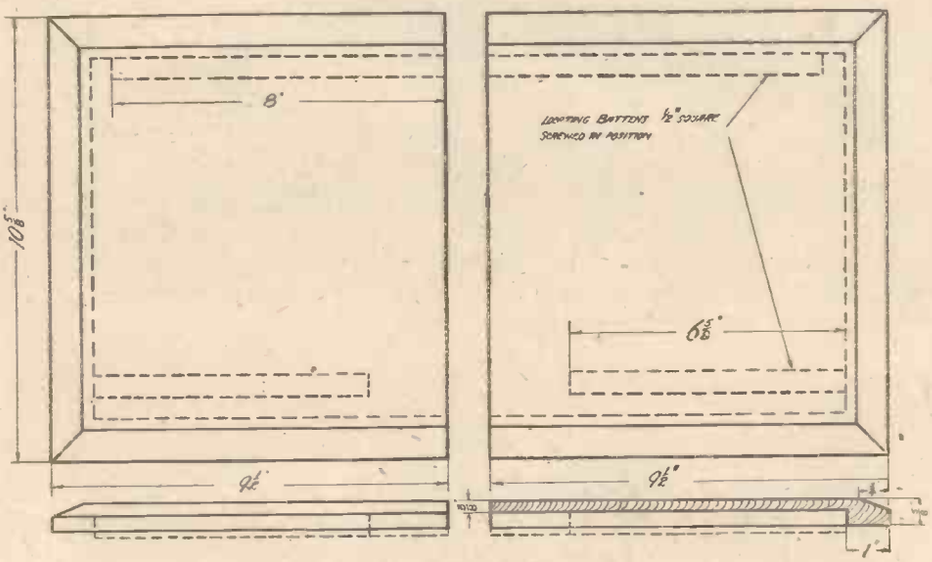


Fig. 6.—Plan and Elevation of Top.

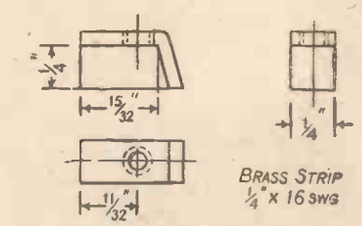


Fig. 4.—Details of Brackets for Securing Panels.

If the batteries are enclosed in the cabinet it will not be necessary to use this strip, but it is advisable to retain it for the sake of symmetry. Each component should preferably be fitted with terminals instead of using soldered connections, as this facilitates alteration.

A study of the accompanying photographs and drawings should make the constructional points quite clear. F. W. O.

Marching Songs of the Great War are to be given from Manchester on August 4.

The final defeat of the Spanish Armada in 1588 will be commemorated by a special programme between 8 and 9 p.m. on July 28.

The discussion of the American debt policy, which was to have been broadcast, was forbidden at the last moment by the Postmaster-General. The reason given was that anyone hearing only excerpts of the debate might take offence at the opinions expressed.

The Radio-Toulouse station has inaugurated for the summer a series of big concert transmissions in which an orchestra of some fifty-eight musicians take part. The concerts are given in the gardens of the Villa Schmidt, in which the transmitter is installed, and take place every Wednesday from 8.30 p.m. onwards.

The whole construction when assembled and bolted together is perfectly rigid. To present a neat front, small strips of the requisite size and ¼ in. thick are screwed to the grill by small wood screws, thus filling in the gap which otherwise would be left between the ebonite and the case sides. To finish off the base, pieces of shaped moulding are screwed on (see Fig. 7). Thus it is a simple matter to remove the back or both back and sides to facilitate wiring up or make modifications.

By unscrewing the coupling bars and fitting in suitable sections of grill, baseboard, back and top, and holding together by further coupling bars, it is a simple matter to extend the set when a larger

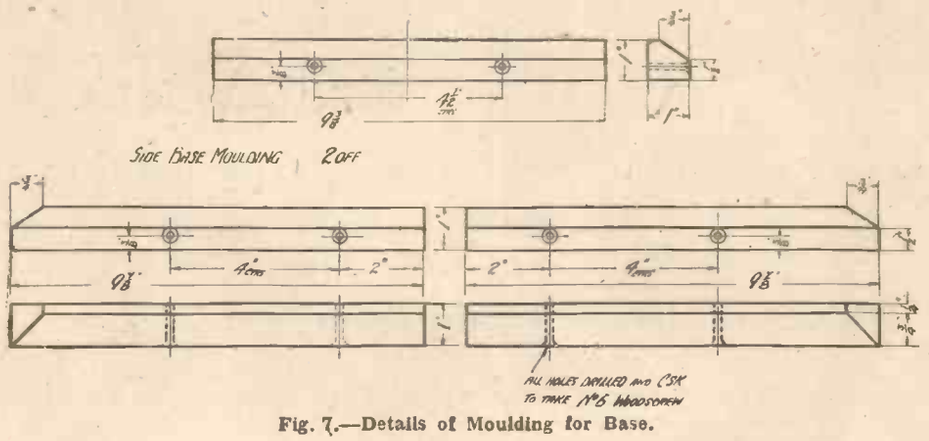


Fig. 7.—Details of Moulding for Base.

"A.W." TESTS OF APPARATUS

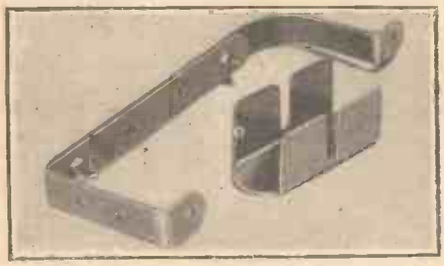
Conducted in the "Amateur Wireless" Research and Test Department

Useful Components

A. F. BULGIN AND CO., of 9 to 11, Cursitor Street, Chancery Lane, London, E.C.4, are the manufacturers of two components that will be found very useful in the construction of sets. The photograph illustrates the adjustable panel bracket and the grid bias battery clip.

The first accessory is designed to support a vertical panel attached to a baseboard, and is adjustable from 5½ in. to 6½ in. or 7½ in. in height, whilst it leaves sufficient room for terminals to be fitted on the extreme edges of the panel. The bracket prevents the panel from sagging, due to the weight of the mounted components.

Dimensioned to hold a standard pocket-lamp battery, the grid bias battery clip is intended for baseboard mounting. It effectively clamps the battery in position and prevents the latter from falling about inside the receiver and damaging connections.



Bulgin Panel Bracket and Battery Clip.

A Good One-valve Set

FOR those listeners who desire a good one-valve receiver incorporating well-known components and obtainable at a reasonable price (or on the extended payment system) we can confidently recommend the set produced by J. G. Graves, Ltd., of Sheffield.

With the exception of the two-way coil holder, all the components are mounted on a small sloping panel measuring 6 in. by 8½ in. in a polished oak cabinet, on the side of which the coil holder is fixed.

There are three controls, consisting of the tuning condenser (fitted with a friction-vernier device), the filament rheostat, and the coupling adjustment between aerial and reaction coils. At the top of the panel, aerial and earth terminals are mounted, while the remaining battery and phone terminals are mounted down the right-hand edge of the panel. If desired, all accessories can be supplied, including batteries, phones, coils and a Cosmos valve, type S.P.18 Green Spot. The circuit employed is straightforward.

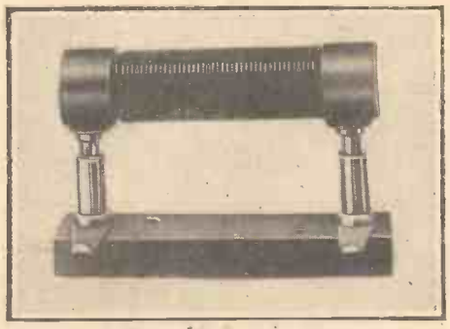
On test we have obtained really good results with this receiver. Using a good outdoor aerial-earth system, we have been

Graves' One-valver.

able to receive several broadcasting stations, including London, Birmingham, P T T, Daventry and Radio-Paris at good phone strength. When London was not working we were able to receive Bournemouth. These tests were made at a distance of eight miles from 2 L O. Tuning is very simple, and is greatly aided by the vernier control.

Magnum Resistors

MAGNUM resistors, manufactured by Burne-Jones and Co., Ltd., of Magnum House, 296, Borough High Street, London, S.E.1, are intended to replace the ordinary type of filament rheostats. The



Burne-Jones' Resistor.

number of controls on the panel of a set may thus be considerably reduced, but at the same time each valve is working at its correct filament temperature.

