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One Shilling

The Wireless Magazine

Edited by
Bernard E. Jones

November, 1925

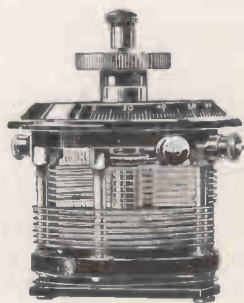
VOL. 2,
NO. 10.



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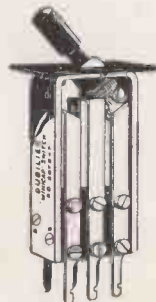
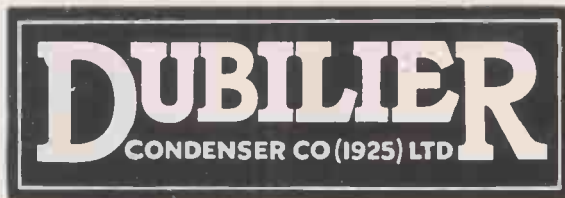
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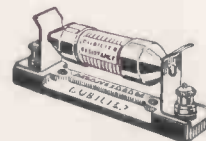
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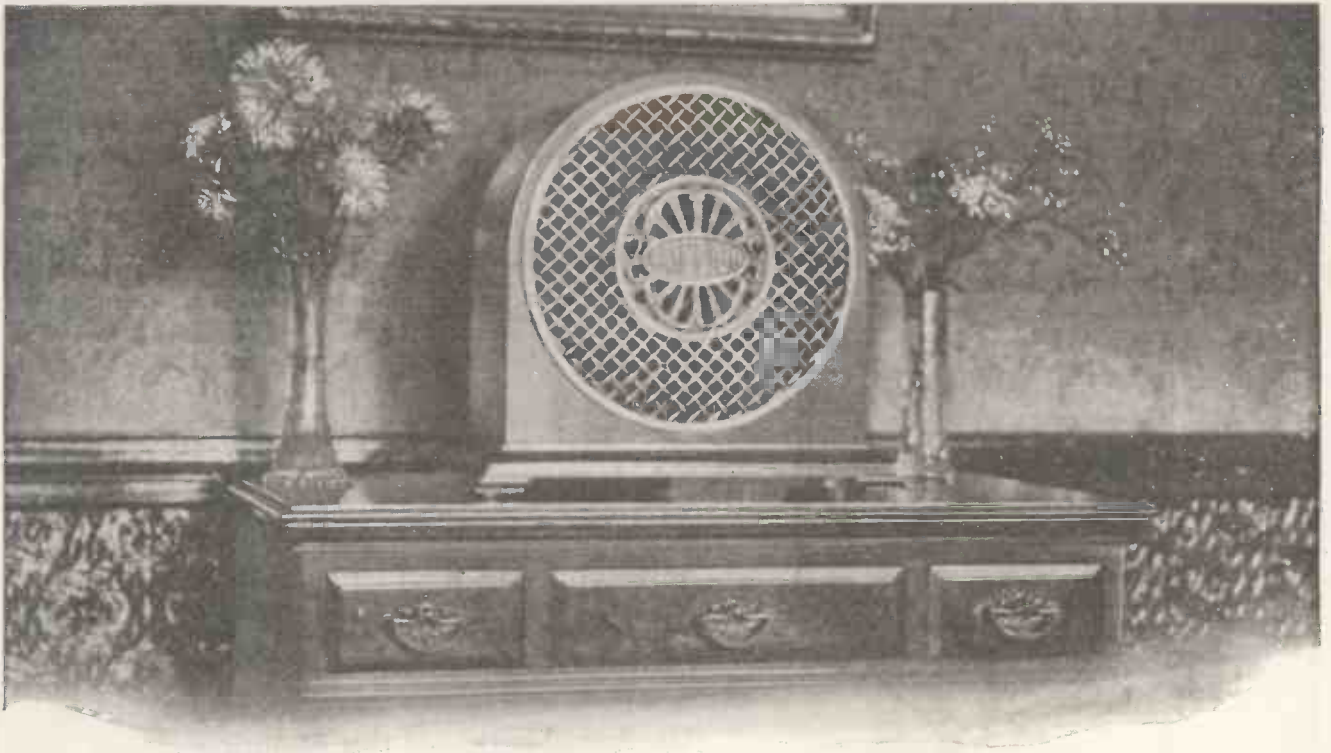
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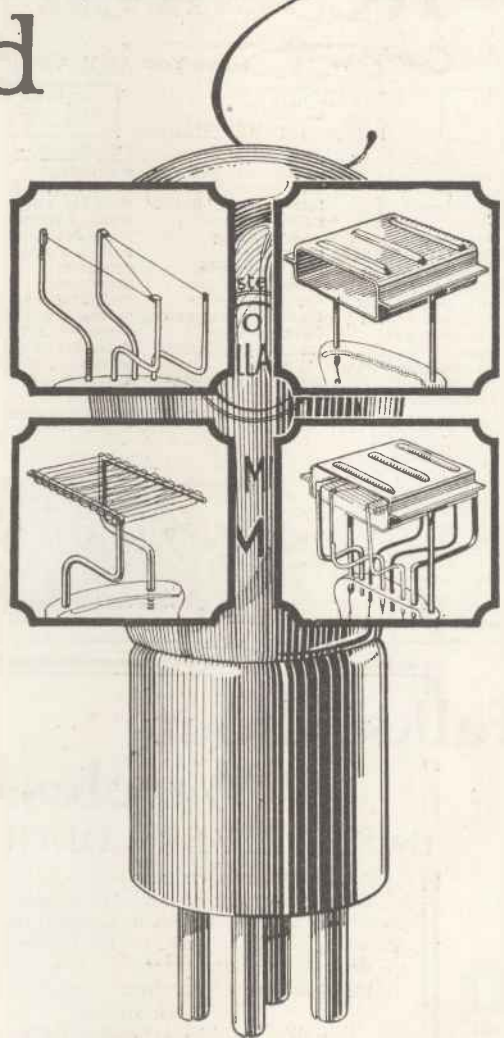
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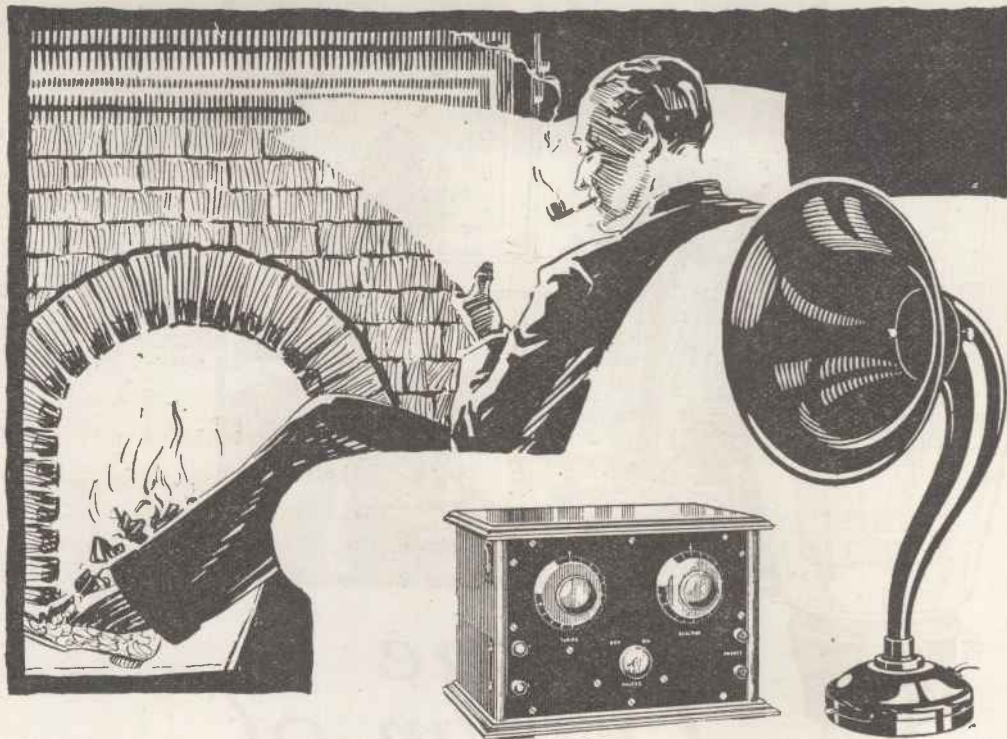
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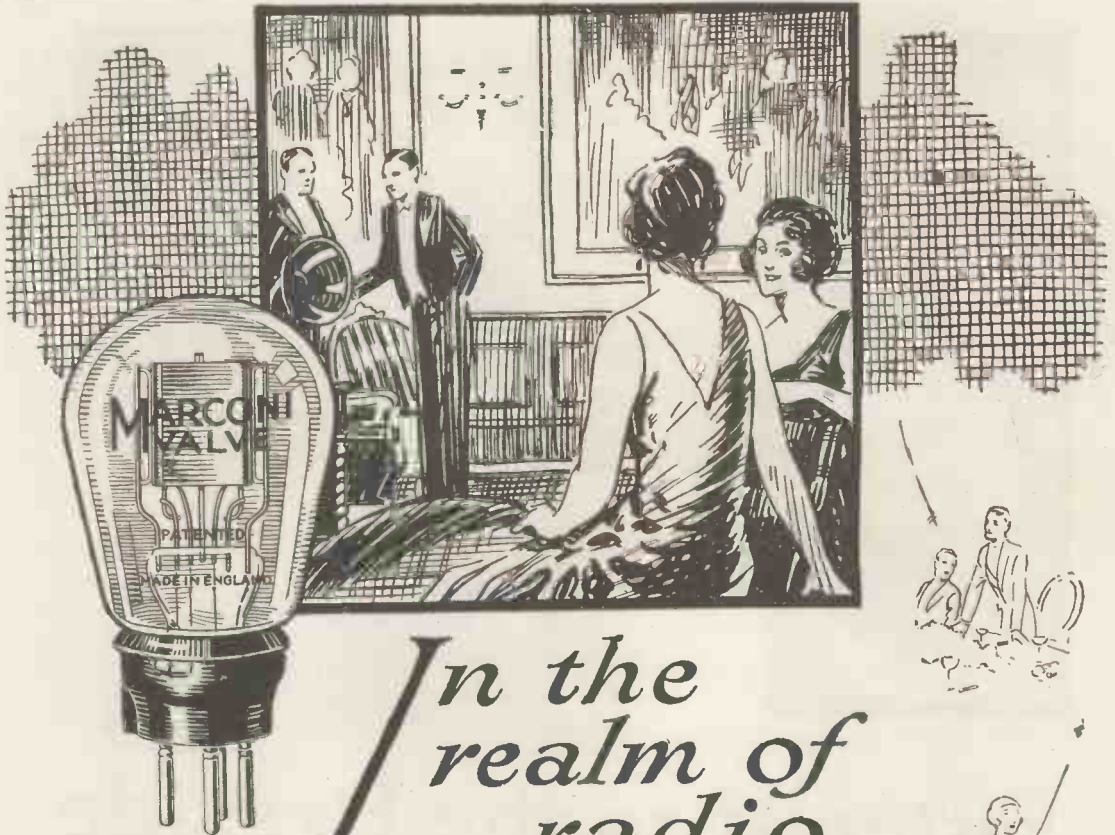
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The Wireless Magazine

for November, 1925

Announcements: THE WIRELESS MAGAZINE, edited by Bernard E. Jones, is published about the 25th day of the month and bears the date of the month following. One Shilling Net. Subscription rates are 15s. 6d. a year, post free; Canada, 13s. 6d. a year, post free. Contributions, accompanied by stamped and addressed envelopes, are invited. All editorial communications should be addressed to The Editor, THE WIRELESS MAGAZINE, La Belle Sauvage, E.C.A. Subscriptions should be addressed to The Publishers, THE WIRELESS MAGAZINE.

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HOME-CONSTRUCTOR SETS.

AN ULTRA-EFFICIENT ONE-VALVER. A set designed to give the best possible results without the use of an additional amplifier 334

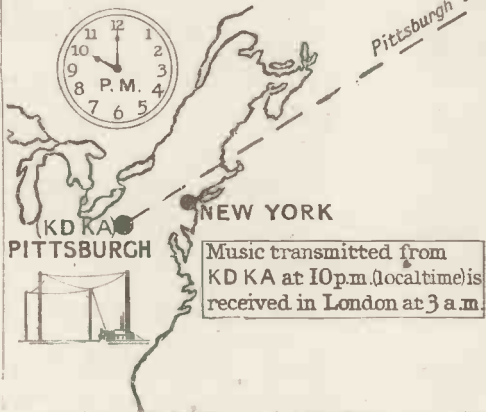
A "SELF-STARTER" THREE-VALVER. Switches itself on and off absolutely automatically and incorporates a distant-control switch 354

CUT OUT THOSE INTERFERING STATIONS! How to make an eliminator to cut out two sources of interference at the same time 364

A TWO-VALVE REFLEX SET FOR LOUD-SPEAKER WORK. With free Structograph plate. A set for receiving transmissions from the local station on a loud-speaker 379

The Facts of To-day as Stepping-stones to the

WIRELESS WONDERS OF TO-MORROW



Pittsburgh to London, 4,550 miles

In this article the scientific members of the "Wireless Magazine" Staff offer an absorbingly interesting and not too technical peep into the early future of wireless. Their prophesies are not nebulous fancies, but are the logical outcome of their deep and practical acquaintance with wireless science.

*Secret Wireless : Directing a "Pencil" of Signal Energy :
 Broadcast Service de Luxe : Cutting Out the Batteries :
 Thermo-electric Generators : Dancing to Mystic Strains :
 "Bottled" or "Frozen" Wireless : Oscillating Crystal :
 Prospecting by Wireless : Stabilised Receiving Sets :
 Wireless Control : Communal Installations for Flats.*

GREAT wireless possibilities lie immediately ahead of us—the wonder of to-day will be the commonplace of to-morrow. It may be a platitude to say that wireless is yet only in its infancy, but most platitudes are very near the truth, and perhaps we may be forgiven for repeating this one. For the more you know of wireless the more you realise how limited that knowledge is, and you cannot help but give credence to possibilities that might in other circumstances seem like the fantastic dreams of a madman.

No Wild Fancies

But no such wild fancies are indulged in in this review, which deals only with practical possibilities that may well see attainment during . . . who can say when—this year, next year, some time, never?

Like those in any other branch of science, wireless developments of the future will be directly influenced by the needs of to-day, and of these the overcrowding of the ether is the most pressing.

This overcrowding is due partly

to the rapid growth in the numbers of transmitting stations, and partly to the fact that the standard type of receiver now in use is largely inefficient so far as selectivity is concerned.

The consequence is that, in spite of the decided improvement in the quality and variety of the broadcast service both at home and abroad, the average listener is unable to enjoy more than a small fraction of the fare provided.

He is limited, in practice, to the programme from his local station, with possibly one or two alternatives from amongst the scores of other centres that are theoretically within range of an ordinary two- or three-valve set.

You have only to consider the existing congestion, and to contemplate the condition of affairs when the present number of transmitting stations is doubled, as will soon be the case (on the Continent at all events), to realise that some drastic alteration must be made in the present system if chaos is to be avoided.

A short deliberation of existing conditions shows that the only feasible remedy is that indicated by the recent advances made in the region of short-wave transmission and reception. By shifting the present range of broadcast wavelengths down to the neighbourhood of 100 metres the whole problem of congestion would be immediately solved.

Double the Number of Stations

Working, for example, on a band of wavelengths lying between 40 and 100 metres, the present number of broadcast centres could be doubled, whilst at the same time the degree of overlap would be considerably reduced.

A difference of one metre between two stations working on wavelengths of, say, 50 and 51 metres respectively is equivalent to a frequency-difference of over 120 kilocycles, which, so far as selectivity in reception is concerned, corresponds to a difference of 100 metres on a basic wavelength of 500 metres.

A move towards the shorter wave-

lengths for broadcast transmission is accordingly inevitable in the near future, and the change will involve many modifications in the ordinary type of apparatus now in use.

Whilst many of the difficulties peculiar to short-wave working have already been satisfactorily overcome, the problem that remains to be solved is to devise a type of receiver capable of dealing with high-frequency energy of this order, and at the same time adapted for simple control in the hands of the inexperienced operator.

In fact, we may expect radical changes in the design of receivers to take place during the next few years.

Successful Experiments

The practicability of short-wave transmission has been amply demonstrated not only by various amateur experimenters, who have from time to time secured some really amazing long-distance results, but also by the admitted success of the East Pittsburgh station (KDKA) in America, the broadcast transmissions from which are regularly received in this country on a wavelength of about 60 metres.

Broadly speaking, the chief trouble in short-wave work is to confine the signal oscillations within the apparatus in which they are modulated (in transmission) or in which they are detected and amplified (in reception).

High-frequency currents of this order are extremely prone to escape or leak away across even the smallest capacities, such as those existing between the grid plate and filament electrodes inside the bulb of a valve, or across the adjacent windings of tuning or other inductance coils, or from one lead to another, and to earth, in the external circuits.

The construction of special straight-line and positively-gearred condensers affording a high degree of refinement in tuning, together with carefully designed low-loss inductances, has already reached an advanced stage, so we may say that the requisite standard of short-wave

efficiency in this respect is well within sight.

As regards valve losses, perhaps the most promising solution lies in the well-known neutrodyne system of balanced high-frequency stages of amplification. The "super het" circuit method, on the other hand, by converting the incoming short-wave energy into an intermediate frequency, and amplifying the signals in this form, evades the leakage losses peculiar to high-frequency work.

Somewhere along these lines will be found a clue to the production in the near future of a stabilised receiving set, marketed at a reasonable figure and capable of receiving short-wave broadcasting over long distances with a degree of selectivity far in advance of anything that can be accomplished with the ordinary type of apparatus now in use.

Whether the alteration of the present scale of broadcast wavelengths will await the production of an ideal short-wave receiver, or whether the change will be forced upon us by the growing clash in the ether, leaving the designers of receiving sets to

concentrated in a given direction much more effectively than longer waves.

Rotating-beam Transmitter

In the new Marconi rotating-beam transmitter, recently installed at the South Foreland to act as a wireless "lightship" to ships at sea in foggy weather, a wavelength of only 6 metres is used. By means of a grid-iron arrangement of short rods, acting as reflectors, more than eighty per cent. of the total energy can be radiated in any desired direction along a narrow beam subtending an angle of only 15 degrees.

It is probable that, in the near future, similar beam transmitters will be installed at all dangerous points along the coast line of this and other countries, and that wireless direction-finding sets will become an essential part of the navigating equipment of all sea-going vessels.

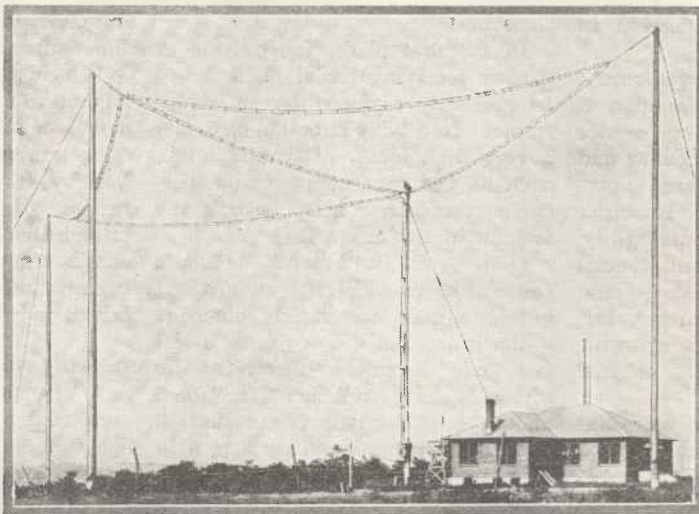
In the same way directional beam transmission will play an increasingly important part in the control and navigation of aircraft, particularly for long-distance flights at night or in the daytime during periods of poor visibility.

Moreover, short-wave transmission seems likely to provide one line of approach to the problem of secret wireless. So far it has only been possible to concentrate the radiated energy in a vertical plane, that is, more or less preventing lateral spread, but claims have recently been made for a "compound focusing" system by means of which the waves are stated to be confined both vertically and horizontally, so that they

travel in a well-defined pencil of approximately square cross-section.

A Secret System

By reflection from the Heaviside layer it is stated that such a pencil of signal energy can be directed to a definite receiving area, cutting out the surrounding locality and all intermediate points. This would, in effect, provide a secret system of wireless communication between a



Aerial at the East Pittsburgh (KDKA) short-wave experimental station.

adapt themselves to the new conditions as rapidly as possible, remains to be seen.

But the whole trend of modern development seems to point inevitably to a decisive move towards the short-wave end of the scale, and that before long.

Quite apart from the considerations mentioned above, the use of shorter waves opens out various other interesting possibilities. In the first place such waves can be focused or



Dancing to mystic strains: the dancers, wearing tiny phones without external connections, hear the music which is inaudible to the card-players.

given transmitter and any selected receiver.

A "Narrowcast" Service

Other methods of secrecy have, however, already reached a more complete stage of development, and there is little doubt that before long we shall see secret wireless transmission in practical operation.

The most promising development in this direction depends upon a double modulation of the carrier wave, combined with a peculiar and deliberate distortion of the superposed voice frequencies. In order to receive such messages intelligibly, it is necessary to install special apparatus at the receiving end, comprising a local oscillator valve, together with a device for restoring the distorted speech to its original form.

Such a receiving set is by no means as complicated as the description may sound. However, unless one is provided with the proper receiving outfit together with the necessary "setting" instructions, it is impossible for an unauthorised person to listen-in to this type of transmission.

The ordinary crystal or valve receiver would detect nothing, whilst any casual attempt at heterodyning would only produce an unintelligible medley of sounds in the phones.

Provided therefore that the necessary permission can be obtained from the Postmaster-General, the provision of a broadcast "service de luxe," distributing special items of news or entertainment available only

to a limited number of subscribers is a development already within the bounds of practical politics.

Turning to the question of the changes we may expect to see taking place in existing types of receiving apparatus, we find several lines of development already clearly foreshadowed.

In the first place, the outside or garden receiving aerial is likely to be generally replaced by an indoor frame. Receiving circuits possessing a very high factor of amplification, such as the neutrodyne and super-sonic type, are already setting the fashion in this respect.

Quite apart from merely aesthetic considerations—and the majority of outside aerials are frankly hideous!—the use of an indoor frame aerial not only increases selectivity by virtue of its pronounced directional effect, but it also reduces re-radiation and consequent interference with other receivers in the same neighbourhood—a point that is becoming more and more important as the total number of listeners increases.

Outside Aerials Prohibited

In fact, it is by no means unlikely for this reason alone that the use of the outside aerial for broadcast reception may sooner or later be *definitely prohibited* in the more densely populated localities.

As an alternative to a loop aerial the leads of the domestic lighting supply will no doubt become more popular as time goes on. This arrangement is, of course, already in use to some extent, more particu-

larly in Paris and other Continental cities.

Plug-in connectors of the Ducon or similar type enable the receiving apparatus to collect the high-frequency currents from the lighting mains, whilst protecting the set and listener from the heavy low-frequency or direct current forming the main power supply.

The chief drawback to this method has, up to the present, been the difficulty of barring-out audible frequencies due to the supply generator, but by further refinements in the present design of filter circuit all undesirable noises will be completely eliminated, and a perfectly silent background ensured for signals received in this way.

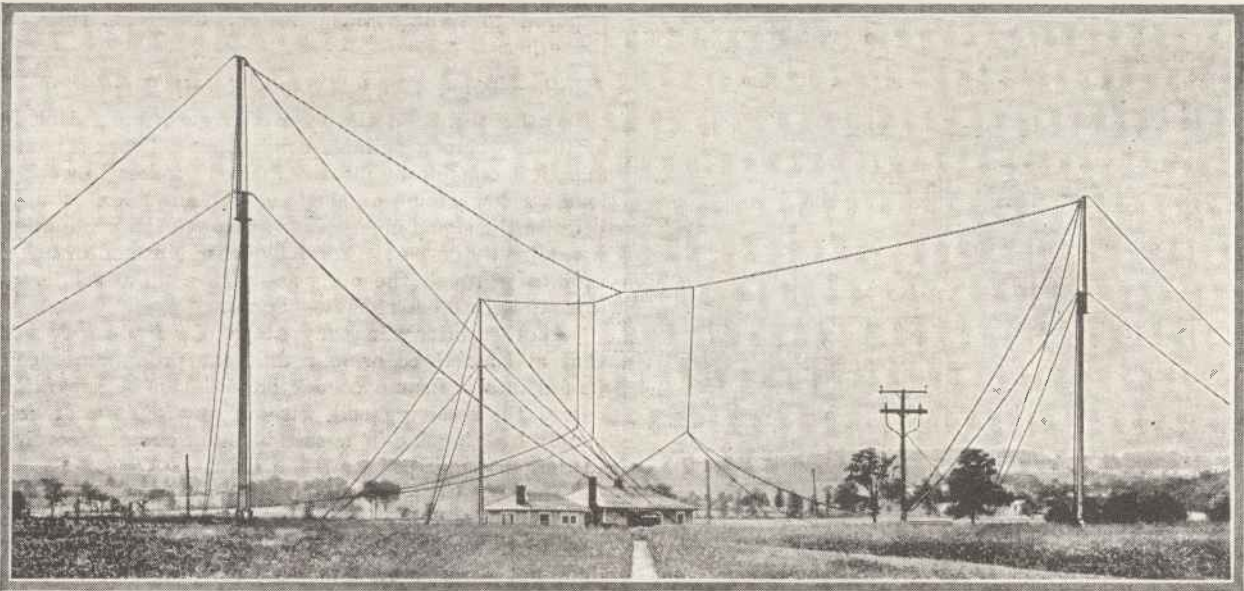
Solving the Battery Problem

A development that is eagerly awaited by valve users as a class is some means for minimising the general inconvenience associated with the filament and high-tension batteries.

Here again the domestic light supply is already being put to useful service for recharging purposes, by utilising rectifiers of various kinds such as the Tungar, Nodon or vibrating-contact type where the main supply is alternating current.

Where a direct-current supply is available, all that is necessary is a suitable charging board to reduce the voltage and current to the proper values.

The disadvantages of the dry-cell battery for supplying plate current is fully recognised by manufacturers



The aerial system at the G.E.C.'s Schenectady Short-wave Experimental Station (WGY)

and there is now a general movement to substitute batteries made up of small secondary cells for this work. By making a tapped connection to the transformer of a Tungar rectifier, or by designing a special transformer as a removable unit, it should be possible to recharge both the high- and low-tension accumulators comfortably at home.

"Heat" Batteries

At the same time home-charging constitutes only a partial solution of the battery problem. A more attractive possibility lies in the use of thermo-electric batteries for supplying both filament current (to valves of the dull-emitter type) as well as high-tension voltage for the plate circuit.

A thermo-electric battery consists simply of a number of plates of different metals, such as tellurium and nickel, the different metals being arranged alternately in contact with one another. If one set of contacts is heated either by a gas flame, or by any other source of heat, to a high temperature relatively to the other contacts, a steady potential difference is created, similar to that existing across the terminals of an ordinary wet- or dry-cell battery.

With an electric generator of this type, all that is necessary to run a valve set is to have access to some suitable source of heat. In one form of thermopile, already in extensive use in America, the contacts are heated by means of a special resistance wire fed from the electric house-supply mains.

But where there is no electric supply, the necessary heating could be effected by means of a suitable gas or spirit burner, so that one could maintain a valve set in this way without the aid of any battery necessitating either constant recharging or periodic renewal.

It may even be that before long we shall see advertisements of sets in THE WIRELESS MAGAZINE, "complete with spirit lamp, enabling owner to convert set into cooking stove in a few seconds"!

Amplifying Without Batteries

A further, but probably a more remote, solution to one aspect of the vexed battery question may lie in the discovery of an amplifying relay which does not depend upon the electron stream from a lighted filament.

Certain colloidal solutions, which show peculiar erratic molecular activity, known as the "Brownian movement," possess distinct possibilities in this direction, and the production of the so-called "cold-emitter" valve may not be so far distant as is generally imagined.

Finally, the recent discovery of the oscillating crystal may lead to developments of far-reaching importance in this direction. Amplifying effects, due to crystal regeneration, are undoubtedly possible, and whilst at the present stage it is unwise to be unduly optimistic, it is quite conceivable that this peculiar property of the crystal (and possibly other substances) may yet cause it

to become a formidable rival to the thermionic valve.

Turning to the more general aspect of broadcast reception we find several interesting features already on the threshold of development.

"Self-starter" Systems

One of these is a device for automatically energising a loud-speaker valve set directly broadcasting begins, and similarly throwing it out of action when transmission ceases.

Calling devices have, of course, been in use for some time at sea for automatically warning the wireless operator, should he be absent from his cabin, of the receipt of an SOS or other emergency call. In this case, however, it is generally necessary to keep a "watch-dog" valve constantly energised, in order to operate the alarm bell when the calling-up signal is received.

A more practicable proposition so far as broadcast reception is concerned is to shunt the aerial inductance with a simple crystal detector, which consumes no unnecessary power. As soon as the carrier wave from the local broadcasting station is received, a rectified current will flow in the crystal circuit, and this can be utilised to operate a suitable relay, which in turn closes the filament and high-tension circuits and thus automatically brings the loud-speaker into operation.

This development is upon us already and a set incorporating this system is described in this issue under



Soon outdoor aerials may be prohibited—

the title of "A 'Self-starter' Three-Valver." There is nothing difficult about the construction.

Communal Installations

The installation of special distributing systems, designed to supply the occupants of a block of flats, or the different wards of a hospital, from a common collecting aerial is another up-to-date development.

For those who only wish to receive items from the local station, there is no reason why the "communal" aerial should not be extended to supply whole streets of houses. The distributing network on the low-frequency side is a comparatively simple and inexpensive matter. All that the individual listener requires is a loud-speaker to be switched in as desired.

The custody and care of the receiver and amplifier, together with such troublesome matters as battery recharging, etc., would, of course, be relegated to the hall-porter or other willing victim.

The initial cost of the set together with upkeep and other charges will in practice amount to a comparatively low figure when divided amongst so many subscribers, particularly when compared with the actual expense of a separate loud-speaker set for each individual household.

A communal service of this kind can more readily be provided by utilising the so-called wired-wireless system of broadcast distribution. Provided that there is an existing network of wires, such as the electric-lighting mains, or the telephone leads, it is possible to distribute broadcast programmes from a central station with a much less expenditure of power than is

required to radiate them in all directions through the ether.

Loud-speakers Worked from Small Sets

In other words, in the case of large cities and other localities where a suitable conducting network is available, it is feasible by means of wired-wireless to work a loud-speaker from a single-valve amplifier, simply because the signal energy is fed through the conducting wire directly on to the receiving valve, instead of being radiated through the ether and picked up at relatively low strength on a receiving aerial.

Another interesting advantage of wired-wireless is that at least three or four different programmes can be fed into the same conductor, and can be separated out at the receiving end, without mutual interference, simply by plugging-in a suitable filter circuit according to the particular programme desired.

The signal currents are tapped off from the mains or telephone line by a condenser coupling which passes the high frequencies into the receiving valve but does not divert any low-frequency or direct currents that may exist in the main conductor.

There are distinct possibilities of a somewhat amusing nature in an invention that has recently been protected for filling a room with low-frequency pulsations which can be heard by simply wearing a small portable headphone without any aerial attachment.

It is proposed, for instance, to energise a ballroom so that those who are provided with special earpieces can dance to wireless music that is inaudible to persons not so provided.

(Continued on p. 418).



—and "super hets" with frame aerials take their place!

Starting Wireless with a Crystal Set

NOW is the time of the year to start wireless. Long and tedious winter evenings are already upon us, and broadcasting provides a form of entertainment that can be indulged in without the physical effort of going out into the cold and wet.

In fact, few things are more satisfying than to sit in a comfortable armchair before the warm glow of a fire and listen-in to— What matters, so long as it is melodious and needs no great mental effort to be appreciated?

Both from the point of view of simplicity of operating and cost, it is a good thing to start wireless with a simple crystal set; the adjustments are few and easy to make, the initial cost is comparatively low, and there is no upkeep cost worth troubling about (except the licence fee of 10s. a year, of course).

A good crystal set of well-known make can be bought for about 30s. or £2, an aerial can be put up in the average case for 10s. (this amount varies considerably in individual circumstances), and phones cost about another £1. A complete installation of good quality should not, in most cases, cost more than £4.

Of course, this cost can be considerably reduced if the set is made up at home from one of the designs given in THE WIRELESS MAGAZINE month by month.

There is a multitude of designs of crystal detectors that can be used for broadcast reception; a few of the better-known types are illustrated at the top and bottom of this page.

Most of them, it will be noticed, are provided with a glass cover. This is to keep the crystal free from dust and immune from the detrimental effects of exposure to the atmosphere. Unless it is intended to experiment with different kinds of crystal (in which case the detector should be of such construction that it can easily be taken apart) it is wise to use a detector of the "enclosed" type. Crystal detectors bought as separate components may cost anything from 1s. to 10s. 6d.

As regards a suitable circuit, twelve arrangements are shown on this page. Some are easier to operate than others, amongst them being those marked "parallel tuning," "variometer," and "series tuning." One of these three should be tried before the others are tackled.



Double slider



Parallel tuning



Tapped coil



Variometer



Loose-coupled



Series tuning



Wave trap



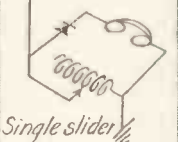
Twin crystal



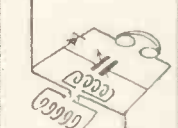
Auto-coupled



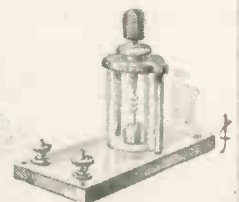
Aperiodic aerial



Single slider



Long or short wave



An Ultra-efficient One-valver

This set has been specially designed in "THE WIRELESS MAGAZINE" Workshop to give the best possible results without the use of an additional amplifier.



It is really remarkable how many stations can be received with one valve and how much enthusiasm can thus be aroused. Indeed, there is no end to the possibilities of a single-valver, provided that a great deal of care is exercised over the construction, the wiring, and, most important of all, the choice of a suitable valve.

Special Detector Valve

There are a few special detector valves on the market from which we chose a Mullard D3 as one of the most suitable for our purpose.

This valve, besides being a very efficient detector, possesses the great advantage of consuming little filament current, thus avoiding the necessity of using an accumulator of large capacity. The necessary current is supplied by a 2-volt accumulator cell or a large 1½-volt dry cell.

List of Components Required

Excluding the valve, H.T. and L.T. batteries and phones a list of components is given below, showing the values of the components used and, in most cases, the manufacturers' names:

1 Radion ebonite panel, 12 in. by 7 in. by $\frac{3}{16}$ in. thick (American Hard Rubber Co.).

1 .0005-microfarad variable condenser with fine adjustment (Sterling).

1 300-ohm potentiometer (Igranic).

1 30-ohm filament rheostat (Igranic).

1 valve-holder (Burndept Antiphonic).

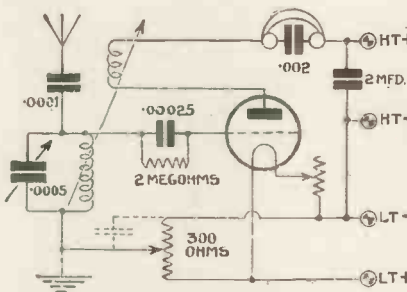
1 2-microfarad fixed condenser (T. C. C.).

1 .0025-microfarad fixed condenser with 2-megohm grid leak (Dubilier).

1 2-way coil-holder for baseboard mounting.

1 .0001-microfarad fixed condenser (Dubilier).

1 .002-microfarad fixed condenser (Atlas).

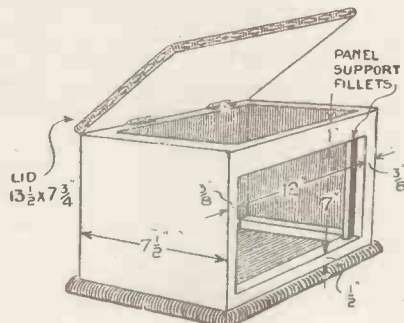


Circuit Diagram of Ultra-efficient One-valver.

8 terminals (Belling-Lee).

1 cabinet with baseboard.

Made of $\frac{3}{8}$ -in. mahogany, the cabinet is very simple to construct.



Details of Cabinet.

The two sides and the back should first be made, great care being taken that all the corners are square and the edges straight. Unless the constructor has a fair amount of experience in cabinet-making the joints should not be dovetailed.

The base is next made; this has a moulded edge, the sides and back being screwed and glued to it. A lid hinged at the back, and also having a moulded edge, completes the construction of the cabinet, after which it may either be french-polished or stained and varnished.

A sketch of the cabinet is given, showing the dimensions and the positions of the fillets to which the panel is attached.

Preparing the Panel

The panel is a standard size stocked by the firm mentioned in the list of components, much time and trouble in cutting and squaring up the corners and sides thereby being saved.

A drilling template should be made by drawing the centres of the holes to be drilled on a piece of paper cut to the exact size of the panel. For this purpose a panel-drilling diagram is given.

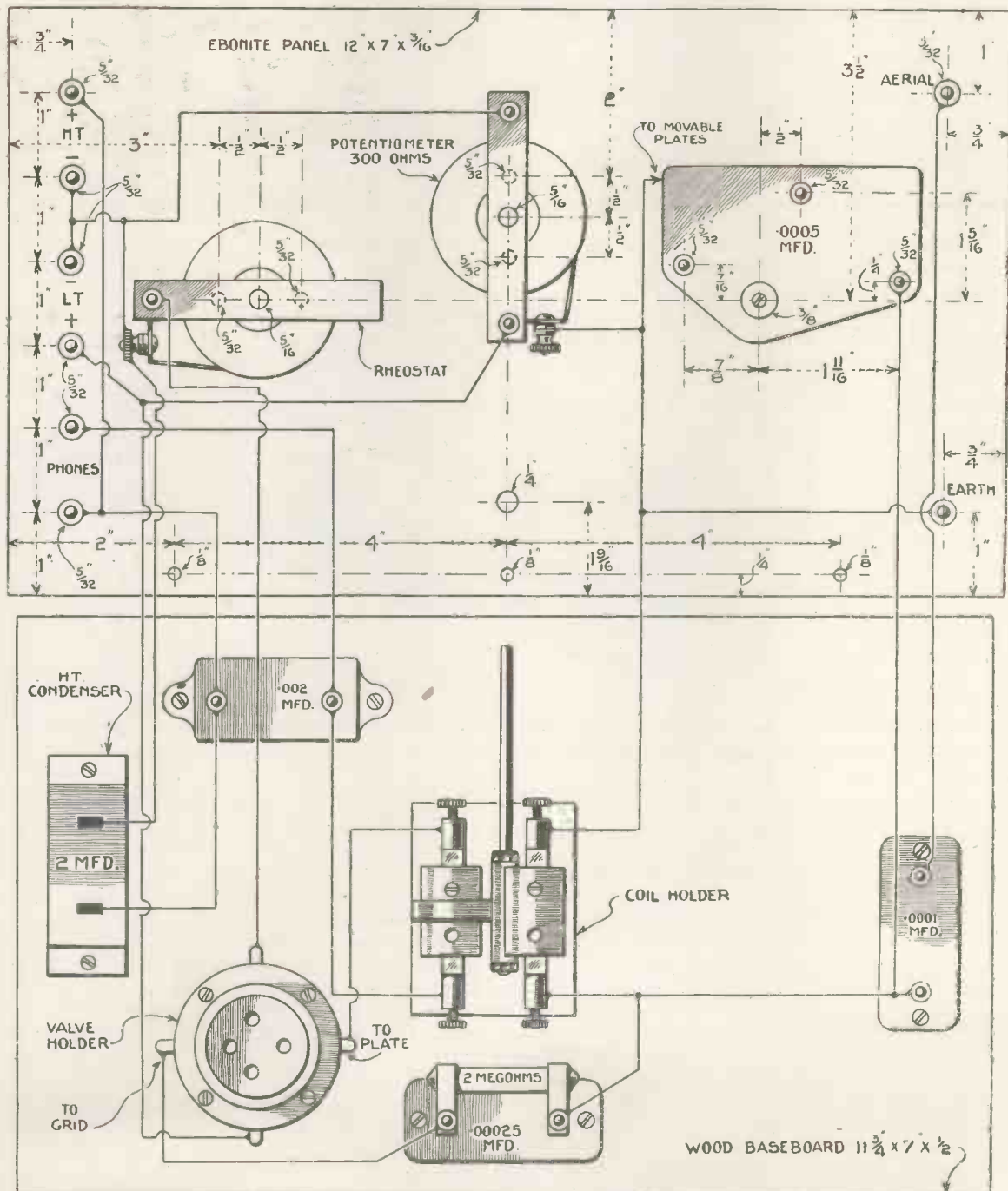
The paper template is then laid flat on the panel so that its edges coincide with those of the panel. Holes of the sizes indicated on the drilling diagram are drilled through at these marks.

Mounting the Components

Next mount on the panel the variable condenser, filament rheostat, potentiometer, and the eight terminals. The panel may then be laid aside until the remainder of the apparatus has been screwed down to the baseboard.

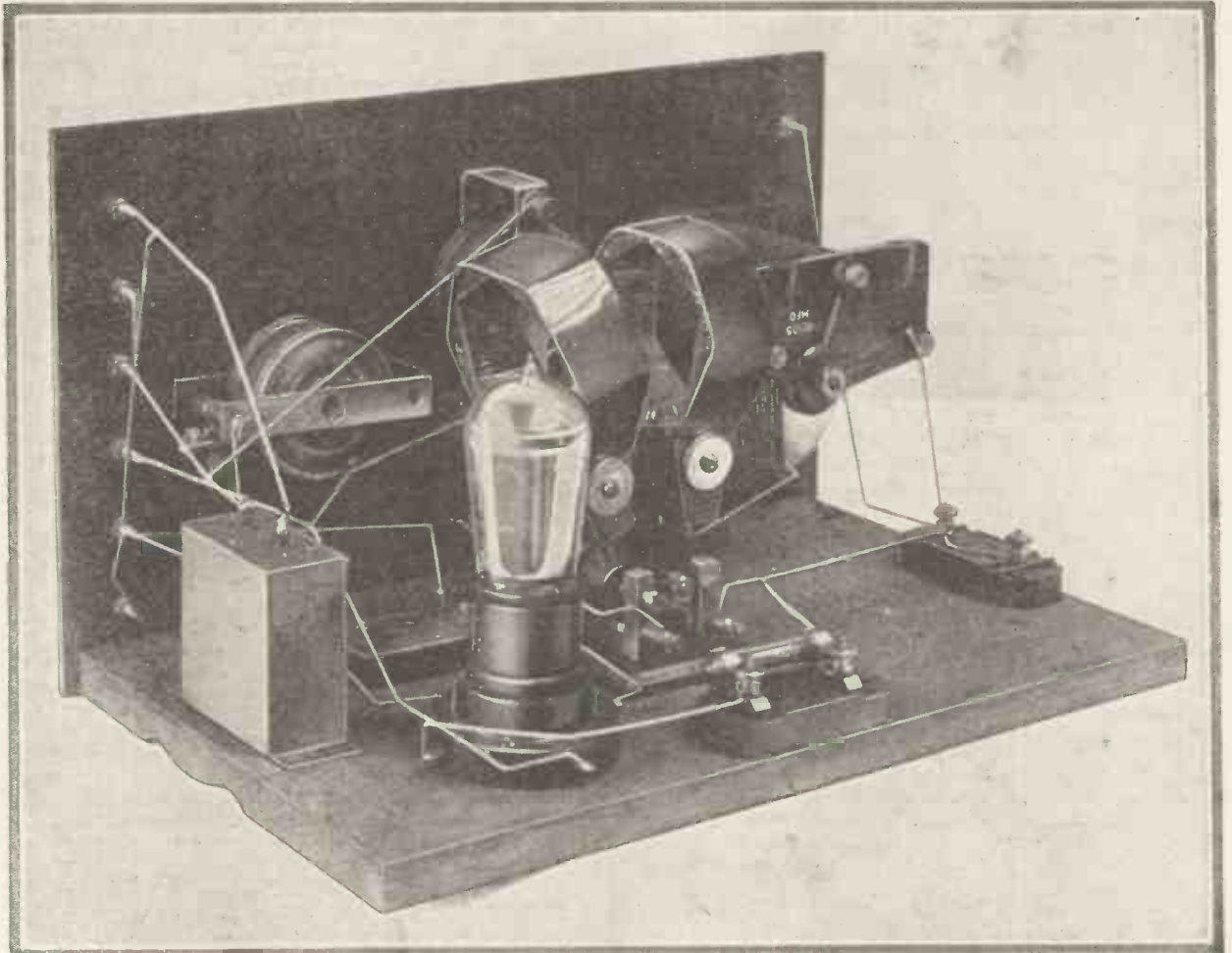
A piece of teak or well-seasoned oak measuring 11½ in. by 7 in. on ½ in. thick forms the baseboard, by which are mounted the two-way coil-holder, valve-holder, the four fixed condensers and the grid leak.

COMBINED PANEL AND BASEBOARD LAYOUT AND WIRING DIAGRAM OF AN ULTRA-EFFICIENT ONE-VALVER



It will be seen from this half-scale drawing that there is nothing difficult about the construction of this one-valve set, which is in fact, an ideal receiver for the beginner.

AN ULTRA-EFFICIENT ONE-VALVER (Continued)



The Components used in this One-valve Set are few in number and inexpensive.

The coil-holder, which has a long adjusting arm, is mounted on the baseboard in such a position that plenty of room is allowed for the radial movement of the moving coil. A suitable position for the mounting of the coil-holder is the exact centre of the baseboard as shown in the wiring diagram.

Fixing the Baseboard

After screwing down the components to the baseboard the latter is then fixed to the bottom of the panel by three 1-in. brass wood screws.

This finishes most of the actual constructional part, all that remains being the wiring together of the apparatus. For this purpose a wiring diagram has been given which not only shows how each component is connected up to the

others, but also shows the relative positions of the components on the baseboard.

No. 16- or 18-gauge wire should be used for wiring, the usual practice of spacing the wires yet keeping them as short as possible being observed.

An efficient aerial-earth system is essential if anything like good results are to be obtained. Here are a few tips to remember when putting up the aerial:

Use a good non-corrosive aerial wire. The old-fashioned 7/22 enamelled wire is as efficient as any.

If possible, make the free end of the aerial higher than or level with the lead-in end.

Remember that the free end of the aerial is at the highest potential and therefore should be well insulated.

Avoid running the lead-in wire close to the walls or roof of the house. Also see that good insulation is provided at the lead-in point.

Place the set as near as is convenient to the lead-in point.

Keep the earth wire lead well away from the aerial lead-in and make sure that the earth is an efficient one.

Where a connection to a good buried earth or to a water-tap is impossible, remember that a counterpoise will give equally good results.

The earth wire should be of the same section as the aerial wire.

Operation

A very little experience will be sufficient for the constructor to get the best out of this set, but as a guide for the novice the following instructions are given:



First connect up the aerial, earth, batteries, and phones to the proper terminals. Place the detector valve in the valve-holder, and coils Nos. 50 and 60 in the aerial and reaction coil holders respectively.

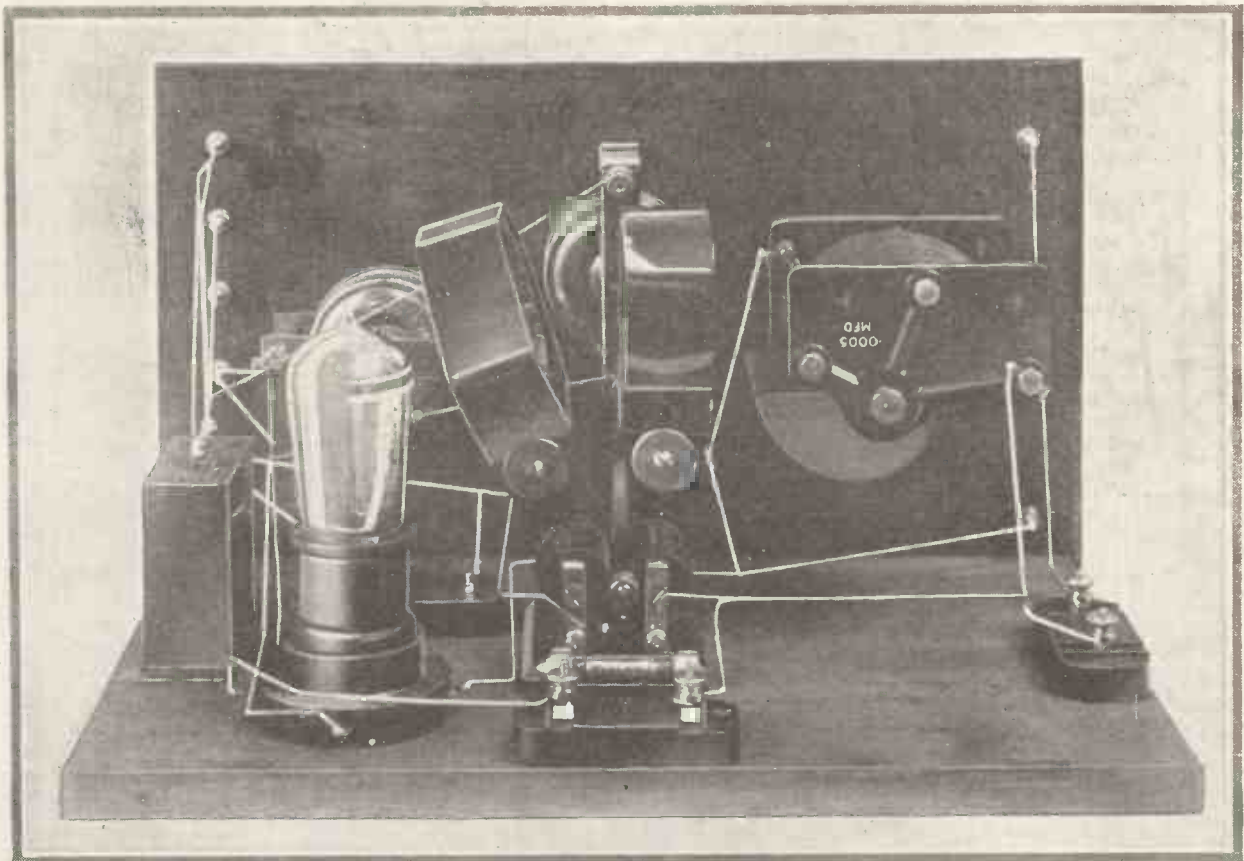
Keep the reaction coil well away from the aerial coil, and search

If no strengthening effect is noticed the polarity of the reaction coil requires reversing. This is done by reversing the two wires connected to the coil.

The potentiometer is then adjusted until best results are obtained.

The set was then taken and connected to an excellent aerial-earth system several miles away from London. On this aerial it was demonstrated what a single valve can do in the way of long-distance reception.

Tuning, of course, was fairly



This photograph shows how easy is the wiring of the Ultra-efficient One-valver.

round for signals by slowly rotating the condenser dial on the left, having previously adjusted the filament of the valve to a suitable temperature by means of the filament rheostat.

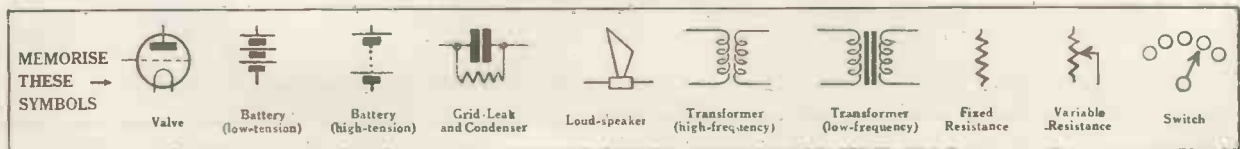
When signals are received, they may be further strengthened by tightening the coupling between the two coils.

Test Report

Results obtained with this receiver on a very badly-screened aerial in London were as follows: 2 LO came in at quite a reasonable loud-speaker strength. Birmingham, Bournemouth, Cardiff, Newcastle, L'Ecole Supérieure, and Radió-Paris were audible on the phones.

critical, especially the amount of reaction. It was found, for instance, that the filament rheostat could be used as a fine adjustment for reaction control as well as the potentiometer.

As an indication of the sensitivity it may be stated that Radio Toulouse was received at readable strength.



Many New Loud-speakers



Made in pine, walnut, mahogany and oak, this National Wireless & Electric horn fits an Amplion gramophone attachment.

It is manufactured in one size only, that is, with a diameter across the bell of 23 in. The end of the horn fixed to the gramophone attachment is of polished aluminium.

If desired, of course, this horn can be adapted for use with an ordinary earpiece.



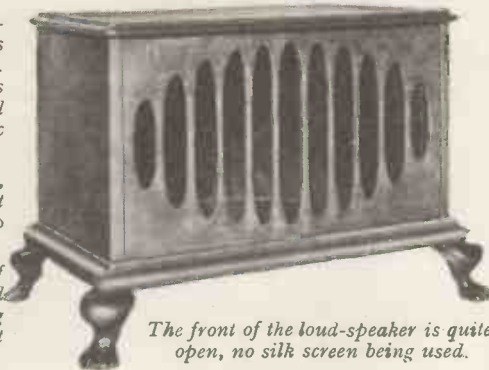
This Ericsson Junior Supertone loud-speaker represents an attempt to supply a reliable instrument at a low price—and the attempt has been singularly successful.

Resistance, 2,400 ohms; height, 15½ in.; adjustable diaphragm.

Designed to harmonise with the furnishings of a room, this C.A.V. hornless loud-speaker is an instrument that will satisfy the most æsthetic taste.

The length is 16½ in., width 10 in., and height 9 in. Resistance 1,000 ohms.

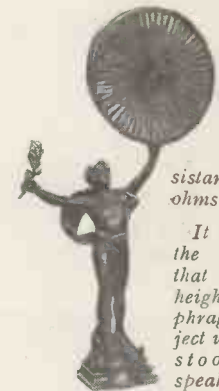
The cabinet is of polished mahogany, and a diaphragm adjusting device is provided at one side.



The front of the loud-speaker is quite open, no silk screen being used.

The Sterling Primax loud-speaker was one of the first of the hornless type to be put on the market in this country, and this particular model is one of the most artistic yet produced.

The statuette supporting the speaker proper is finished in bronze, and the overall height is 42 in.



The receiver actuating the diaphragm is of the adjustable variety, and has a resistance of 2,000 ohms.

It is claimed by the manufacturers that owing to the height of the diaphragm from the object upon which it is stood this loud-speaker is more mellow in tone than most others, even of the hornless type.

Constructed of moulded ebonite, the horn of the Gecophone model A loud-speaker measures 26 in. high and 15 in. wide across the bell; there is no metallic vibration, of course.

The adjustable magnet coils are housed in the non-magnetic brass base and are so arranged that they can be connected in series (giving a resistance of 4,000 ohms) or in parallel (giving a resistance of only 1,000 ohms).

This arrangement allows of the best results being obtained with valves of various impedances.



Height 20 in. Made in 2,000 or 4,000 ohms resistance.

This new Brown HQ loud-speaker is a cheaper edition of the



well-known Q model, which is probably the most luxurious instrument ever put on the market.

The HQ can be supplied with either a brown or black horn, in each case the base being of polished mahogany with nickel-plated fittings.

The sound conduit of this Ethovox Junior loud-speaker curves into a comparatively large metal flare, 11½ in. in diameter.

The instrument stands 16½ in. high and has an adjustable diaphragm.



Some Radical Changes



This ornamental Edison loud-speaker is also notable for its special adjusting device. Apart from the usual diaphragm and magnet adjustment there is also a device for adjusting the tonal quality; in other words, it has both volume and tone control.

The flare measures 14 in.

A new hornless loud-speaker (but not of the pleated-paper type), the Sterling Mellovox is supplied in three colour combinations of brown, blue or purple.

It is 20 in. high and 15 in. in diameter at the head.



Standing just 10 in. high, the new Brown H4 loud-speaker (which is sold for 30s.) incorporates an adjustable-reed receiver; this has been specially designed and is not an ordinary phone fixed in a loud-speaker base.

The instrument, which has a resistance of 2,000 ohms, is finished in black with nickel-plated fittings.



Another hornless loud-speaker is that made by the Radio Communication Co., Ltd. The diaphragm, which is of fibrous material shaped cylindrically, is enclosed in a mahogany cabinet that has a silk screen.

There are no "directional effects."

Even an ordinary loud-speaker can be made quite ornamental by painting an artistic design on the inside of the horn, as this Amplion model shows.



Designed for use with a special step-down transformer, this Western Electric loud-speaker incorporates a non-metallic diaphragm. It is wound to a resistance of 320 ohms.

Western Electric loud-speakers are supplied with decorated horns if desired.



This A.J.S. loud-speaker has a special non-resonant wooden horn which is made of either mahogany or oak.

The loud-speaker stands 24 in. high and has, of course, an adjustable diaphragm.

Outwardly resembling an English bracket clock, the new Amplion Radiolux RS1 model loud-speaker presents a pleasing appearance.

The acoustic system, which includes a horn, is entirely insulated from the cabinet and the electromagnetic unit from both components, so that the material of the casing has no influence on the quality of reproduction.





A Big Aerial

ONE of my wireless neighbours is engaged in the motor-car trade, and his business takes him about the country a good deal. He has recently returned from one of his journeys through the Midlands. During that journey he picked up very cheaply a forty-foot steel aerial mast and a sausage-shaped aerial consisting of seven wires held in position in the usual manner by small hoops.

As soon as I heard of this big aerial, I had grave doubts as to



Picked it up cheaply.

whether it would give better reception than my friend's single-wire aerial, but I kept my own counsel on the matter.

The aerial mast was erected in my friend's garden after some difficulty, and the sausage aerial was hoisted into position. I did not stop to hear the results obtained.

A few days later I met my friend and he immediately fired this question at me:

"What value of fixed condenser ought I to use as a series shortening condenser for an aerial of rather large capacity?"

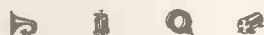
"The smallest you can possibly get," I replied, "and that, I think, is a three noughts one; but you might make one yourself of even smaller capacity. How is the new aerial going?"

"Pretty fair; the trouble with it is that I seem to get much coarser results with it than I did with the old aerial."

"Take my tip, old man," I said, "the high mast is all right, but just you go back to a single-wire aerial

and you will get better results than ever you got before."

My advice has been followed and my neighbour has now the best aerial in the district, and proud he is of it, too.



Cleaning a Switch

In one of my valve sets I have a throw-over switch by means of which I can change rapidly from a coil giving me wavelengths of from three hundred to five hundred metres to a much larger coil giving me wavelengths of from one thousand metres to two thousand metres and vice versa.

During the last few weeks this switch has given me a great deal of trouble. It is a switch of well-known make and it is supposed to be self-cleaning.

It was very evident that the trouble was caused by bad contacts between the moving parts and the fixed parts. So exasperated was I with this troublesome switch the other night that I decided to take it out from the set and have a good look at it. To remove the switch I had first of all to undo six soldered contacts, but that was quickly accomplished. I am ever so much better at unsoldering than I am at soldering.

When I got the switch in my hand and began to examine it minutely, the first thing I saw was a streak



Cleaning a Switch.

of corrosion at each place where a moving part rubbed on a fixed part. A little fine emery paper and a little patience soon removed the corrosion. I have put the switch back in the set and it is now working perfectly.

Three Classes

If you were to divide up your wireless friends into groups according to their wireless activities and apparatus, how many groups do you think you would make?

I have recently enjoyed a quiet hour or two grouping my wireless friends in this way, and I find I have three very distinctly different classes of wireless friends.

My first class contains all the humble crystal users of my acquaintance. No, I do not mean that quite. Rather should I say that my first



Skill in borrowing.

class contains all the users of the humble crystal that I have the privilege of knowing.

In this class there figures a large number of schoolboy wireless enthusiasts, whose chief characteristics are their skill in borrowing things and their artfulness in getting things out of me for next to nothing.

One bright lad in this group brought a newly-constructed frame for a frame aerial to me yesterday. Looking at me in that very wise way some boys affect when they are talking to their elders on a scientific subject, the boy said:

"What kind of wire have you the most of in stock just now, sir?"

"Twenty-two d.c.c.," I replied.

"Would twenty-two do for a frame aerial?" was the next question.

"Oh! yes," I replied unsuspectingly.

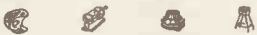
"I suppose you couldn't lend me enough for this frame aerial, could you, sir? I would let you have it back when I have finished my experiments with the frame."

Yes, there are some promising lads in my wireless class of users of the humble crystal. But it is a most interesting class, for the crystal users of to-day is the valve user of to-morrow.

My second class is made up of all my wireless friends who use more or less straightforward valve sets. I look upon this second class of mine as representative of the backbone of the world of listeners-in. These valve users may not, perhaps, accomplish anything brilliant, but they do their two or three hours of listening-in each night, and they are very loyal to their own particular type of wireless set.

My third and last class contains all the aristocrats and valve millionaires I know. In it are various members of the Dynes family, such as the Heterodynes, the Neutrodyne and the Chlorodynes. There are also various members of the Super family such as the Sonics, the Regenerates and the Degenerates.

Of this class of wireless folk, I live in mighty awe, but good luck to them though, these aristocrats and valve millionaires, as to all other wireless folk.



Canned Broadcast

What are your ideas on the subject of "canned broadcast." I wonder? I see that the B.B.C. officials are giving serious consideration to the problem of obtaining records of broadcast items, so that, by means of these records, important items which have been broadcast may be transmitted again whenever suitable.

Personally, I have no very strong opinion on this subject. I did, however, ask my meteorological friend for his opinion. As he happens to be one of a few friends of mine who have spoken from a B.B.C. station, I thought his opinion might be of value.

"How do you like the idea of canned broadcast, Mr. Fair-weather?" I asked him.

"Idea of what?"

"Canned broadcast."

"Canned what?"

"Canned broadcast, you know what canned music is—gramophone records."

"Oh! I see, canned broadcast, gramophone or other records of broadcast items. What a rotten idea."

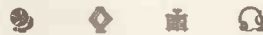
"What makes you say that?"

"I'll tell you, old man. When I spoke so well from 2 L O I made one mistake in pronunciation. On my way home, no less than five knowing silly asses told me of that little error. Suppose my talk had



Canned Broadcast.

been recorded for further use. Why! dash it all, I should never hear the last of that mistake, should I?"



University Lectures

I asked a Cambridge undergraduate friend what he thought of the idea of broadcasting lectures from the university. He was not very enthusiastic although he expressed his pleasure at the announcement that Cambridge had been selected as well as Oxford for this purpose.

"Lectures at Cambridge are really deadly dull affairs," he informed me. "At least all the lectures I have attended have been killingly dull. During the whole of the two years I have been at Cambridge, I have never heard one decent joke cracked at a lecture."

"I once saw an amusing thing happen at a lecture though. One of the college mathematical lecturers always used to lecture for an exact hour. He always began punctually at eleven and always finished just as punctually at twelve."

"One morning some silly ass put the lecture room clock on twenty minutes. Scoops did not notice the clock when he began to lecture. About five to twelve by the clock he looked up to see how the time was getting on. Then, with a puzzled look he glanced at his notes. Again



University Lectures.

he looked at the clock and, more puzzled than ever, he again looked at his notes. His face was a mixture of unbelief and astonishment but he wound up his lecture at twelve by the clock.

"I never heard what happened when Scoops found out the joke that had been worked off on him. Perhaps he never did find out."

"Is there much wireless at Cambridge now?" I asked.

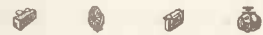
"Never heard of much. I believe, though, there is some kind of a university wireless club—about as important as the cross-word club, I should think."

"But I thought there was a professor or lecturer at Cambridge for wireless."

"Now you come to mention it, I believe there is."

"What is his name?"

"Haven't the foggiest. The undergrads call him Leaky Luke."



Cost of Ebonite to be Increased?

At the moment of writing there seems to be a good deal of concern in wireless circles at the way the price of rubber has increased. I have a trade circular on my desk from a wireless dealer informing me that his prices for ebonite panels will hold only while his present stock lasts, and that, when this stock is exhausted, my panels may cost me a good deal more.

I am not unduly alarmed, for these inflated prices of certain commodities frequently come uninflated as suddenly and unexpectedly as a bicycle tyre.

At the same time, I shall be very interested to see if wireless home constructors are compelled to use one or other of the substitutes for ebonite in the near future for their panels.

Two or three years ago, I used to buy sheets of insulating material sold under the name of "fibre." I believe this particular brand of fibre was made of pressed wood pulp impregnated with—was it zinc chloride? I am not sure of these details now. It was so long ago as far as wireless things are concerned.

On my junk heap I have an old "fibre" panel twelve inches square and a quarter of an inch thick. This queer old panel has warped so badly that, one way, the centre part must be a good half inch below the edges.

If we do really have to use a substitute for ebonite any time, I do hope it will be one which will not warp badly.

New Variable Condenser

American wireless engineers have designed and have already placed on the market a new type of variable condenser which is aptly described by its name, the straight-line frequency condenser.



On the dial.

This new variable condenser is somewhat similar in appearance to the familiar square-law variable condenser; but whereas the square-law condenser is designed to give a straight-line relationship between the dial reading and the wavelength, the new straight-line frequency condenser is designed to give a straight-line relationship between the dial reading and the frequency.

If, on the dial of a square-law variable condenser, twenty-five dial divisions represent a difference of

TUNING CHART.

Transmitting Station	Wavelength in Metres	Frequency in Kilocycles	Difference in Wavelength
A	100	3,000	0.3
B	99.7	3,010	
C	500	600	8
D	492	610	
E	1,000	300	32
F	968	310	

a hundred metres in wavelength at one part of the dial, then twenty-five dial divisions will represent a difference of a hundred metres in wavelength at any other part of the dial.

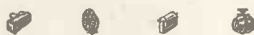
Similarly, on the dial of the new straight-line frequency variable condenser, if twenty-five dial divisions represent a frequency difference of a hundred kilocycles at one part of the dial, then twenty-five dial divisions will represent a frequency difference of a hundred kilocycles at any other part of the dial.

The need for this rather interesting departure in condenser design is to be found in the ever-growing demand for selectivity in wireless sets. It is now assumed that for there to be little risk of interference between

two transmitting stations, the frequencies employed by those two stations must differ by at least ten kilocycles.

This measure of safety from interference between two transmitting stations cannot be put conveniently into wavelength. The above table will perhaps make this clear.

Between the stations A and B, C and D, E and F, there is a frequency difference of ten kilocycles. The corresponding differences in wavelength are 0.3, 8 and 32 metres. This table will show very emphatically how great an advantage there is in using a measure of frequency instead of wavelength when the question of interference is under consideration.



Volume

"Oh! dear. Have you got one of those wretched loud-speakers?" asked one of my relations as she came into my sitting-room the other evening.

"No, it is not one of those wretched loud-speakers," I replied. "In fact, it is a pretty good one, quite the best of the three I have in the house at the moment."

"Three? Do you mean to say you have three loud-speakers? How perfectly appalling!"

"Why in the world do you say that? You haven't a wireless set, have you?"

"No, and we are not going to have one either, if I can help it."

"Then what do you know about loud-speakers? I don't suppose you have ever heard one."

"Heard a loud-speaker, haven't I just? I've heard nothing else the last week."

"One of your neighbours got a wireless set?"

"I should just think so. The loud-speaker makes the most awful noise I have ever heard. It goes



Even under the bed clothes.

on the whole evening, and the worst of it is that we cannot get to sleep for it when we have gone to bed. We can even hear the wretched thing when we bury our heads under the bed clothes."

Too Easy

One of my near neighbours still persists in using an antiquated type of three-valve set, tuned-anode, detector and low-frequency amplifier.

I get a good deal of amusement out of my neighbour over this set



Get a good deal of amusement.

of his. The other day I asked him why he did not try a foolproof reflex set, a two-valve Reinartz, or a picnic set.

"Why should I?" he asked.

"To get decent results. It's not worth carrying your accumulators to the charging station and back to get the results you're getting," I said.

"But I am getting very much better results now than when you heard my set last and were rude enough to suggest my selling the set as an antique to a museum and purchasing a new set with the proceeds."

"How have you managed to improve things?"

"By making a new coil."

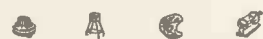
"A special kind of coil?"

"Dear me, no. Just an ordinary coil exactly like those you have seen me using all the time."

"What is there new about the coil then?"

"Instead of having thirty-five turns, the new coil has forty-two. You'd be amazed at the results I am getting now. The extra seven turns have made all the difference in the world."

"Oo—oo, have they?"



Religion a Matter of Wavelength

We have many things to be thankful for with regard to the present position of broadcasting here in England. Contrast the number and control of our broadcasting stations with the number and control of the broadcasting stations in the United States. In that huge country it seems possible for any organization, which has the necessary money, to establish a broadcasting station with the avowed object of sending out some particular form of propaganda.

One of the latest wireless developments in the United States is the

establishment of a number of broadcasting stations owned and run by religious bodies. A section of the Roman Catholic Church has announced its intention of establishing a chain of broadcasting stations across the continent with the object of acquainting the American wireless "fan" with the Catholic viewpoint on current affairs. This announcement was quickly followed by a similar one from the National Lutheran Church to the effect that a broadcasting station at St. Louis would be used to bring the Lutheran viewpoint to the notice of the wireless audience.

I have been wondering if such a state of affairs could ever be possible in this old-fashioned country of ours. Even if our system allowed such things to happen, I doubt if public opinion would tolerate them.

It is a splendid thought, and one we ought to emphasise, that here in England, bishop, minister and Salvation Army officer all stand

with his high-frequency valves in a type he recommends for high-frequency amplification and detection. A third manufacturer will turn out two types of valve, a general-purpose valve and a power valve. There are certain valves which are excellent



The Rivals in Detection.

detectors, and these valves are now made in England.

I am very glad that manufacturers have found it worth while to design and make a new type which really has specially good powers of detection. I heartily congratulate our valve manufacturers, and I suggest that the "Sherlock Holmes" valve would not be at all a bad name for such a valve. "Do you not agree with me, Watson?"

only three valves in use in my set: a detector valve and two low-frequency amplifying valves. What you were listening to an hour ago must have been one of the most distorted reproductions of wireless telephony it was possible to listen to. Four valves and a microphone amplifier, what gluttony. Just listen to that high note of the soprano's voice coming through now. You never heard anything so clear as that on the other loud-speaker."

That's the way to talk to wireless noise gluttons.



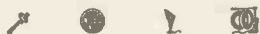
Observant

I am quite aware that, in relating to you the following story, I am running the risk of being accused of repeating a wireless chestnut. The story I have to tell is, I know, closely related to a well-known wireless story which went the rounds a year or two ago.



Stand before one Common Microphone.

before the one common microphone. Broadcast religion is not a matter of wavelength here in England.

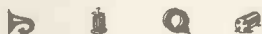


Detection

How often has it happened to you that, when you have moved the valves about in your set, you have found one particular arrangement to be better than any of the others? Why is it so, do you think?

My idea is that it all depends on finding out which of the valves is the best detector. Of the half dozen valves I have in regular use, I know exactly which one is the best detecting valve, and I know which is the second best.

If you look through the advertisements of our valve manufacturers, you will seldom see a valve advertised as a detector only. One manufacturer will turn out a high-frequency amplifying valve as a separate type, and will combine his detector valves in a type he recommends for detecting and low-frequency amplification. Another manufacturer will turn out a low-frequency amplifying valve, and will combine his detector valves



A Wireless Glutton

It is not often that I get exasperated with anyone who comes to talk to me about wireless, but I did so last night and I am quite sure that you would have done so had you been in my place.

I had a man in listening to one of my loud-speakers. The reception was about as good as could be wished for.

"What do you think of my loud-speaker?" I asked.

"Not so bad, but it isn't loud enough for my liking. I heard a much louder one an hour ago," was the reply.

"What kind of a loud-speaker was it?" I asked.

"An X—. It must have been twice as loud as yours."

"What kind of a set was the receiving set?"



A Wireless Glutton.

"Oh! A four-valve set with a microphone amplifier."

"My dear sir," I said, really warming up to it, "you ought to be jolly well ashamed of yourself coming here to make a comparison. I have



Observant Children.

I am not, however, giving the story just for the story itself, but rather am I giving it to illustrate how the powers of observation may be developed in small children who live in a house where there is wireless apparatus about, and where wireless is often under discussion.

On the front cover of a recent issue of an American wireless magazine there was a coloured illustration of a piece of apparatus used to measure the rate of growth of a plant. The apparatus more or less resembled a wireless receiving set.

There was, on the right-hand side of the picture, a flower-pot which contained the plant whose rate of growth was to be measured by the apparatus.

Two little girls, one aged ten and the other six, looked at the picture admiringly.

"This is a funny wireless set," said the little girl aged ten.

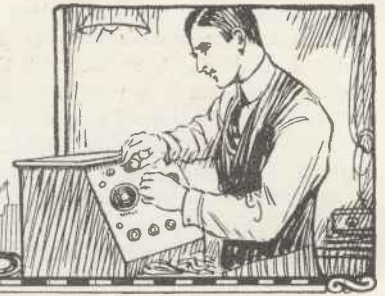
"What's the flower-pot for?" asked the younger girl.

"That's the earth, of course," replied the older girl without a moment's hesitation.

Modern education!

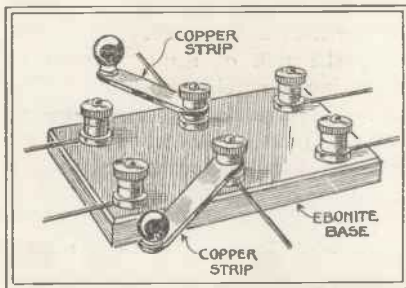
HALYARD.

Gadgets, Hints and Tips



Series-parallel Switch

A USEFUL D.P.D.T. switch can be made—as shown in the adjoining illustration—from material found in most home constructors' scrap boxes.



Series-parallel Switch.

Six small pillar terminals are fitted to a rectangular piece of ebonite in the positions indicated and two strips of copper, each fitted with an ebonite knob, are arranged so that they can swivel on the centre terminals.

By movement of the strips to either of the end terminals various switching arrangements, such as placing a condenser either in series or parallel with a coil, or earthing the aerial, may be conveniently carried out. I. M. R.

Fitting Spring Feet

SPRING terminals screwed into the base of a receiving set provide an excellent shock-absorbing device and are not likely to be so unsightly as rubber pads.

Another advantage over fixed feet, is that, if there are any inequalities in the base of the set or the surface on which the set is placed, the spring feet will automatically set themselves so that all are in contact with the resting surface. A. P.

Phones and Bald Heads

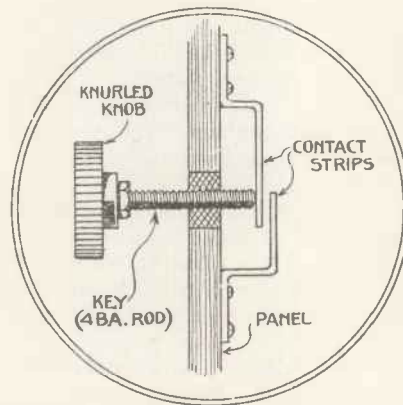
WITH certain makes of Continental phones, it is found that when the headbands are touched with the hand a very marked diminution of sound takes place.

To bald or thin-haired persons this is a source of inconvenience and a fault very difficult to locate.

It can, however, be effectually remedied by covering the bands with some material (preferably silk), padded with cotton wool. S. H.

Simple and Foolproof Low-tension Switch

A STRIP of fairly stout brass is bent Z shape and provided with two holes for attaching it to the inside of the panel by means of small screws or bolts. A strip of spring brass about 3 in. long and cut to the same width as the thicker piece is similarly attached to the panel in the position shown. Near the end of this strip and in a direct line with its



Simple and Foolproof Switch.

centre a hole is drilled through the panel and a 4 B.A. nut is carefully fitted.

The key comprises a short length of 4 B.A. screwed brass rod rounded off at one end and fitted with a small knob at the other end.

The two brass strips are connected in series with one of the battery leads, and it will be seen that by screwing in the key the lower strip makes contact with the upper one and closes the circuit.

This is a neat and efficient switch and is practically foolproof.

R. H. G.

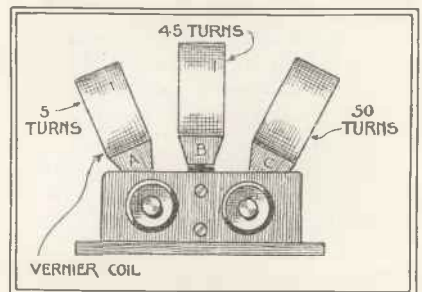
Preventing Vibration

QUITE a good method of preventing vibration reaching the receiving set is to stand the instrument on a felt pad of the kind sold at typists' equipment stores; these pads are obtainable quite cheaply in various thicknesses of felt and are large enough to hold most present-day receiving sets.

If the set is to be moved about to any extent it is a good plan to seccotine the pad—after cutting to shape—to the base of the set itself; this will not detract from the appearance of the instrument, and any valued piece of furniture on which the receiver is stood will be protected from possible scratches. I. M. R.

"Vernier" Coil-holder

THE average reaction control is apt to be very difficult to manage, especially when trying to receive W G Y, etc., on a single valve. Even if a "vernier" condenser is connected across the reaction coil, the adjustment still leaves something to be desired. The following hint may help matters. Use is made of a 3-way coil-holder. The aerial coil is mounted in the centre, the reaction coil in one adjustable socket and a coil consisting of about five turns only in the other. The five-turn coil is wired in series with the reaction coil, either to increase reaction or to act



"Vernier" Coil-holder.

as a damping coil, whichever is preferred.