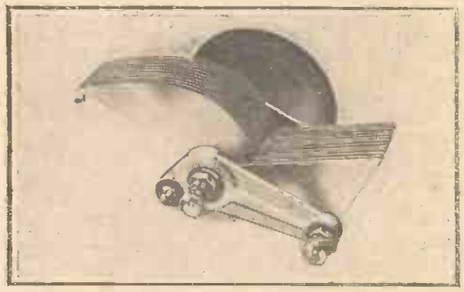
They permit of the use of any type of valve by plugging in a suitable resistor, as they are made in types suitable for most of the British valves.

Each resistor consists of a certain amount of resistance wire—depending on the voltage and current required by the filament of the valve—wound on a small cylindrical bakelite former. The two ends of the resistance wire are connected to plugs which fit into corresponding sockets mounted on an ebonite base. We have used these components with every satisfaction.

Raymond S.L.F. Condenser

A VARIABLE condenser of the straight-line-frequency type, which is extremely well made and finished, is produced by K. Raymond, of 27 and 28A, Lisle Street, Leicester Square, London, W.C.2.

As will be seen from the accompanying photograph, the instrument has a simple but very rigid construction employing a minimum amount of metal. The two end-plates consist of thick aluminium castings electrically connected to the moving vanes and insulated from the fixed vanes by



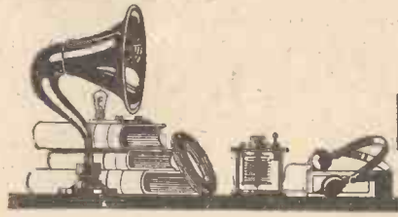
Raymond S.L.F. Condenser.

small ebonite insulators, the fixed vanes being supported in two places.

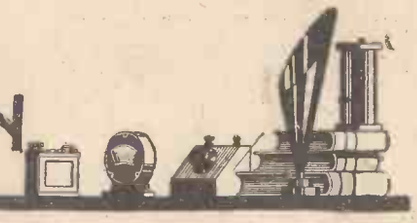
Owing to the length of the moving plates necessary for the S.L.F. curve, their extremities are supported by a bolt passing through holes in the plates, which clamps them together. Two small ebonite washers, having a slightly larger diameter than the metal spacing washers, serve as a stop.

A one-hole fixing device is employed, and the moulded ebonite knob and dial supplied is very attractive in appearance.

A sample of the condenser was first tested for the straight-line-frequency effect, which requires that the change in frequency of an oscillating circuit consisting of an inductance and variable capacity must remain constant over any equal portion of the condenser dial. With the Raymond S.L.F. condenser a "curve," drawn to show the change in frequency with respect to the setting of the dial, was found to be practically a straight line. H.F. losses were exceptionally low, and the motion of the moving plates has a smooth and pleasant "feel." We can thoroughly recommend this condenser.



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, layouts, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 140).

Reducing Absorption Losses

Q.—*I am now using a wooden mast, but propose replacing it by a steel one held in position by galvanised wire stays. Are there any special precautions that I can take to minimise the amount of energy that will be absorbed by mast and stays?—L. C. B.* (*Canterbury*).

A.—Provided that plenty of space is available, losses due to absorption will not be serious if the free end of the aerial is not taken right up to the mast-head. Let the aerial wire finish several feet from the mast and make up the intervening distance with rope. The stay wires can also be cut up into short lengths and joined together with insulators.—J. F. J.

Interference

Q.—*I am using a crystal set and experience no interference from an electric tramway which passes in front of the house. I am thinking of installing a three-valve set, but should like to know whether I am likely to get interference from the tramway.—H. F.* (*Manchester*).

A.—The effect of near-by electric power mains on wireless reception varies so widely that it is impossible to give a direct answer to your question. Sometimes mains which are quite close to the set cause no noticeable interference, while in other cases reception is rendered almost impossible by mains which one would think too far away to have any effect. A lot depends upon the type of circuit you intend using, and interference is less likely if you do not use transformer-coupled L.F. amplification. Much of the interference which is picked up from power mains is due to earth currents, and in such cases the trouble can often be eliminated by the use of a counterpoise instead of an earth connection.—J. F. J.

Use of Hydrometer

Q.—*I have bought a hydrometer and should like to know what is the lowest permissible specific gravity of the acid when accumulator cells are fully discharged.—K. M.* (*Dover*).

A.—This varies with the type of cell, but the makers' instructions should always be followed when they are available. Generally speaking, the specific gravity should not be allowed to fall below 1.18.—R. W.

Trouble with Reflex Set

Q.—*I am using a single-valve-and-crystal reflex set and am troubled by the set suddenly bursting into oscillation when I am adjusting the catwhisker, although the reaction coil has been adjusted first, so that the set is perfectly stable. Can you account for this?—K. S.* (*Purley*).

A.—You are not carrying out the adjustments in the proper order. A sensitive spot should be found on the surface of the crystal *before* any reaction coupling is introduced. The amount of reaction which must be applied to bring about a state of self-oscillation depends upon the damping of the various circuits. If, with one setting of the catwhisker, the reaction coil is adjusted until the set is on the verge of oscillation, then an alteration of the point of contact on the crystal will affect the damping of the anode circuit. This will either increase or decrease the tendency to oscillate, so that sometimes the set may oscillate violently.—J. F. J.

Best Three-Valver

Q.—*Which, in your opinion, is the best three-valve straight circuit?—O. P.* (*Herts*).

A.—It is quite impossible to make a definite statement on this point, as the best receiver for a particular purpose might be quite unsuitable when circumstances are different. For general loud-speaker work from the local and moderately distant stations an H.F., det., L.F. circuit is the most suitable provided a fairly efficient aerial system is available. This will be the ideal three-valver in the majority of cases. For great volume from the local station only, it would be better to use a detector followed by two L.F. valves; while for extreme range with phones only, two H.F. stages followed by a detector valve are to be preferred.—J. F. J.

OUR WEEKLY NOTE

TESTING THE H.T. BATTERY

A great deal of the trouble experienced with wireless receivers is directly due to the H.T. battery being exhausted. This causes such well-known symptoms as poor signal strength, a difficulty in obtaining a proper reaction effect, crackling noises, poor amplification, distortion, etc.

It can be easily ascertained whether the H.T. battery is up to strength by testing it with a voltmeter. But as there is only one right way of carrying out the test and many wrong ways of doing it, people often draw erroneous conclusions from the results obtained, condemning a perfectly good battery or retaining a defective one.

The proper way is to test the battery with a voltmeter having such a high resistance that the current required to operate it is well within the amount the battery was designed to supply. Moreover, the battery should be tested while delivering the normal current required by the set and only after it has been in use for some time.

The use of a low-resistance meter results in an excessive current being drawn from the battery, which causes rapid polarisation, making the voltmeter show a reading considerably below the voltage applied to the plates of the valves; while testing a battery that has been out of use for some time may result in obtaining a high reading, although the voltage would quickly fall after the battery had been in use on the set a few minutes.

THE BUREAU.

The Bangso Band has just played "Only the Two of Us."

Grid Condenser and Leak in Transmitter Circuits

Q.—*Why is a grid condenser and leak often used in a transmitting circuit when it is obviously not desired to rectify anything?—O. D.* (*Durham*).

A.—As you suggest, rectification is not intended in these cases. However, by suitably choosing the values of these components the grid of the valve can be maintained at a predetermined negative potential, as the values used will obviously control the intensity of the negative charge which will accumulate on the grid. It is found that the valve generates oscillations of the greatest amplitude when the valve is being worked near the bottom end of its characteristic curve, and as very high H.T. voltages are usually used in transmitters, a very large grid-bias battery would be necessary in order to move the operating point to this position. Hence if the bias may be obtained without recourse to a separate battery, so much the better.—R. W.

Separate H.T. Tappings

Q.—*I have a three-valve set comprising H.F., det., and L.F. stages, and at present the same H.T. voltage is applied to all the valves. Can I easily alter the set so that an independently variable H.T. voltage may be applied to each of the valves?—H. C.* (*Blackburn*).

A.—This should be a matter of no great difficulty. Examine the internal wiring of your set, and notice that the plate of each valve is ultimately connected to the present single H.T. positive terminal. The plate of the first valve will be connected to this terminal through the anode tuning coil or the primary of the H.F. transformer, depending upon the type of coupling used between the first two valves. The detector plate will have in series with it the reaction coil (if one is used) and the primary of the L.F. transformer, or the choke coil or resistance if either of these couplings are used instead of a transformer. The last plate will go to H.T. positive through the windings of the phones or loud-speaker. You must fit two new H.T. positive terminals in convenient positions on the panel, and disconnect the H.T. positive ends of two of the plate circuits, which must each be transferred to one of the new terminals. The H.T. negative terminal will remain common to all the valves. You will probably find, upon experiment, that the detector requires the lowest H.T. voltage, the H.F. valve a slightly higher voltage, and the L.F. valve a considerably higher voltage than either of the preceding valves. With the H.T. voltage of the last valve variable, it will be of great advantage to apply grid bias to this valve.—R. W.