The operation is obvious, the smaller coil being used to obtain fine adjustment. A. E. S.

Mr. ANNOUNCER!

The Cicerone of Broadcasters

Mr. Announcer
Speaks Into
An Early Form
of Microphone



THE Cicerone of Broadcasts. The title should be his, for does not Mr. Announcer guide both broadcaster and listener amid the facts and fears of the studio?

A suave introduction, as perfect and complete as any earthly introduction, a kind of ether bow; no mere perfunctory nod of the head, mark you, but a courtly bending from the waist, and a bend in the purpose of the will—and the introduction has been gracefully performed, by this most modern of cicerones.

Perfection

The truth of the name is so obvious that we who listen so critically forget his perfection. He is so fluent that we ignore his fluency; he is so *au fait* that we forget the frailty of mankind that makes his fine accent no accidental thing and a well-spoken phrase the priceless attribute of an orator.

Where should we be in this new element without our immediate surroundings were it not for him? He settles all doubts. The turning coil of wire within a coil, the soft glow of the magic lamp, may bring all the voices of the world in turn to the silence of our sitting-rooms, but this patient cicerone, speaking at 2 L O or 5 I T or 2 B M or 2 Z Y, he alone settles the question with an inevitability against which there can be no appeal.

It is not Timbuctoo or K D K A that we heard! It is not one or another of the thousand or more voices of broadcast! It is 2 L O and no other.

Sacred "Box"

Mr. Announcer waits maybe at the threshold of his studio where now so many have entered for him to guide them to the sacred "box" which collects every sound for listening Britain to hear.

He has heard all the secrets that have been whispered into it. He knows that, inanimate as it is, it is far more sensitive than many a brain, that, too, so it is said, it has overawed even those who have not

quailed before the eyes of thousands.

The perfect cicerone, he would put all at their ease. With the visitor at his side he performs the short introduction that matters, finding in a heaven-sent phrase, it seems, a new personality for the broadcaster-to-be.

He seems very much like a familiar friendly fingerpost amid the mysteries of these new vistas of broadcasting. Out of the millions of human beings that live in the globe he names one man; out of the great mountains of music scores that seem to hand he indicates one or two. "You will hear," he says, and it is so. The fingerpost has pointed the direction and towards the determined goal progress is made.

And yet this *deus ex machina* is so human that to a listener there

comes the thought: This politeness, this unflinching tact and charm and accuracy of prophecy—does it not pall? Does not the humanness of this cicerone sometimes pucker and frown beneath the re-iteration without end of "London calling; you are to hear now"

Does he not tire? Would he not wish to say, yes, say nothing? He only knows. H. S. C.

LOUD-SPEAKER TONE

ARE you satisfied with the tone of your loud-speaker? Different instruments vary considerably in their pitch, some being rather on the high side, and others on the low. Speaking generally an instrument of rather high pitch gives the clearest reproduction of speech, whilst music comes through better when the pitch is on the low side.

It is not always realised that the pitch of the loud-speaker can be varied to a very great extent in the simplest way. The best means of doing this is to remove the fixed condenser across the telephone terminals of the set, and in its stead to mount a pair of clips so that various capacities can be tried. The smaller the capacity across the output terminals the higher will the pitch of the loud-speaker be.

The most convenient method is to

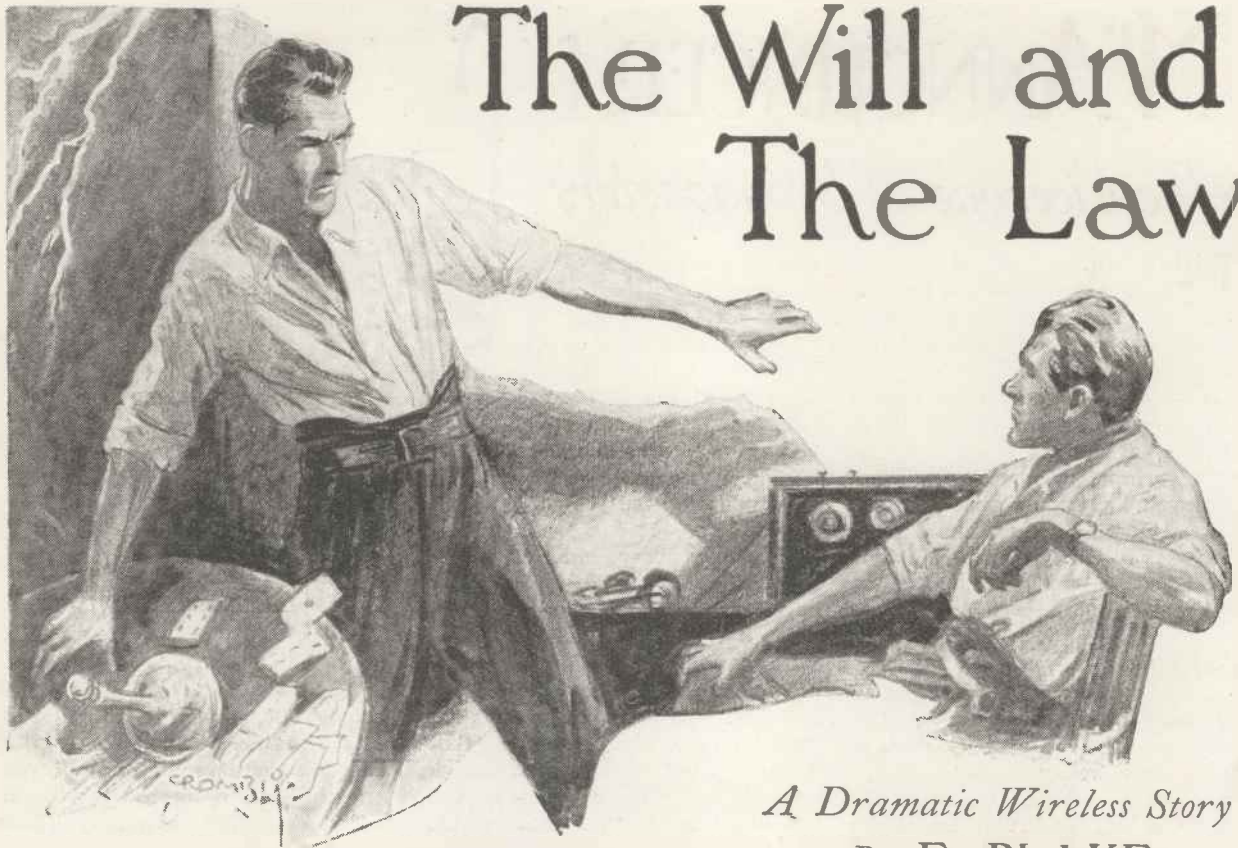
experiment with various clip-in condensers until the capacity is found which gives reasonably clear speech and musical reproduction that is pleasing to the ear.

Another Method

Another way is to fit two pairs of clips and a small switch. One then finds the most suitable condenser for speech, and that which gives the best results when music is coming in. By means of the switch one can throw into play the condenser required for any particular item of a broadcast programme.

Do not forget, by the way, that if you use very long leads for your loud-speaker made of double flex you considerably increase the capacity in shunt since the two insulated wires form a condenser.

J. H. R.



Illustrated by Charles Crombie

The Will and The Law

A Dramatic Wireless Story

By E. BLAKE

The following narrative was sent to me by my friend Henry Fraithe with the remark that it might perhaps form the basis of a story, but I have decided to publish it as it stands, not only because of its human interest, but also because of the half-revelation it affords of the unseen. I have called it "The Will and the Law," because the incident shows that athwart the human will runs the bar of immutable natural law.

When we consider how periodicity affects us from birth onwards, how our environment directs our thoughts and actions, and how our purposes can be abetted or brought to naught by the movements of celestial bodies, we can say, without splitting upon the rock of free-will, that our wills are ours, our destinies ours to make, but only within the adamantine circle of the law.

I MUST confess that until the affair at Cabo Grande I had never looked upon the ether as anything very remarkable; in fact, I had not even regarded it with respect save on those occasions when I tried to explain wireless to my lady relations. I then found that the

ether was as mysterious as the human whisker.

To me it was only a tool, and I stood my watch, day in, day out, taking no more account of it than a telegraph clerk does of the wires. I took it for granted, as I do air and water; just the right stuff in the right place. By its definition it did not seem to be much of a mystery and at that time I considered the so-called "etheric body" of the theosophists to be a concept entirely worthy of a gang of nut-eating cranks.

Yet if there was not more in the ether than our scientists dream, how is it that I was murdered at Cabo Grande and saw Porter wipe my blood from his hands and heard him curse me in a language he never learned? Hallucination? Well, here are the facts.

There were three wireless operators attached to the station—Porter, James and myself. James was in town at the time and Porter and I were in the operating room together, Porter being on duty. It was a stifling hot August night following a day of blazing sun and scorching sirocco wind, and Porter grumbled

about atmospherics which, he said, were abnormally strong. Out at sea, on the horizon, the lightning glared and flickered without cessation and the banked storm-clouds made the night pitch dark.

At ten o'clock we heard the first long growl of thunder reverberating amongst the mountains and our native cook crossed herself fervently and called upon the Virgin, upon which I ordered her to bed.

The centre of disturbance was plainly shifting towards us. Lightning began to play around the massive flanks of Puig Mayor, the nearest mountain, throwing the black, gnarled trunks of the olive trees into strong relief against the vividly illumined sky. The heat seemed to grow more intense, but no breath of wind or drop of rain came to relieve us. As Porter remarked, it was like being screwed down alive in one's coffin. "Atmospherics" increased every minute and reached a startling maxim. The lightning spat and crackled like cats.

Porter took off the telephones and wiped his hot ears. "It's a bender of a night. We're in for a Number

One bust-up," he said, and went to the kitchen for a drink of wine. When he came back he carried two glasses, and handing one to me remarked, "Here's to the poor chaps who are trying to receive long-distance press messages to-night." We lifted our glasses to drink, and then lowered them as there came a heavy bump at the door, followed by the rattle of a chain and a terrible long-drawn howl.

"The pup has got the funks and has broken loose," I said, and going to the door I opened it and let in a small avalanche of dog and chain. It was my hound, a huge deep-jowled brute, descended from the sacred dogs of Egypt, whom I had named Pharaoh out of a conceit of mine regarding the doctrine of metempsychosis, by which I was wont to make believe that the dog was the reincarnation of a Pharaoh.

"Are the bones of your former self ill at ease, pup?" I asked, as he padded into the operating-room, dragging his broken chain.

"Don't start that ghastly talk to-night," protested Porter.

"Hul-lo," I answered, turning round on him in surprise, "Was oo nervous cos of the thunder, then? Can't a poor old Pharaoh revisit the glimpses of the moon without getting on the nerves of a materialistic Porter?"

"Don't talk rot," he returned sulkily. Then: "How that dog glares at me," he burst out in a tone of pettishness which amazed me. Undoubtedly Pharaoh was glaring. He lay between my legs and stared with unblinking eyes at my companion in a manner quite foreign to his usual behaviour, for he generally wore a look of sleepy boredom.

"Come on," I said, "let's have our wine and a spell with the *baraja*. I'll get the cards. The dog is only scared."

Porter put on the telephones and we sat down to play, gambling mildly for halfpenny points with Spanish cards. The row in the heavens grew in volume as the minutes passed, peal on peal of thunder in quick succession making "a rolling organ harmony" amongst the rocky spurs and peaks, mingling their glamour with the echoes of their predecessors so that the noise was continuous. To this Wagnerian pandemonium the lightning added the limelight effect in fitting style. Pharaoh, crouched against my legs, uttered little whining yelps from time to time and showed

his teeth to Porter, for which breach of good manners I cuffed him soundly.

The cook came in presently babbling incoherences about Saint This and That, and begged permission to sit in the kitchen with our manservant Juan, whom we called from his shack and bade keep her from hysterics on pain of dismissal, for cooks were of more value in that lonely spot than much fine gold.

Eleven o'clock found us playing steadily. Porter seemed unusually keen and wanted to increase the stakes. I agreed, and noted this fact as peculiar, for neither of us were gamblers *per se*. Porter lost two pesetas, grew querulous, and drank wine without noticing the quantity he took. Then it was that I began to feel quite distinctly . . . what shall I say? . . . the influence. *I began to desire to cheat.*

It was a case of Jekyll and Hyde, with this difference, that I was both Jekyll and Hyde simultaneously; two personalities were co-existent and manifested themselves at one and the same time. My normal self, curiously enough, was able to observe and criticise my induced *alter ego*, so that I regarded my desire to cheat with disgust and at the same time was calmly trying to see Porter's cards.

I did not cheat, however, but played squarely from start to finish; yet Porter snarled and pawed over the tricks after each game, for all the world like a choleric half-pay colonel at a whist-drive. He began to gesticulate like a Spaniard and to roll his r's when he spoke, and when I called his attention to this he scratched his head perplexedly and said he could not help it.

Then he grabbed the pack, dealt the cards with a dexterity he had never before shown, and said he would wager his olive-garden at Lluch against all my winnings. Olive-garden? Lluch? I thought he raved and then, even as I called him a fool, I pushed two pesetas into the pool and we played.

Porter lost the first hand and glared suspiciously at the cards which remained in my hand. Again we played and this time he won. He drank more wine, spat, and tightened his belt as I have seen Spanish gamblers do at critical moments; he had the very trick of it . . . six weeks out from England, remember. For a third time we played, and I won.

As I threw the winning card down with a triumphant smack there came an appalling crash of thunder which sent the blood from my heart. I heard the cook shriek, and saw Pharaoh watching Porter, teeth bared, hackles erect.

Porter's face was pale with fury. With a sweep of his arm he sent the decanter flying; he sprang to his feet, scattering cards and table, and putting his face close to mine, screamed in pure Castilian, "Cheat," immediately followed in English by "Good lor, what a clap. Did you hear Juan and cookie squeaking?"

I think it was the thought of danger to the station which set me thinking rationally again. I listened in the telephone for a few seconds and then earthed the aerial.

"The station is closed until the storm has passed," I said, and made an entry in the log.

"We must be bang in the middle of it," remarked Porter, "the flash and the thunder were practically simultaneous."

"Yes, its working to the southward; I'd let the fellows at the Las Arenas station know, if the aerial were not tied up," I replied, glad to think he was once more his normal self. Meanwhile the storm concentrated itself upon our devoted heads, blinding us with its flashes and making a row like ten thousand tea-trays. A crash and sudden flame to the right told us that our one tree had been struck.

"Thank goodness nobody was out there in the hammock," I said, for we had often slept under that tree, and as I spoke I felt myself in the grip of the influence.

"Come out into the tempest and cool that hot Sevillano head," I said. This to Porter, mark you, who was born in Crewe.

He answered in Spanish, "*Ay, thou Moor, better a hot head than a cold hand. Let us go,*" and he broke into a snatch of an old song:

"*Muchos van más pocos vuelven.*"

"Many go but few return." This did not strike me as peculiar, nor did I marvel at Porter's mastery of the language, but I answered, "Righto, let's put on our pipes first to keep the mosquitoes off."

So we lit our pipes and stepped out into the Cimmerian gloom streaked by the fires of the Pit.

As though by common consent we turned our steps towards the summit of Cabo Grande, which rose up behind the station. Out there in the

night, with sea and sky and mountain, open to the play of the elements, I suppose we became more susceptible to the influence of *IT*, for although I could hear myself speaking as though it were another person who spoke, I ceased to wonder at the things I said. I was a spectator at a play and I was a player too.

As we clambered up the rough volcanic rock, which seemed to oscillate beneath our feet, I began to feel a violent antipathy towards Porter. By the time we reached the summit and saw the gleaming foam-fringe of the coast and the fires of stricken trees dotted about the dark mass of Puig Mayor, I hated him.

Now, as I am telling the facts, it is right that I should at this stage put on record my impressions as we stood in the midst of those intolerable, magnificent electrical effects.

As to the physical, there was the tense, stifling atmosphere, and the inky blackness of the sky cut into a thousand slices by the lightning which every few seconds cast its blinding, pinkish light upon the scene; there was the horrid crash of the thunder, succeeded by its myriad echoes which in turn were mocked by the booming of the sea.

As to the mental impressions . . . I will no more than hint at the psychical . . . there was the feeling of hatred, evidently mutual, and the confusedness of thought arising from the fact that I was a mental witness of my own induced thinking. There is absolutely no mistake about this, for whilst I desired to deceive, and schemed to falsify the play, at the same time I sat in serene judgment on myself and decided that my conduct did not square up with my accepted code and that I would play honestly. Porter bears witness that he experienced the same sort of thing, but apparently in a lesser degree; there is evidence that he was far more submissive than myself.

Then, consider the sense of compulsion under which I did and said such strange things, and lastly, remember the strong suggestion we received from each other, from our environment, and from *IT*. I recall now that almost every time Porter became abnormal I followed his example and answered or acted fittingly.

I reached the summit first and sat cross-legged, panting; Porter heaved himself up and over the edge, half a minute later, muttering imprecations.

"Phew, what asses we are to come climbing on a night like this," he said, mopping his face. Then, sliding into Castilian, added:

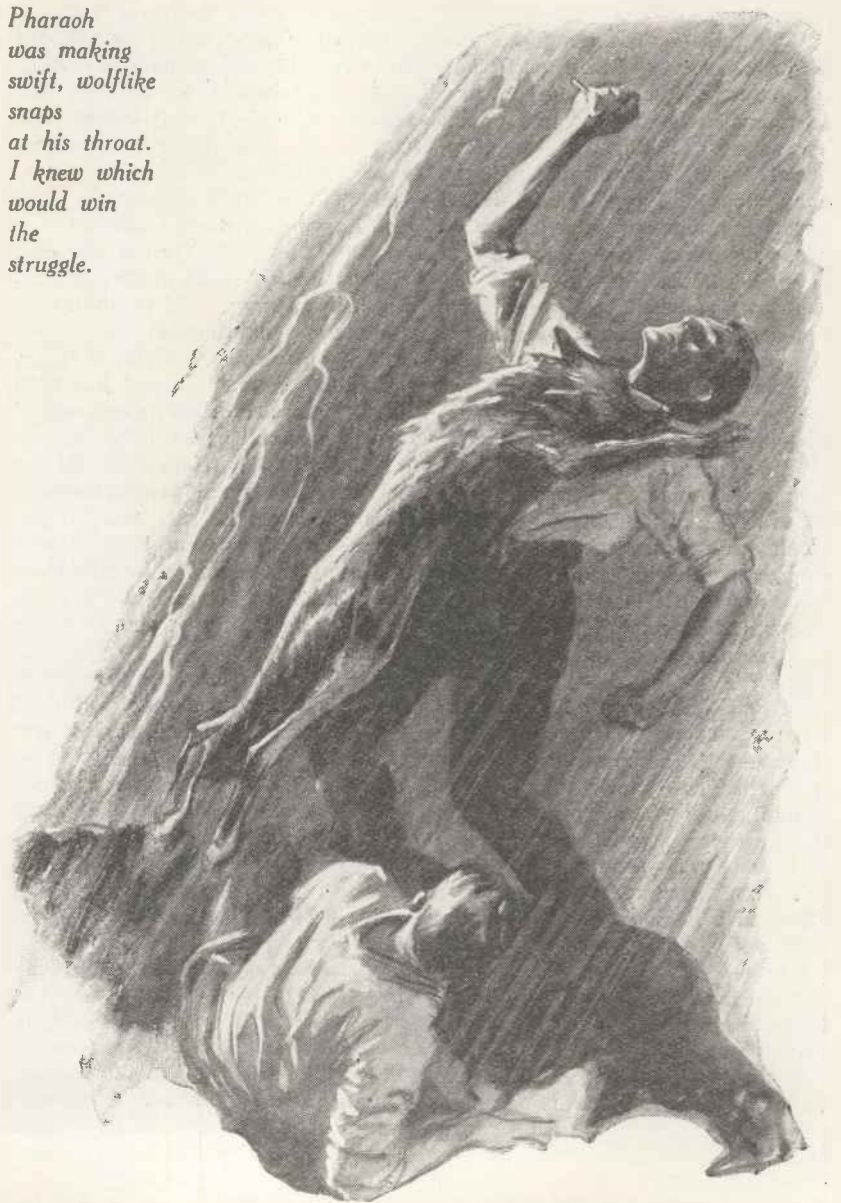
"*Shall I pay thee thy dues, Gold Hand . . . Thief?*"

I replied, "When you like, old chap. It was only a couple of pesetas, wasn't it—you base-bred dog?" Here a sudden gust of fury shook me.

*Pharaoh
was making
swift, wolflike
snaps
at his throat.
I knew which
would win
the
struggle.*

Porter's face. He was out of his mind and his features were those of a Spaniard. He jabbered incessantly in the vernacular, of foreign cut-purses, of my cheating, my insolence, my cold hand, and I know not what else.

Sick with horror, I went towards him, but with a cry of "*Now, now I pay,*" he struck me twice on the



"*That word to me again, you filthy, garlic-stinking peasant, and thy head is knocked into thy hands.*"

"AAH—r-r-r-ruffff." The huge form of Pharaoh loomed up over the cliff edge and bounded to my side. A flash of lightning showed him to be all a-bristle and slaving. For a brief space I became my ordinary self and grew frightened as I saw

breast with his pipe held daggerwise. Amidst peal on peal of thunder the storm burst and I fell to the ground, blinded, drenched and half-stupefied.

Porter shrieked pitifully, and the fitful glare revealed him at grips with Pharaoh who was making swift, wolflike snaps at his throat. I knew which would win the struggle, and

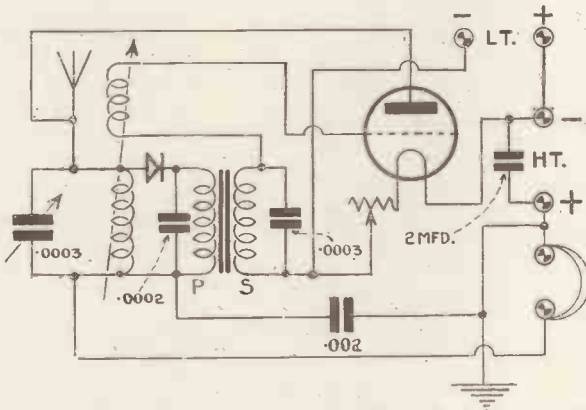
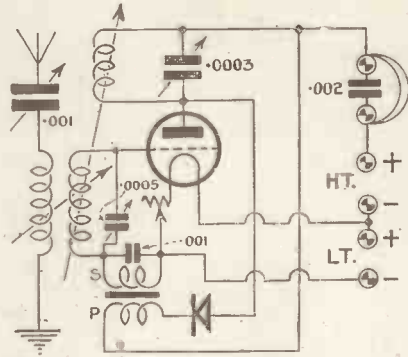
(Continued on page 424)

Special Valve-crystal Circuits You Should Try

This particular circuit is one of the most popular of the reflex type because it is about the simplest to operate; it is, indeed, the best circuit for those amateurs who have not before tackled reflex systems.

The action is as follows: The valve first amplifies the signals at high-frequency, after which they are rectified by the crystal and again passed through the valve for amplification at low frequency—the strength thus being nearly equivalent to that given by a three-valve set comprising high-frequency amplifier, detector, and low-frequency amplifier.

Known as a series reflex circuit, this arrangement depends for its action on the fact that the secondary of the reflex transformer is in series with the secondary tuning coil. Single-circuit tuning can be used if desired.



Although not a reflex in the generally accepted sense of the term, this circuit is far from being straight. It will be seen that it comprises a crystal and one valve, the latter amplifying rectified impulses from the former at low frequency.

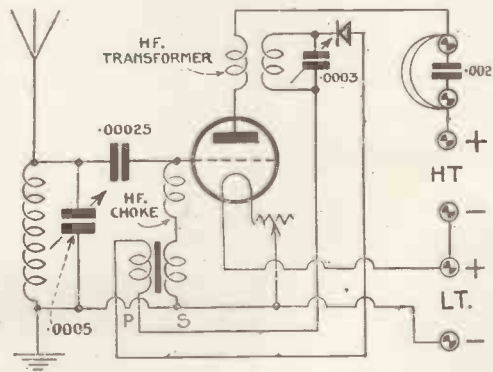
Further than this, however, the valve enables reaction to be used to still further boost up signal strength.

A novel feature is the position of the phones which, it will be seen, are in series with the aerial coil. This circuit has interesting possibilities.

Similar to the first in essential points, this reflex circuit is different in that it is one of the parallel type—that is, the secondary of the reflex transformer is in parallel with the tuning coil instead of in series as in the first circuit.

To prevent high-frequency oscillations from the tuning coil from flowing to the filament side of the circuit instead of to the grid, a high-frequency choke coil is used in series with the secondary of the low-frequency transformer.

It will be noticed, also, that this circuit makes use of a high-frequency transformer in the anode circuit of the valve in place of a tuned-anode coil.



H.T. from Your L.T. Battery!

THE amount of energy received from any broadcast-ing station on the average aerial is less than the energy re-quired by an ant to walk up a wall. In fact, it is rather less than the energy displayed and consumed by the ant in carrying one of its little eggs up a wall against the action of gravity on the egg.

The fact that we can work loud-speakers in unison with the trans-mitted energy is entirely due to our ability to use the energy gathered in by our aerial as a trigger for liberating a local supply of power.

This local supply of power is contained in our low-tension and high-tension batteries, but mainly in the former.

A Few Figures

In my own three-valve set I consume 1.5 amperes at 6 volts in the filament circuit and 6 milli-amperes at an average of 80 volts in the H.T. circuit.

Putting this into terms of power and expressing it in watts (1 watt = 1 volt x 1 ampere) we get 9 watts for the output of the L.T. accumulator, and 480 milliwatts or about half a watt for the output of the H.T. battery.

The two expenditures of energy are therefore roughly as 20 to 1, 20 watts being expended by the L.T. battery for every watt furnished by the H.T. battery.

Single Source of Power

If, therefore, we choose to make the L.T. battery supply all the local power, we shall only add 5 per cent. to its output.

Now there is nothing absurd or strange about obtaining H.T. from L.T. or vice versa. It is done in every alternating-current transformer. What is gained in voltage is lost in current, and the product of the two, which measures the expenditure of energy, remains the same.

It is true that in the case of direct current such as we obtain from all

A Special Article by Dr Fournier d'Albe

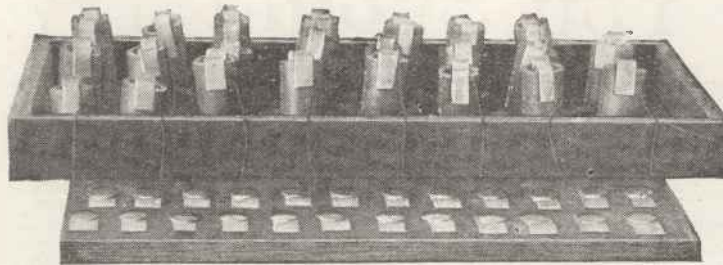


Fig. 1.—Photograph of Dr. Fournier d'Albe's Experimental H.T. Accumulator.

wireless batteries no "transformers" are available, and recourse must be had to a rather complex set of switches.

But, on the other hand, a good switch is practically everlasting, and need not give any trouble, and even a complicated set of switches can work with absolute smoothness and precision if well designed.

We may obtain any voltage we please by charging up a number of small accumulators in parallel,

In this article Dr. Fournier d'Albe describes a device for maintaining a constant H.T. supply with the aid of the low-tension accumulator. This device is intended for the use of those who have no domestic high-tension supply available for wireless work.

disconnecting them from the source of power and then connecting them in series.

Moreover, we can have two such sets of small accumulators, one of which is always being charged while the other is working the set. As soon as the latter gets exhausted we can put it on "charge" and use the other.

I have made a number of experi-ments in order to determine how far the smallness of the accumulators can be driven.

The smallest accumulator I could think of consisted of short lengths of lead wire connected by short rubber tubes which tightly held them. The space free from lead inside the

rubber tubes was filled with dilute sulphuric acid.

I arranged fifty of these in a chain and sent a milliampere through the chain from end to end, discharging and re-versing the direction of the current every five minutes.

I found, however, that after a short time the chain would no longer pass the

current, owing to the formation of gas bubbles which are inseparable from the charging process even when the current is very small.

While this experiment lasted, the voltage obtainable from the miniature H.T. battery was quite satisfactory, and it was gratifying to find what a very short process of "formation" sufficed to get the lead up to full efficiency as regards voltage.

The current capacity was, of course, another matter. When we consider a 40-ampere-hour L.T. battery requires fully formed plates some 80 square inches in area, we cannot expect to store much energy in a lead surface of $\frac{1}{10}$ square inch.

At the most, we might expect to store a power of 10 milliampere-hours. Even that, however, would suffice to give 5 milliamperes for two hours, after which we could change over to the set under charge.

Actually, the current capacity of small accumulators is much less than this, owing to the difficulty of em-bodiment either red lead or lead peroxide in very small plates.

Nevertheless, even small batteries will yield quite a useful H.T. current which can be employed in wireless reception.

Experimental H.T. Battery

What is probably the cheapest and simplest 50-volt unit it is possible to make is shown in the photo-graph.

The cells consist of 1½ in. lengths of rubber tubing, ¼-in. in diameter. They are placed upright in a shallow box or dish into which a thin layer of a mixture of resin and beeswax has been poured.

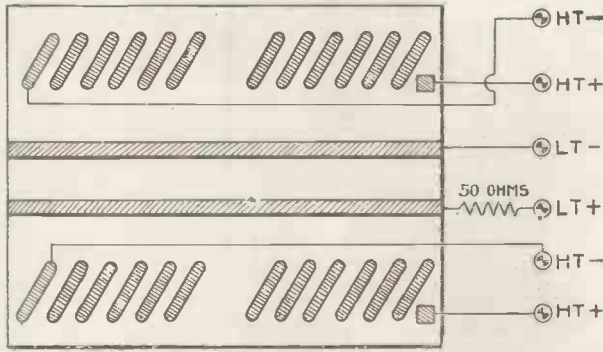


Fig. 2.—Transformer Switch from below. The straight bars in the middle are for charging the H.T. cells in parallel. The slanting contact pieces are for discharging in series.

Before the mixture cools, the rubber tubes are placed in position. The congealing mixture fixes them to the base and also forms an acid-resisting bottom, so that the tubes become as many cups capable of holding acid.

A number of short lengths of sheet lead—two for each cell—are then cut out and inserted in the cups, with enamelled wire leads attached to their outer ends.

The leads are bent round so as to grip the rims of the "cups" and are brought to a set of outside contact pieces arranged in rows of 12 each.

The cells are filled with a 20 per cent. solution of sulphuric acid by means of a fountain-pen filler.

A battery of this construction, weighing a little over a pound and costing less than 3s. in materials, was found capable of furnishing 5 milliamperes at 50 volts for half-an-hour without re-charging. During that period the voltage never fell below 48. It

then fell away suddenly, unlike dry cells, whose E.M.F. falls gradually.

The more such batteries are charged and discharged the greater becomes their current capacity. The lead plates are more and more completely "formed," and their effective surface increases.

Accidental short-circuits of the battery do not produce permanent injury.

The rubber tubes may be rendered more permanent by coating them with celluloid varnish. But for permanent use it is probably better to use short glass vessels resembling

special care need be devoted to insulation, as the H.T. battery need not be guarded from leakage with

flat-bottomed test tubes, which may be obtained from wholesale chemists.

"Transformer" Switches

It remains to connect up such an H.T. set to the L.T. battery. Two complete sets are required, one of which is to be charged while the other is in use.

In this case, no

In charging up the cells, all the positives are connected together and joined to the positive terminal of the L.T. battery through a resistance of, say, 50 ohms.

If the L.T. battery is capable of supplying 6 volts, the H.T. cells can be charged in sets of two, as their counter E.M.F. will never exceed that of the L.T. battery.

A switch for connecting the cells for charge and discharge is shown in Fig. 2. The middle bars are for connecting to the L.T. battery, while the two outer sets of contact pieces are for connecting the H.T. cells in series to the receiving set.

Fig. 3 shows the arrangement of contact springs for a double set of H.T. cells giving 50 volts.

The cells are in groups of 2 cells each, which always remain connected in series, both for charging and discharging.

There is a difference of 4 volts between successive contact springs. When set A is being charged, set B is discharging through the set, and vice versa.

How It Works

There are only two positions in which the switch comes into action. In one position (near set A) shown in Fig. 3, set A is being charged from the L.T. battery with a resistance of 50 ohms in series with it.

The total charging current will not exceed 120 milliamperes, and will fall to 40 milliamperes by the time charging is complete.

If a higher plate current is to be taken out, or if the internal resistance of the cells is high, the resistance must be reduced

from 50 ohms to a more appropriate value. (Continued on page 422.)

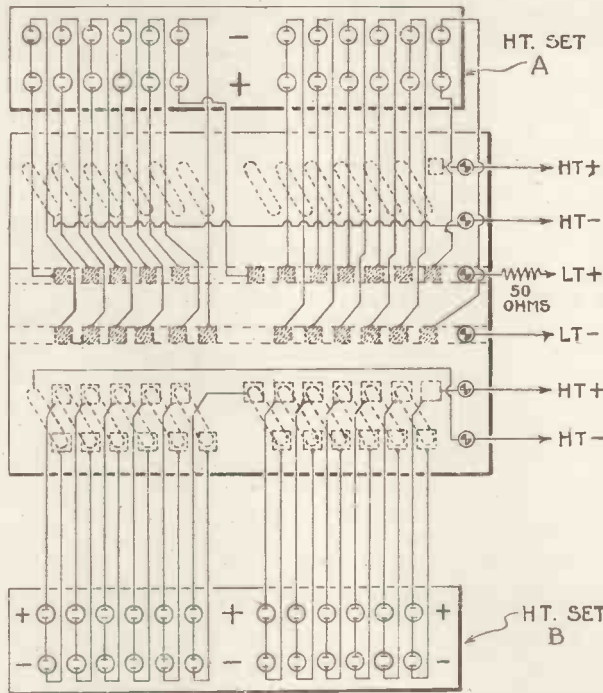


Fig. 3.—Two H.T. sets arranged for simultaneous charging and discharging. Set A is being charged from the 6-volt L.T. battery, while set B is discharging at 50 volts into the receiving set. To change over the switch is shifted close up against set B, whereupon the whole process is reversed.

the usual care. Dry hard wood can be used as a basis for contacts and switches.

The leads are taken to as many contact springs, fixed to the board by means of round-headed screws or drawing pins. A set of such contact springs is shown in the photograph (Fig. 1), one row being positive terminals and the other negative terminals.

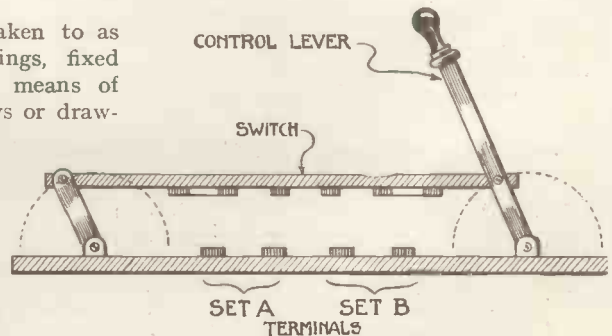


Fig. 4.—Lever for switching over from set A to set B.

ALTHOUGH the B.B.C. endeavour to provide programmes to suit all tastes, there are many middle-brow listeners who complain that the very low-brows and the very high-brows are far too liberally treated; there are high-brows who complain that the low-brows have it all their own way; and there are low-brows who maintain that the ether is absolutely swamped with stuff that hurts their ears.

Well, personally I sympathise with all the listeners, and with the B.B.C. as well. My brow is neither high nor low, but just average. When it comes to "talks" (which are really readings and sound like readings), I appreciate hardly any of them. When it comes to wireless dramas, I pull out the H.T. plugs, cut off the juice, and wait till the dramatic clouds have rolled by.

A Tune

When it comes to music, I demand, above all things, a tune. I don't particularly want "In a Monastery Garden," or anything of its *genre*, but I would far sooner listen to "In a Monastery Garden" for the thousand and umpteenth time than to any of the tunes Handel borrowed from obscure composers and buried in a lot of noise. I like Bach and Brahms and Mendelssohn and Liszt, Coleridge-Taylor and Gershwin. I revel in Chopin and Chaminade. I like all dainty little songs, ranging from "Cherry Ripe" to "The Panquin Bearers."

Modern—But Not Music

But I loathe and detest the so-called modern school of music as exemplified by (let us say) Flümpff and Holskivinski, because, as I contend, it may be modern, but it certainly isn't music. It consists (in my ears) of a lot of chords slung together with some sort of rhythm but with no sort of tune, and most of the chords are as near to discords as they can get without slopping over into sheer juvenile josh.

I am convinced that the first of



the so-called "modern" composers was inspired by a piano that hadn't been tuned for twenty years, during which interval the rats had been at the felt.

Modern music, indeed, sounds (to me) as though it needs both a tune and a tuner. And when a musician (?) of the ultra-modern school takes an old tune and toys with it, he usually commits an offence which, in my view, ought to be dealt with by the police.

Philistines

I mention these things just to give you some idea of my own taste (or lack of taste) in programmes. I am, if you like, a Philistine. In fact I am worse than a Philistine, because, while appreciating the Savoy Bands as bands I detest that insistent tum-tum-tum-tum of the banjos as much as I detest the more ambitious works of Elgar. But I take out a licence (for my set, not for myself) and I have to be considered.

The high-brows and the low-brows will probably feel that I ought not to be considered at all, but I contend that I ought to be considered far more than I am, because there are at least ten thousand other listeners whose ears are as ridiculous (if they *are* ridiculous) as my own.

But the B.B.C. do their best without consulting me and without consulting any of those who provide the B.B.C. with funds. They receive an enormous number of letters of praise and abuse from listeners, and no doubt they shape their programme

course through the ether largely by the indications of their letter-bags.

But the B.B.C. overlook one very important point—which is that the vast majority of listeners do *not* write letters. They address rude remarks to the loud-speaker—I have often done this myself—but they do not address letters to 2, Savoy Hill.

From an official point of view they suffer, or they do not suffer, in silence. Consequently the B.B.C. continue to

give us programmes which satisfy the few more often than they satisfy the many. They feel the pulses of those listeners who extend their wrists, and they endeavour to prescribe for those listeners under the impression that the mute multitude have no complaints.

The Mute Multitude

But it is not so. The mute multitude—of whom I have hitherto been an unimportant unit—are full of complaints, only they don't take them to the B.B.C. They nurse them in secret, or communicate them to their immediate friends. They tear off their headphones, they utter insulting but wholly ineffective remarks to the loud-speaker, and they generally exhibit, within the four walls of home, all the symptoms of their case.

But the B.B.C. go sublimely on, administering to the ultra high-brows, administering to the ultra low-brows, and offering, at all sorts of odd times, little doses of soothing syrup to the vast unknown in the shape of items that happen to do them good.

Doing Their Best

We cannot blame the B.B.C., we who never pen a word to them of praise or blame. They do their best according to their lights (as the lawyers express it), and we only suffer because we do not assist.