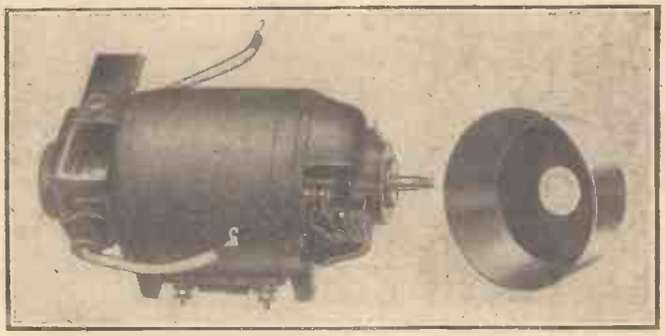
MACHINE-MADE HIGH-TENSION

The second and concluding article on the construction of a rotary transformer to take the place of the high-tension battery. By A. H. AVERY, A.M.I.E.E.

IN the case of the armature the maximum slot-space is necessary, and the highest economical saturation point in the cross-section of the armature teeth, and this in conjunction with minimum reluctance in the air gap, hence the semi-enclosed form of tooth with parallel sides. Every part of the frame that can be made of aluminium is built of that metal, such as shroud, end brackets, brush holders, covers, etc. At the same time the sections must be kept sufficiently substantial to resist working stresses and normal service conditions.

Fig. 8 is a graph of the saturation curve of the field magnet, with calculated values of flux density corresponding to different degrees of field excitation in ampere-turns.

Finally Fig. 9 represents the actual test performance of the rotary transformer with a 1,000-volt D.C. H.T. output as regards input watts, output watts, H.T. volts, H.T. amperes, regulation, temperature rise and efficiency.



Rotary Transformer with End Cores Removed.

Windings

Winding specifications for various outputs suited to the majority of purposes, such as 60 volts for detector circuit, 120 to 150 volts for amplifying, and 300 to 1,000 volts for transmission, are given below. As the output capacity in watts will be the same whatever the H.T. voltage, the current rating in milliamperes will, of course, vary inversely as the H.T. volts.

A.—6 *volts L.T. to* 60 *volts* 400 *milliamperes H.T. output.*

B.—6 *volts L.T. to* 150 *volts* 160 *milliamperes H.T. output.*

C.—6 *volts L.T. to* 300 *volts* 83 *milliamperes H.T. output.*

D.—6 *volts L.T. to* 500 *volts* 50 *milliamperes H.T. output.*

E.—6 *volts L.T. input to* 1,000 *volts* 25 *milliamperes* H.T.

Any intermediate voltages are obtainable within the current rating of that particular specification by varying the speed of the rotary by a series resistance on the L.T. side.

Specification A.—Armature L.T. winding to consist of 12 double coils each containing 3 plus 3 turns of stranded copper wire consisting of 28 conductors of No. 36 S.W.G. double-silk braided wire. H.T. winding to consist of 72 former-wound coils, each containing 15 turns of No. 26 S.W.G. double-silk-covered copper wire. Fields to consist of two coils, each with 300 turns or No. 22 S.W.G. double-silk-covered copper wire, in series with one another and in shunt to the low-tension armature winding.

Specification B.—Armature L.T. winding as in "A." H.T. winding to consist of 72 former-wound coils, each with 38 turns of No. 33 S.W.G. double-silk-covered copper wire. Field winding as in "A."

Specification C.—Armature L.T. winding as in "A." The H.T. winding to contain 75 turns of No. 36 S.W.G. double-silk-covered copper wire in 72 former-wound coils. Fields as in "A."

Specification D.—Armature L.T. winding as in "A." The H.T. winding to consist of 72 former-wound coils, each containing 125 turns of No. 40 S.W.G. enamel-covered copper wire. Fields as in "A."

Specification E.—L.T. armature winding as in "A." Fields also as in "A." H.T. armature winding to consist of 72 former-wound coils, each with 250 turns of No. 41 S.W.G. enamel-covered copper wire.

Without extending these notes to too great a length, it is only possible to supplement the above by a few instructions regarding the winding processes in general, without which failure might result. Owing to the extremely high voltage of the last two specifications, special care must be taken as regards the slot insulation. There are, of course, two separate sets of coils in the slots, low-tension at the bottom and high-tension at the top, and each must be kept electrically separate from the other.

The low-tension winding presents no difficulty, and the only insulation necessary is a slot lining of one layer of 10-mil leatheroid or good-quality presspahn. After this winding is in place and connected up, the slot is again relined with a further two layers of 5-mil empire silk before any of the high-tension coils are inserted. The winding of the L.T. coils is quite an easy matter; they are "double" coils—that is, one section is wound first and the end looped out for a couple of inches—then the second section is wound over the first on the same former without cutting the wire. No taping of the coils is necessary for this low voltage.

The high-tension coils require very careful handling, not only because of the excessively fine wire, but because there is considerable difference of potential between the start and the finish of any one coil, and the insulation must therefore be carefuly preserved. After long experience the writer has come to the conclusion that it is better to wind the coils "dry"—that is, without insulating varnish—provided a really good grade of enamel covering is obtainable. Six sections are wound before cutting the wire, as the coil grouping on the H.T. side is six per slot, being looped out at five points for connection to intermediate commutator segments. After winding, the coil is to be taped all round with 5-mil half-lapped silk tape ⅜ in. wide and the ends brought out.

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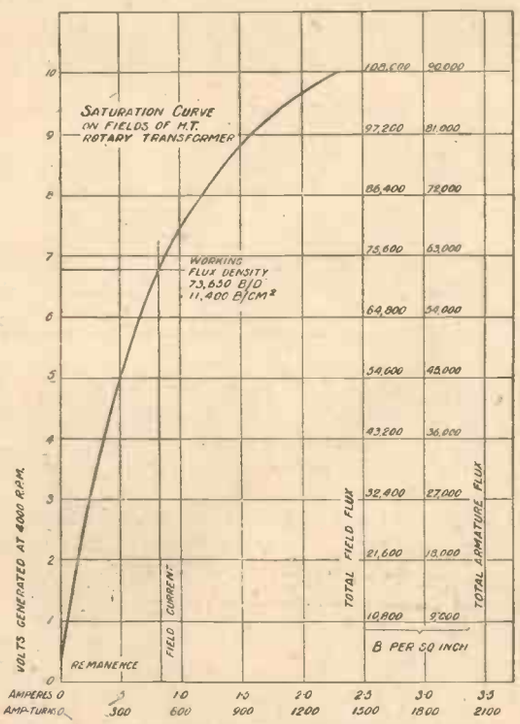


Fig. 8.—Saturation Curve of Transformer Fields.

NEXT WEEK AT 2LO

By "THE LISTENER"

Emilio Colombo, of the Hotel Victoria Orchestra

LONDON has had opportunities lately of hearing some of the best of the provincial conductors, and on Sunday next a programme of popular classics will be conducted by the conductor of the Bournemouth station, Captain W. A. Featherstone. The soloists are Gladys Naish and Isabel Gray (solo pianoforte).

The evening programme will be by the Wireless Orchestra, conducted by Stanford Robinson. The soloist is Leonard Gowings, the well-known tenor.

There is a decidedly holiday spirit in the air on Monday. There is, it is true, no morning concert from Daventry, but the London station will commence with the Holborn Restaurant Orchestra from 1 to 2 o'clock, followed from 3 to 5.15 by a popular orchestral concert by the Wireless Orchestra. Clarkson Rose's Concert Party will be relayed in the evening from Westcliffe-on-Sea, followed at 9 by a light entertainment given by Florence Oldham and Sydney Nesbitt. The 10 o'clock feature will be given by the Wireless Military Band, assisted by Tom Kinniburgh (bass) and a performance of Keble Howard's cockney sketch *Benkoldy*.

A unique feature is to be given on Tuesday in the form of a programme of works for two, three and four 'cellos. Amongst the players are Carl Fuchs, Harry Dugarde, Ambrose Gauntlett, with Winifred Fisher as the singer. This will be followed at 9 o'clock by the first London performance of Julius Hare's Cromwellian play, *Force, Wits, and a Woman*. Two new-comers will be heard at 10 p.m., S. Haywood, the champion mouth-organist, and the Canadian entertainer, Clara Salisbury-Baker.

The outstanding item of Wednesday's programme is the speech by H.R.H. the Prince of Wales, relayed from Oxford on the occasion of the meeting of the British Association. The remainder of the evening will be a programme arranged by the British Legion.

During Thursday evening the London Trio will be heard.

A sing-song, relayed from the annual camp arranged by H.R.H. the Duke of York at New Romney will be given on Friday, followed by a programme of music from the Grand Hotel, Eastbourne, by Albert Sandler and his orchestra, assisted by Ellis Burford (soprano). Later the London Wireless Orchestra will be heard and also Dennis-Noble, the young baritone of the B.N.O.C.

On Saturday night a popular programme will be provided by the Irwell Springs Band, with songs contributed by George Greenwood. Later come the Radio Follies Concert Party and the Savoy Bands. Miss Lucy Pierce, a Manchester pianist, is the player of the week, and Handel the chosen composer.

The French Government has now decided to put all broadcast telephony in France under immediate State control.

"MACHINE-MADE HIGH-TENSION" (*continued from preceding page*)

After assembly in the slots, the slot lining is cut off long enough to tuck in over the top of the coils and a thin fibre or leatheroid wedge slipped in under the overhanging teeth to prevent the coils from flying out. After finally connecting up to the commutator, the whole armature is made hot and immersed in Ohmaline insulating varnish for twelve hours, then baked out for four hours at 180 degrees F. This seals all the windings in place and, besides providing good insulation, prevents the wires from chafing or moving in the slots. In the smaller gauges of wire it is also advisable to reinforce the commutator connections with one or two strands of No 40 S.W.G. tinned copper when soldering up. The short connections between the coils and the commutator riser can be further protected by slipping them through ½-mm. varnished silk sleeving to prevent any slack from contacting with other connections and to some extent protect them.

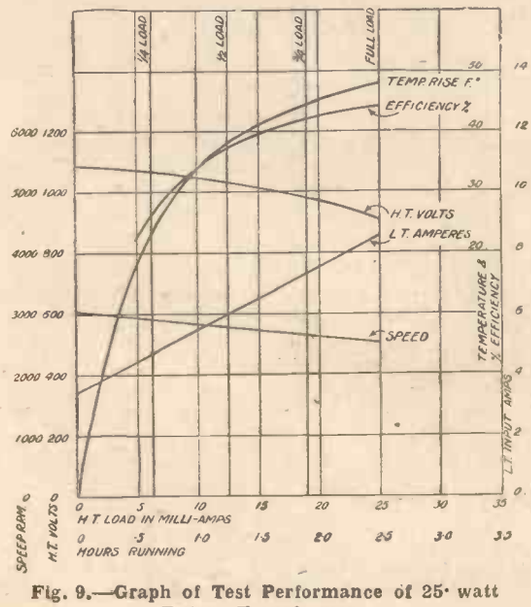


Fig. 9.—Graph of Test Performance of 25-watt Rotary Transformer.

A volume might be written on the subject of insulating and winding small armatures with fine-gauge wires, but experience and the personal equation count more than written instructions. A job that seems impossibly difficult on the first attempt often assumes quite a different aspect after profiting by one or two failures.

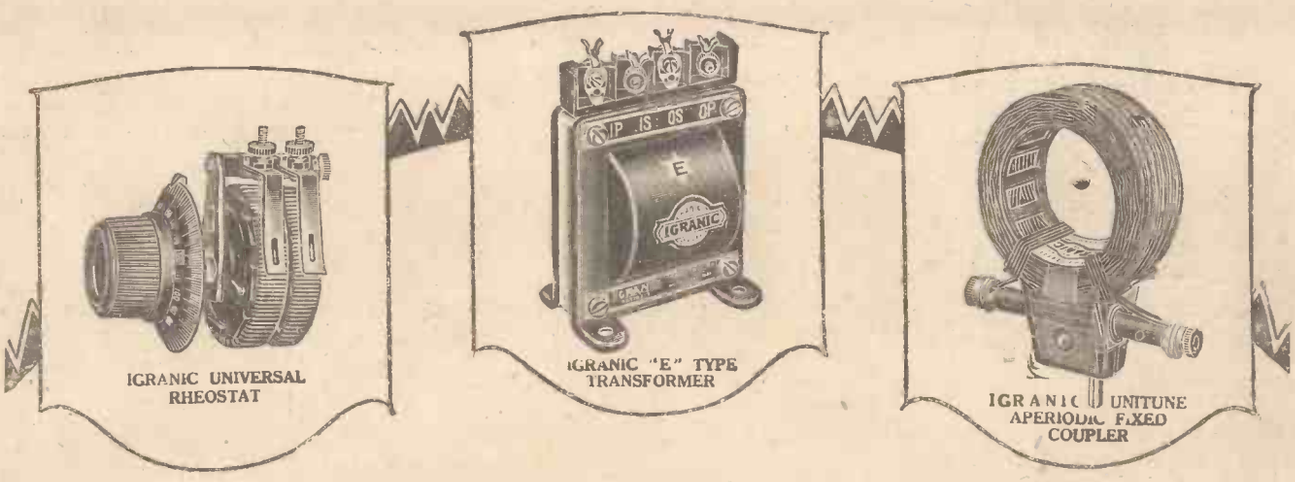
A. H. A.

A WIRELESS FURNACE

A FURNACE which is heated by means of wireless currents oscillating nearly three-hundred-thousand times per second is being used by the American Bureau of Standards for the purpose of melting platinum and other high melting-point metals. A furnace operating at such a frequency is capable of producing extremely high temperatures, at the same time providing easy and complete control over the heat generated. This type of induction furnace, is, of course, not new, but it is probably the first time that such high frequencies have been used for such purposes. The method of the high-frequency induction furnace bears out the old saying, "One man's meat—another man's poison," for it functions purely in virtue of the eddy-current losses produced in the metal to be melted. While the radio engineer trys to keep his losses as low as possible, the furnace engineer likes them as high as possible. The metal to be melted is placed in a fired china-clay container, around which, together with suitable lagging, are turns of wire through which the high-frequency current is led. The metal, being in the high-frequency field, is subjected to intense heating by eddy-currents

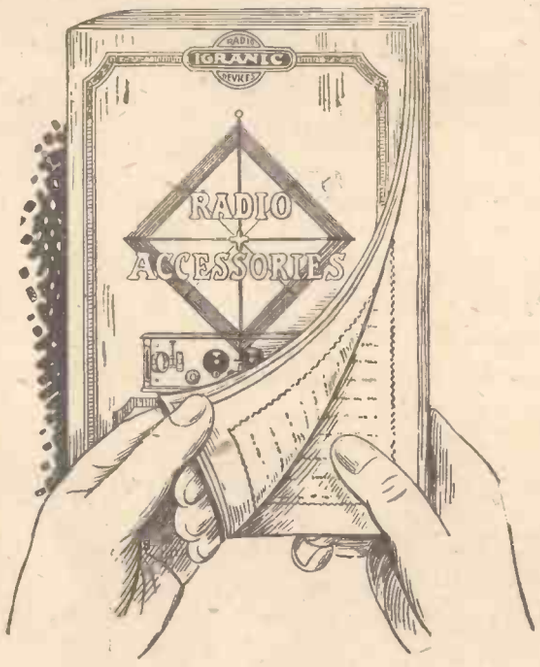
T. A.

NEW COMPONENTS— LOWER PRICES



THE new Igranic Radio Accessories Catalogue is now ready. It contains particulars of many NEW AND INTERESTING COMPONENTS and SUBSTANTIAL PRICE REDUCTIONS, made possible by improved manufacturing methods. Even if you are in no immediate need of components you will find the new Igranic Catalogue of considerable interest and useful for reference.

Above are illustrated the new Universal Rheostat, adaptable for the control of all types of valves; the well-known "E" type L.F. Transformer which has been reduced in price, and the new pattern of the Unitune Aperiodic Fixed Coupler, also at a much lower price.



The Universal Rheostat is made in two types, "A" and "B." Type "A" is adjustable to resistances of 4, 8 or 16 ohms, and Type "B" to 7½, 15 or 30 ohms. The price (as illustrated) is 4/6 for either type.

The well-known Igranic "E" Type L.F. Transformer is still made in two ratios, 1 : 5 for the first and single stage and 1 : 3 for second stages. The prices have been reduced to 16/- for the 1 : 5 and 15/- for the 1 : 3 pattern.

The Igranic Unitune Aperiodic Fixed Coupler—the most simple means of increasing the selectivity of a receiver without alteration or additions—has been re-designed, and is now only 4/6. The wavelength range is approximately 250 to 500 metres.

Send for your copy of the new Catalogue (*No. D* 20).