I am about to assist. I have hit upon a plan whereby, with the minimum of trouble, we can communicate to the B.B.C. our desires in the matter of programmes, and

whereby the B.B.C. may readily ascertain the tastes and wishes of the mute majority and deal pleasingly with them.

If you, and I, and all of us go through all the programmes of all the stations for any one week, you and I and all of us can almost certainly find among the fourteen or fifteen

for future policy would be in their hands.

But no prizes whatever should on any account be offered to the listeners whose forms included the items that received most votes. I have had some inside experience of voting competitions for prizes, and I know that the entrants indicate nothing more

vast majority, but a programme that might win a prize!

There should be no prizes—only a promise; a definite promise that the items favoured by the greatest number should be combined in a once-a-week programme from Daventry. It would be our own programme, my friends; we should have only ourselves to blame if we didn't like it—and it would provide a liberal education for the B.B.C.

There would, of course, be always the difficulty that on the specified evening some of the specified artistes might be at the other end of the kingdom; but by relaying some items and providing a party of artistes and musicians at Savoy Hill to render the rest, all difficulties should be quite readily smoothed away.

Proposed Voting Form

Programmes for Week Ending

Station	Day of Week	Approx. Time	Item	Rendered by

hundred items a sufficient number to make up at least one programme that shall appeal to the majority from beginning to end.

A Voting Form

Let the B.B.C., therefore, issue a voting form, something after the style of the specimen here given, and let us all—whether we be high-brow, low-brow, medium-brow or no brow at all—fill it up according to our fancy; compile in its columns a programme that will really please our individual selves.

Let us send the completed form to the B.B.C. and let the B.B.C. arrange a programme, to be transmitted on one evening of every week from the high-power station, consisting entirely of the items which receive the greatest number of votes.

Naturally the programme which emerged each week would not be entirely my own programme, or your own programme, but it would be the programme of the majority, and it would contain items that would please all of us. I venture to think that if the B.B.C. were to adopt this suggestion, they would be astonished—and we should all be more or less satisfied.

Radically Changed

I am convinced that if this expedient were given a month's trial and the character of the items which received the largest number of votes were diligently studied by the officials concerned, the B.B.C. programmes in general would be radically changed thenceforward. A real guide

useful than a desire to win the prize. Human nature is human nature, and competitors for prizes would carefully put down not the items they wished to hear themselves, but the items they imagined most of the other competitors would plump for. The nett result would be not just a programme that would please the

What Do You Think?

Anyhow, there is my own idea—the high-low-medium-no-brow brain-wave which has shaken me out of my hitherto silent approval and disapproval of existing programmes within easy reach of my set. And now it is for you to decide what you think of the notion—and for the B.B.C. to decide whether or not it is worth a trial.

Prof. E. Sopp's Fables

Specially Revised and Brought Up-to-Date for the Edification and Guidance of Wireless Amateurs.

No. 3.—THE FELICITOUS PLUMBER

ONCE upon a Time, an Intelligent Plumber who in his Spare Time also dealt in Radio Components, and to Whom in the Course of a fortunate Racing Season, two Flagons of the Best had been presented as a Token of Esteem by a Benevolent Book-maker, was walking leisurely towards his Parent's Abode with the choice Gifts enclosed in a small Basket balanced on his Head.

Wending his Way through the Crowded Lanes of the Great City he soliloquized thus:

"Here have I, lucky Jim, two Bottles of Cordial which, as Abstainer, I do not drink. I would fain sell these Bottles to my friend Bill who, always hankering for Strong Waters, will pay me a big Price. With this goodly Amount of Sterling will I, on my next

courting Visit, astonish Liza Ann and thereby raise her Enthusiasm to such a Pitch that she will endeavour to cajole me into promising her a Radio Set with a three-valve Power Crystal of Great Purity. But scornfully will I remind Her of the Partiality She has recently shown for my Rival 'Arry. I will say Nay and shake my Head thus."

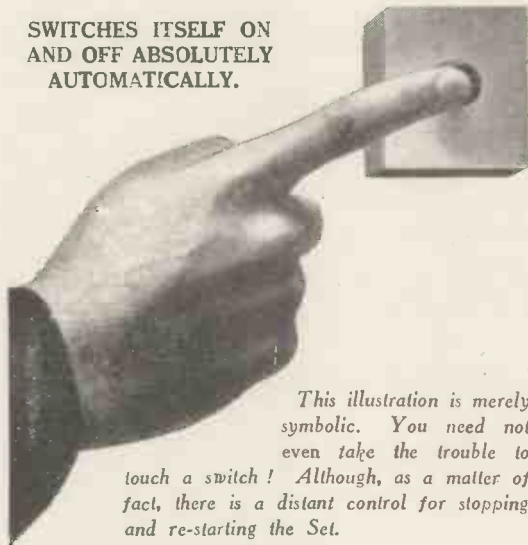
Suiting the Action to the Word, he tossed his Head and down came the Basket. But having, of necessity, studied Physical Jerks in the Course of the Great War, he deftly caught the two Flagons in his Hands and All came to pass as he had hoped.

MORAL: In building WIRELESS MAGAZINE sets keep to the "Structograph" and you won't be disappointed.

JAY COOTE.

A "Self-starter" Three-valver

SWITCHES ITSELF ON AND OFF ABSOLUTELY AUTOMATICALLY.



This illustration is merely symbolic. You need not even take the trouble to touch a switch! Although, as a matter of fact, there is a distant control for stopping and re-starting the Set.

This "self-starter" three-valver is the result of prolonged experimental work carried out by THE WIRELESS MAGAZINE Technical Staff; it is, in some respects, an attempt to attain an ideal.

Once the set has been tuned-in to a station that can be received at good crystal strength it will automatically switch itself on and off as broadcasting begins and stops.

This development represents, there can be no doubt, a considerable advance in receiver design and, at small extra cost, readers of THE WIRELESS MAGAZINE can try the system for themselves.

IN the last issue of THE WIRELESS MAGAZINE, under the title of "The 'Trigger' Switch," appeared an article that described the construction of a piece of apparatus to automatically bring any set into action as soon as the local broadcasting station starts to transmit.

Set Complete with "Trigger"

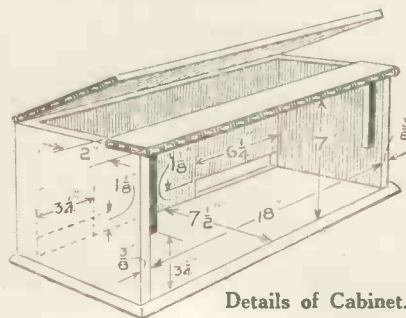
We have now designed and built a set incorporating the "Trigger," thus making it an integral part of the set. As the title suggests, the function of the "trigger" has its analogy in the self-starter of a motor-car.

In the case of the latter, the driver gets into his car and presses a button. A small electric motor geared to the flywheel of the engine starts up immediately the button is pressed. After a few rotations the engine starts to fire and runs under its own power.

In the self-starter set to be described, the electromagnetic waves transmitted from the broadcasting station take the place of the driver in the motor-car analogy. They are received at the aerial, rectified by a crystal and "press the button"—a very sensitive relay which by actuating a second relay completes the filament-lighting circuit of the three-valve set.

When the broadcasting station closes down a reverse action takes place and the filament-lighting circuit is broken. Thus it is seen that once it has been tuned this set will start and stop itself automatically and is entirely independent of any external actuating agency.

A glance at the circuit diagram will show how the cycle of operations is automatically performed. Con-



Details of Cabinet.

nected to an aerial is an ordinary crystal set comprising a tuned inductance and a crystal rectifier. In place of the phones, however, the moving coil of a sensitive Weston relay is substituted.

The moving coil of the relay is delicately pivoted between the poles of a large permanent magnet. If a very small current is passed through the moving coil it will possess a small magnetic field of its own which will

exist as long as current is flowing through the coil. The coil is so suspended that the magnetic field due to the large permanent magnet and the magnetic field that the coil temporarily possesses are at right angles. Hence the coil will rotate on its pivots and take up a position compatible with the resultant of the two magnetic fields.

Fixed to the moving coil is a light metal blade which makes contact with a metal stop when the coil moves. It is obvious, therefore, that a separate and external circuit can be closed by the movement of the coil and the consequent contact between blade and stop.

Second Relay

Owing to the very light contact between the blade and stop, it is not feasible to complete an external circuit carrying a heavy current. This difficulty is surmounted by the use of a second relay not so sensitive as the first, but capable of dealing with much heavier currents.

The field coil of the second relay is connected in series with the filament lighting battery and the blade and stop of the first relay. As soon as the first relay closes its contact points the field coil of the second relay magnetises its iron core, attracting to it an iron armature, thus

closing a second pair of contact points.

These latter contacts are wired in series with the filament-lighting supply and as soon as they close the filaments of the three valves light up.

Furthermore, by placing a switch across the moving coil of the first relay, it is possible to switch off the receiver from any part of the house.

For this purpose a wire is taken from each side of the moving coil and soldered to two terminals mounted on the panel front. Two external wires are then taken from these terminals and connected to a simple "off and on" switch situated in some convenient room — preferably beside the loud-speaker.

In this manner the set can be in one part of the house and controlled in another part. The advantages of this system are obvious. The action of the switch, of course, is to short-circuit the moving coil, thus depriving it of its magnetic field.

A full description of the theory and working of the "self-starter" will be found in the preceding issue of THE WIRELESS MAGAZINE.

The actual receiver consists of a detector valve (with reaction) transformer coupled to a low-frequency amplifying valve and further amplified by a stage of resistance-capacity coupling.

A separate aerial is used for the receiver — distinct from that operating the first relay. The same aerial could be used for both purposes, but actual experiment proved that separate aerials gave better results.

The components required for the

construction of this receiver are given in the following list:—

- Ebonite panel, 18 in. by 7 in. (American Hard Rubber Co.).
- 2 ·0005-microfarad variable condensers, with fine adjustment (Raymond).

- 002-microfarad fixed condenser (T.C.C.).
- 0003-microfarad fixed condenser and 2-megohm grid leak (Dubilier).
- 0002-microfarad fixed condenser (Dubilier).

- 001-microfarad fixed condenser (Watmel).

Weston moving coil relay (Economic Electric).

9 terminals (Belling Lee).

4 plugs and sockets (Belling Lee).

2 ebonite terminal strips, 6 in. by 1 in. and 3 in. by 1 in.

Teak baseboard 18 in. by 7 in.

Cabinet (Carrington Manufacturing Co.).

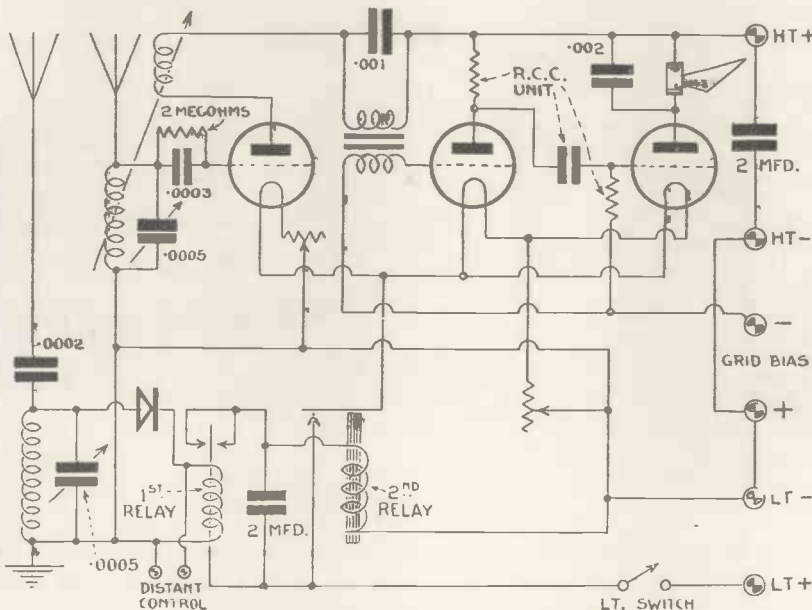
The above list does not include the parts necessary for the construction of the second relay. Of necessity these

must be made by the constructor himself, although he will find that the armature of the second relay may be conveniently adapted from the trembler of an electric bell. Sketches are given of the armature, contact points and supports.

The field coil and magnet of the second relay are made as follows: A large French nail, $\frac{1}{4}$ in. in diameter and 2 in. long forms the iron core. Two ebonite end cheeks, $1\frac{1}{4}$ in. in diameter, and about $\frac{3}{8}$ in. thick, have a hole drilled through the centres large enough for the nail to pass through with a very tight fit.

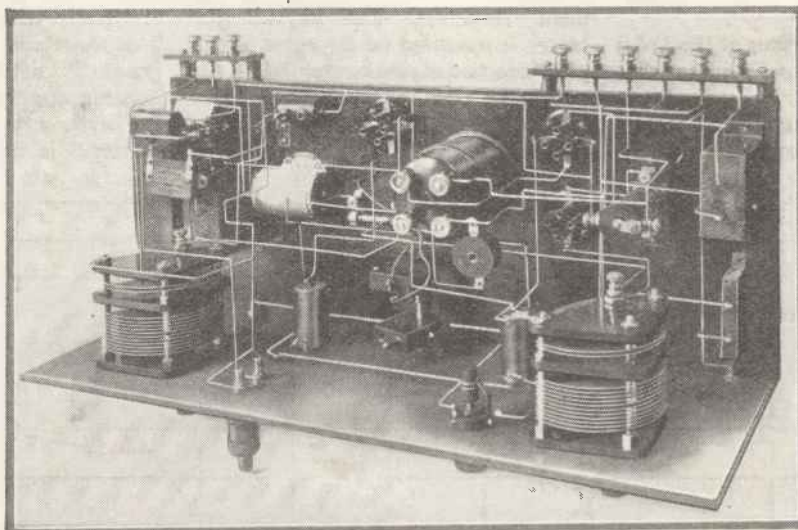
The winding space between the two cheeks is 2 in. long, this space being wound full of

No. 36-gauge wire, the two ends being pushed through small holes drilled in the cheeks. A piece of celluloid 4 in. by $1\frac{1}{2}$ in. is used to cover the coil and clamp it down to the baseboard.



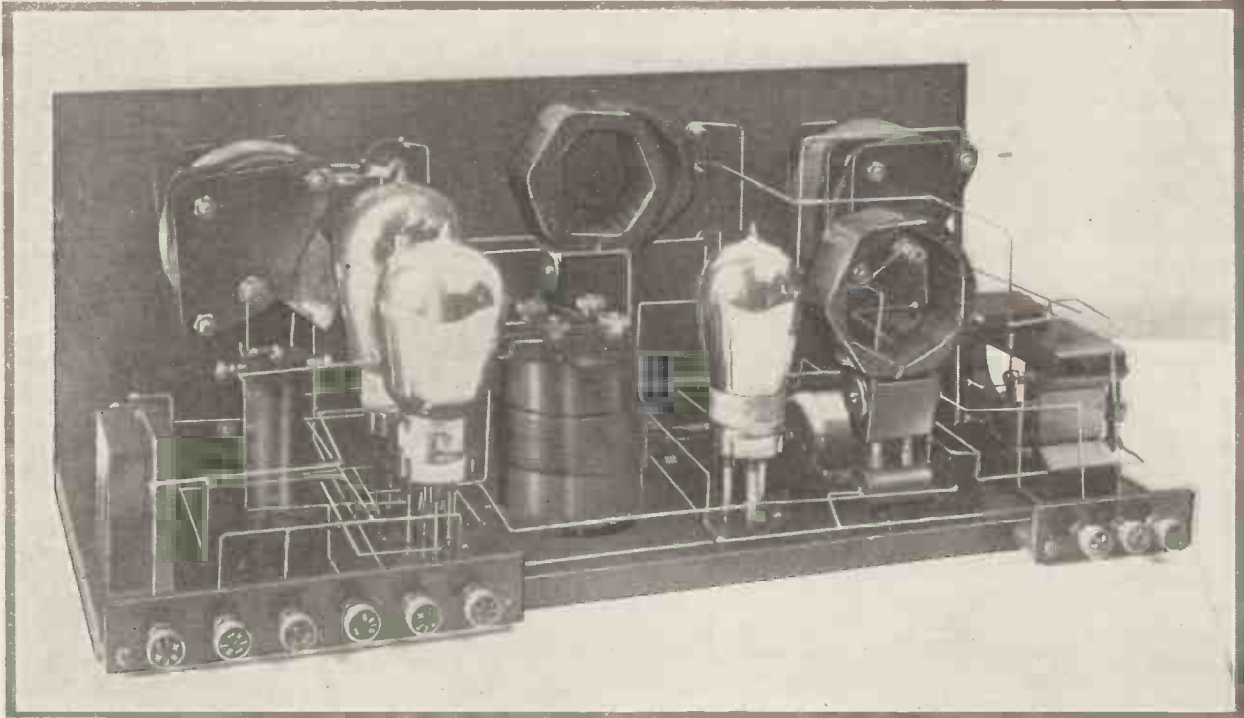
Circuit Diagram of "Self-starter" Three-valver.

- Crystal detector (Wates Bros.).
- 2 filament rheostats (Lissen).
- Push-pull switch (Lissen).
- L.F. transformer (M.L.).
- Resistance-capacity coupling unit (Polar).



View of Completed "Self-starter" Three-valver.

- 3 baseboard-mounting valve holders.
- Fixed coil holder.
- Panel-mounting two-way coil holder (Aermonic).
- 2 2-microfarad condensers (T.C.C.).



In this photograph of the "Self-starter" Three-valver the second relay is behind the right-hand coil.

The ebonite panel is a standard size and therefore requires no cutting. With the exception of the crystal detector all the components are one-hole fixed, thus facilitating drilling operations. Altogether 16 holes must be drilled, including those for attaching the panel to the baseboard.

Drilling the Panel

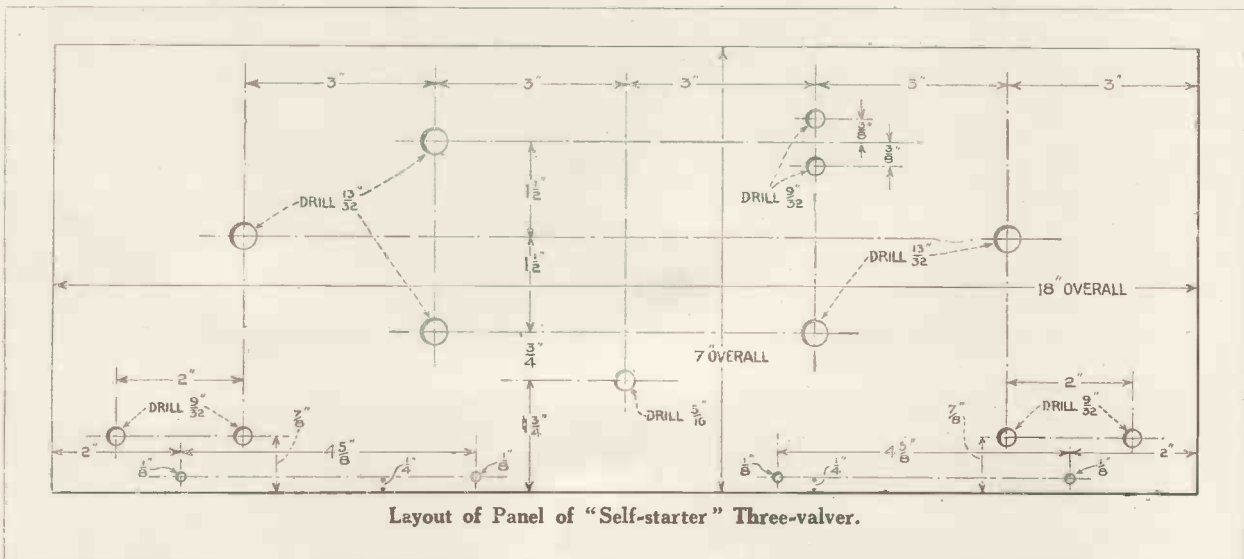
The positions and sizes of the holes are shown in the panel-drilling diagram, which should be reproduced full size on to a sheet of paper to be used as a drilling template.

The two .0005-microfarad variable condensers are mounted on the left and right of the panel. That on the left tunes the coil of the crystal circuit, whilst the other tunes the coil of the actual receiver.

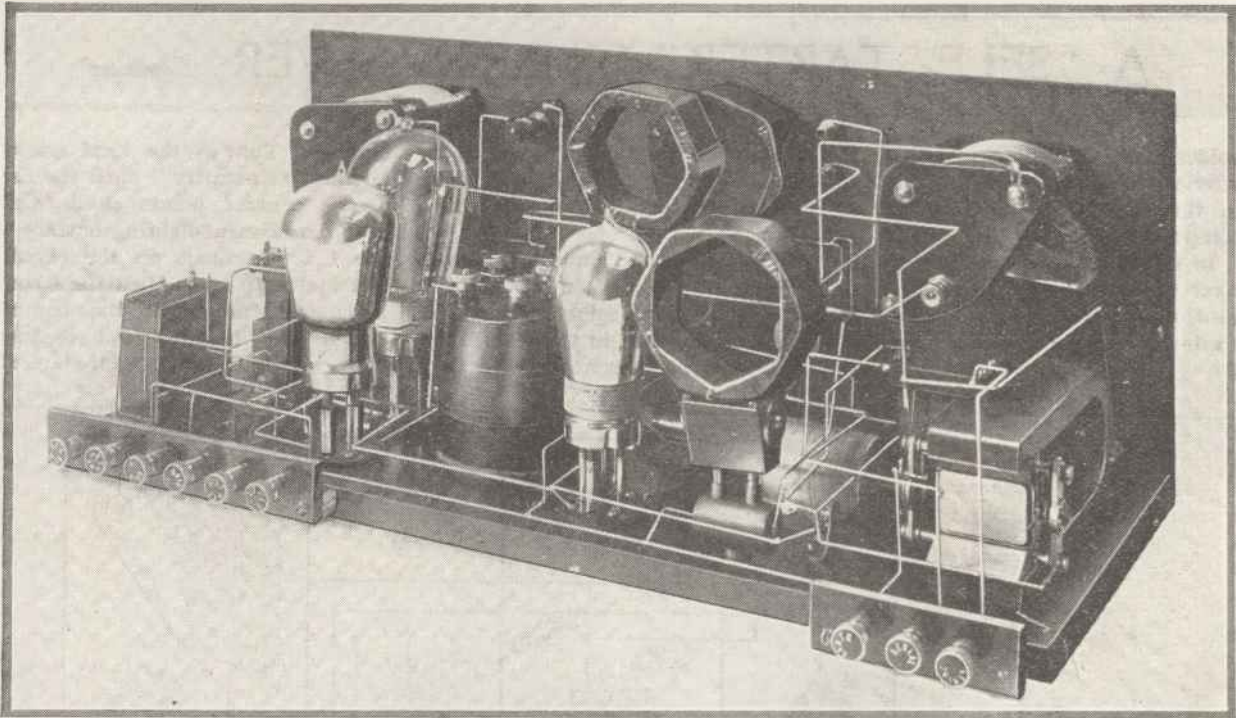
Beside the left-hand condenser is mounted the crystal detector and directly underneath one of the filament rheostats. The crystal detector is mounted on two pins which plug into two sockets mounted on the panel in the position indicated. In the centre of the panel at the bottom the two-way coil holder is

mounted, leaving enough room at the back vertically and horizontally to allow of free movement of the coils. The layout of the components on the right-hand side of the panel is symmetrical to that of the left-hand side.

An off-and-on switch of the "push-pull" type is mounted symmetrically with the crystal detector. This switch is intended for the purpose of cutting off the filament-lighting supply at such times when the automatic action of the "self-starter" is not required. This ob-



Layout of Panel of "Self-starter" Three-valver.



Compactness is a feature of the "Self-starter" Three-valver, as can be seen from this photograph.

viates the waste of current when, for instance, no one is at home.

Distant-control Leads

Two sockets are mounted on the right for phone or loud-speaker plugs and two sockets on the left for distant-control leads.

The baseboard consists of a piece of hard wood, such as teak, 18 in. by 7 in. by $\frac{1}{2}$ in. thick, on which are mounted the remainder of the components. Their arrangement is given in the wiring diagram.

Two ebonite terminal strips are

mounted at each corner on the edge of the baseboard. The smaller strip mounted on the right-hand corner carries the two aerial and the earth terminals, whilst the left-hand strip carries the H.T., L.T., and grid-bias terminals. Directly behind the smaller strip the "self-starter" mechanism is screwed down.

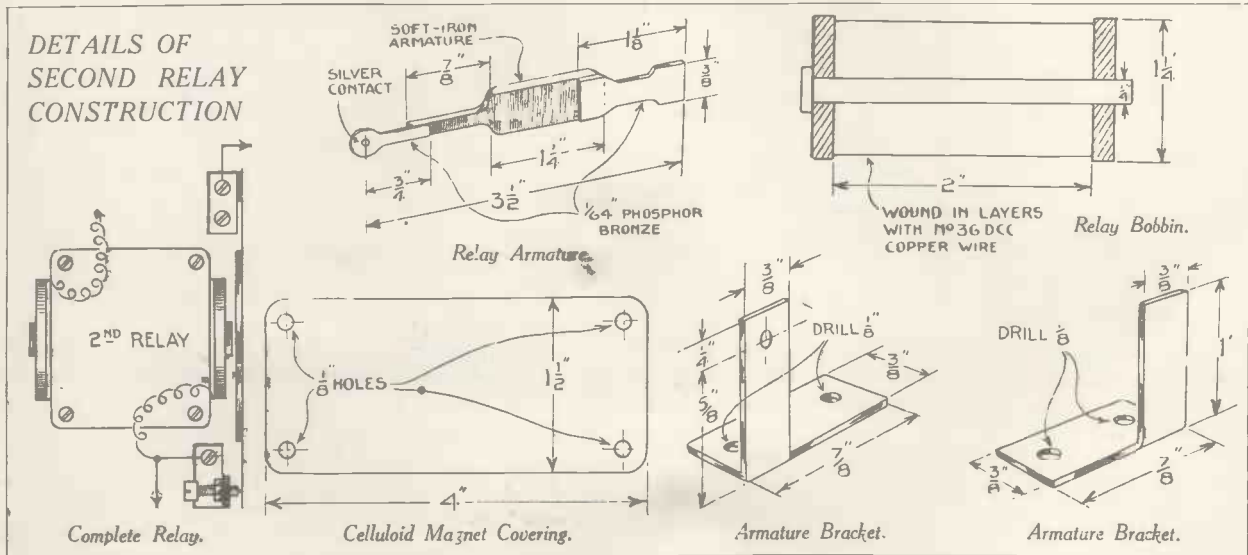
A sketch is given showing the mounting of the second relay's field coil and armature. The contact points of this relay should be adjustable and preferably tipped with silver. Across the contact

points of the first relay is connected a 2-microfarad fixed condenser to prevent any sparking.

Components on Baseboard

The remainder of the components relating to the actual receiver are screwed down to the baseboard as shown in the wiring diagram.

The whole assembly may now be wired up, particular care being taken to allow plenty of room for the rotary movement of the reaction coil. For the sake of convenience it is advisable to wire up the valve



A "SELF-STARTER" THREE-VALVER (Continued)

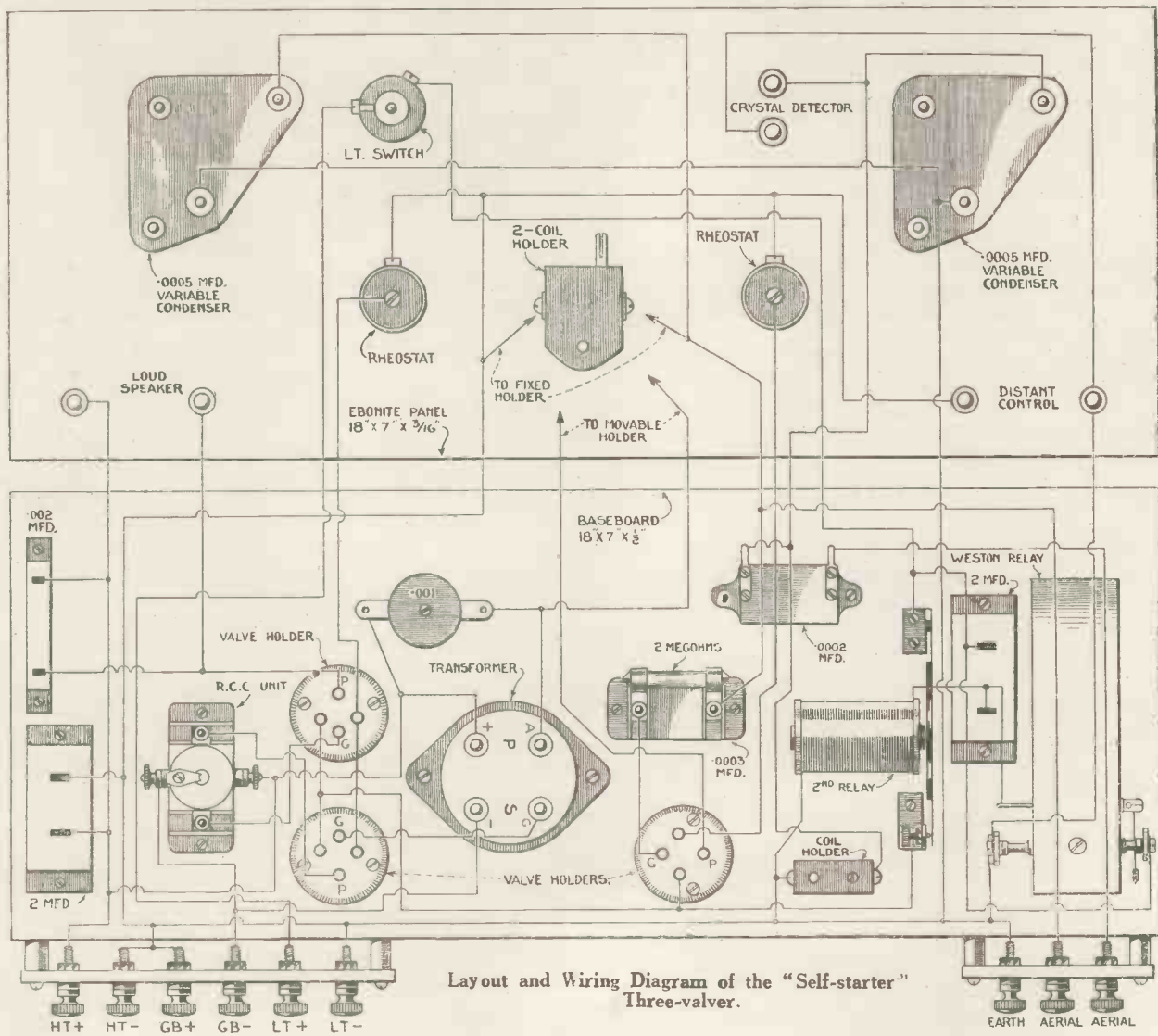
holders and filament rheostats first, after which attention may be turned to the larger and more accessible components.

In the construction of the original receiver it was found more convenient to leave the wiring of the "self-starter" to the last. Indeed, the set should be wired up first and

moving coil the contact blade should move either up or down and make positive contact with one of these stops.

Which stop the blade makes contact with depends on the crystal detector. By plugging the latter in one way and then in the reverse the blade will make contact with each

manner. Tune-in the local station on the "self-starter" until the first relay's contact points close. Connect the filament-lighting battery to the L.T. terminals on the ebonite terminal strip and adjust the second relay armature until the contact points are making good contact. Now de-tune the "self-starter"



Layout and Wiring Diagram of the "Self-starter" Three-valver.

tested in order to make sure that there is no fault in the wiring.

Assuming that the wiring has been completed, the next step is to adjust the two relays. The contact blade of the Weston relay works between two adjustable metal stops, and it is essential that when the rectified H.F. currents pass through the

stop alternately. The adjustment of the contacts should be so fine that, by de-tuning the aerial coil by means of the variable condenser the contacts separate.

The second relay also possesses adjustable contacts, but in this case there is only one metal stop. This should be adjusted in the following

until the blade and stop separate. Immediately this happens the armature and stop of the second relay should also separate.

The "self-starter" mechanism is connected to an aerial separate to that used for the receiver. The aerial should be an efficient one, for

(Continued on page 421)

The Ubiquitous Expert

I WAS transferring my personal belongings, goods and chattels to a new house—from which you will understand that I have moved.

One of the last items brought out of the van was a four-valver, the unloading of which I, of course, personally supervised. As, comfortably nestled in my arms, I carried it tenderly through the garden gate, my next-door neighbour, who had been standing at the top of his front-door steps, came down to the pavement and accosted me.

"Moving in, I see!"

I looked around, taking in at one glance the various items which were piled up on the garden path.

"It looks like it," I answered casually.

"Nowell's my name," he said, and his face lit up with a cheerful smile. "I see you go in for wireless."

The four-valver was an awkward load; I shifted it into a more portable position.

"Just dabble in it," I answered.

"Well, see here," replied my neighbour. "You'll want to fix things up a bit—just to get the news. If you like I'll pop in at six o'clock and help you rig up something. Been at it quite a while now and flatter myself that I get wonderful reception all over the house. Folks around here dub me an expert."

"Delighted," I retorted and, nodding politely, carried my treasure into the house.

The last van had departed, leaving us, as it were, stranded on a desert isle, surrounded by the flotsam and jetsam of a particularly effective shipwreck.

Still, on a table, in an empty room, I had carefully placed my receiving set and, just as carefully, had connected up both accumulator and batteries. The grandfather's clock in the hall struck eleven, which, by mental computation, I translated into 6 p.m. On the last stroke of the chimes, I heard a hefty knock on the front door.

I remained in the empty room and tuned in 2 L O on the Children's

Hour. The maid announced "Mr. Nowell."

"Punctual to the minute, what?" he began breezily. "Just rigging up the box of tricks, eh? I'll soon get you fixed up."

The man annoyed me, he was so obnoxious. Still, he was to be my neighbour for at least twelve years, if luck, or should I say ill-luck, decreed it.

"Oh," I politely replied, "I was just tuning-in."

"Tuning-in? Why—where's your aerial and . . ."

I thought of the learned judges in the High Court.

nocently than before. "What is an earth?"

My neighbour gave me a quick look. Was I pulling his leg or was I just a . . .

"Anyway, I'm tuning-in," I repeated. "I can hear something," and I carefully adjusted the secondary vernier.

"Yes," he conceded. "Yes—you might get a squeak or so that way, but . . . Is that a four-valve set? I've got a crystal, built it myself and wired all the rooms. Wonderful results, sir, wonderful. Been very careful with my aerial and earth too.

D'you know, on Friday night, after 2 L O had closed down I distinctly heard Aberdeen."

I muttered something about "line tests" under my breath.

"No?" I feigned surprise.

"Yes, sir. Something wrong up there because they came in on 2 L O position on my slider. I expect these wavelengths are always going astray and have to be adjusted."

Should I disillusionize him or—

"One minute, please," I begged, in true B.B.C. announcer style. From a near-by case I pulled out the loud-speaker and connected it to the set.

"Why not start on the aerial," interrupted Mr. Knowall—Nowell, I mean.

I pushed down the L.F. switch and the four filaments glowed.

Boom—boom, went Big Ben—the noise reverberating through the uncarpeted hall.

"I say! What's this?" cried my neighbour, his eyes popping out of his head. "No aerial, no earth. Seems to me you're not quite such a novice as you tried to make out. How long have you been at this wireless game?"

"I dabble in it," I answered sweetly, "but I am always willing to learn. You see, I am within two miles of 2 L O as the fly crows—as the flow cries, I mean, and . . ."

Big Ben had broadcast his chimes. I looked around; Mr. "Know-all" was slamming the front door behind him.

Some people have no sense of humour. . . . JAY COOTE.

WIRELESS ABROAD

*A THREAD far up among the trees,
A box upon the ground,
The sighing of a gentle breeze,
And shadows all around.*

*Far o'er the desert's sandy waste,
Far o'er the moonlit sea,
Soft sounds of music interlaced
Bring happiness to me.*

*Good tidings of a homeland dear
Come stealing through the night.
How glad am I that I can hear
That message of delight.*

*The moon in all her fair array
Is sinking in the west.
A voice so far—how far?—away
Tells me 'tis time to rest.*

*A distant chime rings out and then
Faint tolls the midnight hour.
I think me of my kith and kin
And take me to my bower.*

J. A. H.

"Aerial?" I queried. "Aerial? What is an aerial?"

He gasped, he positively gasped, and I distinctly read a look of pity in his eyes.

"An aerial? Well, you can't hear without an aerial—and you've got no earth."

I knew it. I knew it; I could see it coming. Confident in his long experience and superior wisdom he was on the point of patronising me.

"Earth?" I said even more in-



THE TRUTH ABOUT RUSSIAN BROADCASTING

A Special Article by J. GODCHAUX ABRAHAM

FROM time to time short paragraphs are published in the newspapers to the effect that broadcasting stations of high power are being erected in Russia, but, up to the present, information regarding the development of wireless telephony in the land of the Soviets has been scanty, and in most instances particularly inaccurate.

Present Conditions

It is the purpose of this article to describe the present conditions of broadcasting in Russia, and to fully detail the experiments which have led to its advent, and the great activities which are now being undertaken to further its development in that country.

Until October, 1924, the Lenin Laboratory at Nijni-Novgorod was working entirely under military control; since that date it has been taken over by the Soviet Post and Telegraph authorities, and is operating in conjunction with the *Radio Peredacha* or Russian Broadcasting Company.

The laboratory was started in 1918, on a small scale, by an army staff of eighteen engineers and mechanics; and so great has been the progress achieved that now it employs many hundreds of skilled workmen and possesses large buildings, power stations, stores, and its own experimental transmitting station. It is, in fact, the principal factor in the development of the Russian wireless industry, and may well be termed the *deus ex machina* of the entire system.

During the period which the Soviets term "blockade," namely,

the years during which they were cut off from all foreign markets, the Lenin laboratory, through these circumstances, was compelled, on its own initiative, to adapt to its requirements for the construction of wireless apparatus any raw or semi-finished product available in the country.

The lack of certain valuable metals which could only be imported—an impossibility at the time—induced the engineers to experiment with valves fitted with aluminium anodes. For several months these were the only types they were able to manufacture, but in 1919 copper was again obtainable, and the first transmitting plant erected attained a power of about 30 watts in the aerial.

Later, new models of cathode valve rectifiers were developed, and these, working on 12,000 volts, proved highly successful. Within the next twelve months the first 1-k.w. valves furnished with water-cooled anodes were turned out, and the 3-k.w. Moscow (Komintern) transmitter erected.

The First Broadcast

In September, 1924, the Soviet Union passed a bill by which wireless telephony was released for the use of the general public. Broadcasting became an accomplished fact during the following month, and concerts were sent out by the Moscow Central station once weekly, namely, on Sundays. Transmissions had been made previous to this date, but they were only available to a select few, such as members of certain political committees, Government officials, etc.; in fact, only to those people to whom, by special favour, receiving permits had been granted.