COMPANY
IGRANIC
ELECTRIC
LIMITED

149 Queen Victoria Street, LONDON, E.C.4
Works : BEDFORD.

RADIOGRAMS

APPROXIMATELY 20,000 reports have been received by the B.B.C. from listeners in the London area on the subject of the alternative programme experiments. Many of the writers indicate that only by the adoption of the loose-coupling method in crystal receivers were they enabled to receive either station at will.

A remarkable feature of the Glasgow Fair holidays has been the large number of people who made it their business to keep in touch with broadcasting while sojourning by sea or in the country. Receiving sets became quite common as articles of luggage.

Amongst the latest broadcast competitions is that known as "Empire Slogans." The programme is in acrostic form, and the initial letter of the names of various composers, whose works are played, form the clues.

Mr. J. J. Walsh, Irish Free State Minister for Posts and Telegraphs, announces that a high-power broadcasting station is likely to be erected in the centre of Ireland, and low-power stations will be established at Cork, Galway, and probably Bundoran during the next few months.

The Indian Broadcasting Co., Ltd., has been registered with a capital of R.1,500,000 (about £100,000). The company undertakes to provide wireless stations at Calcutta and Bombay of the same capacity as the London stations. It is expected that the Calcutta and Bombay stations will be ready to broadcast programmes by next winter.

With the object of setting up a standardized pronunciation for all its announcers and news readers, the British Broadcasting Company has appointed a special committee to select as many words as possible which are habitually pronounced in alternative ways and to decide upon uniform pronunciations for them.

Tetney beam station, for communication with Australia, is nearing completion.

A French theatrical staffs' association are demanding the imposition of the same taxes on wireless broadcasting as are imposed in connection with theatrical performances.

A tablet has been put up in Fort Rouge United Church, Winnipeg, to commemorate the broadcasting of a church service for the first time in Canada. This first wireless service was held on Easter Sunday, 1923.

Now that community singing takes place every Thursday in the churchyard of St. Martin-in-the-Fields, it will be relayed to the London station from 1 to 1.20 p.m. on those days.

A special national programme will be broadcast from the 2LO studio on September 27 in celebration of New Zealand's Dominion Day.

The Ulster Wireless Traders' Association have fixed on September 11 as the date for the opening of the second Ulster Wireless Exhibition, which will be held in the Ulster Hall, Belfast.

The United States Naval Observatory announces that there will be a world longitude determination by radio signals, beginning Oct. 1, 1926, and ending Dec. 1, 1926, for the purpose of determining the differences in longitude with great accuracy.

The Marconi Company has orders for thirty beam stations in various parts of the world.

From the Duke of York's Camp, New Romney, where public-school boys and factory lads spend their vacation together, a sing-song will be relayed on August 6.

Mr. R. E. Jeffrey will present on Bank Holiday, August 2, a cockney sketch entitled *Benkoldy,* from the pen of Mr. Keble Howard.

A dramatic episode of the days of the cavaliers and roundheads, *Force, Wits and a Woman,* has been specially written by Mr. Julius Hare, for production at 2LO on August 3.

A small broadcasting station, erected by a French wireless club at St. Etienne, has begun tests on 220 metres (power 100 watts). The call is Radio-Forez.

By special request Verdi's opera *Rigoletto* is to be repeated by the London studio on August 20.

The wavelength of the Kiel broadcasting station has been increased to 234.5 metres.

Bands are to be a special feature of the Glasgow programmes during the holiday months. The Scots Guards, the Glasgow Police Band, and the Clydebank Burgh Band are three of the leading combinations to be heard shortly, while the Kaluans Dance Band, in which the performers are Glasgow University students, and which has made a great reputation for itself all over the country, is also to contribute a programme.

From July 3 until July 17, Mr. Eric Megaw, of Belfast, on board the ss. *Lord Antrim,* from Dublin to Sydney, Nova Scotia, was able to maintain nightly communication with Mr. Frank R. Neill, of Whitehead, Belfast. The tests will be resumed when the steamer makes the return voyage, about August 1. A wavelength of 45 metres will be used.

Further relays contemplated by the B.B.C. include a torchlight tattoo on August 6 by the Band of the Royal Marines, at Deal; a programme of orchestral music by the Band of the 2nd Battalion Queen's Own Royal West Kent Regiment, from the Granville Gardens Pavilion, Dover, on August 12; a sea-side entertainment provided by the Poppies from the Pier Pavilion, Hastings, on July 31, and a concert broadcast by Clarkson Rose and his company from Westcliffe-on-Sea on August 2.

From any post office it is now possible to telegraph to a ship afloat in almost any sea in the world. The rate is 1s. 6d. per word.

As a result of the recent meeting of the *Union Internationale de Radiophonie* at Paris, on July 2-6, under the new scheme for apportioning to each country a sufficient number of stations to meet the requirements of the inhabitants, nine exclusive wavelengths have been allotted to Great Britain. This constitutes the first step towards dividing up this country into areas served by possibly ten main stations working on a power of 15-20 kilowatts, with five stations of the low-power type and a super high-power station for linking up the United Kingdom with the Dominions and other countries. As there are now twenty-one broadcasting stations operating in the British Isles, such a re-arrangement means the dismantling of five stations or, alternatively, a possibility of working them on duplicate wavelengths.

THE INTERNATIONAL SET COMPETITION

Elimination Competition

ENTRIES in this competition will be on public view on Thursday, Friday and Saturday, July 29, 30 and 31, from 10 a.m. to 5 p.m., at the offices (ground floor) of Messrs. Cassell & Co., Ltd. (the Proprietors of AMATEUR WIRELESS), La Belle Sauvage, Ludgate Hill, London, E.C.4 (250 yards west of St. Paul's).

Competitors, readers and indeed the public generally are given a very hearty invitation to come to La Belle Sauvage and see the sets.

In the States, British sets will be in competition with American, French, Belgian, Spanish, Australian and other sets at the Radio World's Fair, Madison Square Garden, New York, where they will be on view from September 13 to 18 inclusive, and further, the winning sets will be given a place of honour at the Fifth Annual Radio Show in Chicago.

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 British Summer Time.

London (2LO), 362 m. 1-2 p.m., con.; 3.15-4 p.m., transmission to schools; 3.30-5.45, con. (Sun.); 4.15 p.m., con.; 5.15-5.55, children; 6 p.m., dance music; 7-8 p.m., time sig., news, music, talk; 8-10 p.m., music; 9.0, news (Sun.); 9.30 p.m., time sig., news, talk; 10 p.m., special feature (Mon., Wed., Fri.). Dance music on Thurs. and Sat. until midnight.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 440 m. **Birmingham** (5IT), 479 m. **Bournemouth** (6BM), 386 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 422 m. **Manchester** (2ZY), 378 m. **Newcastle** (5NO), 404 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 315 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 321.5 m. **Liverpool** (6LV), 331 m. **Nottingham** (5NG), 326 m. **Plymouth** (5PY), 338 m. **Sheffield** (6FL), 306 m. **Stoke-on-Trent** (6ST), 301 m. **Swansea** (5SX), 482 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 4 p.m. onwards, own con. on Mon. Dance music daily (exc. Sun. and Tues.) till midnight; on first Friday in each month until 2 a.m.

IRISH FREE STATE.

Dublin (2RN), 397 m. Daily, 7.30 p.m. Sundays, 8.30 p.m. until 10.30 p.m.

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. B.S.T.

AUSTRIA.

Vienna (Radio Wien), 582.5 m. and 531 m. (temp.) (10 kw.). 11.00, con. (almost daily); 15.30, con.; 19.25, news, weather, time sig.; con., lec., news; 20.00, con.; 22.00, dance (Wed., Sat.).

Graz, 402 m. (1 kw.). Relay from Vienna. Also own con. (Tues., Wed., Fri.), 20.10.

BELGIUM.

Brussels, 487 m. (2½ kw.). 17.00, orch. (Tues., Thurs., Sat. only), news; 20.00, lec., con., news. Relay: Antwerp, 265 m. (100 w.).

Liege (Radio Club). 585 m. Con., 20.30.

CZECHO-SLOVAKIA.

Prague, 372 m. (5 kw.). Con., 20.00-23.00, daily.

Brunn (OKB), 521 m. (2.4 kw.). 10.00, con., news (Sun.); 19.00, lec., con. or dance (daily).

Kbely, 397 m. (500 w.).

DENMARK.

Copenhagen (Radioraadet), 347.5 m. (2 kw.). Sundays: 10.00, sacred service; 16.00, con.; 20.00 dance. Weekdays: 20.00, lec., con., news, con.; dance to 24.00 (Thurs., Sat.).

Ryvang, 1,150 m. (1 kw.). Sundays: 09.00, sacred service.

Odense, 810 m. Relays Copenhagen.

Sorö, 1,150 m. (1½ kw.). Relays Copenhagen.

FINLAND.

Helsingfors (Skyddskar), 504 m. (500 w.).

Helsingfors, 440 m. Con., 18.00 (Tues., Thurs., Sat., Sun.).

***Tamafors**, 368 m.

***Jyvaskyla**, 561 m. (200 w.).

***Uleaborg**, 233 m. (200 w.).

* Relay Helsingfors.

GRAND DUCHY OF LUXEMBURG.

Radio Luxemburg (LOAA), 1,200 m. Con. 14.00 (Sun.), 21.00 (Thurs.).

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 07.15, 08.00, physical exercises; 11.00, markets (exc. Sun. and Mon.); 11.20, time sig., weather; 15.00, 16.45, Stock Ex. (exc. Sun. and Mon.); 18.00, talk, con., news; 19.00 and 23.10, weather; 21.00, con. (daily). Relays PTT, Paris: 07.15, 08.00 (daily).

Radio-Paris (CFR), 1,760 m. (about 3 kw.). Sundays: 12.45, con., news; 16.30, Stock Ex., con.; 20.15, news, con. or dance. Weekdays: 10.40, news; 12.30, con., markets, weather, news; 16.30, markets, con.; 20.15, news, con. or dance.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (800 w.). 07.15, 08.00, physical exercises (except Sun.); 20.30, lec. (almost daily); 21.00, con. (daily).

Le Petit Parisien, 333 m. (1 kw.). 21.15, con. (Tues., Thurs., Sat., Sun.).

Radio L.L. (Paris), 350 m. (250 w.). Con. (Mon., Wed.; Thurs.), 20.30.

Radio-Toulouse, 431 m. (2 kw.). 12.30, con., time sig. (daily); 17.30, news (exc. Sun.); 20.45, con.; 21.25, dance (daily).

Radio-Lyon, 280 m. (2 kw.). 20.20, con. (daily). Temporarily closed.

Strassburg, 205 m. (100 w.). 21.15, con. (Tues., Thurs.).

Radio Agen, 318 m. (250 w.). 12.40, weather, Stock Ex.; 20.00, weather, Stock Ex.; 20.30, con. (Tues., Fri.).

***Lyon-la-Doua**, 480 m. Own con., 20.00 (Mon., Wed., Sat.).

***Marseilles**, 351 m. (500 w.).

***Toulouse**, 280 m. (2 kw.).

***Bordeaux**, 411 m.

* Relays of PTT Paris.

Montpellier, 220 m. (1 kw.). 20.45 (weekdays only).

Angers (Radio Anjou), 300 m. (500 w.). Daily: 20.30, news, lec., con.

Bordeaux (Radio Sud-Ouest), 330 m. Con., 21.00 (Mon., Fri.).

Mont de Marsan, 390 m. (300 w.). Con. (weekdays only), 20.30.

Algiers (N. Afr.) (PTT), 310 m. (100 w.). 22.00, con. (Mon., Thurs.).

Ste. Etienne (Radio Forez); 220 m. (100 w.). Testing.

GERMANY.

Berlin, on both 504 and 571 m. (4 kw.). 06.30, con. Phys. Exer. (Sun.); 09.00, sacred con. (Sun.); 11.00, con. and tests; 12.55, time sig., news, weather; 15.00, educ. hour (Sun.), markets, time sig.; 17.30, orch.; 20.30, con., weather, news, time sig., dance music until 24.00 (Sat., Sun., Thurs.). Relayed on 1,300 m. by Königswusterhausen (1,300 m.) and Stettin (241 m.).

Königswusterhausen (LP), 1,300 m. (8 kw.). 11.30-12.50, con. (Sun.); 15.00, lec. (daily); 20.30, relay of Berlin (Vox Haus) con. (daily). 2,525 m. (5 kw.), Wolff's Buro Press Service: 06.45-20.10. 2,880 m., Telegraphen Union: 08.30-19.45, news. 4,000 m. (10 kw.), 07.00-21.00, news.

Breslau, 418 m. (3 kw.). 12.00, con. (daily), Divine service (Sun.); 12.55, time sig. (Sun.), weather, Stock Ex., news; 16.00, children (Sun.); 17.00, con.; 19.00, lec.; 20.30, con., weather, time sig., news, dance (relays Berlin). Relay: Gleiwitz, 251 m.

Frankfort-on-Main, 470 m. (3 kw.). 08.00, sacred con. (Sun.); 11.55, time sig., news; 12.55, Nauen time sig.; 16.00, con. (Sun.); 16.30, con.; 18.00, markets, lec.; 20.00, lec., con., weather. Dance: relays Berlin. Relay: Cassel, 273.5 m.

Hamburg, 392 m. (3 kw.). Relayed by Bremen (279 m.), Hanover (297 m.), Kiel (230 m.). Sundays: 07.25, time sig., weather, news, lec.; 09.15, sacred con.; 13.15, con.; 18.00, con.; 19.15, sports, weather, con. or opera, dance. Weekdays: 05.45, time sig., weather; 07.00 and 07.30, news, weather; 12.55, Nauen time sig., news; 14.00, weather, con.; 16.15 con; 18.00, relays Berlin; 19.00, lec.; 19.55, weather and con.; 22.00, dance (Sun., Thurs., Sat.).

Königsberg, 463 m. (1 kw.). 09.00, sacred con. (Sun.); 12.55, time sig., weather, news; 16.30, con.; 17.00, con. (Sun.); 19.30, lec.; 20.00, con. or opera, weather, news, dance (irr.).

Leipzig, 452 m. (3 kw.). Relayed by Dresden (294 m.). 08.30, sacred con. (Sun.); 11.00, educ. hour (Sun.); 12.00, con. (daily); 12.55, Nauen time sig., news; 16.30, con., children (Wed.); 20.15, con. or opera, weather, news, cabaret or dance (not daily).

Munich, 485 m. (3 kw.) and 204 m. (1½ kw.). Relayed by Nuremberg (340 m.). 11.30, lec., con. (Sun.); 14.00, time sig., news, weather; 16.00, orch. (Sun.); 16.30, con. (weekdays); 18.30, con. (weekdays); 19.15, lec.; 19.30, con. (Sun.).

Muenster, 410 m. (1 kw.). Relayed by Elberfeld (259 m.), Dortmund (283 m.). 11.45, radio talk, Divine service; 12.00, news (Sun.); 12.30, news (weekdays); 12.55, Nauen time sig.; 15.30, news, time sig.; 16.00, con.; 17.00, children (Sat.); 19.40, news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 24.00 and 04.00, weather and news.

Stuttgart, 446 m. (1½ kw.). 11.30, con. (Sun.); 16.30, con. (weekdays); 17.00, con. (Sun.); 18.30, time sig., news, lec., con. (daily); 21.15, time sig., late con. or cabaret.

HOLLAND.

Amsterdam (PCFF), 2,125 m. (1 kw.). Daily: 06.35-15.30 (exc. Mon. and Sat., when 12.30-13.30), news, Stock Ex.

Hilversum (HDO), 1,060 m. (5 kw.). 09.00 sacred service (Sun.); 19.10, con.; 21.00, news, con.

HUNGARY.

Buda-Pesth (Csepel), 560 m. (2 kw.). 09.30, news; 12.00 and 15.00, weather, news; 17.00, dance music; 20.00, con. or opera; dance nightly.

Kosice, 2,020 m. (2½ kw.). 19.00, con.

ICELAND.

Reykjavik, 327 m. (700 w.). Con., 20.30.

ITALY.

Rome (1RO), 425 m. (3 kw.). 10.30, sacred con.; 13.15, official communique; 17.00, children; 17.30, relay of orch. from Hotel di Russia; 17.55, news, Stock Ex., jazz band; 20.30, news, weather, con.; 22.15, late news.

Milan, 320 m. (2 kw.). 20.00-23.00, con., jazz band.

JUGO-SLAVIA.

Belgrade (Rakovitza) (HFF), 1,650 m. (2 kw.). 17.00, news (daily), con. (Tues., Thurs., Sat.).

Agram (Zagreb), 350 m. (500 w.).

LETTLAND.

Riga, 475 m. (2 kw.). Con. daily, 21.00-22.00.

NORWAY.

Oslo, 382 m. (1.2 kw.). 11.00, Divine service (Sun.). Stock Ex. (weekdays); 19.15, news, time, lec., con.; 22.00, time, weather, news, dance relayed from Hotel Bristol, Oslo (22.30-24.00, Sun., Wed., Sat.).

Bergen, 357 m. (1½ kw.). 19.30, news, con. etc.