The advent of this form of entertainment took the city by storm.

Realising the great educational possibilities of wireless, and the facility with which this method would enable the Government to enter into rapid and direct com-

munication with a population amounting to roughly 130,000,000 souls, the Soviet Union afforded every assistance for the establishment of clubs, the equipment of halls and open spaces in and around which a great number of listeners could be accommodated, and where scientific, literary, musical and political instruction could be disseminated.

Aerial Chaos

Aerials sprang up overnight in all parts of Russia's capital; use was made of any and every house; wires were slung across the streets in a haphazard manner from roof to roof. As Moscow is suffering to-day, in a similar way to other cities, from a dearth of habitations, most of the older and larger mansions have been subdivided into small suites of rooms for the working classes.

Where several tenants desired to erect aerials, every part of the building was utilised and wires were taken to trees in a neighbour's garden, or to a convenient electric-light standard in the street. The city was a network of temporary aerials, and for a time chaos and trouble prevailed.

The authorities encountered considerable trouble in enforcing certain regulations, as they were in every quarter met with the reply that "Broadcasting had been instituted for everybody's benefit, that it was in keeping with the ruling communistic ideas, and that all good citizens down to the poorest classes desired to enjoy its benefits."

At the outset, licences were only issued to true Russians, that is, born nationals, but they are now available to foreign residents. Their cost varied according to the status of the owner, and some classes of society were mulcted in comparatively high charges. But owing to the rapid development of the service, and to the ever-increasing number of listeners, licences are to-day obtainable at the low rate of 6 roubles per annum.

As this sum is considered too high, it is fully expected that it will shortly be reduced to 3 roubles—approximately 6s. a year—truly a cheap commodity!

Registered Receivers

All instruments must be registered with the authorities at a cost of 1½ roubles, but, according to statistics recently published, the Russian conscience is like that of other nationalities, somewhat elastic—Moscow boasts of about 8,000 pirates!

The Russian Broadcasting Company, under the title of *Radio Peredacha*, came into being in September, 1924. All shares are held by the undermentioned firms or organisations: The Rosta Telegraphic News Agency, The Commissariat of Posts and Telegraphs, the Weak Current Trust, comprising eleven factories, and the Main Electrical Administration (Glav Elektro). The Soviet Government is thus interested in the concern to a high degree through the medium of its Post and Telegraph department.

Receiving licences are issued by the Postal authorities in very much the same manner as in this country, the main portion of the income derived from this source being handed over to the broadcasting company, which, in addition, possesses the sole monopoly for the sale of all receiving apparatus and wireless components, including telephones, valves, batteries, and so on.

The rapid development of this industry is proved by the fact that in January, 1924, the turnover was only 32,300 roubles, whereas, in April, 1925, it had reached the substantial figure of 494,600 roubles, or an increase of 1,531.3 per cent. on the amount of business done fifteen months previously.

In a previous paragraph reference was made to the assistance given by the Soviet Union in the formation of radio clubs. A few words regarding this scheme may prove of interest to readers. It was deemed advisable to provide facilities for the reception of

concerts and speeches by the greater mass of the population, and as it was found impossible to cope with the daily increasing demand for finished receivers, it was decided to form radio societies, the membership to which would cost but a trifle, and to equip these, without delay, with efficient apparatus and loud-speakers.

So keen is Moscow on the solution of the problem of rapid communication with all parts of the country that considerable encouragement is given to all amateurs in the purchase of

assistance to enthusiasts; everything possible is done to further the desire of listening to lectures and, in very many instances, the absence of a receiving licence is winked at by the authorities!

For the Proletariat

In furtherance of the same scheme, plans have now been made to open 12,000 reading rooms, 6,500 artisans' clubs and 4,000 peasant inns, all of which will be fitted with receivers and loud-speakers.



A specimen page of the Russian wireless paper, *Novosti Radio*, which is published weekly. Of the photographs that in the centre is of Mr. Schottman, president of the *Radio Peredacha*, whilst on the right is that of Mr. Boten, assistant manager and technical director.

finished wireless receivers of a suitable pattern for the reception of near and distant stations, or for the home construction of sets with the components manufactured by the radio factory group of the Russian Broadcasting Company.

Advisory offices have been opened in many quarters of the larger cities to give the necessary technical

The following stations are either already in operation or in course of construction:

Moscow, Radio Peredacha, an experimental transmitter, 375 metres (4 k.w.).

RDW, Moscow Central or Komin-tern station, 1,450 m (25 k.w.).

Sokolniki, now called the Popoff station, in commemoration of the

The Truth about Russian Broadcasting (Continued)

great Russian inventor of that name, 1,010 m, 2½ k.w.

Trades Union Council station, 450 m (1 k.w.).

There are also two other 500-watt stations working irregularly on 675 and 305 metres.

High-power Station

Chablovka, 1,450 metres (50 k.w.) is the high-power station recently erected in the neighbourhood of the capital. It is to be fitted with the new 100-k.w. water-cooled valves, and should be testing by the end of November. It has been built for both wireless telegraphy and telephony and will, when ready, take over the service at present worked by the Central or Komintern station.

Leningrad, 800 m. (2½ k.w.).

Kiev (Ukraine), 1,000 m. (5 k.w.).

Rostov (Don), 4 k.w., Nicolaevsk, 8 k.w., Ekaterinburg, 4 k.w., under construction.

Further stations of the Chablovka type are also being erected at Tiflis and Chabarovsk, but their power will not exceed 20 k.w.

The *Radio Peredacha* also has under construction a special receiving station, in the neighbourhood of its laboratory at Moscow, with a view to relaying Daventry, the Eiffel Tower, Radio-Paris, Königswusterhausen and other transmissions. If successful, these concerts will be relayed, in their turn, via overhead cable, to distant transmitters throughout Russia.

In Touch with the B.B.C.

In connection with this scheme, it is interesting to note that Mr. Poliakoff, a well-known engineer, temporarily residing in London, has been for some time past in touch with the B.B.C. authorities in regard to the necessary arrangements for the proposed relay of Moscow symphonic and operatic programmes to this country.

The establishment of a further thirty broadcasting stations is contemplated by the Soviet Union but, in view of the difficulty experienced in coping with the demand for the necessary transmitting plant, it has been decided to adapt most of the wireless telegraphy installations to telephony, and to put them at the disposal of the broadcasting officials

during those hours at which the stations are relatively free from commercial and other duties. By this means they will be used for the ordinary transmission of concerts and political talks.

These steps are merely being taken as a temporary measure, as all apparatus has already been designed by the Nijni Novgorod laboratory.

Russia's Broadcasting Activities

The first broadcast was made in October, 1924.

Broadcasting is controlled by the Soviet Post and Telegraph authorities and operated in conjunction with the Radio Peredacha or Russian Broadcasting Company.

Receiving licences cost 12s. a year.

Every receiver must be registered at a cost of 1s. 6d.

In fifteen months between January, 1924, and April, 1925, the turnover of the wireless industry increased from 32,300 to 494,600 roubles (say £49,460).

The authorities installed in various clubs during a period of seven months, 250 loud-speakers in Moscow, 1,030 in other towns, and 500 in distant villages.

and work is being carried out by the Weak Current Trust. The stations will all be fitted with valve transmitters fed by a three-phase alternating lighting current converted by motor-generators.

In most of the big cities large numbers of small crystal sets are used, but the Radio Trust, in order to satisfy the requirements of more distant listeners, have placed on the market three different types of valve receivers. These are all capable of tuning-in wavelengths between 300 and 3,000 metres, and most of them are built on the *unit* or *block* system well known in Great Britain.

More elaborate circuits have been evolved and 10-valve super-hets are being made.

Professor Bontsch Brujewitsch, who is attached to the Lenin Laboratory, and to whom is due the new cathode valves with external water-

cooled copper anodes which are destined for the new Chablovka station, is also responsible for a new type of dull-emitter valve working on 0.0045 ampere, which only requires 8 volts high tension. These are being tested in a super-regenerative type of circuit which the Radio Trust will shortly manufacture under the title of Microdyne.

New Transmitter

Whilst on the subject of experiments, mention must be made of the work done by Professor Rojanski and the engineers Tatarinoff and Chapochnikov, who have invented a new telephony transmitter which is now being tried at the Peredacha experimental station. Broadcasting will take place simultaneously on two different wavelengths from the same aerial. Tartarinoff is also interested in short waves and has transmitted on wavelengths as low as 9 metres.

Speech on wavelengths of 20 and 26 metres has been clearly received during the daylight hours at Taschkend. Chapochnikoff, another experimenter, has built a small transmitter for the little Komintern station at Moscow. It is fed by the municipal three-phase alternating electric current, is housed in two small cupboards, one of which contains six kenotron rectifiers, and the other the transmitting and modulating panels.

A. J. Lossev, the young engineer to whom the oscillating crystal circuit is ascribed, and who is now working on his Crystodyne transmitter and receiver, has already been mentioned on many occasions.

Official Broadcasting Journal

In February, 1925, the Radio News, or to give it its Russian title, *Novosti Radio*, was published for the first time. It is a weekly paper (we give illustrations on these pages) containing all the broadcast news, wireless circuits, programmes, as well as articles of general interest. The contents of some of the columns as well as entire paragraphs from the daily newspapers are read before the microphone and thus broadcast twice daily. The transmission of the news bulletin alone usually lasts about an hour. A special bulletin is broadcast during the luncheon hour when the

workpeople are enjoying their mid-day meal.

It is for this purpose, amongst others, that the radio clubs and rest houses were instituted in order that the lower classes could adjourn to

taken as typical of those given out by the other cities of the Soviet Union; although, of course, certain modifications have been made to suit local tastes and requirements.

In the capital there are two main

medical and hygiene talks, and lectures on the various aspects of agriculture are broadcast for the benefit of the peasants. Wireless circuits published in the *Novosti Radio* are explained over the microphone, and



Russian broadcasting artists: another specimen page of the *Novosti Radio*.

these premises during intervals of work.

The programme of transmissions has been modelled, with the exception of certain definite items, on those sent out by broadcasting stations in the neighbouring countries. The Moscow transmissions may be

concert transmissions daily, to which artists from the Opera House and celebrities from the Russian music world contribute vocal and instrumental items. During the season, relays are made of performances from the larger theatres.

Other hours are devoted to legal,

competent engineers give talks on various technical matters.

On most days of the week special hours are reserved for children and scholars. They are respectively called "The Young Lenin" and the "October Pioneers," the former in

(Continued on page 420)

An Article for
Everybody
Who Owns a
Set

Cut Out Those Interfering Stations!

How to Make an Eliminator that Will Cut Out Two Sources of Interference at the Same Time



THOSE of our readers who live in big towns have the doubtful advantage of living on top, so to speak, of a broadcasting station.

Against the Valve-set Owner

This is all very well for the crystal enthusiast who has little or no interest in other more distant stations, but the man who possesses a valve set and desires to listen to stations other than the local one will find such an ambition exceedingly difficult to realise.

Indeed, the question: "How can I cut out my local station?" is becoming increasingly acute.

The wavetraps are the best of the more simple remedies yet evolved. Most of the wavetraps that have been described are designed to cut out one source only of interference. It must be remembered, however, that there are places, especially on the coast, where more than one source of interference is experienced.

The local station transmitting on a wavelength of, say, 400 metres, to-

gether with a broadly-tuned spark transmitting station on 600 metres, may entirely blot out the reception of another station working on 450 metres.

In order to receive that station without the annoying "background" formed by the other two stations it would be necessary to use a wavetraps that would cut out both sets of interference.

A piece of apparatus which will do this is described in this article.

Circuit

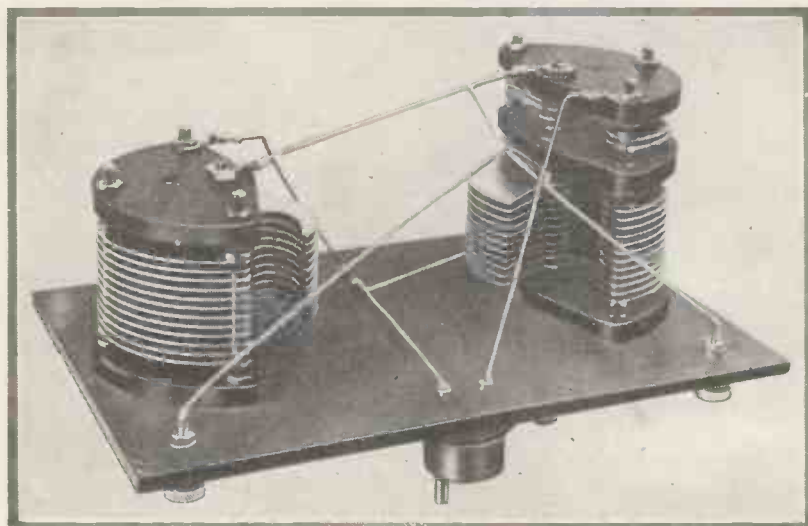
A glance at the theoretical circuit diagram will show that the name "wavetraps" in this case is in reality a misnomer. The two interfering sets of waves are not trapped. They are drained off from the aerial.

In technical terms, the interference eliminator consists of two acceptor circuits, both of which are tuned to the wavelengths of two interfering stations and both of which reject the waves of the station it is desired to receive, passing them on to the actual receiver where they are tuned-in in the ordinary way.

A list of the components required to build the eliminator is given below:—

Radion ebonite panel, 9 in. by 6 in.

2 .0005-microfarad variable con-



View of Wiring of the Interference Eliminator.

Designed by the Technical Staff of "The Wireless Magazine"

condensers, one fitted with vernier (Wates "K" square-law).

2 panel-mounting coil plugs.

3 terminals (Belling-Lee).

No. 18-gauge square-section tinned-copper wire.

Small Expense

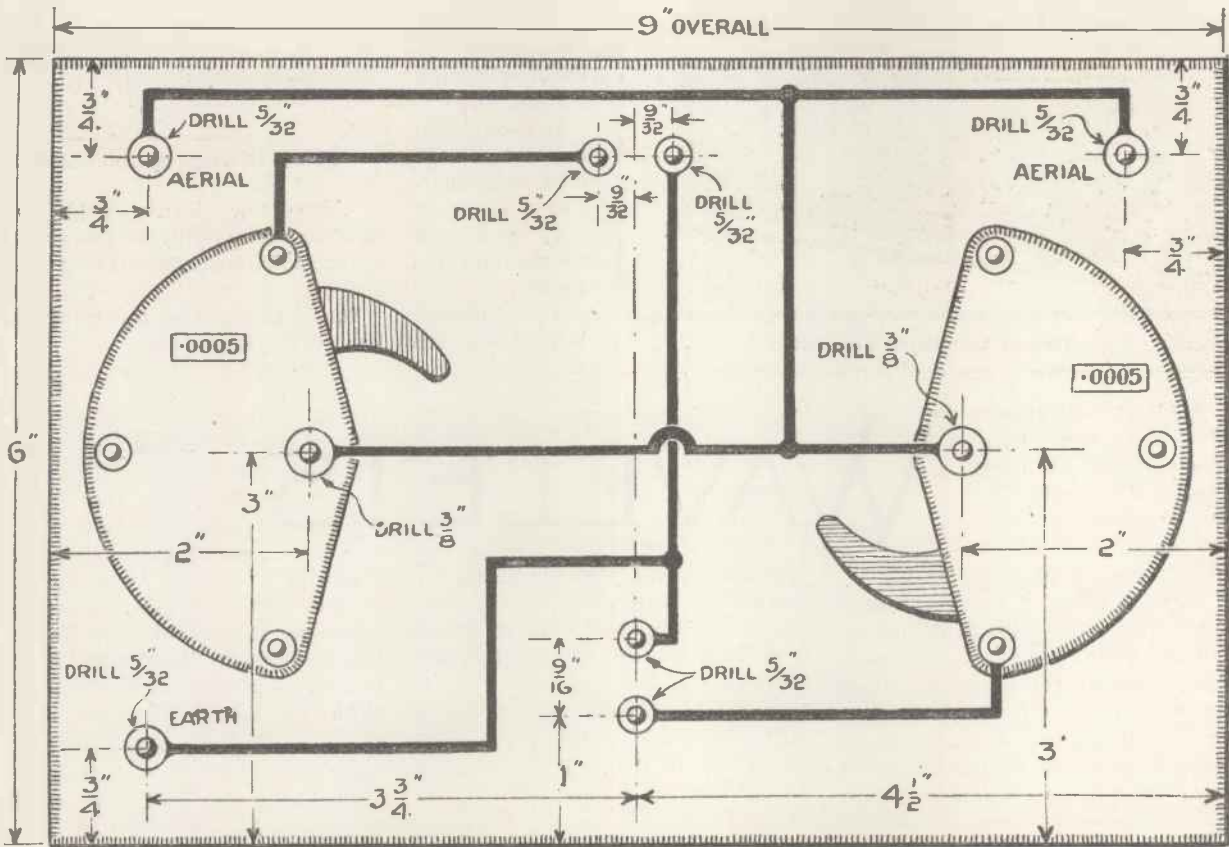
It is very likely that the constructor has most of these components in his possession already. In any case,

The components can now be fixed to the panel—a very simple matter, both condensers being of the one-hole fixing type. Each of the coil-holders is fixed by means of two 6 B.A. cheese-headed screws which also serve as sub-panel connections to the plugs and sockets.

Having mounted all the components, wiring may be started. All joints should be soldered, tags being

output terminals of which are joined to the aerial and earth terminals of the set.

If interference is caused by only one station then it is only necessary to plug a suitable coil into one of the coil-holders and to tune it to the wavelength of the interfering station. If two interfering stations are heard, two coils capable of being tuned to the interfering wavelengths are re-



Panel Layout and Wiring Diagram of the Interference Eliminator.

so little is required that the expense will be quite small.

Drilling, Mounting and Assembling

Cut a piece of paper the same size as the panel and mark on it the positions of holes to be drilled. Place the paper on the top of the panel and attach it in some way (a paper clip will do quite well), and mark through on to the panel by means of a sharp-pointed tool.

The paper can now be removed and holes drilled at these marks to the sizes indicated on the panel-drilling diagram.

provided with the variable condensers for this purpose.

The application of heat to a terminal often has the effect of loosening the nut. Consequently every nut should be tightened up after soldering operations have been completed. With the help of the wiring diagram little difficulty should be encountered in the actual wiring.

Using the Eliminator

Instead of attaching the aerial and earth leads to the receiver in the usual way, these wires are connected to the aerial and earth terminals respectively of the eliminator, the

required, each "drain circuit" thus formed being tuned to one of the interferences.

Tuning Complications

Owing to the increased number of controls, tuning will naturally be more complicated and signal strength slightly impaired. This decrease in signal strength, however, is an unavoidable evil, and it is left for the reader to choose whether he prefers loud signals accompanied by distortion produced by interference, or signals that are not quite so loud, but perfect in reproduction.

When the receiver is situated very

Cut Out Those Interfering Stations! (Continued)



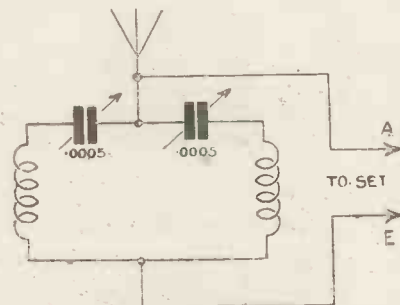
View of Completed Eliminator.

close to the transmitting station it is advisable to take further precautions against interfering stations by so arranging the aerial that its position of best reception is opposed to the transmission of the broadcasting station.

A good counterpoise will also help matters considerably and will sharpen up the tuning.

If interference is very bad, the

addition of a high-frequency amplifying valve will greatly improve the selectivity. The tuned-anode method of coupling the valves is recommended for this purpose.



Circuit Diagram of Eliminator.

These few latter suggestions, however, only apply to cases where the local station jams out everything else.

It will be seen that this Eliminator has great possibilities.

WIND instruments over three thousand years old are being used in Denmark. We had no idea that wireless uncles lived to such a ripe old age.

"WHAT is value?" was the title of a recent lecture from Nottingham. We are thinking of putting the question to our Aberdeen representative, whose expert opinion may be useful. It is really quite unnecessary for 2 L O to broadcast time signals every day. Most of their listeners are also users of the—you know, the railway I use, so that an odd five minutes does not matter much.

It is stated that B.B.C. experts are considering the question of getting more life into the programmes. Not more death, as it seemed when the Grand Guignol broadcasting began.

A BAGPIPE performance did not arouse much enthusiasm amongst the Nigerian natives who listened-in at Wembley. Which shows that in one respect they must be more civilized than we are.

ALL tastes are catered for in the American wireless programme, says a New Yorker who is over here. But he himself has had to come to England to satisfy his taste for a decent drink.

WAVELETS

WORKING men's clubs in Russia are being fitted with loud-speakers. We were of the opinion that they had been so equipped for the last few years.

How useless are such talks as "Farm Water Supplies" which was recently given from 6 B.M. Why, we have never met a single farmer who drinks the stuff.

THE clergyman who conducted the first wireless service from Nottingham was named Hale. That evidently accounted for his hearty welcome.

THE railway centenary celebrations that were broadcast included remarks by the porters. In the interests of good order it is to be hoped that the Billingsgate fish market authorities do not embark on a similar commemoration.

AN extremely important item in connection with wireless sets, says an advertisement, is the cost of upkeep. That explains why many listeners refer to their sets as "she." AMERICA's universal call signal should be H₂O.

AN experimenter says he picked up Russia with a crystal detector. He must have been making a noise like a trade-union delegation.

A LISTENER wants to know all about the Silent Fellowship, which has been mentioned in the Cardiff programme. We can assure him that it has nothing whatever to do with the Mothers' Union.

A SCENT tester recently insured her nose for a large sum. The Postmaster-General would have needed to protect his officials in a similar way if the inquisitorial provisions of his original Wireless Bill had gone through.

FATHER: "I can't for the life of me understand how the human voice can be heard for miles and miles without wires."

SON: "Why, dad, it's easy. Y'see, it's a magnetic wave in the medium of ether radiated from a transmitting aerial which induces high-frequency oscillations of full amplitude into another receiving aerial which has to be electrically tuned to the frequency of the transmitted radiated wave, and this . . . why, dad, whatever is the matter?"



When YOU are Invited to Broadcast!

A Special Article by
EUSTACE MILES, M.A.



Photographs by Miss Joyce Hammond

THE first hint that I would give is with regard to the position of the body. The head should be held well up, though not to an uncomfortable degree. Although I fully realise that the announcers at the broadcasting headquarters announce, as a rule, well and clearly, I cannot but condemn the general rule that the speakers and talkers should read from a written or typed manuscript, for this often means that the head is held down; and sometimes, also, there may be some hurry.

Limited Time

To limit a person to a certain number of minutes, though a convenient and natural rule, is, in a vast number of cases, to ruin the ease and leisureliness of the talk.

The wrong position of the body, and especially of the shoulders and head, may lead to a cramping of the muscles of the throat and to a contraction of the lungs, and to very poor voice-production, partly due to very poor breathing.

To get the body in the right position needs considerable practice. The art of deep and full breathing needs considerable practice also. The speaker, as well as the singer, should have deep and full breathing under control, whereas too many people use the upper breathing, and do not use even that at all well. Very often they speak with their lungs only half full, and with a breathing that has no rhythm at all, but is jerky and shallow.

Relaxed Muscles

It is a great help to speakers to keep as many muscles as possible relaxed; to keep relaxed the muscles not only of the hands and eyes, but also of the throat. It is surprising how this brings a feeling of ease,

and imparts a sensation of ease to the hearers as well. Good actors and actresses are masters and mistresses of the art of relaxing their hands in particular.

There should be a deep and thorough inhaling before the speaker begins.

Speakers should try to throw their voices up instead of letting themselves speak down. One of the famous teachers of voice-production advised his pupils to throw their voice almost

So universal is wireless becoming that at any time you may be invited to broadcast. What will you do when you face the microphone? Will you be a success or a failure?
The choice of words, and therefore the choice of ideas, is vitally important. But even when you have something good to say, the effect may be marred through inferior voice-production.
In this article Mr. Eustace Miles gives practical hints that you should read. Some day you will be glad of his advice.

as if they were throwing a stone to a distance: that is to say, to throw their voice up into the air.

As to the direction of the voice, there are many different opinions; but, if people speak, as it were, up towards the roof of their mouth, or towards their nose, I think they would get a much better effect than if they produced their voice in the usual haphazard way.

I now come to a point of very great moment. It is the pronunciation of the consonants. The consonants should be very clear and distinct.

Usually speakers slur their consonants; and this is not so bad in ordinary conversation, but in speaking it is a great handicap to the audience. The (all too common) sloppy and inaccurate rendering of our English consonants makes many speakers extremely difficult to understand.

Singing Words

Singers are, I think, to blame much more than speakers; in fact it is not often that one has the ghost of a notion of what words the singer is using! Again and again I have puzzled myself to find out what the words were. Again and again I have guessed entirely wrongly. Why people should mar the English language as if it were Italian, I cannot conceive. I wish it were insisted on, in each concert hall and in each place where people speak, that English was the language required.

As it is, most singers refuse to say the word "all" at all. Some of them call it "oil"; some of them call it "arl." The veteran actor, Mr. Barnes, is very severe in his condemnation of this false English language, which I call *Singlish*.

Priggish Effect

Of course, there should not be too much exaggeration in the direction of clearness, since this gives a priggish effect. Many so-called "elocutionists" make the mistake of being far too distinct. They are aggravatingly unnatural because of this.

I think that a lot of difficulty would disappear if people were leisurely in their pronunciation, and were not in so much of a hurry.

Another very simple hint, besides the clear pronunciation of consonants, is not to drop the voice, but

(Continued on page 416)

Some Technical Points

ELUCIDATED BY FISHGLUE

I'VE just come to the conclusion that our amateurs are not sufficiently *au fait* with the *raison d'être*. (That's rather a good start, isn't it?) Now, if your set just won't, it doesn't follow that the high tension is too low,



The landlady's daughter has been playing ball

or that the landlady's daughter has been playing ball with the batteries, it's probably due to a technical fault.

Now that's just what I'm eternity, or here after, if that sounds better, this trip, merely to clear up a few



And that's where the trouble comes in

technical points. For example, I ask you, do you know the main point about a tuning coil?

It isn't low-lossness, a low high-frequency resistance, or little self-capacity, or distributed capacity, but

merely this, that the intensity of the field inside it must be of this order of magnitude, namely $4\pi nc$.

Lots of people don't realise this, and that's where the trouble comes in, as the merchant worried with bills said with regard to the pillar box. It's essential that amateurs insist on this point!!

The idea is sound, and can be traced a long way back. What does Chaucer say?

Tuning troubles to avoide,
Use ye coil that's solenoide.
Moreover, its intensity,
Might just this be, $4\pi nc$.

"C" stands for current, of course, π for the sort that mother made, you know:—

"I fill my skin right full within,
With π 's like mother made."

to quote Bede, in his "Monastic Musings," n , for the number of turns, and 4 —well, because it would look silly lying down. Also, what did Louis XVI's technical adviser say, in his quaint old-time French, which you probably won't understand?

Je ne sais pas, que cique c'est,
L'intensité était yesterday,
Mais, il travail bien aujourd'hui,
Car c'est precisement, $4\pi nc$.

And that all goes to show you, doesn't it?

Then again, your condensers must also be very carefully considered.

Their capacity must always be $\frac{KA}{4\pi d}$.

"K" stands for a constant, because it's spelled with a "c," 4 and π , as before, and "d"—not what you think, but for distance. (There may be something missed out here, but I'm not quite sure.)

If the capacity of your condenser does not conform with this, take it back and buy a square-law.

Lord Kelvin was most emphatic on this point. He said:—

To buy a condenser just refuse,
Till they calibrate the hypotenuse;
And the N.P.L. must swear to thee,
Its capacities KA upon $4\pi d$."

I'm sure that neglect on these points is responsible for a huge amount of trouble, otherwise, why should my secretary keep handing me letters like this?—

"Please tell me why my set won't work."

"What is the matter with my outfit?"

"Why do signals stop when I turn the top knob, and not when I pull the bottom one?"

Only the other day I received a

So we miss Cla'a's solos



very touching letter from "Troubled"—Timbuctoo, who writes:—

"Show me the way to get Rome,
I've tried when I should have been
in bed,
I thought I heard a howl from IDO,
And it's gone right to my head.



I snapped my fingers,
ha! ha! ha!

I've added an extra megohm,
But the thing won't even groan;
And I know why the grid leaks and
that sort of rot,
But I don't know the way to get
Rome."

Sad, isn't it?

Then again, Bright and Binged writes from Bungleham :—

There's a champion programme from ZY each night,
But the rattlebox shies, and it won't function right.
So we miss Clara's solos " Sing High and Sing Low,"
And the violet concertos by Prof. Ikey Mo.

That's sad, too, isn't it?

On the other hand, since publishing several articles given originally as papers on Comic Sections to the Académie Français d'Applied Elec Tricks, I have received several encouraging letters. Just listen to this one :—

We made it to function at 4π nc.
The condenser condenses upon 4π d.
The music's très charmant,
Très belle, sir, mais oui !
Yours, beaucoup respectfully,
Jean et Marie.

Now I hope you've taken that to heart. Just a few more words. There are a lot of nasty people who don't have licences, whose motto is:— " Music pour tous, pour nowt," a Franko-Yorkshire expression which I don't like. Their arms is an aerial rampant, on a bedroom d'or, or is it door?

I was talking to one the other night, and he expressed his sentiments as follows :—

I snapped my fingers ha ! ha ! ha !
And I snapped the other one ho ! ho ! ho ! ho !
I don't care for the P.M.G.,
He can take a walk to Jericho with the B.B.C.
So I go up in my attic and howl away,
And if the tyros all had my sense,
The " Do as you're told " would leave them cold,
And they'd never buy a blighted licence.

Those people will come to a bad end! Oh ! and another point, to those of you who don't use filament resistances.

I should like to point out that it is a much better way of putting the valve out than punching the pip with a spanner. " And why ? " you ask being quick at repartee—simply because they light again easier, this way.

And now to conclude on a cheery note :—

If your valve set's always dumb,
Never mind !
Better days will surely come,
Never mind !
When the acid starts to bubble,
And you can't afford a double,
Write to me about your trouble,
Never mind !!

Bye-bye, everybody !

FISHGLUE.

WHAT CRYSTAL TO USE—AND WHEN

It is a matter of common knowledge that the majority of crystals in use at the present day are composed of either natural or artificial galena. Such crystals belong to the "-ite" family, and are all more or less satisfactory.

Without entering into the vexed question of the relative efficiency of natural as compared with manufactured galena, it may be fairly stated that the latter is the more stable, though not the more sensitive of the two.

Before Broadcasting

Before the innovation of broadcasting there was a large number of different crystals at the disposal of experimenters. Nowadays their place has been taken by hertzite and its many relations, and also to a small extent by perikon and carborundum.

Hertzite crystals, though sold under various names (mostly terminating in "-ite") are all very much of the same appearance and sensitivity. Any deviation from the normal is found in the individual specimen and not in the type.

Such specimens should be carefully looked after and treated as valuable possessions.

A perikon detector consists of two crystals, zincite and bornite or copper

pyrites and bornite, which make contact with each other at varying pressures. The perikon combination is much more stable than hertzite.

Carborundum is the most reliable crystal of all, but requires a battery and a potentiometer; the potentiometer regulates the current passing through the crystal in order to obtain the maximum sensitivity. The contact is a steel plate or needle.

The choice of a crystal depends largely upon the work it has to perform. In simple crystal circuits without valve amplification hertzite is about the best for general reception and the catwhisker should be a spiral of No. 30-gauge copper wire.

Hertzite will give loud and clear reception within fifteen miles of a main broadcasting station; after this signals, though wonderfully pure and clear, are rather faint. Of course, there are numerous exceptions where this limit has been exceeded, but generally ten to fifteen miles is the maximum range for really enjoyable reception.

L.F. amplification with a crystal detector is perfectly satisfactory, and very good loud-speaker reception can be obtained with this combination; radio-frequency amplifi-

cation presents more difficulties as the valve in this case comes before the crystal and often interferes with its rectifying properties.

Carborundum is the most reliable combination with H.F. amplification, but the battery and potentiometer often prove troublesome especially to beginners.

The same remarks also apply to dual-amplification circuits which employ crystal detectors; on the whole, however, hertzite is preferable in reflex sets because the potential necessary for carborundum introduces complications.

Care in Adjustment

In such circuits special care should be taken to find the most sensitive spot on the crystal and the most satisfactory pressure if the best results are to be obtained.

Particularly does this apply to receivers in which reaction (direct or indirect) is used.

In conclusion, remember how sensitive most crystals are to extremes of temperature, as well as to dust and grease. Treat them with care and they will give good service. Above all, handle them with tweezers and not with the fingers. If these precautions are observed crystals will retain their sensitivity for an astonishingly long period. G. J. M.



Success with Your Valve Set

IT is extraordinary how a pair of "straight" valve receiving sets, constructed by two amateurs from precisely the same components but rather upon different lines, can vary in their performances.

Look for a moment at the two circuits shown in Figs. 1 and 2. Each is a two-valver consisting of a rectifier and a single stage of note magnification. Which of the two would you put down as the more efficient, supposing that valves, components and batteries of exactly the same make were used in each? Do not read further until you have made your choice.

There cannot be any doubt about it that the Fig. 1 circuit is by far the better of the two, though, as we shall see later, it could be improved in one or two ways. The circuit shown in Fig. 2 has what is known as a single-circuit tuner, the aerial-tuning inductance being common to both the aerial itself and the grid circuit of the valve. This means that the whole of the damping due to the aerial is introduced into the grid circuit of the valve, reducing signal strength and flattening out the tuning.

A set of this kind can never be selective and it will not be of much use for long-range work. If we introduce reaction directly on to the A.T.I. we shall find that a fairly large coil is required and that it must

be coupled pretty closely to do much good, for a great deal of the energy introduced into the A.T.I. by the reaction coil goes simply to counteract the effects of aerial damping.

In a receiver such as that seen in Fig. 1 we can work with a very loose coupling between the A.T.I. and the C.C.I., thus reducing the amount of damping in the grid circuit and increasing both the sensitiveness and selectivity of the

by using inductances of the very best design. For long-wave work a parallel A.T.C. is desirable. A suitable series-parallel switch is shown in Fig. 3A.

But there is still one thing lacking in the better circuit to make it quite satisfactory. It must be remembered that in the receiving set we are dealing with two sets of potentials, namely the oscillating and the direct. In the circuit shown in the diagram

the closed circuit is not earthed. This means that all the large components such as condensers, the transformer, the telephones and the batteries through which the oscillating currents pass are left, so to speak, up in the air so that they may be at quite a big high-frequency potential with respect to earth.

There will thus be a fairly large capacity between them and earth which will lead to instability. By joining

the points A and B in Fig. 1, we automatically earth all of these components with beneficial results. This is a point that should never be forgotten in any kind of valve set using a double-circuit tuner. It is especially important in sets employed for short-wave work and in those provided with one or two stages of resistance-capacity coupling between low-frequency valves. Failure to earth the closed circuit leads to low-frequency oscillation.

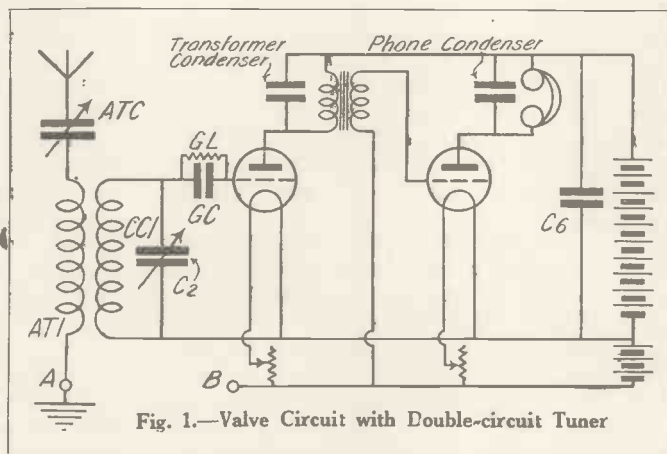


Fig. 1.—Valve Circuit with Double-circuit Tuner

set. Further, we have placed the aerial-tuning condenser in series with the A.T.I. instead of in parallel as in Fig. 2.

It is well known that to obtain the largest possible high-frequency potential difference across an inductance the capacity in parallel must be kept as small as possible. Even in the first circuit there will be a little parallel capacity owing to the self-capacity of the windings of the coil. This we can keep down only

There is one drawback to the use of a double-circuit tuner, which is that it renders searching more difficult, since two circuits must be tuned practically simultaneously. This difficulty we can get over in one of two ways. That most commonly employed is the tune-stand-by switch. By throwing the switch over to the right we bring the double-circuit tuner into action, whilst if it is turned to the left the CCI is cut out and searching can be done simply with the help of the aerial tuning condenser (see Fig. 3B).

This is quite a good method provided that the switch used is of a pattern which does not make for the introduction of a large amount of capacity.

Either a barrel switch or double-pole change-over knife switch of large size is suitable. Small knife switches should never be used on the high-frequency side of the set, since there is invariably a great deal of capacity between their clips, which lie very close together.

The second method, which is extremely good, is that shown in Fig. 4. This is known as the "aperiodic aerial," though the term is rather a misnomer since owing to the very close coupling between primary and secondary the aerial is really tuned simultaneously with the CCI by the closed-circuit condenser.

An aperiodic aerial tuner for broadcast wavelengths can be made by winding a single-layer coil on a 3-in. former with 75 turns of wire to form the secondary and placing 25 turns immediately over the middle of this layer to act as the ATI. The fewer the number of turns in the primary the more selective will the tuner be, though there will be some loss in signal strength if the reduction is carried too far. The amateur can experiment with a view to discovering the number of turns that best suit his own aerial.

There is another bad point that is common to all the circuits shown

in Figs. 1, 2 and 4. This is that both valves receive the same high-tension voltage on their plates. I suppose that in the vast majority of receiving sets this condition of affairs exists and it certainly does not make for efficiency. With a valve which is acting as detector there must be a fairly large flow of grid current for rectification to take place.

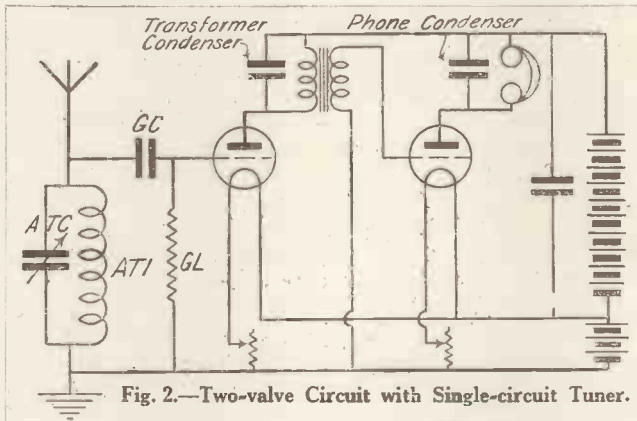


Fig. 2.—Two-valve Circuit with Single-circuit Tuner.

Now if the plate potential is high the flow of grid current will be cut down, for electrons, on leaving the filament, are so strongly attracted by the highly positive anode that very few of them are caught up and held by the grid. Fig. 5 shows in dotted lines the two means of supplying a lower potential to the rectifying valve. The first, which is more commonly used, is to provide upon the set a second high-tension *plus* terminal connected to the primary

the transformer and high-tension *plus*. The value of this resistance can be found by experiment, though it can usually be worked out if the characteristic curves of the valve are obtainable.

Let us suppose, for example, that we are using a high-tension voltage of 80 and that we want to deliver 40 volts to the plate of the first valve, the characteristic curve showing that this is the best voltage for rectification purposes. All makers now give the figures for the internal resistance between plate and filament of their valves. For some reason they refer to this as impedance, though actually it is nothing more or less than the direct-current resistance in the majority of cases.

Let us suppose that in the case of the valve under discussion that its resistance is 40,000 ohms, which is about the usual figure for general-purpose valves. To halve the right plate voltage we must place an anode resistance of equal value in series. There will then be a drop of 40 volts across the resistance and 40 volts across the valve; that is to say, the potential difference between plate and filament of the valve will be 40 volts.

It is not unusual in home-made sets, and even in some of those sold by manufacturers, to find that one or more of three important things are omitted. These are the telephone condenser, the transformer condenser and the high-tension condenser. The reason why they are required is simply this: the plate of the rectifying valve is at a high (oscillating) potential with respect to earth. The

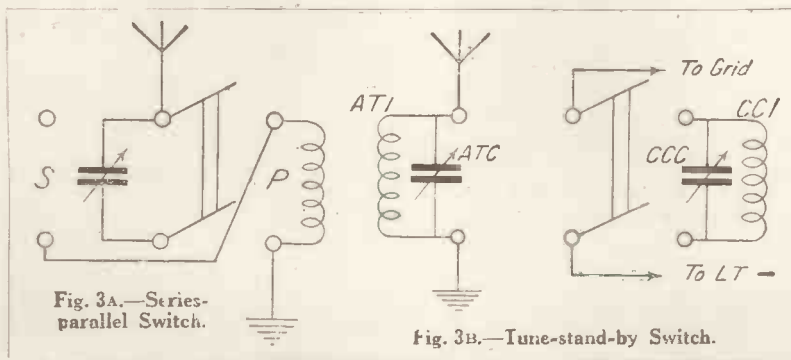


Fig. 3A.—Series-parallel Switch.

Fig. 3B.—Tune-stand-by Switch.

primary windings of the iron-cored low-frequency transformer, which have a very big inductance, form an effective barrier to the passage of the high-frequency part of the plate current. The condenser acts as an open path to these currents, allowing them to escape to earth.

The second retains the usual single high-tension *plus* terminal and reduces the potential on the plate of the rectifier by inserting an anode resistance AR between OP of

primary windings of the iron-cored low-frequency transformer, which have a very big inductance, form an effective barrier to the passage of the high-frequency part of the plate current. The condenser acts as an open path to these currents, allowing them to escape to earth.

If the transformer is badly designed and has a very high self-

SUCCESS WITH YOUR VALVE SET *(Continued)*

capacity the transformer condenser may not be absolutely necessary, since the capacity of the windings may give a sufficient path to these currents. The same remarks apply to the telephone condenser. The high-tension battery condenser provides a path across the battery. If it is not there high-frequency currents must pass through all of its cells one after another, meeting considerable resistance as they do so.

Further if any cell is "dead" or nearly so the resistance to high-frequency currents will be enormous. This condenser also serves another purpose by "mopping up" and smoothing out any irregularities in the delivery of current from the high-tension battery. It is thus a potent factor in suppressing battery noises.

One Other Improvement

In all three circuits shown I could make one more improvement. This is the inclusion of a grid battery,

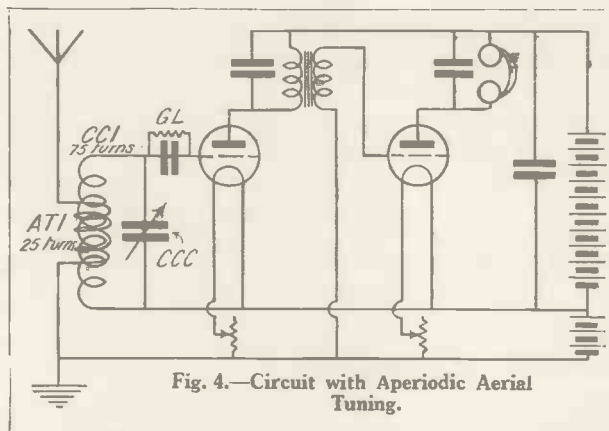


Fig. 4.—Circuit with Aperiodic Aerial Tuning.

shown in dotted lines (GB) in Fig. 5. It is often said that in a small set such as the two-valver that we are discussing a grid battery is unnecessary. So it is as far as the sounds produced in the telephone receivers are concerned. In a set of this kind, unless it is operated very close to a main broadcasting station, the potentials upon the grid of the note magnifying valve will be so small that no noticeable distortion will occur when the grid battery is absent. But it must not be forgotten that the grid battery, by making the grid of the note magnifying valve one or more volts negative, cuts down the high-tension current considerably.

Now most noisy sets owe their defect to the fact that they are drawing too much current from the high-tension battery, which becomes rapidly polarised and is irregular in its delivery. The ordinary small high-tension battery should never be called upon to give more than about three milliamperes of current, and the more you can reduce this amount the longer will be the silent working life of the battery. I recommend, therefore, that a grid battery should be used even in a two-valve set.

So much for points of design. Now let me mention a few of the small things which make or mar the performances of the valve set. In the first place you

should choose your valves with care. The old idea that any valve will do in any position in the set leads often to very poor results.

Though valves are now turned out so well standardised that there is very little difference in their characteristics, there is still, as a rule, some tiny difference between any two of the same make. You may find when you come to try them out that one, for example, is a better rectifier than the others. Never fail to try each valve that you have in various positions and to note where each does best.

Inductances

Next pay some attention to your inductances. If they are wound with thin wire the resistance to high-frequency currents, especially on short waves, may be very great indeed, and your signal strength will suffer. Other things being equal choose coils wound with wire of the heaviest gauge that is compatible with reasonable compactness. It pays to buy inductances of good make, for these are designed to have a very low self-capacity.

If the self-capacity is high, tuning will be flat and selectivity will be conspicuous by its absence. Do not forget that a screwed-down joint between a wire and a terminal may offer an enormous resistance to high-frequency currents. When you first put the set together the metal surfaces of both the nut and the wire are bright and the resistance is then not very high.

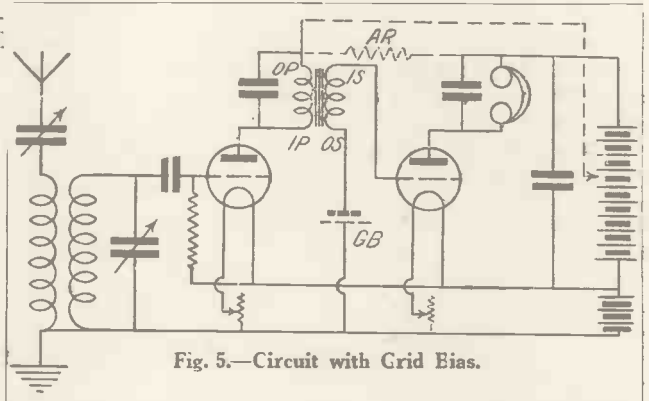


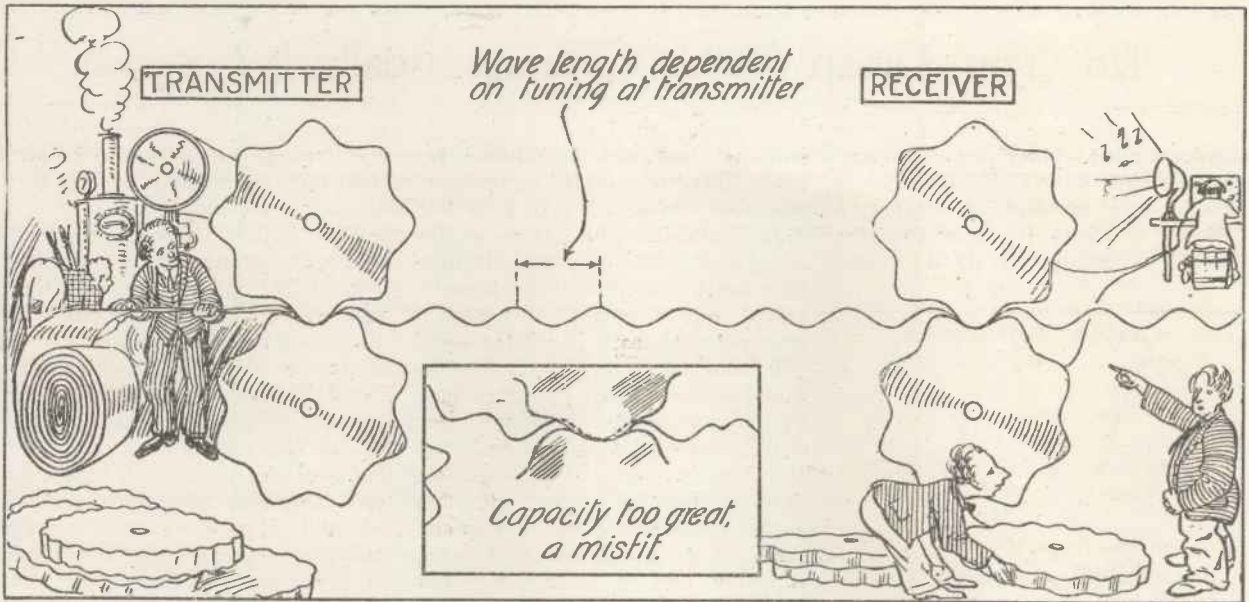
Fig. 5.—Circuit with Grid Bias.

But in course of time the two corrode and then efficiency falls off. For this reason every possible joint should be soldered, care being taken to use flux which has no corrosive action upon brass and copper.

The usual connections of a low-frequency transformer are those shown in Fig. 5, the plate going to IP and the grid to OS. This, however, is not an infallible rule, and various connections should be tried until the best are found.

The fixed condensers must be of good quality. This is particularly important in the case of the grid condenser, which must be pretty nearly of its reputed capacity value. Cheap condensers labelled .0003-microfarad have very seldom a capacity that is anywhere near that figure. Amongst a great many that

(Continued on page 413)



Do You Grasp What Tuning Really Is?

MOST amateurs know that by "tuning" is meant the adjusting of the inductance or capacity (or both) of a circuit until signals are received with the greatest strength. The reason for this is that the natural frequency of the receiving circuits must be the same as that of the incoming signals to enable good reception to be maintained. But how many amateurs have a really clear conception of what exactly is meant by tuning? Probably very few.

Misleading Analogies

One reason for this general vagueness of ideas on a very important subject is the difficulty of giving an explanation which the beginner can understand. Analogies are useful up to a point but they are also misleading, and the beginner is tempted to carry the analogy too far.

Analogies are used with the idea of enabling the student to form a mental picture of what happens by likening what takes place at a receiving station to something with which he is already familiar. The most usual of these analogies is that of water in tanks at different levels, with a connecting pipe between the tanks. This explains Ohm's law (the relation between potential difference, resistance, and current) fairly well, but after this it soon breaks down.

It fails to explain the phenomenon of induction, for instance. A current of water in one pipe cannot cause a current to flow in another pipe not connected to it in any way.

Thus, an analogy, though to a certain extent useful, may ultimately only succeed in puzzling the beginner more than ever if the point at which it breaks down is not clearly defined to him.

It is here attempted to explain what happens when wireless waves reach a receiving aerial, and the reason why this should be "tuned" to their wavelength, not by imagining water flowing in a pipe, but by trying to form a mental picture of what really does take place—electricity flowing in a wire.

In order to keep this article within a reasonable length it will be necessary to take certain things for granted without further explanation. It must be taken for granted that one half of a wireless wave tends to cause electricity to flow from the ground into the aerial, while the next half wave tends to make electricity flow from the aerial into the ground. The reason for this has often been explained elsewhere. (See Fig. 1.)

It is not thought necessary to define what is meant by inductance and capacity. Suffice it to say that electrical capacity means the property of a conductor to store electrical

energy. The larger the capacity, the more electricity will the conductor hold. All that it is necessary to say about inductance is that it forms an "impedance," or in other words it impedes the flow of electricity. The larger the inductance the greater the impedance or the more is the flow of electricity impeded.

Aerial Circuits

It is presumed that the reader is familiar with the various means of varying the inductance and capacity of an aerial. We will here take the case of an aerial which is tuned by means of a tapped coil and variable condenser in series with the aerial. (See Fig. 2.)

Let us consider this aerial circuit. Starting from the ground we have first the earth lead, then comes the tapped coil, and after that the variable condenser. Beyond this there is the lead-in wire, and last of all the horizontal portion of the aerial terminating at the insulator at the free end.

It is proposed to make current flow into and out of this aerial. Here is the beginner's first difficulty. He had previously thought that current could only flow when a complete conductive circuit existed, which finally returned to the point at which it started. This, however, is not quite true, even in the case of

Do You Grasp What Tuning Really Is? (Continued)

direct current. When one end of any conductor is joined to a terminal of any source of electrical energy, a current of electricity flows into the conductor. If a person stood on some

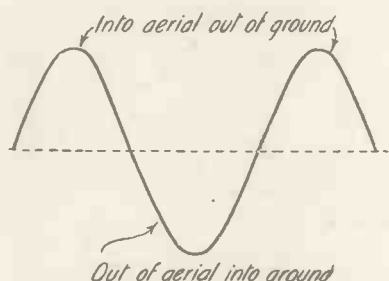


Fig. 1.—Current Flowing In and Out of Aerial.

good insulating material and grasped a bare wire carrying a current at a pressure of, say, 500 volts, electricity would flow into his body. (See Fig. 3.) He would not, however, feel any shock as he would be "full" of electricity in a very short time and then, of course, no more could flow into him. He would experience no ill effects, as the time during which current was flowing into him would be very short indeed. If, still grasping the wire, he stepped off the insulating material on to the ground he would probably receive a very severe shock; current would now be passing through his body into the ground and would continue to do so as long as he held the wire. In order to notice any effects of a current flowing through one's body it is necessary for the current to flow for an appreciable length of time.

This shows us that it is possible to make current flow into an aerial, even though it terminates at an insulator at its free end.

When a certain potential difference is established between the end of the aerial and earth, a current will flow into the aerial until it is "full." The length of time the aerial will take to become "full" will depend upon two things: the capacity of the aerial and the rate at which the current flows into it.

Considering the structure of the aerial circuit again it will be observed that there is only one path by which electricity can flow from the earth into the aerial. When a difference of

potential has been established between aerial and earth, current will flow into the aerial until it is full. This electricity will remain in the aerial as long as the potential difference which caused it to flow is maintained, but as soon as this force is removed the electricity in the aerial will immediately "run out" again into the earth, along the same path by which it entered the aerial.

It is generally understood that for the loudest signals we want the greatest possible current to flow through the tuning coil. This current will, of course, flow first in one direction and then in the other. Suppose the wavelength of the station to which we are listening is 300 metres. This means that the fre-

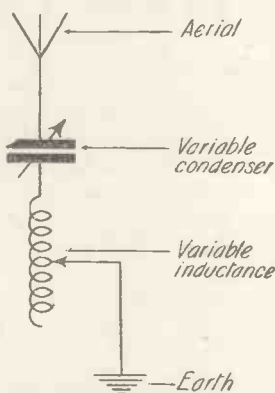


Fig. 2.—Aerial Circuit Containing Coil and Condenser in Parallel.

quency with which the waves are reaching our receiving aerial is one million per second. One million times every second the incoming waves will try to make electricity flow into our aerial and one million times in each second they will try to make electricity flow out of the aerial into the ground. We want to "tune" our aerial to their frequency so that they will produce the greatest possible current through the lower part of the aerial circuit. What must we do?

The first half-wave arrives. In one two-millionth of a second its force will have been spent. Suppose that before this time it has already filled the aerial with electricity, then the remainder of the time its energy will be wasted, and the current through

the tuning coil will cease before it need have done had the capacity of the aerial been bigger.

This is an undesirable state of affairs and we must do our utmost to remedy it. There are two things which we can do. We can either turn the dial of the aerial condenser so that a greater area of the moving plates interleave with the fixed ones, and so increase the capacity of the aerial, or we can increase the number of turns of the tuning coil that are in circuit, and so make the impedance of the coil greater so that the electricity flows into the aerial more slowly.

The state of affairs that we want to bring about is that the aerial is just filled by the time that the force of the first half-wave is exhausted, so that the current is already tending to flow out of the aerial again when the second half-wave comes along and hastens its departure. We also want the aerial to be as "empty" as possible by the time the third half-wave comes along to fill it again.

If we do this we make the compulsion applied to the electricity coincide with its own inclination and everything goes as smoothly as possible, and we get current flowing through the tuning coil almost the whole of the time, which is just what we want.

Of course, this is by no means a scientifically complete explanation of what happens in a receiving aerial,

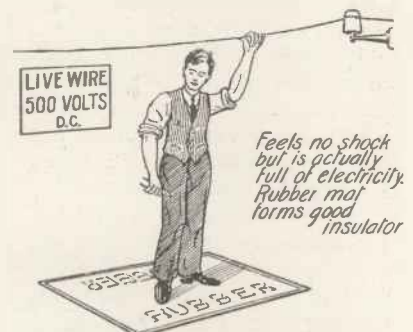
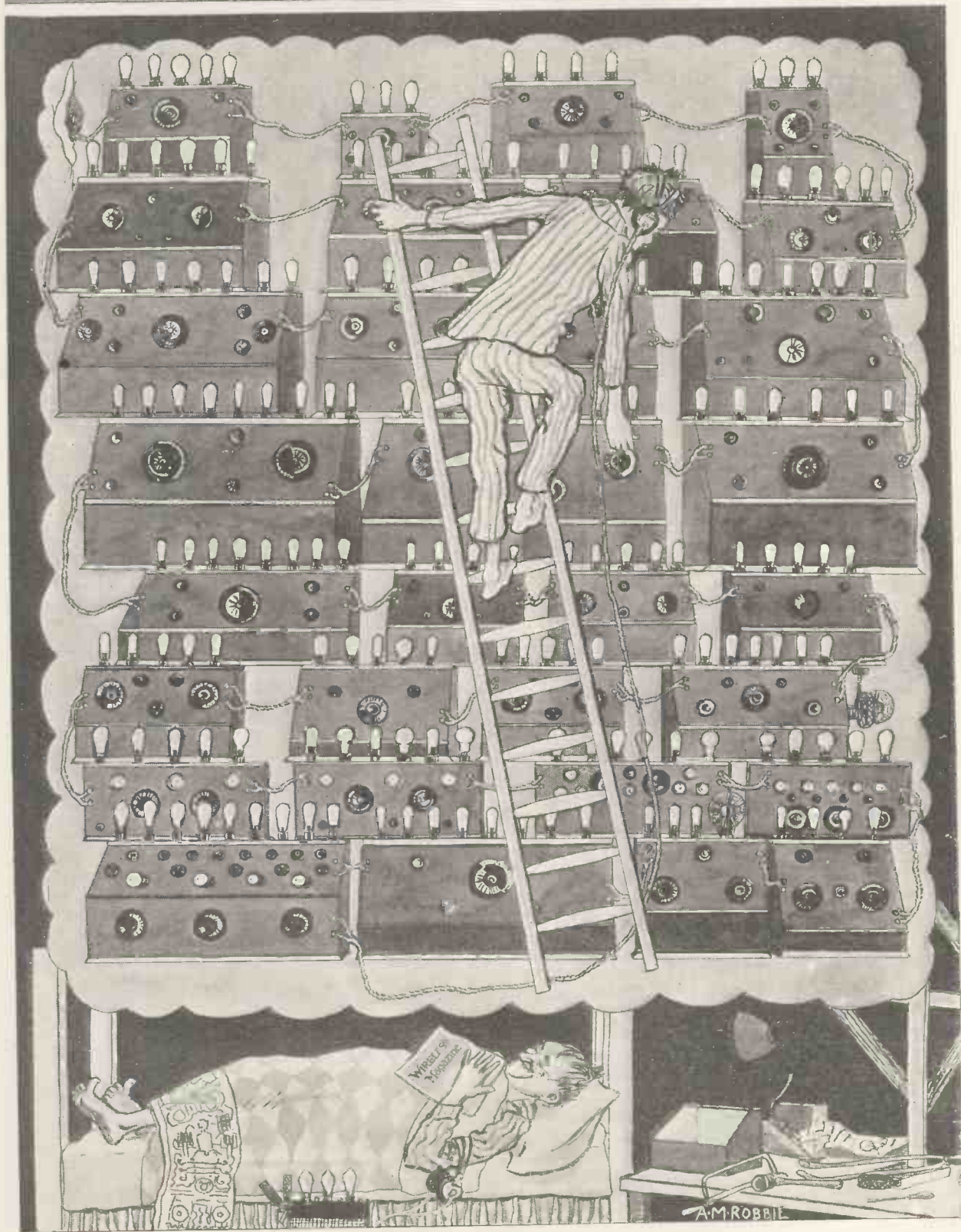


Fig. 3.—Body Being Filled with Electricity

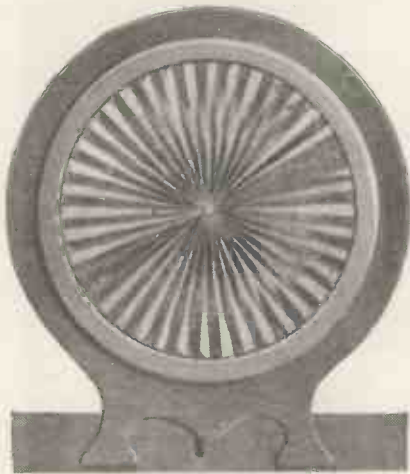
but it is hoped that it will enable the beginner to appreciate the necessity of accurately "tuning" his receiver.

J. F. JOHNSTON.

The Super Set of His Dreams



Making the Pleated-paper Loud-speaker



Loud-speaker designed by Mr. L. A. Purser, of Stirling.

A New Device for Pleating the Paper Diaphragm by SIR H. CASSIE HOLDEN

flat on the table the bevel should be on the right-hand bottom edge looking at it lengthways. (See Fig. 1.)

Lay the rule on the gauge so that the edges coincide. Be sure that a line drawn longitudinally against the edge of the rule marks the longitudinal centre line of the gauge. It is of the greatest importance that this should be so, otherwise the pleats will be wrong. When satisfied that the position is as true as possible clamp the two together. (See Fig. 2.)

Having cut the $\frac{1}{8}$ in. brass into two equal parts $\frac{1}{4}$ in. long and



Loud-speaker designed by Mr. A. G. Ahrens, of East Dulwich.

THE ruling and folding of the paper strips for the pleated-paper diaphragm of a loud-speaker is somewhat laborious and decidedly tedious, but the tool described herein makes the construction of the diaphragm a very simple process. It consists of a bevelled gauge, and a rule acting against two stops.

Making the Tool

To make the tool the following materials are required: gauge, a strip of steel about 12 in. long by 1 in. wide and say $\frac{1}{16}$ in. thick (Messrs. George Adams supply ground steel strips 1 in. by $\frac{1}{16}$ in. by 24 in. which are admirable); rule, $\frac{1}{2}$ in. by

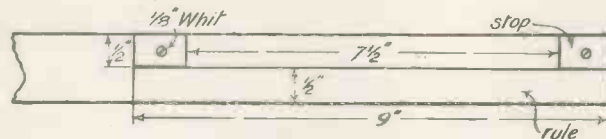


Fig. 1.—Bevelled Edge on Gauge

trimmed them up, lay one on the gauge, against the rule as shown, and clamp in position. Drill through gauge and stop about centrally. Repeat with the second stop at the other end of the rule. Tap the holes in the stops $\frac{1}{8}$ in. Whitworth and countersink those in the rule from the underside. As it is essential these stops should be rigid I tin the underside of the stops and the area covered by them on the gauge, and after screwing them firmly together sweat them together with a lamp.

To Use the Tool

To use the tool, place some suitable support, such as a piece of rectangular metal rod not exceeding $\frac{3}{4}$ in. wide, under the gauge and clamp all to a table, with the gauge projecting about 9 in. in length from one end. If preferred, the gauge can be drilled and screwed to a suitable batten, the holes for

holding down screws being well countersunk.

Having cut the paper strip to the correct width, carefully square across one end with a T rule and scribe. Fold the paper carefully along the line. As this forms the base line great attention should be given to get it true.

Pleating

Place the paper on the gauge so that the fold comes against the back edge of the gauge. (See Fig. 2.) Now lay on it the rule tight up against the stop, press down, and with a blunt tool (say a steel paper knife) scribe a line heavily along the edge of the stop.

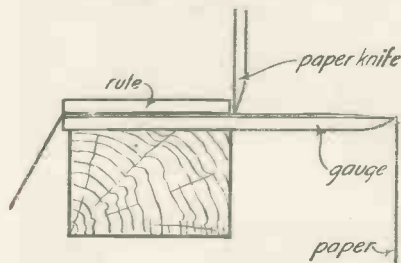


Fig. 2.—First Stage in Folding.

$\frac{1}{8}$ in. steel 9 in. long; stops $\frac{1}{2}$ in. by $\frac{1}{8}$ in. brass—about $1\frac{1}{2}$ in. long.

A bevel should be filed or ground on one edge of the gauge, about 9 in. in length from one end. This bevel should not be made into a cutting edge. With the gauge lying

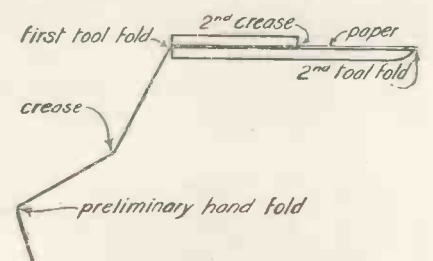


Fig. 3.—Second Stage in Folding.

Then fold down and well press the rest of the paper over the bevelled edge. Lift the rule and adjust the paper with the last fold at the back edge of the gauge. (See Fig. 3.) The paper will now have two "downward" folds and a marked line which

will tend to produce an "upward" fold; the distance between the "downward" and "upward" folds will be as nearly as possible $\frac{1}{2}$ in.

Proceed in this way until the whole of the paper is pleated with well-made downward folds and well-marked upward ones. Turn the paper right over on a table or smooth surface, and wherever the marked line comes complete the fold.

Finally, run each fold between the finger and thumb and cut off all surplus paper, leaving 19 "crests" above and 19 below.

It is not a bad idea to draw, say, four cross lines equidistantly on the paper very lightly with a pencil and T-square purely as a check on the folding, but if the latter has been done carefully it will be found that the final crease is not very much out.

Another Method

Another method of operation is to make the "creases" as before, but not so heavily. When the strip is finished, fold at the first crease quite flat. Then, turning the paper over and placing *this* fold against the back edge of the gauge—in the same way as the hand-made fold was used in the first operation—fold over the bevelled edge, and continue as before.

In this way the paper will be folded in the reverse direction, each fold coming centrally between the folds originally made.

Care must be taken to keep the rule firmly in position.

THE BEST POSITION FOR THE SET

THE efficiency of a receiver is often adversely affected by reason of its being situated in an unsuitable position. The set should be treated with the same care as a piano as regards its position if consistent and good results are wanted.

H.T. Batteries

The H.T. batteries are extremely sensitive to heat, and this, therefore, points to a position away from the fireplace. Furthermore, they will wear considerably longer if a point is made of always keeping them in a cool place.

Some makes of transformer also are delicate and prefer a moderate temperature to a place near the fireplace. Their windings are impregnated with paraffin wax or shellac varnish, and this is affected by heat to such an extent that the transformer may easily be ruined by undue exposure to warmth. Furthermore, the windings of transformers, loud-speakers and phones are all susceptible to violent changes in temperature. The copper wire of which the windings are composed expands and contracts on exposure to heat and cold, and this often is the cause of a "burnt out" winding.

Draughts bring dust, and dust is

one of the greatest enemies to wireless receivers. The set should be kept out of draughts as much as possible.

Dampness

Dampness is another sworn enemy to wireless work. The inductance values of the coils, H.F. transformers, fixed condensers, grid leaks and even the internal capacity of the set may be altogether altered if it is situated against a damp wall. Copper wire oxidises very readily in a damp atmosphere, and the H.F. resistance of the inductances thus increases. Gas fumes affect the ebonite and the lacquer on the terminal, and the set will look very much second-hand in a very short period of time if located near a gas fire.

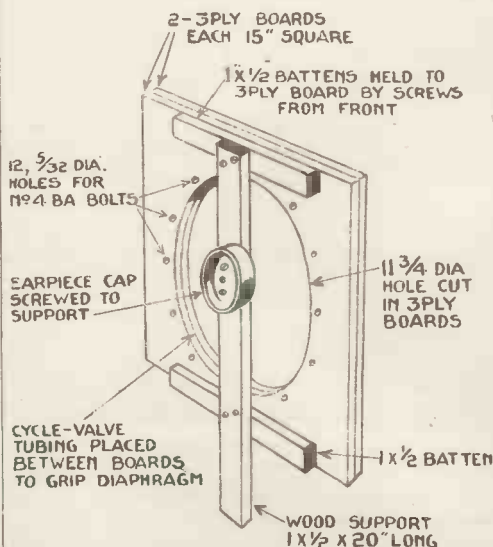
Best Position

The best position for the set is in a cool, dry corner—away from draughts and extreme changes in temperature, when its appearance will remain good for many years and uniform results may also be expected.

A. J.

THE Postmaster-General's name is William. Perhaps this is why he was so fond of his Bill.

TWO FRAMES FOR THE PLEATED-PAPER LOUD-SPEAKER

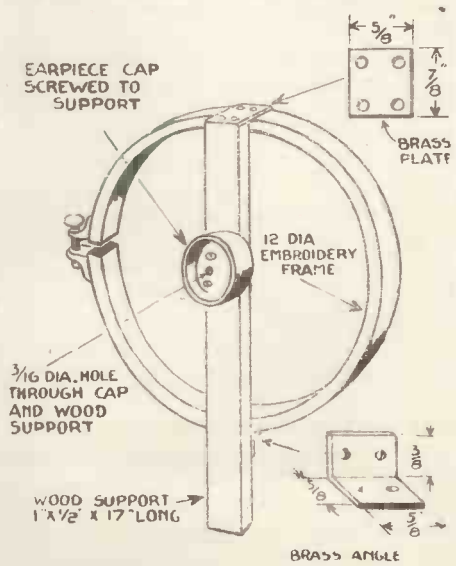


Square Frame for Loud-speaker.

For constructing the pleated-paper loud-speaker, either a square or a circular frame can be used, an example of each being shown.

The pleated paper is stuck round a small circular piece of cork, which is attached to the reed of a Brown A-type telephone receiver by a length of 12 B.A. threaded rod.

In the case of the square frame the periphery of the diaphragm is clamped between the two pieces of three-ply wood, and in the case of the circular type between the two rings of an embroidery frame.



Circular Frame for Loud-speaker

The Salesman Is Done Again!

"NOW, these sets," said the salesman to himself, thoughtfully, as he ran his eye over the dozen two-valve receivers which he had just unpacked, "should yield a profit of—let me see!" Taking a piece of paper, and bending over the counter, he began to make intricate calculations.

Happening to look up after a minute or two, he was surprised to see a very fashionably attired young fellow (bowler hat, slightly tilted; grey lounge suit, with waist; grey suede gloves, and light spats) looking at the largest set in the shop. His mouth was agape, and he appeared to be faintly interested.

The salesman coughed. "Er—good morning, sir," he remarked, "I see you are admiring that magnificent five-valve set. Remarkable value that, sir. Only forty-five guineas, minus valves!"

"Miner's valves, old fruit!" ejaculated the young exquisite. "Dashed funny thing, that! You're extending my jolly old limb, my good man! My brainy old tutor rambled on about miner's lamps I remember. Sir Humphry Somebody made 'em out of gauze and whatnot, so he said. Not that I'd doubt a Johnny with such a plain, homely frontispiece as yours, old bean!"

The salesman summed up the position. "A young swell," he thought, "with tons of money and nothing of importance under his bowler. The chance of a lifetime! Humour him—that's the game!" His features relaxed.

"Ha ha!" he laughed. "I have just seen the joke; very good indeed, very! You are a wit, sir, unless I am very much mistaken. What I really meant, of course, was that the price of the receiver was forty-five guineas without the valves."

"Without the valves, dear old lad?" gasped the young blood. "Without the valves? Not really! Dash it all, you know, what's the use of the bally thing without 'em? Play the game, old thing! Will the jolly old box of tricks work without valves—answer me that?"

A few beads of perspiration gathered on the salesman's brow.

He felt that he was not making good. He must take charge of the situation. "It is usual, my dear sir," he began, "to quote for wireless receivers without valves. You see, the purchaser may have a particular fancy——"

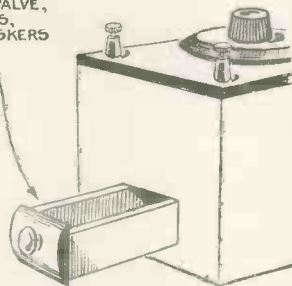
"You're absolutely right, old sport!" broke in the young dandy. "My own particular fancy is a spot of green Chartreuse. I find it warms up the jolly old gizzard as quickly as anything. Buzz out a bottle from the old wine-cellar under the counter, old cheese, and let's give Pussyfoot one for his nob!"

Restraining himself with an effort,

FOR THE CRYSTAL ENTHUSIAST

Crystal-set accessories (spare crystals, cups, catwhiskers, etc.) are such small things that they are easily lost—a fact that may cause considerable annoyance if they

DRAWER FOR SPARE VALVE, CRYSTALS, CATWHISKERS ETC.



cannot be quickly located at the critical moment.

Such a catastrophe can be overcome by fitting in the bottom of the cabinet a small drawer as shown in the diagram.

the salesman made a gallant attempt to keep up the atmosphere of pleasantry. "You're joking, sir, of course. I am no rabid teetotaler, sir, but the only liquid I keep under the counter is a gallon or so of accumulator acid. You wouldn't want to drink a toast in that, sir, I'm sure?"

"Rather not, old egg," rattled on the young blade, "but a truce to jesting. I popped in to take an inventory, so to speak, of your topping stock. What I'm after, if you follow me, is a jolly old trumpet affair that'll serve out one-steps and fox-trots till I turn off the tap, or

joy-stick or whatever it is. In a burst of confidence, old sort, I'm a dancing man, and the Mater doesn't like me to turn out in old King Wencelas's particular brand of weather. Chewing the fat about carols, there was a clever Johnny in Park Lane last Christmas who played about a baker's dozen of assorted musical instruments at once, the while he sang "The Mistletoe Bough" and tripped a merry measure. I coughed up a couple of bob."

The salesman seized the opportunity afforded by a pause to take breath, and turned the conversation towards commercial matters.

"I gather that you want a loud-speaker set, sir?" he interjected, and, without waiting for a reply, went over to a side table and drew his visitor's attention to a long squat receiver to which a large loud-speaker was attached. "Now, this set, sir," he said firmly, "is one of the finest instruments you could buy. The exterior is, as you see, piano-finished——"

"Quite, old cheese!" agreed the listener. "But what about the Little Mary—the old tum-tum, you understand? Only the best gridirons and transformations, of course; no inferior split-pins or axle-trees, what! And the bedrock figure you would quote to a dear old pal?"

The salesman thought rapidly. "To you, sir, the wonderfully low price of sixty guineas. This is a special cut price, sir, and reduces my profit practically to vanishing point!"

"It tickles the ear to some extent," admitted the elegant one. "What do they call the dashed thing?"

"It is known as Rumbleby's Ace of Trumps No. 2," replied the salesman. "Where may I have the pleasure of sending the outfit?"

"Don't trouble to send anything, old bird. You see, the Pater's promised me a set for my birthday next month, and he's got a pal in the wholesale. Well, I must be toddling. Tooodle-oo, old thing, pip-pip!"

His visitor gone, the wretched salesman laughed hysterically, went through the motions of wringing the neck of a fellow-creature, and gibbered!

ALFRED HEARD.

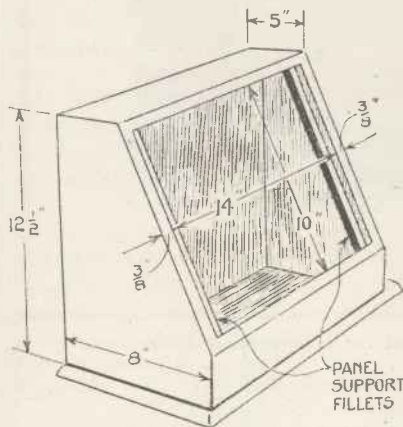
Structograph Plate of this Set Given Free

A Two-valve Reflex Set for Loud-speaker Work

Specially designed to reproduce transmissions from the local station at loud-speaker strength, this set (produced by THE WIRELESS MAGAZINE Technical Staff) embodies a number of novel features.



In order to work a loud-speaker successfully it is not always necessary to use three or four valves. In many cases, especially where the reader lives within a few miles of a broadcasting station, any more than two valves is a waste.



Details of Cabinet.

This fact needs emphasis, for there seems to be a general opinion that three valves is the absolute minimum where loud-speaker reception is concerned.

It should be remembered that each additional valve introduces a slight amount of distortion which, unfortunately, is not directly proportional to the number of valves used.

Distortion

For instance, the distortion present in a four-valve set is more than double that existing in a two-valver. Every additional valve not only introduces its own distortion but amplifies the distortion produced by the preceding valve. With great care this distortion may be reduced to a negligible quantity, but it is still there.

From what has just been said it will be seen that when working a loud-speaker a minimum number of valves should be used consistent with good volume. For those who live within 10 to 15 miles of a broadcasting station plenty of volume may be obtained from two valves.

It is the purpose of this article to describe an excellent two-valve reflex set suitable for the operation of a loud-speaker on the local station and, at the same time, having a good receiving range on the phones.

Referring to the circuit diagram, it will be seen that the first valve amplifies at high frequency, the amplified oscillations being passed on to the second valve, which rectifies them.

The rectified oscillations are then passed through the primary of a low-frequency transformer, the secondary of which is connected to the grid circuit of the first valve.