***Riukan**, 445 m. (50 w.).

***Porsgrund**, 405 m. (100 w.).

* Relays Oslo.

POLAND.

Warsaw, 480 m. (6 kw.). Daily: con., 11.00-13.00; 15.00-23.00, daily.

RUSSIA.

Moscow (RDW), 1,450 m. (12 kw.). Weekdays: 12.30 and 17.55, news and con.; 23.00, chimes from Kremlin.

(Popoff Station), 1,010 m. (2 kw.). 10.00, 11.00, lec.; 13.00, 19.00, con. (Tues., Thurs., Fri.).

Radio Peredacha, 410 m. (6 kw.).

Trades Union Council Station, 450 m. (2 kw.). 18.00, con. (Mon., Wed.).

Leningrad, 940 m. (2 kw.). Weekdays: 16.00.

Nijni Novgorod, 860 m. (1.2 kw.). 17.00 (Tues., Fri., Sun.), con.

Astrakhan, 650 m. (1 kw.).

Kieff, 780 m. (1 kw.). 18.00, con. (daily).

SPAIN.

Madrid (EAJ6), 392 m. (1½ kw.). Daily: con.

Madrid (EAJ7), 373 m. (4½ kw.). Con. daily.

Madrid (EAJ4), 340 m. (3 kw.). 16.00, con.

The Madrid stations are again working to a rota, varying time of transmissions daily.

Barcelona (EAJ1), 325 m. (1 kw.). 17.00-21.00, news, lec., con. (Sun.); 18.00-23.00 (daily).

Barcelona (Radio Catalana) (EAJ13), 462 m. (1 kw.). 19.00-23.00, con., weather, news.

Bilbao (EAJ9), 415 m. (1 kw.). 19.00, news, weather, con. Close down 22.00.

Bilbao (Radio Vizcaya) (EAJ11), 418 m. (2 kw.). 22.00-24.00, con. (daily).

Cadiz (EAJ3), 357 m. (550 w.). 19.00-21.00, con., news. Tests daily (exc. Sun.), 01.00.

Cartagena (EAJ15), 335 m. (1 kw.). 20.30-22.00, con. (daily).

Seville (EAJ5), 357 m. (1½ kw.). 21.00, con., news, weather. Close down 23.00.

Seville (EAJ17), 300 m. 19.00-22.00, con. (daily).

San Sebastian (EAJ8), 343 m. (500 w.). 17.00-19.00, 21.00-23.00 (daily).

Salamanca (EAJ22), 355 m. (1 kw.). 17.00 and 21.00, con. (daily). Closes down 23.00.

Saragossa, about 325 m. Testing.

SWEDEN.

Stockholm (SASA), 430 m. (1½ kw.). 11.00, sacred service (Sun.); 12.30, weather; 14.00, con. (Sun.); 17.00, children (Sun.); 18.00, sacred service; 19.00, lec.; 21.15, news, con., weather. Dance (Sat., Sun.), 21.45.

Relays.—Boden (SASE), 1,200 m.; Eskilstuna, 250 m.; Falun (SMZK), 370 m.; Gothenburg (SASB), 288 m.; Gefle, 208 m.; Joenkoeping (SMZD), 199 m.; Kalmar, 253 m.; Karlsborg (SAJ), 1,350 m.; Karlscrona (SMSM), 196 m.; Kristinehamm (SMTY), 292 m.; Karlstadt (SMXG), 221 m.; Linkoeping, 467 m.; Malmo (SASC), 270 m.; Norrkoeping (SMVV), 260 m.; Orebro, 237 m.; Ostersund, 720 m.; Säffle (SMTS), 245 m.; Sundsvall (SASD), 550 m.; Trollhattan (SMXQ), 322 m.; Umea, 215 m.; Varborg, 385 m.

SWITZERLAND.

Lausanne (HB2), 850 m. (1½ kw.) (temp.). 20.00, lec., con. (daily).

Zurich (Hongg), 515 m. (temp.) (500 w.). 11.00, con. (Sun.); 12.00, weather; 12.55, Nauen time sig., weather, news, Stock Ex.; 13.30, piano solo; 17.00, con. (exc. Sun.); 18.15, children, women; 19.00, news, weather; 20.15, lec., con., dance (Fri.).

Geneva (HB1), 760 m. (2 kw.). 20.15, con. (daily).

Berne, 435 m. (2 kw.). 10.30, organ music (exc. Sat.); 16.00, 20.30, con.

Basle. 1,000 m. (1½ k.w.), con. daily, 20.30.

H.R.P. H.T. Battery Cells.—Particulars of component parts for building wet high-tension batteries made by the H.R.P. Co., of 46, St. Mary's Road, Leyton, E.10, were given in No. 214, and these were styled H.P.R. Battery Cells. The correct designation, is H.R.P. Cells, the R and P having been inadvertently transposed.

A speech by the Prince of Wales at the annual meeting of the British Association at Oxford on Wednesday, August 4, will be broadcast.

The Albertans, a new dance band from a Glasgow palais de dance, is broadcasting from the Glasgow studio.

A TRANSMISSION RECORD COMPETITION

IN connection with the Radio World's Fair of New York, a cup is to be given to the amateur who transmits and receives a key message in the shortest space of time, using lowest power and achieving greatest distance. His record must be complete, and an acknowledgment in the form of a QSL card will be required. The competition is now in progress, and concludes at midnight on August 15, 1926.

The key message to be sent is as follows:

"The amateurs of America, in co-operation with the Radio World's Fair in New York, send cordial greetings. This is a test message and I am entered in a contest covering its reception. Will you kindly QSL to U 2 E V as well as to myself."

U 2 E V is Mr. J. B. Kilpatrick, official traffic officer for the test, representing the Executive Radio Council and the Radio World's Fair. His transmitting station, 2 E V, is located at 206, West Sixty-ninth Street, New York City, U.S.A.

"The Practical Wireless Data Book."—So many relevant facts and so much data are now associated with wireless science that it is essential for anyone who takes more than a passing interest in the subject to have these in an easily accessible form. With the object of supplying this need the "Practical Wireless Data Book" has been compiled which may be briefly described as containing all the material facts of wireless and providing a handy reference book for any problem that is likely to crop up. The price of the handbook is 2s. 6d.

Loud-speaker Tone

SIR,—Most discerning listeners will probably have realised the usefulness of varying the capacity of the fixed condenser across the L.S. or phone terminals. Personally, I use a *separate* choke filter, the L.S. terminals of which are fitted with two Klutch clips. I have fixed condensers from .003 to .01. Soldered to the tags are 2-in. lengths of No. 14 copper wire, spaced so as to engage the Klutch clips. I change the condensers in accordance with the instrument being played or the voice.—W. B. (Batley).

Wireless as Weather Prophet

SIR,—In a recent issue of "A.W." Thermion had a note on atmospherics. I wonder if he has discovered what a good weather prophet his receiver can be? Having made mental notes on this subject since I became a radio amateur some three years ago, I have noticed how the quality of the weather may be foretold by the presence and type of this phenomena. By this I do not mean that the amount of rain or wind can be gauged, but that a general idea of "settledness" can be arrived at.

It is most noticeable that in fine settled weather the static is practically absent. An occasional fizz is all that is heard and a background of silence obtains. Distant stations such as are usually difficult to tune in during the summer are picked up with comparative ease. I was very surprised to get hold of 5 I T in the afternoon recently, as this station is always elusive, even in the winter, in this district. When the weather becomes wet and unsettled the crackles and fizzes are much in evidence. The presence of lightning is easily detected even though it is several miles away. In winter the conditions are somewhat different, and a bright frosty night will often be rather noisy and the rainy periods silent.

It would be interesting to know if other readers have noticed the same effects.—R. Y. (Saltburn).

Transmission Power

SIR,—I notice in No. 214 that a correspondent claims a miles-per-watt record. May I point out that such terms are very misleading. While every credit is due to 2 C S for his low-power achievement, nobody would suggest that if his power had been increased to 1 watt that communication over a distance of 20,000 miles was possible.

He asks if anybody has set up a bigger miles-per-watt record, and here I may say that his figure has been many times surpassed. Using an American UV201A, I myself have successfully signalled over a distance of 200 miles. The input was provided by one flashlamp battery of 4½ volts and I was unable to measure the plate current.

Assuming that the impedance of the valve is 8,000 ohms, my miles-per-watt record works out at the tremendous figure of 500,000 miles per watt. Such a figure is, of course, ridiculous, and it is high time that some other standard of efficiency be instituted. I suggest that the formula be ÷ miles per (watt²). Such would be a more suitable standard.