The low-frequency impulses are thus impressed on the grid of this valve, which acts as a low-

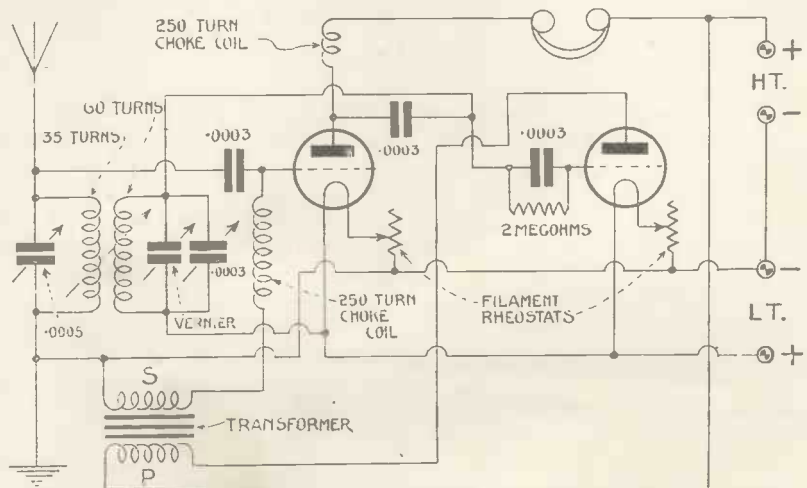
frequency amplifier. The phones are therefore connected in the plate circuit of this valve.

Between the phones and the plate is inserted a high-frequency choke coil which prevents the H.F. oscillations from passing through the phones and confines them to the tuned oscillatory circuit coupled to the aerial coil. Another H.F. choke coil is inserted in series with the secondary of the L.F. transformer to prevent the H.F. oscillations from passing through the secondary winding. These chokes have no effect on the rectified impulses.

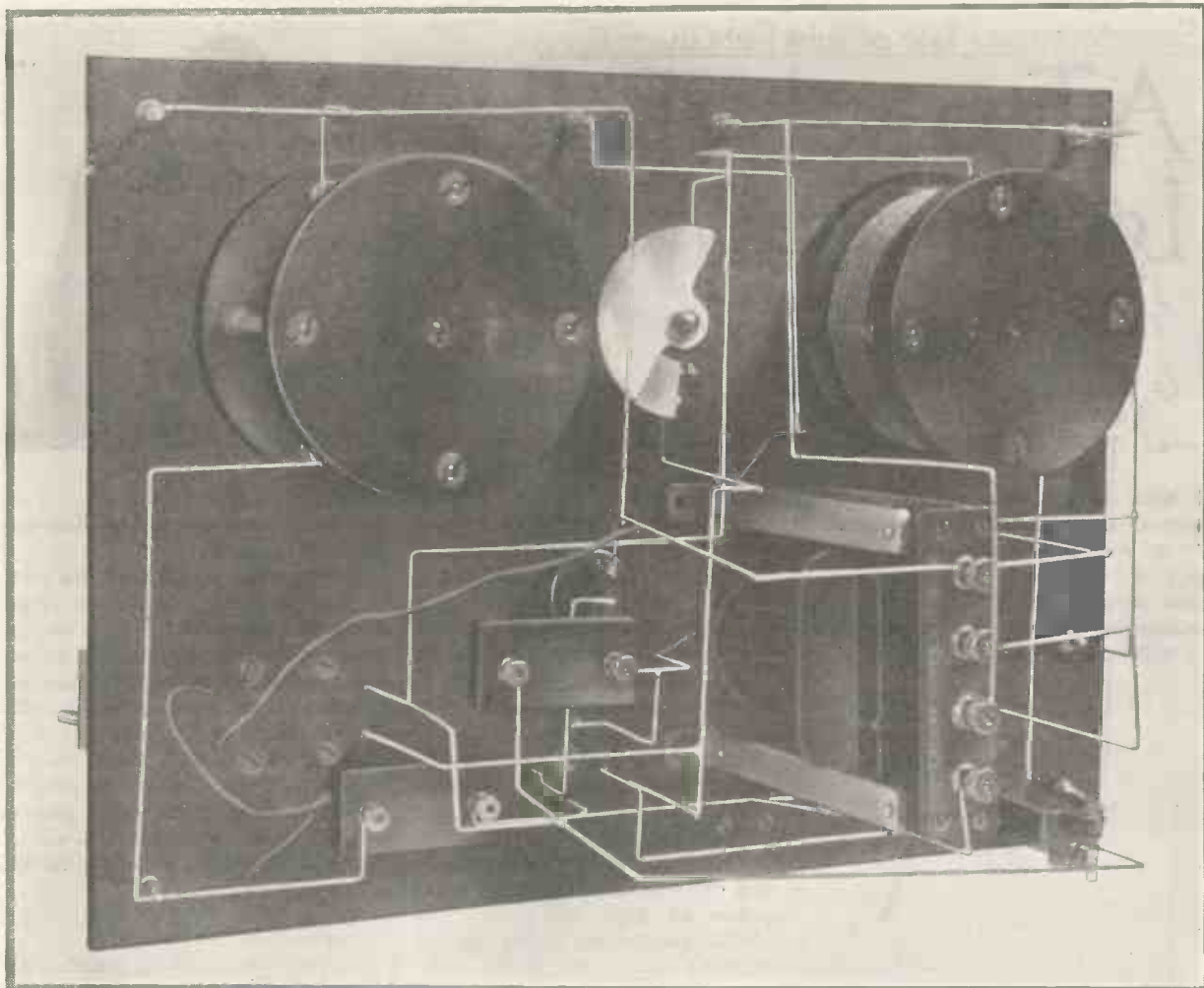
Components Necessary

On page 380 is given a list of all the apparatus necessary for the construction of this set. Although it is not essential to use the components specified, it is emphatically necessary to employ instruments of reputable make.

In many of the sets that we have inspected, because of their entire or partial failure to work, the cause has



Circuit Diagram of Two-valve Reflex Set for Loud-speaker Work.



There is nothing complicated about the wiring of this Two-valve Reflex Set for Loud-speaker work.

been found in some faulty component. Even the panel can make or mar a receiver.

Ebonite panel, 10 in. by 14 in. (American Hard Rubber Co.).

.0005-microfarad variable condenser (Peto-Scott).

.0003-microfarad variable condenser (Peto-Scott).

Low-frequency transformer (Grafton Electric Giant).

Vernier condenser (Colvern).

2 filament rheostats (Wates' microstat).

.0003-microfarad grid condenser and grid leak (Mullard).

2 .0003-microfarad fixed condensers (Lissen).

2 valve holders (Lissen).

2 fixed coil holders.

Two-way coil holder, left-hand moving coil (Peto-Scott).

The first step in the actual construction is the cutting and drilling of the panel. The nearest standard size stocked by the firm indicated in the list of components is one 12 in. by 14 in. A strip measuring 2 in. by 14 ins., therefore must be sawn off.

Finishing-off the Panel

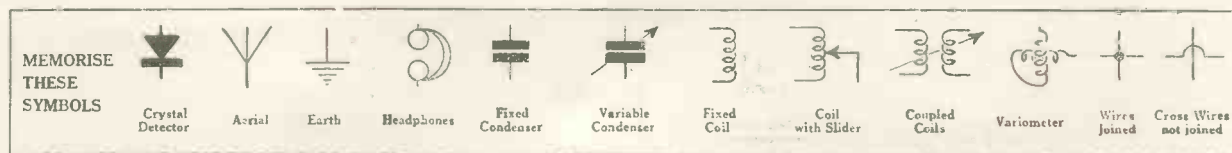
Care should be taken in this cutting operation, for nothing looks worse than a panel that does not fit accurately into a cabinet. The cut edge may be finished off by pinning a sheet of fine emery cloth on to a flat surface and, holding the panel in both hands, rubbing the cut edge on

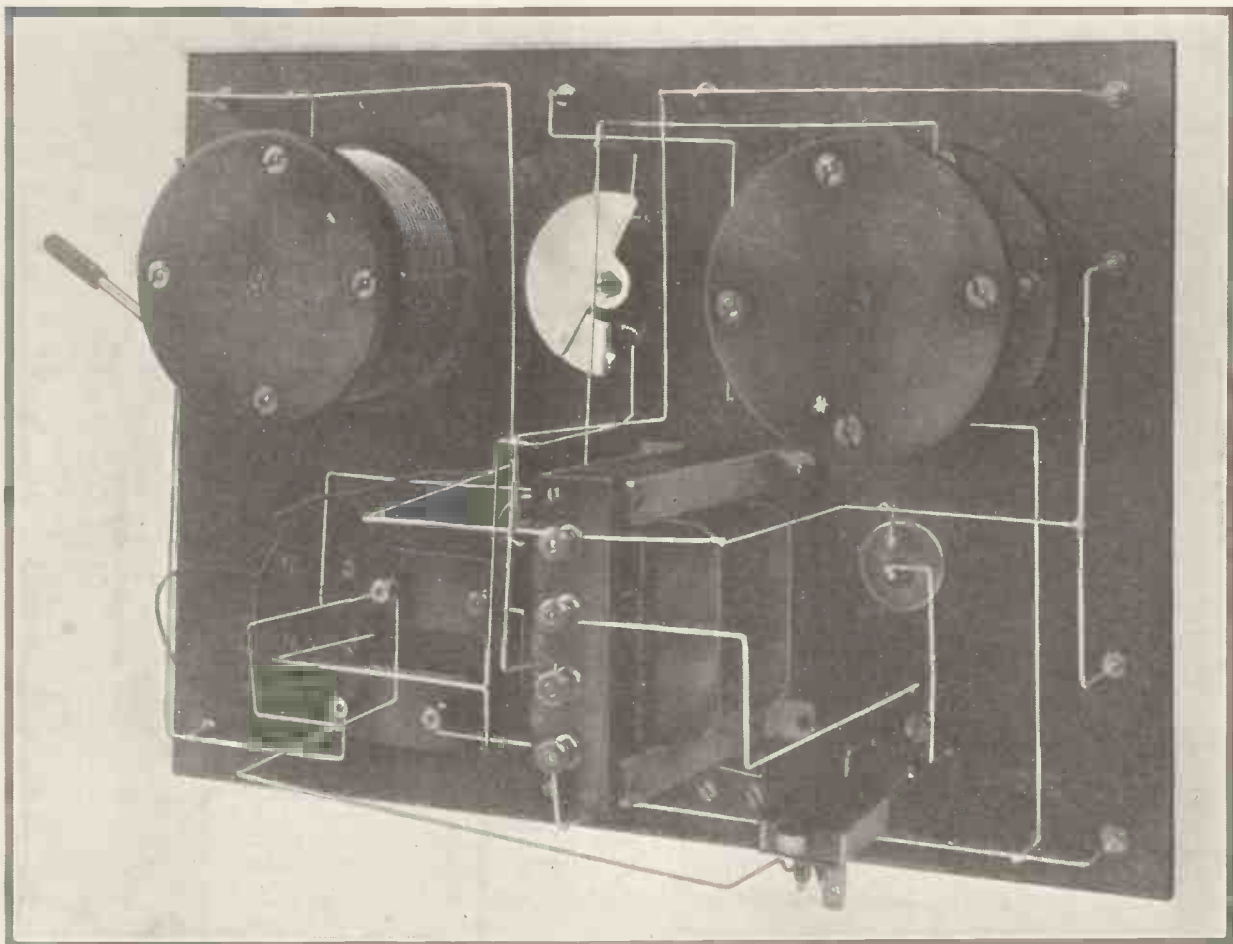
the emery cloth with slow backward and forward strokes.

This will remove any inequalities on the edge which will finally present a sharp, clean-cut appearance.

With the aid of the Structograph plate given away free with this issue of THE WIRELESS MAGAZINE, the drilling of the panel should be a comparatively easy matter.

The Structograph should be placed flat on the ebonite so that the thick blue lines coincide with the edges of the panel. The positions and centres of all the holes to be drilled are transferred to the panel by pricking through with a sharp steel point. Holes of the sizes indicated on the Structograph are then drilled at the marks thus made on the panel.





The components needed for the Two-valve Reflex Set for Loud-speaker work are comparatively few in number.

It should be noted that whilst four holes are required for the mounting of the two-way coil holder four others are necessary for connections to the same.

The two variable condensers, of the one-hole fixing type, are fixed to the panel in the right- and left-hand bottom corners, whilst between them is mounted the Colvern vernier condenser.

The remainder of the apparatus is mounted as shown in the photographs and in the Structograph.

Wiring

Wiring is carried out in the usual manner, using a fairly heavy gauge wire, No. 16- or 18-gauge being suitable.

Referring to the Structograph, it will be seen that each terminal is marked with a small letter of the

alphabet. This is to enable the constructor to wire up his set in the most convenient order.

For instance, the first terminals that should be connected together are marked *a*. All these terminals should be joined together with as few wires as possible. Similarly, all the terminals marked *b* are next connected together, and so on.

With regard to the different colours of the wires, these indicate the plate, grid and filament-lighting circuits. The latter are appropriately shown in red, the plate circuits in red and white and the grid circuits in black.

Connections to the moving coil holder should be made with short lengths of flex.

Some of the small components, such as the three fixed condensers and the grid leak, are held in position by the connecting wire, this being suffi-

ciently rigid to hold such small components in position.

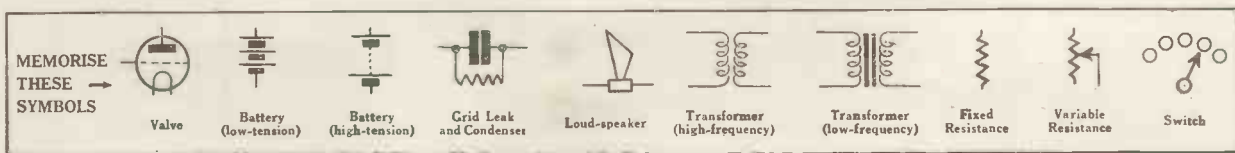
That completes the construction of the set, all that remains to be done being the mounting of the panel in a suitable cabinet. A satisfactory type is shown in the photograph, a dimensioned sketch of which is also given.

Operation

The set can now be tested, for which purpose aerial, earth, high- and low-tension batteries and phones should be connected up to their respective terminals.

Into the fixed coil holders are plugged two No. 250 coils, whilst in the fixed and moving holders of the two-way coil-holder coils No. 35 and No. 60 respectively are inserted.

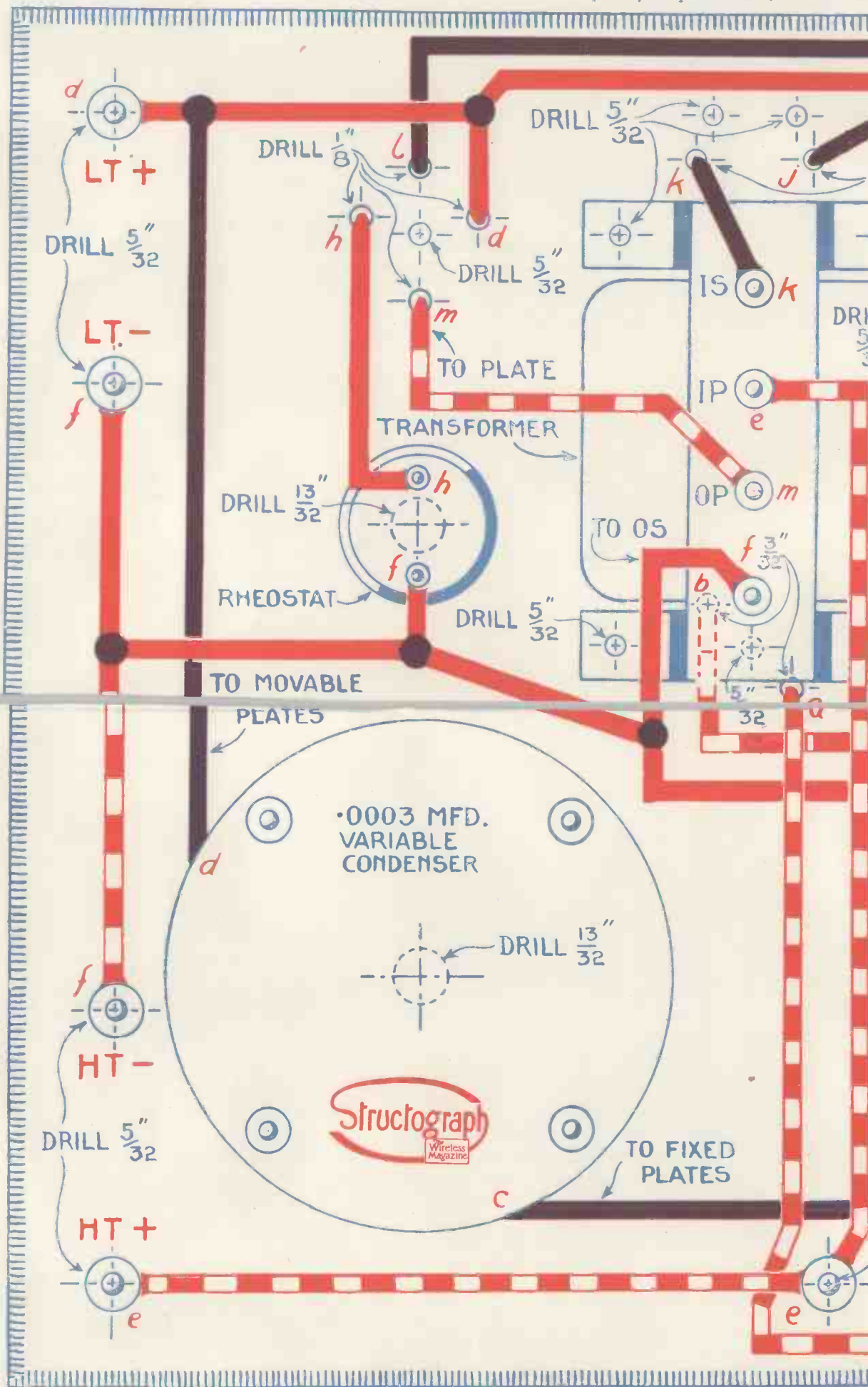
On the original receiver it was found that two Mullard D. F. A. 1. valves gave good results.



A TWO-VALVE REFLEX

Combined Drilling Template

(For full particulars, see article)



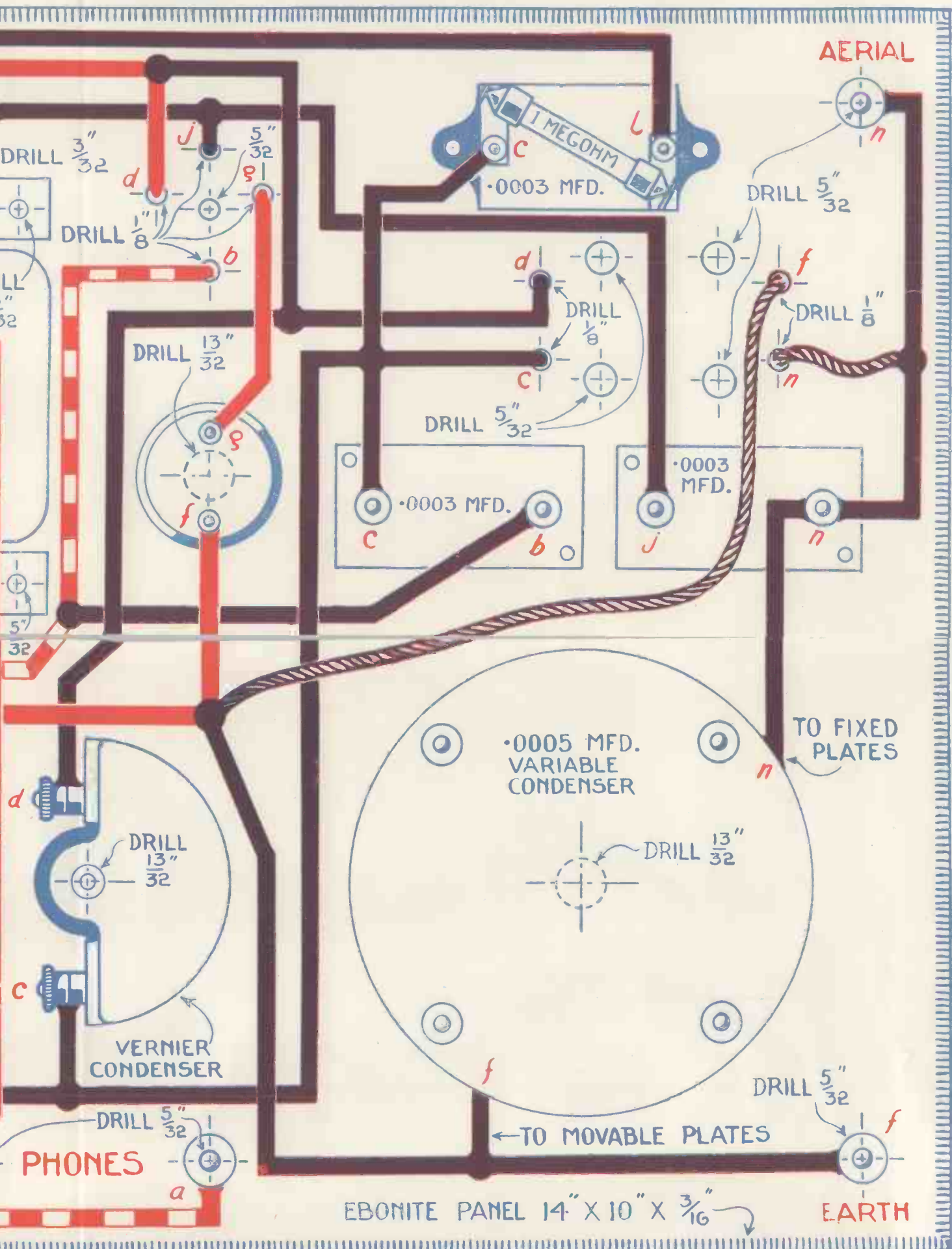
HOW TO USE THIS DIAGRAM AS A TEMPLATE :—The blue shaded outline indicates under which the panel and the drilling centres pricked through, the template thus serving many times.

SPECIAL INSTRUCTIONS FOR WIRING :—There is a choice of three methods. (1) Follow the black lines the grid circuit. A black circle at the intersection of two wires indicates that the two wires are to be joined. (2) Ignore the lines of the wiring, if you like, and work entirely by means of the red letters shown. Thus all the a's together, all the b's together, and so on, and you should do so in alphabetical order. (3) The ideal method is to combine (1) and (2).

SET FOR LOUD-SPEAKER WORK

Complete and Full-size Layout and Wiring Diagram

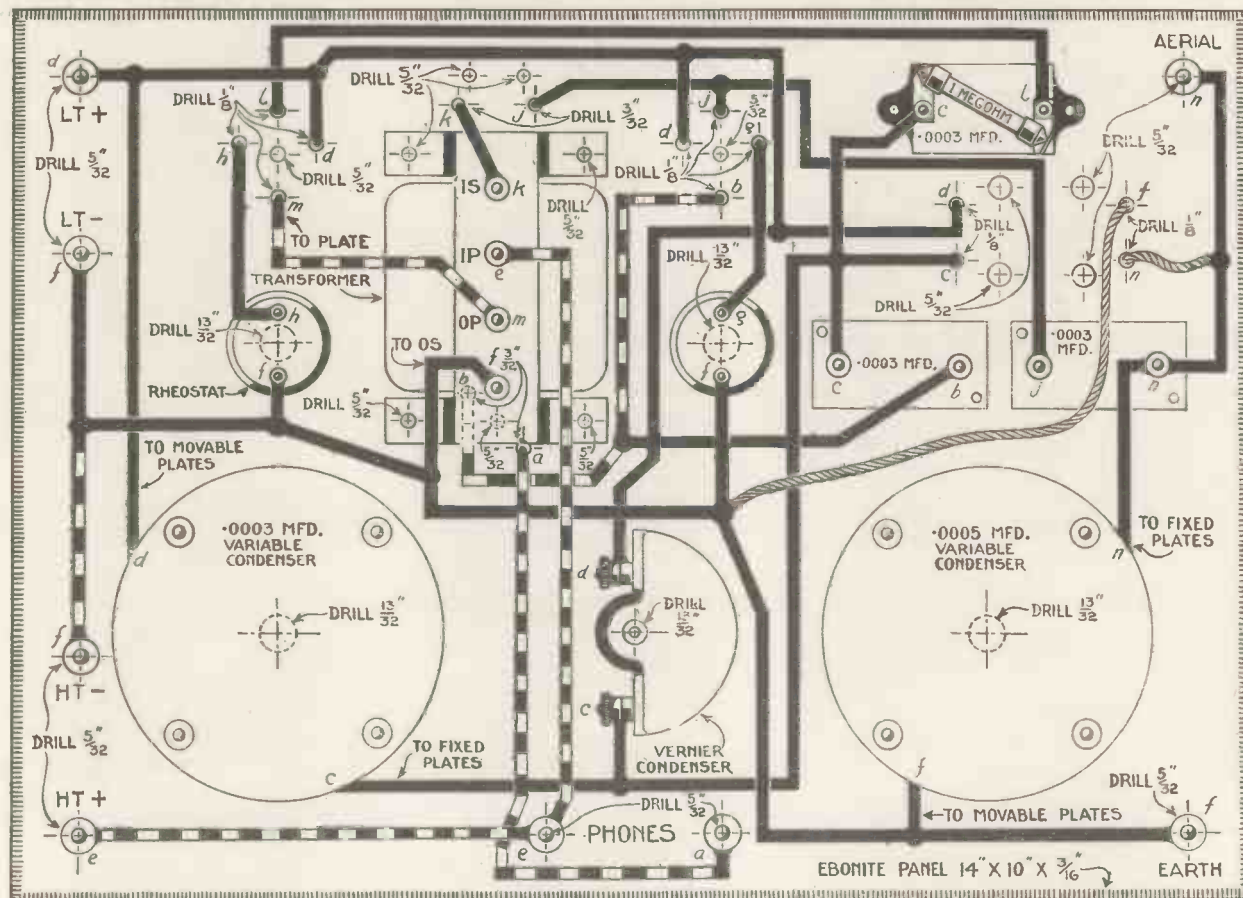
(as published in "The Wireless Magazine" for November, 1925.)



side of panel and upperside of baseboard : all blue lines relate to either panel or components. This template should be used as a guide for drilling holes and for the wiring, and the whole plate being retained for use as a layout and wiring diagram.

The wiring lines, red lines indicating the filament-lighting circuit ; red-and-white lines, the H.T. or plate circuit ; and blue lines, the signal circuit. All wires are soldered together. At all other intersections there is no connection between the two wires. (2) You can save space by connecting the wires at the various terminals. You just connect all like letters together with one wire or with as few wires as possible, in the order, the a's first. By this method you cannot go wrong if you are careful, it having been carefully worked out to save

A Two-valve Reflex Set for Loud-speaker Work (Continued)



This is a reduced reproduction of the free Structograph coloured panel layout, drilling guide and wiring diagram.

The coupling between the coils mounted in the two-way coil holder should be kept fairly loose, otherwise a tendency to howl will develop. The aerial coil is tuned by the .0005-microfarad variable condenser in the left-hand bottom corner of the panel looking at the front.

In the opposite corner the .0003-microfarad variable condenser tunes the "reaction" coil mounted in the moving socket of the coil holder. Across the smaller variable condenser the vernier condenser is connected for the purpose of fine tuning.

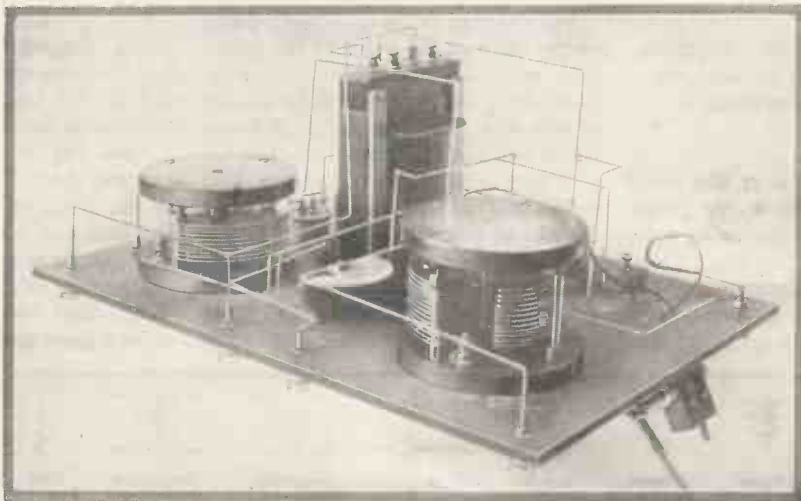
Although this set was specially designed for the

reception of the local station on a loud-speaker with a minimum number of valves, other stations came through with remarkable volume.

London, Birmingham, Bournemouth, and two French stations were received on the loud-speaker,

whilst a few others were audible on the phones.

It may be found necessary to alter the polarity of the coil mounted in the moving coil holder socket. This is done by reversing the two wires connected to the socket.



Back of Panel of Two-valve Reflex Set.

"BURY your extension wire in the garden," says an advertiser.

LATEST D.X. reports are to the effect that Aberdeen has been working with Palestine. We understand that no decision was arrived at as to which of the two should incur the cost of sending the confirmatory post-card.

For the Home-constructor

How You Should Solder

EVERY amateur is proud of the outward appearance of his wireless set when finished: he should likewise be proud of the work at the back of the panel.

There are various ways of making the connections on the reverse of the panel, but the most efficient and satisfactory method is to solder all joints and connections to the terminals underneath. To do this neatly and in such a manner that the work becomes a pleasure rather than a hardship it is essential that the reader should have a knowledge of the orthodox method of soldering joints.

Vital Points

The vital points to remember are that the metals to be soldered must be perfectly clean. (It is usually advisable to scrape the points of connection with an old penknife to remove any dirt there may be adhering to the surface of the metal or wire.) The soldering bit itself must be perfectly clean and well tinned, as it is termed, and sufficiently hot to cause the solder to run freely.

A word of advice upon the preparation of the soldering bit will serve to simplify the work of soldering. The bit, which is of copper, should be filed clean all round to the extent of about half an inch from the point. It should then be inserted in a gas-ring flame, or a flame supplied by a blow-lamp, in such a way that the filed portion of the bit is just out of the flame. This is important, otherwise the bit will become burned and need refiling to clean it.

Gauging Temperature

When heated sufficiently the gas flame will be seen to turn a greenish tint. The bit should then be taken from the flame and a small quantity of "Fluxite" applied to the filed portion all over to form a film of varnish upon the surface.

While the bit is hot it should next be brought in contact with the solder. This will be found to adhere to its surface nearest to the point. Take a soft rag and brush

this solder briskly all over the surface where filed, until it is completely covered. This process is called "tinning."

If the bit is now heated again, care being taken to keep the tinned portion out of the flame, and then applied to solder, it will be found to readily pick up small quantities which can then be conveyed by means of the bit to the metals it is desired to solder.

In soldering up the connections on a set, it is recommended that bare

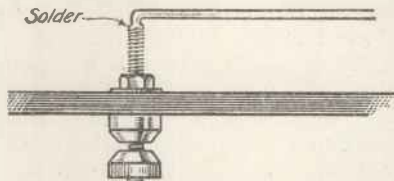


Fig. 1.—Lead Soldered to Terminal.

tinned-copper wire strips be used; these are on sale at most of the wireless retailers' stores in one foot lengths, and with the aid of a pair of pliers can be handled very easily.

To solder lengths of wire to the terminals, the following procedure should be adopted: First go over all terminals at the tops on the underside of the panel with a file or piece of emery cloth just sufficiently to clean them, after which follow up with a film of "Fluxite" on each.

Now heat the soldering bit and

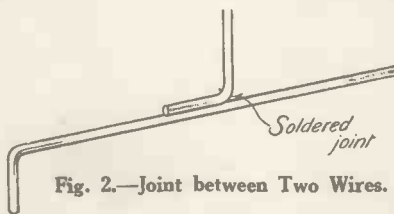


Fig. 2.—Joint between Two Wires.

having picked up some solder as previously described, quickly apply the bit to the top of each terminal in succession. It will be found that a bead of solder will run on to the top of each terminal immediately the latter has become heated by the application of the bit.

It should here be mentioned that it is an essential point in soldering that the metals to be jointed must

be heated sufficiently by the bit so that the solder will run readily and permanently attach itself to them.

Connecting to Terminals

To connect a wire to the terminal all that is now necessary is to apply a film of "Fluxite" to the end of the wire where the joint is to be made and holding it in one hand rest it on top of the terminal at the same instant applying the heated soldering bit.

The solder will run almost immediately, making the wire and the terminal appear as one piece. The bit should at once be withdrawn, leaving the joint to cool and set firmly.

Fig. 1 shows the result of this operation, whilst Fig. 2 gives a clear idea of how joints may be made between two wires. This latter method saves unnecessary lengths of wire being used and obviates the necessity of connecting more than one wire direct on to a terminal.

Soldering is not recommended where proper screw terminals are provided as in the case of most intervalve transformers, etc. D. F. U.

Filament Temperature

IT is not generally recognised that the temperature at which receiving valve filaments are run not only controls the efficiency of a set but also has contrary effects upon the purity of reproduction.

For this reason it is always advisable to install means on the panel for measuring the voltage across the valve filament terminals. This measurement must be taken across the valve itself and not across the rheostat, and should be taken with a voltmeter. All that is necessary is to place two tubular valve sockets on the front of the panel and wire these to either side of the filament legs of the valve holder.

By this means it is always possible to gauge the correct filament temperature for a given anode voltage, and thus secure standard results and maybe preserve the life of the valve.

A. J. C.

The Spartans of Sparrowtowne

SPARROWTOWNE is one of those secluded country towns which you, dear reader, would never have heard of had it not been for Radio. Life there was intensely

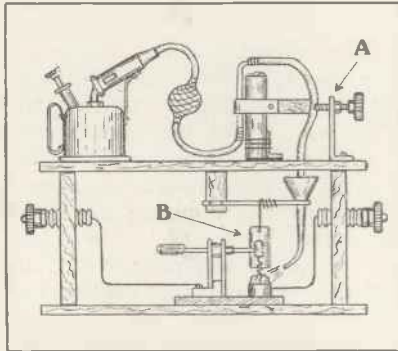


Fig. 1.—Boskins' Anti-dust Detector.

monotonous before the Radio Bug blew into the little hamlet and inoculated the selected few who are responsible for what is now about to be inflicted upon us.

Professors Hiccough, Boskins, Clatterton, Walloph, and Dingleberry were the stung ones, and being thoroughly stung to the bone they had delved into Radio with such gusto that in a very short time they had done up and tried out everything on the board.

Then life to them became a burden, and so they put their heads together, and built a wooden meeting hall where they could congregate once a month to exchange news and views of the Radio World.

This led to the formation of The Society of Radiotricians and Super Inventors (S.R.S.I.—registered at the O.P. as a general nuisance), any member of which would be instantly expelled if he failed to produce some new radio gadget at least once a month. It was then that things began to warm up in Sparrowtowne.

It was the second general meeting of the above-mentioned society and each honourable member had brought along his latest radio invention. The very presence of a member indicated that he had a new idea to demonstrate, for had he arrived idealess, he would have been expelled, according to the rules, in very much the same way as a bee is

expelled from the hive when it arrives home at night without having stung anybody that day.

Our extra special reporter was there, disguised as a carrier wave, and to him great credit is due for the admirable work he did that night. Had it been war time, he would either have been decorated, or executed as a spy, but as it just happened to be peace time, he is entitled to nothing more than his week's wages.

The meeting hall was wrapped in silence, and but for an occasional twitching of the professor's bushy eyebrows, one might have heard a nut drop. Boskins opened the meeting by demonstrating his patent Crystal Duster as shown in Fig. 1.

He had made an effort to overcome the dust nuisance in crystal sets, and, what was more, to utilise certain workshop implements which, in the ordinary way, would be lying idle.

Briefly he had discovered a means

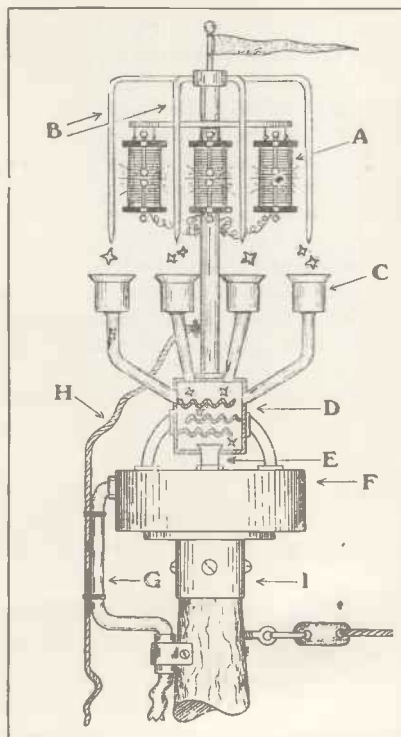


Fig. 3.—Dingleberry Spark Eliminator.

whereby every radio enthusiast could use blow-lamps, whether he could solder or not, and apart from that, there was nothing new about the invention.

It was simply a hook-up of gadgets, previously invented by other people, consisting of an empty paraffin blow-lamp, converted into an air compressor and connected in series with a small

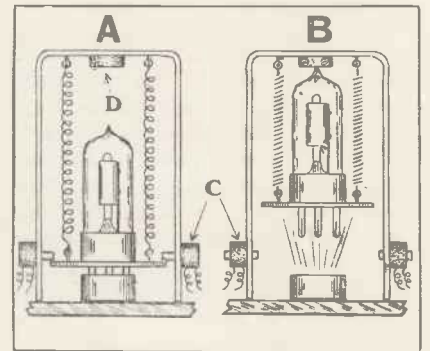


Fig. 2.—Walloph's Patent "Safety Valve."

blow-pipe which delivered a steady current of air over the entire surface of the crystal and thus prevented the smallest particle of dust from settling thereon.

The air pressure was regulated by means of the valve, A, arranged to make small kinks in the rubber connecting tube. A small wind-screen, B, protected the catwhisker, and if necessary the air could be warmed by lighting the wick of the small blow-lamp.

Walloph was the next on the list and he then came forward to demonstrate his patent "Safety Valve" as shown in Fig. 2. The idea, said Walloph, was to eliminate the H.T. fuse.

An ebonite disc was fitted directly under the valve and the edges of this engaged two small solenoid plungers. Two torsional springs were stretched between the disc and the top of the supporting frame. (See diagram A, Fig. 2.)

The solenoid windings, C, were connected to the L.T. battery terminals and when passing a high voltage, as would be the case if the H.T. leads were connected to the L.T. terminals, the plungers plunged, and released the disc, leaving the spring to lift the valve clear of the sockets in the manner indicated at B. A small rubber buffer, D, cushioned the pip impact.

Dingleberry then unrolled a few yards of blueprints and, with the aid

of a few photographs, was able to impress on the minds of his brother members the whys and what-nots of the phenomenal intricacy shown in Fig. 3.

Dingleberry was a veritable tiger at the gentle art of eliminating spark signals and this represented his latest and greatest effort in that direction.

The device was, in fact, a spark trap, and employed four spark "decoys," A, in the form of $\frac{1}{2}$ in. spark coils with gaps, and amongst other things, a series of copper "collectors," B. A number of "receptor cups," C, lined with imitation gunpowder paste, naturally attracted the sparks and enticed them to jump off the ends of the collector rods into the cups.

Before they could recover from the shock of having been fooled so easily they were hurled down small chutes into an ingenious box-like arrangement, D. (This has been drawn in section, in order to make the idea perfectly clear.)