May I also point out that I recently communicated over a distance of forty miles without any H.T. The secret is the use of a Marconi FE3 four-electrode valve.

Another fact often overlooked is the dissimilarity of receivers. It is evident that weak signals from fractional power input might be detected by a super-heterodyne and be inaudible on the conventional o-v-2.

I shall be pleased to hear from 2 C S regarding low-power tests if he cares to write to me.—2 A A R (Liverpool).

Purity of Reproduction and Volume

SIR,—With reference to the recent correspondence on the question of purity of reproduction, I should like to make a few remarks, since I have had some experience of the following types of sets: (*a*) Crystal—two-valve amplifier, transformer and resistance capacity coupled; (*b*) valve detector and two L.F., transformer first and resistance second, and also these stages reversed in the same set; (*c*) Prince two-valve circuit, trigger amplification. As cases *a* and *c* refer to two valves, in the comparisons to be made, one L.F. stage only in case *b* will be considered.

The reproduction given by *a* is, of course, excellent and the volume is rather greater than *b* when no reaction is used with the transformer coupling, and is about equal to *b* when reaction is used with the resistance coupling. Now practically full reaction in *b* with resistance coupling gives hardly any appreciable distortion, whereas it does with the transformer coupling. The volume with the former is about 75 per cent. of the latter. In this set the transformer was used in the first stage for some months before it was changed to resistance coupling, and the latter undoubtedly gives appreciably purer reproduction. It is difficult to detect any difference in purity between *a* and *b*, the latter being used, of course, with resistance coupling.

We now come to consider *c*. I decided to try this circuit when reading the recent article in "A.W." The set was constructed during the following week-end, and duly voiced its opinion when connected up. It "crowed" to some effect over the crystal two-valve amplifier. Its purity leaves nothing to be desired, its volume being greater than (*a*) and at least equal to *b* using the transformer coupling with full reaction. The sooner more is heard about the Prince circuit for general reception the sooner will people be satisfied.—J. C. S. (Sheffield).

"An All-Europe Loud-speaker Set."—Readers who are building, or contemplate building, the All-Europe Loud-speaker Set which was described in Nos. 213 and 214 will be interested in two booklets dealing with the special inductance coils used in this receiver and issued by the makers of the coils, the Power Equipment Co., Ltd., Kingsbury Works, The Hyde, Hendon, N.W.9. The booklets contain a fund of information on wireless generally, and as they may be had free upon mention of AMATEUR WIRELESS, should be in the hands of all enthusiasts.

CHIEF EVENTS OF THE WEEK

SUNDAY, AUGUST 1

London	Popular Classics.
Birmingham	Gounod Programme.
Bournemouth	Symphony Concert.
Glasgow	Request Orchestral Programme and Folk Songs.

MONDAY

London	*Benkoldy*—Three short scenes by Keble Howard.
Aberdeen	Russian Songs and Scenes.
Birmingham	The Metropolitan Works Band.
Bournemouth	Bank Holiday Programme.
Cardiff	The Band of H.M. Royal Marines (Chatham), and the Bristol Harmonic Male Choir, relayed from the Royal Victoria Park, Bath.
Manchester	The Whitworth Vale and Healey Prize Band.

TUESDAY

London	*Force, Wits* and a *Woman*, a dramatic episode.
Daventry	Daventry Pool.
Aberdeen	The Coventry City Salvation Army Band.
Birmingham	Mainly from the Operas.
Glasgow	Old Scots Songs and Melodies.

WEDNESDAY

London	British Legion Programme.
Birmingham	Light Music.
Hull	Sketches and Music.
Newcastle	The Harton Colliery Band-Brass Quartet.

THURSDAY

Glasgow	A Mozart Programme.
Liverpool	Russian Composers.
Nottingham	A Light Holiday Programme.
Swansea	Music and Humour.

FRIDAY

London	A Sing Song from the Duke of York's Camp.
Aberdeen	The London Radio Repertory Players in *The Missing Link*.
Birmingham	Chamber Music.
Bournemouth	Operatic Night.
Glasgow	A Sea Programme.
Manchester	The Besses o' th' Barn Band.

SATURDAY

London	The Radio Follies Concert Party.
Aberdeen	The Aberdeen Fisher Girls' Choir and Police Pipe Band.
Glasgow	Ballad Concert.
Manchester	Dance and Dialect.

MORE RADIOGRAMS

A RADIO club has been formed at Asuncion (Paraguay) and has inaugurated a broadcast service, which has greatly increased interest in radio matters.

For the first time in the history of the cinematograph trade, a reproduction of a British-produced film poster has been sent by wireless to New York. The picture, by John Hassall, was produced for Ideal Films Ltd.

The new Frankfort-on-Main transmitter erected at Heiligenstock, in the vicinity of the city, has now effected its preliminary tests; it has been demonstrated that its power is about four to five times greater than that of the old plant. It is now broadcasting nightly on 470 metres, but until it is officially taken over by the authorities, transmissions will be simultaneously made on the same wavelength from the older and weaker plant.

The Radio Club de France recently voted a sum of money for the equipment of well-known mountaineers' huts with both transmitting and receiving wireless apparatus, in order that in the event of accidents, tourists may get into immediate touch with the outside world.

The Zagreb (Agram) broadcasting station will shortly be officially opened by the Jugo-Slavian Posts and Telegraphs Administration, for whom a second transmitter is also under construction in Belgrade. Should these meet with good response from the listening public, the installation of a further two stations is under consideration in that country.

The Swedish steamer *Skagerrak* has now been equipped with a telephony transmitter from which, during the herring season, regular bulletins of interest to the fishing fleet are daily broadcast at 10.45 and 14.00 B.S.T. on a wavelength of 700 metres. The Nya Varvet wireless telegraphy station also issues daily at 11.00 and 19.00 B.S.T. a weather forecast on the same wavelength.

Wireless licences in force on March 31 numbered 1,965,000, compared with 1,349,000 last year, an increase of 616,000.

"**Holiday Making with a Tilt-cart**" is the title of a well-illustrated article appearing in the current issue of THE AMATEUR MECHANIC AND WORK (3d.), and gives hints of great value to those who intend spending their holidays in the open air. Other articles appearing in the same number are: "Artistic Inlaying for the Home-worker," "An Oven for the Summer Oil-stove," "Testing Eggs with the Flashlamp," "Hints and Kinks Illustrated," "An Adjustable Plug for Wireless," "Overhauling a Motor-cycle for the Summer Tour," "Making an Umbrella-stand," "How to Photograph an Electrical Discharge."

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PATENTS and Trade Marks obtained.—H. T. P. Gee, Patent Agent Member R.S.G.B., A.M.I.R.E., 51/52, Chancery Lane, London, W.C.2. Phone Holborn, 1525.

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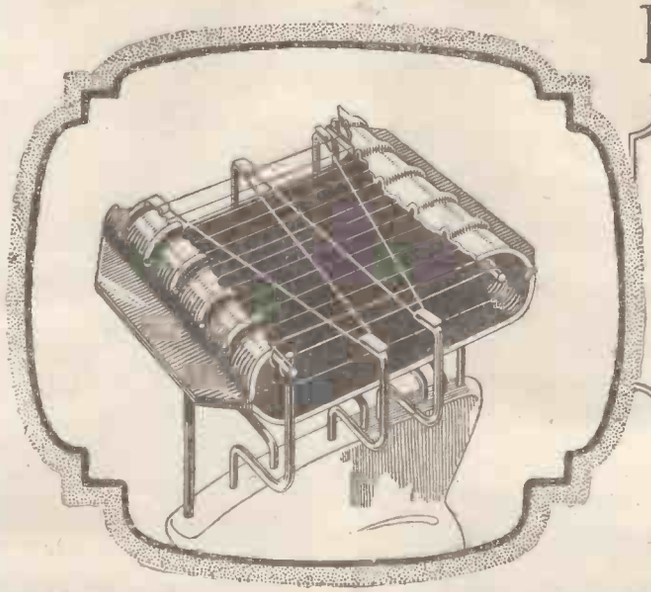

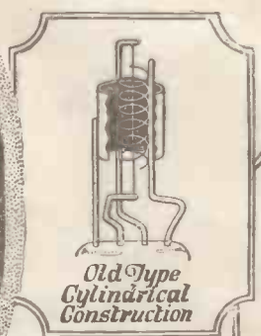

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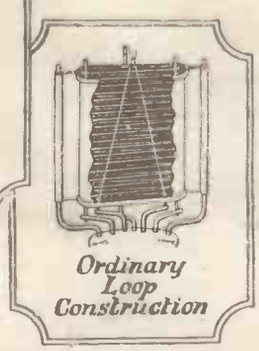

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