The box contained a series of corrugated asbestos baffle-plates, which gave the sparks a pretty rough time and so fatigued them that they took full advantage of the emergency exit and fell helpless through the pipe, E, into the water tank, F, where they were finally quenched.

Once there they were doomed, and even should one or two particularly hefty ones revive, there was no escape for them, except by way of the overflow pipe, G, which was connected to earth via a length of rubber tubing. To this pipe was also fitted the current supply cables, H, for the coils. The device was provided with a metal socket, I, which fitted over the top of an aerial mast.

Clatterton then introduced what was considered the star idea of the evening. Now Clatterton had big ideas, he was a big man, he lived in a big way, and when he spoke he was a big noise.

It had been said that such a man as he could never hide his light under a bushel, but whether he used a bushel or an empty gasometer, we know not, and neither do we care, for it is no concern of ours.

He was there, he said, to show them

the model of his latest idea in flat-dwellers' aerials, and to explain how it worked. (See Fig. 4). "All flats should be round," he bellowed, "that's what's the matter." He then produced his model of a round flat which was slightly tapered towards the top.

Large sheets of waxed paper were stuck all round the exterior, and square holes were cut to clear the windows. Thick insulated wire was wound over this, all round the flat, the turns being arranged to dodge the windows in very much the same way as a variometer winding dodges the spindle. Tappings were taken off at specially measured wavelengths and connected to the studs of a large

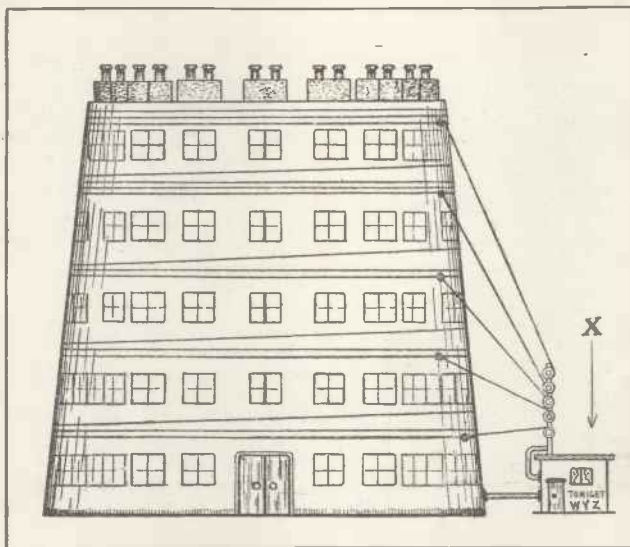


Fig. 4.—Clatterton's Flat-dweller's Aerial.

multiple switch, housed in a special switch-house, X. The cable from the switch arm led into the flat, this being frayed out and connected up to sockets in various parts of the building.

A special switchman would be kept on the premises and he would turn on the juice every night, before going for his supper beer. Not only was the flat-dweller relieved of his aerial troubles; he could use the same set of coils for all wavelengths.

"I want you all to imagine this model as a real life-size ten storey flat," said Clatterton. The professor said he could hardly do that but admitted it was a most ingenious idea and said he was sure that landlords would not object to an aerial like that, especially those who owned very cheap and quickly built flats.

He then went on to explain how

Clatterton's aerial furnished the correct answer to that very perplexing scientific query: "What keeps the bricks of a house together?" The usual answer was: "Mortar," but as any educated person would know mortar keeps them apart.

However, the correct solution would now be: "Clatterton's aerial," and in expressing his delight in being able to dish up a new chestnut in the private bar of The Buckled Plate, he was seized with a sudden attack of hiccoughs and in groping out for a glass of water he knocked the model of the flat to the floor where it fell roof undermost.

When Clatterton picked it up the whole winding uncoiled and slipped off, and his brother members, noticing this, promptly voted the idea as a commercial failure since it would be practically useless in a really bad earthquake.

However, the professor said it may be possible to find a manufacturer willing to take these risks, and he hoped for the sake of his chestnut that the idea would materialise. In closing the meeting, he passed a vote of thanks to all members, and said he hoped to see them all again, with other ideas, at the next general meeting.

OSWALD J. RANKIN.

PHONE HEADACHE

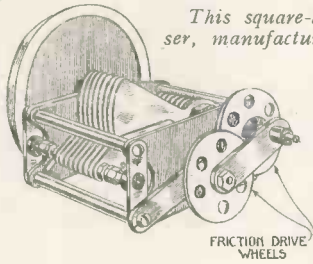
MOST of those who have had to wear telephones for long periods on end in the course of experimental work will have experienced the unpleasantness of phone headache, which is brought about by the pressure of the bands on the top of the head.

To minimise this inconvenience the bands should be shaped as nearly as possible to fit the head. This can be done by starting at the middle of one band and working downwards the earpiece with the thumb and fingers, gradually straightening or curving as you go. When one of the bands has been dealt with the other should be treated in the same way.

When the bands have been made as comfortable as possible in this way, a small pad made of soft material should be fixed to the middle of them.

J. H. R.

Novelties and New Apparatus



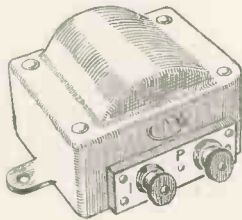
This square-law variable condenser, manufactured by the General Electric Co., Ltd., of Magnet House, Kingsway, W.C.2, has a novel and efficient slow-motion device that entirely eliminates backlash.

The moving plates are connected to the all-metal frame; the construction throughout is rigid and well finished. The vanes are made of brass.

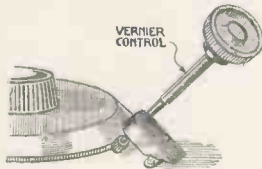
FRICITION DRIVE WHEELS

The general-purpose low-frequency transformer, made by C. A. Vandervell & Co., of London, is shown below. The windings of the transformer are shielded in a pressed steel case.

On test the performance of the instrument was found to be excellent.



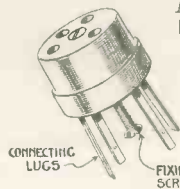
A simple vernier control that can be attached to any existing variable condenser or variometer dial is produced by Beard and Fitch, of 34 to 36 Aylesbury Street, London, E.C.1.



VERNIER CONTROL

A novel feature of this anti-capacity valve holder, made by F. Brown, of Langley Works, Long Acre, W.C., is the flat strip connecting leads attached to the sockets.

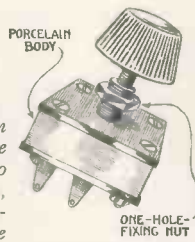
These give minimum capacity effects.



CONNECTING LUGS

FIXING SCREW

A very neat carbon filament rheostat is made by the General Radio Co., of Radio House, 235 Regent Street, London, W.1. This type of rheostat is suitable for bright- or dull-emitter valves, and can be used with either.

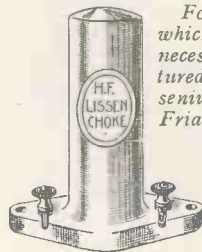


ONE-HOLE-FIXING NUT

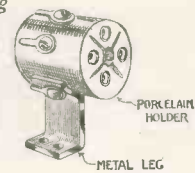
For reflex circuits in which H.F. choke coils are necessary the type manufactured by Lissen Ltd., of Lissenum Works, 16 to 20 Friars Lane, Richmond, Surrey, is ideal.

The unit is easy to mount on to a panel or baseboard.

Each winding is protected by a metal cover.



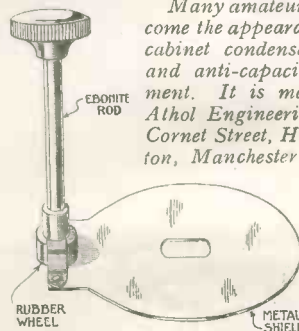
The Athol Engineering Co., of Cornet Street, Manchester, have produced a small brass fitting whereby their valve holders may be mounted on the back of a panel in any desired position.



PORCELAIN HOLDER

METAL LEG

Many amateurs will welcome the appearance of this cabinet condenser vernier and anti-capacity attachment. It is made by the Athol Engineering Co., of Cornet Street, Hr. Broughton, Manchester.



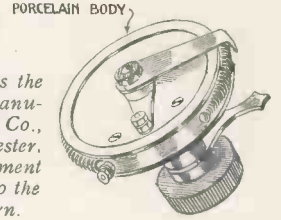
EBONITE ROD

RUBBER WHEEL

METAL SHIELD

A filament rheostat having a porcelain body has several obvious advantages.

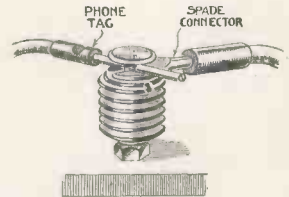
This component, known as the Atlas filament rheostat, is manufactured by H. B. Clarke & Co., Ltd., of Atlas Works, Manchester. However hot the resistance element gets, no harm can be done to the set as the porcelain will not burn.



PORCELAIN BODY

Everybody will admit that a terminal which will take a spade, tag, wire or flex connection is very handy.

Such a device is marketed by Merton Davis, Parnell and Co., of 359 Strand, London, W.C.2.

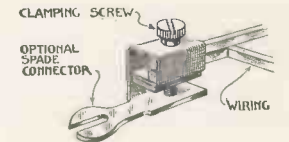


PHONE TAG

SPADE CONNECTOR

The trouble of soldering leads is obviated by the use of this neat little connector.

By virtue of the special clamping device as many as four square-section wires can be accommodated in one connector thus saving time and trouble.



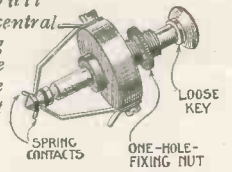
CLAMPING SCREW

OPTIONAL SPADE CONNECTOR

WIRING

It is very convenient sometimes to switch off the filament-lighting supply and leave, so that no one else can switch it on again.

Lissen, Ltd., have produced the necessary means of doing this in the form of a key switch of the "push-pull" type. The central operating spindle may be taken right out.

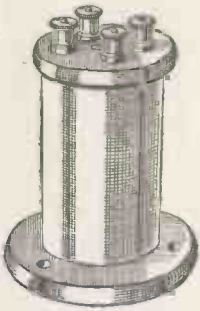


SPRING CONTACTS

ONE-HOLE-FIXING NUT

LOOSE KEY

Illustrated and Described

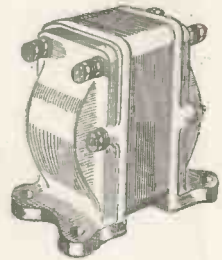


Containing 24,000 turns, this General Radio 83 low-frequency transformer is claimed to give an amplification of 13 to 1 when used with a standard general-purpose valve. Each transformer is nickel plated.

The address of the General Radio Co., Ltd., is 235 Regent St., W.1.

This neat transformer is made by the British Thomson-Houston Co., Ltd., of Coventry, and is sold under a six months' guarantee.

One model, with a turns ratio of 4 to 1, is intended for the first stage, and a second model, with a turns ratio of 2 to 1, is intended for subsequent stages.



What These Pages Mean To You— They Keep You Up-to-date

Wireless development is going ahead so rapidly that it is well-nigh impossible for the ordinary amateur and broadcast listener to keep himself informed of all the new components that are put on the market every week without spending all his leisure in looking through manufacturers' catalogues.

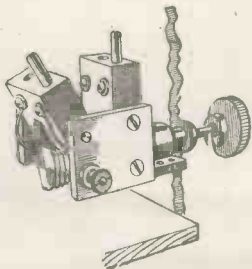
This same desire to keep everything in THE WIRELESS MAGAZINE up-to-date is reflected in the choice of components that are used in making our sets. Our staff carefully watches all the new devices that appear on the market, and the more promising of these are particularly examined with a view to their being incorporated in our sets.

Pages Unique in Wireless Journalism

In publishing these pages (pages which are, we claim, unique in wireless journalism) our object is to present for our readers' information details of all the more important components that have been put on the market during the month. These pages go to press at the very last moment possible to ensure that they are absolutely up-to-date.

Only the Very Best Materials

The fact that a new component is so used may be taken as a sign that we have tested it and vouch for its efficiency—in other words, only the very best materials are used in the construction of THE WIRELESS MAGAZINE sets. Every post brings new testimony to the worth of the "W.M." designs.



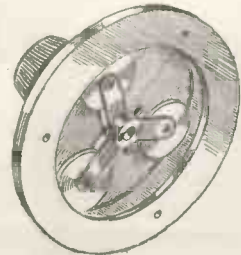
Actuated by a worm gear and incorporating a compensating spring, this coil-holder has been designed to obviate backlash.

It is made by the London and Provincial Radio Co., Ltd., of 34 Colne Lane, Colne, Lancs.

It is particularly suitable for back-of-panel mounting.

For very fine tuning this super-vernier dial is just the thing. It is made in two models—one for one-hole fixed condensers and the other for use with condensers having ordinary screw fittings.

It is marketed by Burndebt Wireless, Ltd., of Aldine House, Bedford St., Strand, W.C.2.





Mr. Sydney Russell.

Broadcast Music of the Month



Miss Mabel France.

A GLANCE at the programmes of the past month reveals to the most ordinary observer a stern fight between high-brow and low-brow, and also a brave struggle on the part of the B.B.C. to satisfy both classes and maintain their own tastes as well.

No "Uplift" Wanted

Unfortunately these three angles differ so widely that it becomes increasingly difficult for the mere man-in-the-street to obtain what he really wants, a pleasant hour or so after his day's work free from "uplift" tendencies, or attempts to improve his scholastic knowledge.

If he could simply speak his mind, to quote that famous engineer, Captain P. P., he would say: "Don't do it."

To satisfy a desire for mere amusement possibly, the directors have, during this last few weeks, evolved at least two new forms of broadcast revue, entitling them *Radio Radiance* and *Winners*. The first title, though

a trifle, gives hopes of better things to come. *Winners*, owing its title probably to the fact that its musical basis is that of the good old musical comedies of our earlier days, and all of them certain winners in the race for public favour, contains far better material.

Abundant scope also has been furnished by the Radio Fantasies of Birmingham, especially the last one, *Cameos of Egypt*, and *The Offenbach Follies*, with the tuneful score adapted from Offenbach's various operas, arranged by the well-known conductor, Mr. John Ansell, and the production arranged by Mr. George Grossmith, a fact sufficient in itself to insure success, for if "G. G." cannot evolve a real "winner" who else could be expected to do so?

Radio Radiance, which has run into some nine or ten editions by this time, engages the work of a clever little band, including Miss Maudie Dunham, Miss Jean Alli-

stone, Miss Iris White, and Messrs. Tommy Handley, James Whigham, Eddie Morris and The Dancing Radios, who look as good as they sound, did you but know it. One of the chief charms is that soupçon of an American accent, which lends much charm to the songs.

"Winners"

With *Winners* personally I like the "testy old father," and the juvenile lead; both make excellent foils for the ladies, Miss Joan Hay and Miss Phyllis Pantling, and, as I have said before, the revival of the old musical comedy gems brings back for many of us the "years that the locust hath eaten."

"Midst threats of strikes and rumours of wars, we are most of us glad to "try and get a laugh somewhere," and luckily we have not had so far to go this month.

We have had several visits from our own John Henry, though we really would advise him not to carry



Mr. Frederic Collier.



Mme. Alice Couchman.



Mr. Julius Harrison.



Miss Irene Brooke.



Miss Astra Desmond.



Mr. J. Dale Smith.



Miss Gladys Ancrum.



Mr. James Whigham.

the "henpecked-husband" atmosphere too far. A good stand-up fight with Blossom would do our hearts good sometimes.

Cockney and Child Studies

Then there has been Mabel Constanduros, always good for Cockney and child studies, Mr. Ronald Gourley with those burlesque symphonies and whistling solos of his, Mabel France who is rapidly establishing her "Aunt Maria" as one of the classic comedy characters. There is, too, a vein of shrewd common sense underlying the voluble lady's remarks. Can it be that Miss France "works off steam" on us occasionally? To quote another well-known humourist: "Yes, I think so."

And, by the way, Mr. Vivian Foster has just been persuaded to record one of those inimitable parson's speeches of his for the Columbia Company. Successful? "Yes, I think so!"

Mr. Middleton Woods

Middleton Woods is another clever entertainer and one, too, who early in the old days of Marconi House, recognised that the new art of broadcasting could not injure a good artist, only, indeed, increase his popularity still further, and Mr. Woods lent his aid between other engagements, notably with Sir Dan Godfrey at Bournemouth, right nobly.

Amongst the instrumentalists we have had some famous musicians and

familiar names all over the country. Most recent have been the violin recitals of Miss Daisy Kennedy and Michael Zacharewitch, both famous artists and both absent now on respective American tours, where, apparently, all our best artists find most appreciation.

Two clever sisters and duettists



Mr. William Michael.

are found in the South, the Misses Una Truman and Irene Brooke, both of whom have made names in London at the great classical concert halls. Leonard Hirsch, the first violin leader of the 5IT Trio, and later its orchestra, has broadcast again recently from 2LO. He is now

a member of the famous Catterall String Quartet.

Mr. Harold Fairhurst, another well-known broadcaster and recital giver at the new hall which has taken the place of the old Steinway, with its rather impossible name, Grotin-Steinweg Hall, was heard from Daventry.

John Dickson, a popular 'cellist at the Bournemouth station, has also been heard, as well as the two famous French pianists, Lafitte and Marcelle Meyer, with Mr. Harold Samuel as the exponent of Bach. In addition, figure well Miss Alice Couchman and Miss Ethel Walker.

Chamber Music

Chamber music is always a vexed question with most listeners-in for, whereas there is no doubt the largest majority for the fine performances of the J. H. Squire Celeste Octet, Casano's Octet and the restaurant bands of De Groot, the Savoy, the Trocadero and the Holborn, there is still a section that seeks to improve its mental calibre and technical ability through hearing the sterner joys of classical quartet.

For these, therefore, the programmes embody the work of the Virtuoso String Quartet, led by Miss Marjorie Hayward; the London Chamber Orchestra, now led by Mr. Samuel Kutcher, late of the quartet party bearing his name; and the 2LO Quartet itself. The latter, however, is a rather more unique combination,



Mr. John Collinson.



Miss Ethel Walker.



Mr. W. Heseltine.



Miss Una Truman.



Miss Malet Constanduros.

BROADCAST MUSIC OF THE MONTH

(Continued)



Mr. Tudor Davies.

for it comprises Mr. J. Kneale Kelley (violin), Mr. Almgill (flute), Mr. Edward Malkin, with his substitute over the summer, Mr. Frank Reade (organ), and Miss Sidonie Goossens (harp). As may be imagined, there are few works written for these concerted instruments, and the special compositions of Mr. K. A. Wright have proved extremely useful and melodious.

Vocal Element

The vocal element is always in good hands, and though there is a tendency still prevailing to broadcast singers without a more than ordinarily clear diction, on the whole there are few complaints to make. John Collinson is a noted tenor, and one who has been heard from the very early stages in wireless programmes. William Heseltine, Astra Desmond, Dale Smith, Rose Myrtil, Mavis Bennett, Dorothy Silk, and Norman Allin are all powerful attractions at any station and have been heard this month frequently. It is safe to say, therefore, that the studio concerts have proved reasonably satisfactory to all parties.

Ballets and Outside Broadcasts

A marked feature, too, of the October programmes has been the performances relayed from the Opera House, Covent Garden, of Pavlova, the Russian dancer. It is in itself a singular thing that the public at large, who have, and for the most part never will, be able to see Pavlova's art, yet are anxious to have the shadow of the substance and hear her over the ether. There are, of course, the attractive qualities of a fine orchestra, and it is difficult to decide which made the best combination.

From the opening night of the season, when *Divertissement* was given, the series included *A Polish Wedding*, *Don Quixote*, *The Fairy Doll*, *The Sleeping Beauty*, Russian

Folk Lore and "hopiniana," all fine examples of the great dancer's art.

For the rest, the revues such as *Charlot's*, the Co-optimists, and *By the Way* have all contributed to the pleasure of the listener-in.

A great debt of gratitude is due to the B.N.O.C. for the loyalty shown to the B.B.C. from the first transmission, and its performances every season are always eagerly welcomed by opera lovers. During their Sep-

artists, Tudor Davies, William Michael and William Anderson. This opera was broadcast from the Leeds-Bradford station to Daventry, Birmingham and Dundee, while on the following night *The Magic Flute* was heard from all stations save Daventry. In this were heard Noel Eadie, another newcomer, and Walter Hyde and fellow members.

Other Operas

There followed *Tales of Hoffmann*, *The Meistersingers*, *Faust*, with wonderful Miriam Licette, Puccini's last opera, *Gianni Schicchi*, and two performances of Vaughan Williams's *Hugh the Drover*.

This opera may be termed, literally and metaphorically speaking, a play "with a punch," for it is, in fact, the only real boxing opera. *Othello*, with Frank Mullings in the title rôle, *La Boheme*, with two more of the newcomers, Katherine Hilliard and Henri de Coninck, the latter a famous Paris Opera House tenor, *Carmen*, *The Golden Cockerel* (Rimsky Korsakov), *Tales of Hoffmann* and *Aida* all furnished excerpts and ideal interpretations for listeners unable to attend the operas. STUDIOS.



Mr. Tudor Davies in Costume.

tember and October season at the Theatres Royal, Leeds and Glasgow, some excellent transmissions were made, care being taken, naturally, to arrange that the relaying did not come into the towns themselves where the company were playing.

In *Rigoletto* (Verdi), the first opera to be transmitted, Sylvia Nelis, a newcomer, achieved a triumph with Marjorie Parry and the more familiar

Vernier Reaction Control

FINE and accurate control of reaction is necessary when receiving distant telephony stations.

In sets using two plug-in coils, aerial coil and reaction coil, the desired effect can be obtained conveniently and efficiently by substituting a three-coil holder in place of the two-coil holder. The third socket in the holder is then used to take a coil of from four to eight turns only, which is connected in series with the main reaction coil.

Approximate coupling values are then obtained by the main reaction coil in the usual way, the small coil then being adjusted to obtain a vernier effect. R.F.T.

A TRANSMITTER FOR AN ARTIFICIAL AERIAL

by E.H. Robinson
(5YM)

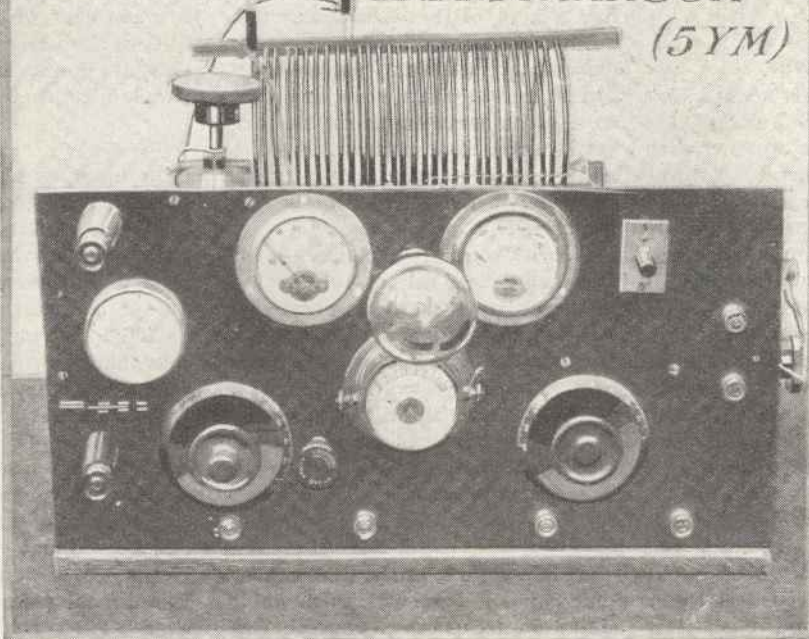
THE enthusiast who applies to the Post Office for a transmitting licence has usually to put up with a permit to use an "artificial" aerial in the first place. This may seem annoying, but it is a wise course, in reality, as it gives the real experimenter a chance of getting used to transmitting work without annoying ether users for miles around whilst he is experimenting. And it chokes off the "ether hogs."

My own station was licensed, for "artificial aerial" work only for more than two years before the P.M.G. could be persuaded to issue to me a full licence. My early troubles were many because I had no knowledge of transmitting and could get no information about it. There is much more information available now, but, even so, there is little to tell the beginner how to work with an "artificial aerial," and what to expect in the way of troubles and results.

Theory and Practice

When I say that I had no knowledge of transmitting I mean, of course, practical knowledge. I knew all about it from the theoretical point of view; but theory and practice, in wireless, often want a good deal of stretching before they will meet.

In a station such as the one illustrated herewith, the chief feature that will strike the uninitiated is the wealth of measuring instruments on so small a set. These instruments, which are aerial current meter, plate milliammeter, plate voltmeter and filament voltmeter, are really essential on any transmitting gear, but it is impossible to do any work



but this only partially solved the problem because its capacity, when built, was too low. Complete satisfaction was obtained by the purchase of an ex-W.D. oil-filled condenser.

This condenser stood up to anything that I could put into it, and of course the modest maximum of 10 watts on which the station works on the radiating aerial does not require anything like this heavy load. But some day, when

at all on an artificial aerial without them.

Work on such an aerial is all measuring. The input and output are measured, and from the relation between the two you judge the efficiency of what you are doing. The writer's transmitter, in the state seen in the photograph, had settled down into what is known as the "Colpitts" circuit, in a modified form, and its business in life was to test out the various forms of power supply available to a station where there is no electricity laid on. It was also used for testing various forms of aerial and earth screens when the station was given a full permit.

It also served to give the useful lesson that ordinary receiving condensers will not stand up to 1,000 volts. One day I had an apparent radiation of nearly half an amp when the valve filament was not alight! The power from a TVT (tuned vibrating transformer) unit was sparking across the series condenser and turning the set into a spark transmitter.

This difficulty was got over, to some extent, by rebuilding an old condenser with very wide spacing,

the power supply is really solved, we may think of emulating the real D.X. hounds and apply for a high-power licence and try to talk to Australia. Then the excellent oil-filled condenser will come into its own again.

For Beginners

Beginners will find the circuit shown an excellent one. It is easy to work and very easy to get results with. On an outdoor aerial in the writer's case it performs well apart from the fact that there is a harmonic that is being chased, the cause of which cannot at present be found.

Referring to the diagram, the inductance L₁ consists of 30 turns of No. 12-gauge copper wire, wound on a former 5½ in. in diameter. Each turn is spaced ¼ in., and the finished coil is supported on three strips of ebonite. One of these strips can be seen in the photograph.

As a matter of curiosity it may be said that the inductance of this coil was measured and was found to be 63 microhenries. The aerial tap is used about 10 turns down and with the series condenser about half in the wavelength is 180 metres.

The grid condenser C₂ has a maximum capacity of .0005 micro-

farad, and is used nearly all in. The grid leak R1 is variable between 2,500 and 15,000 ohms. As the whole 15,000 ohms is used it could probably have been bigger with advantage. The choke coil in series with the leak consists of two basket coils in series, each having 250 turns. The choke coil is an absolute necessity with this circuit.

Measuring Instruments

The measuring instruments, except the filament voltmeter, are shown in the diagram, together with the switching arrangements to throw them in or out of circuit. In artificial aerial work they will normally be in circuit all the time; but when on the radiating aerial the constant flicking will soon spoil the plate milliammeter. The hot-wire ammeter in the aerial circuit has a resistance of at least five ohms which cuts down the actual power radiated.

The variometer in the plate lead acts as a choke which keeps any radio-frequency energy out of the power supply. The variometer was put in with the idea of tuning out harmonics; but it is not a great success. Tuning with it has to be critically controlled, and it is better to replace it with an ordinary basket or honeycomb coil of about 300-400 turns. At present good results are being obtained with a choke consisting of 300 turns of No. 26 d.c.c. wire wound on a 2½-in. cardboard tube.

The essential part of the apparatus, the artificial aerial, is shown on the left hand of the diagram, with the switch to throw it out of circuit. Such an arrangement is useful even when the station is licenced for outdoor aerial transmission, for it enables all adjustments of the circuit to be done before the power is switched on to the aerial.

Any aerial has inductance, resistance and capacity, and an artificial aerial should be constructed so as to have these in the same proportions as will the aerial on which the set is to be worked.

This means measuring these characteristics, which is not an easy job, and requires a resistance bridge, and capacities and inductances of known value. The writer's aerial-counterpoise capacity is .00026

microfarad, and the combined resistance of the wire R1 and the hot-wire ammeter is eight ohms.

It was not found possible, however, to put in the right amount of inductance, and even with the resistance wire inductively wound the inductance and capacity of the artificial aerial fell short, by about five metres, of the inductance of the outdoor aerial.

Not a great matter, you will say; but it means that when one tunes to a given wavelength on the artificial aerial, five metres has to be added when switching over to the radiating aerial. And it may be forgotten!

If there is no likelihood of the station being licenced for full working for some time there is no need to measure the outdoor aerial constants. It will be near enough for comparative experimental work if the artificial aerial is made up with a capacity of .0003 microfarad and a 10-ohm resistance, wound on a former the size of a lead pencil.

Possibilities

As an example of the kind of work that can be done with such an installation, let us take a concrete case. We wish to measure the efficiency of a circuit and compare it with the efficiency of other circuits. We put in a measured amount of power which

all ordinary experiments is fixed at 180 metres. This is important. The characteristics of the circuit change with the wavelength.

We now measure the output. This we will say is 0.15 amp. We then want to know how many watts we are putting on to the aerial. As a matter of fact we might expect to get about fifty per cent. of our input out again; but we shall be very lucky if we do. Output power is found from the simple formula $C^2 \times R = E$.

Efficiency

In other words, if we square the measured output (amps) and multiply it by the resistance in the artificial aerial, the answer will be output in watts. In this case the answer comes out at .17 watt, which is not good enough. We ought to get something over half a watt! This is the ordinary efficiency measurement which is done for every change that is made.

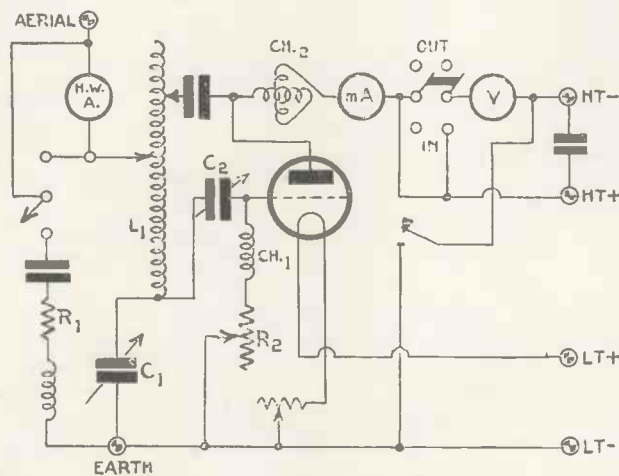
Many people who apply for a transmitting licence are interested in telephony more than in morse, and they find that it is rather difficult to conduct experiments in telephony with an artificial aerial. The difficulty can be got over, however. The problem is, of course, to hear what is being done.

At my own station all work on microphones is done with a simple amplifier circuit working on a "land-line" connected between two rooms as far apart as possible. By this means music can be transmitted and a complete series of experiments on any kind of microphone and amplifier circuit carried out. This does not, of course, necessitate having even an "artificial aerial" licence, as no radiating circuit is used.

But experiments with the actual radiation of telephonic signals on an artificial aerial can be carried out, without a complicated system of measuring instruments, by arranging a high-power receiving set in another room.

The artificial aerial radiates some small amount of energy, and this can be picked up on a multi-valve set. An assistant may then listen on the receiver and report on a "land line," which is simply two telephone earpieces connected to

(Continued on page 394)



Circuit Diagram of Simple Transmitter.

we measure in volts and milliamps, and then convert into watts by multiplying the two amounts together.

In my own experimental work I always use a measured power input of two watts derived from dry cells. This is the method that gives the least trouble. The wavelength for

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The connections of a Lissen Choke Amplifier are as follows:—One terminal of the Lissen Choke is connected to plate of preceding valve, the other terminal to H.T. positive. A Lissen Fixed Condenser of .01 mfd. (price 4/3) is connected between plate of preceding valve and grid of L.F. valve and a Lissen Variable Grid Leak (price 2/6) is connected between grid of L.F. valve and L.T. negative. Grid cells should be introduced between the Grid Leak and L.T. negative if found necessary. Each succeeding stage is connected up in the same way.

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In writing to advertisers, please say you saw the advertisement in THE WIRELESS MAGAZINE.

Problems That Hinder Yet Intrigue

THERE are a hundred and one problems and perplexities which at present intrigue and hinder us in our advance into the mysteries of wireless.

Absorption

Why is it, for instance, that signals received at certain spots from points farther north can be perfectly clear, while those sent from the west are rarely, if ever, received correctly? Beyond contradiction it is difficult to send messages west to east across some countries, when at the same time and at the same places it is easy to send messages from north to south and vice versa.

It has been suggested that mineral deposits in mountains absorb the waves, but this theory does not satisfactorily explain why the phenomenon does not apply in all directions.

It is also curious why wireless is affected by sunrise and sunset. American signals received in England are sometimes barely distinguishable at sunrise, though they improve considerably towards the latter part of the day. Why?

Uncanny effects are also obtained in relation to daylight and darkness. It has been found that ships out of touch with land stations during the day have been able satisfactorily to transmit to and receive from the mainland at night, even though in the meantime they have travelled many miles farther out to sea. Again, why?

Unlimited Range

Then there is also the extraordinary behaviour of wireless waves in certain parts of the Pacific Ocean, and in the neighbourhood of each of the poles. Ships' operators expecting only to be able to send messages for, say, a thousand miles, sometimes suddenly find their range extended to almost unlimited degrees. And there is the reverse of the puzzle when operators with far more powerful sets find their range curtailed by at least half the proper distance. Would not the maritime world pay handsomely for a satisfactory answer to this problem?

The man who shall eliminate "atmospherics" will assuredly be

hailed as a world-benefactor. The problem of tuning-out these unwanted signals is perplexing all wireless engineers and the inventor or experimenter who succeeds will probably be able to ask his own price for his secret.

There is also a crying need for the valve requiring no batteries, or alternatively, a crystal that will take its place; but though the reward offered for solving the problem is indeed great, experimenters are deterred by the initial difficulty of financing the necessary research and experiments.

Television by the aid of wireless is still in its experimental stage. Economy and reliability in operation are demanded, and after that will be needed a man who shall take this

latest scientific achievement and develop its practical commercial possibilities.

At the moment a station working on, say, 700 metres can effectively jam or interfere with stations working on a totally different wavelength, and therefore a profitable line for investigation would be to define the marginal allowance between wavelengths. Beams and directional aerials by no means solve the mystery.

Long Distances and Short Waves

For the present perhaps the most profitable line of investigation in which the average experimenter can engage is connected with long-distance communication on short wavelengths with low power. L. T.

A Transmitter for An Artificial Aerial (Continued from page 392)

a twin wire. By this arrangement a whole series of experiments can be quickly carried out.

The work that can be done on an "artificial aerial" is most fascinating, but it is no use attempting to do anything without the minimum of measuring instruments mentioned in this article.

If the purse of the owner is long enough many others can be added with advantage. Since what one wants is comparisons and not actual measurements true to a fraction there is no need to have expensive instruments for these experiments.

Ex-W.D. gear is still to be obtained. The voltmeter across the filament of the valve should read fairly accurately or you may greatly shorten the life of your valve by over-running it.

Just one final hint as to valves. The beginner will probably find that the cheapest way to conduct initial experiments is to use dry batteries for the power supply. These dry batteries should, of course, be of the largest kind procurable.

Much useful work can be done with ordinary R-type valves. I have worked with DER valves for many months, on and off, and had most useful results on quite low power. But about the best valve

for low-power working is the DE5. The LS5 makes a very good 10-watt transmitting valve, but it takes far too much current for use with dry batteries.

Keying

Keying the power supply, as shown in the diagram, is specially recommended for cases when dry batteries must be used. It is also very useful when power is taken from a TVT unit. For working with a TVT unit with power reduced by running off a 6- or 8-volt accumulator, a Mullard 0.5 (5-watt) transmitting valve is useful.

Despite many rumours to the contrary, the experimenter with some real work to do will find the Post Office authorities most sympathetic. An "artificial aerial" licence is easy to obtain, and directly the experimenter has work that must be done on a radiating aerial he will find that the necessary permission will be forthcoming.

But he must be able to send and receive morse at least 12 words per minute.

Unless the applicant has a certificate from the Army, Navy, Air Force or the Post Office, he must undergo an examination to satisfy the authorities on this point.

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The new goose-neck design is the result of research in radio acoustics, which definitely establishes its value in relation to the diaphragm fitted. One feature remaining unchanged is the patent material used in the construction of the horn which eliminates any suggestion of harshness. It is now possible to control volume and selectivity with the small lever located at the rear of the base and to tune in to a finer degree. Elegantly shaped, it still has that tasteful neutral brown finish and felt-padded base. Height 18 ins., bell 10 ins.

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THE majority of listeners whose houses are supplied with direct current make no use of that current except perhaps to charge their accumulators, during which time the set is out of commission. I except, of course, the transmitters, and even they are not all above reproach for opportunity neglected.

For an outlay small in comparison with the costs of professional accumulator charging, and high-tension battery replacements, all the absolute essentials can be provided whereby the set is never out of commission, the accumulator can be kept charged at a fraction of a farthing per charge, without disconnecting it from the set, even while reception is in progress, and the high-tension battery becomes a thing of the past. Further, the accumulator may be of very moderate dimensions, as it is only used as a reservoir during daylight reception when no lights are in use in the house.

Charging the Accumulator

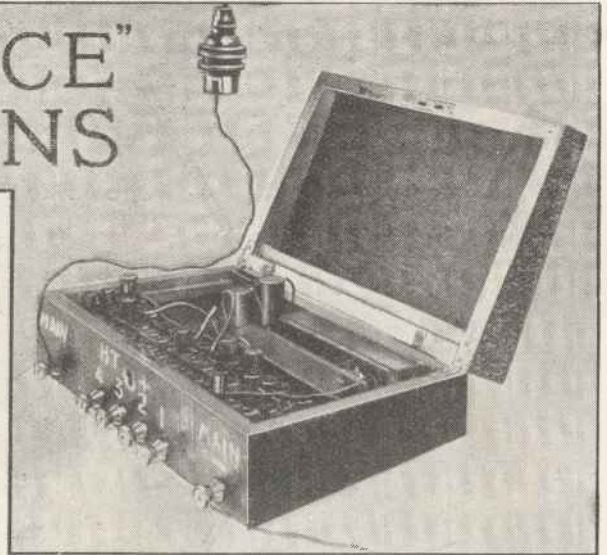
First ascertain that your supply is direct current, and its voltage: discover which side, positive or negative, is at or nearest earth potential. To do this, locate the main switch, which will usually consist of two tumbler switches united by a wooden bar. Expose the "innards" by removing the bar and the covers.

Every amateur should keep a test lamp made up, that is, a lamp-holder, with a bulb, on a short length of flex, the two free ends of which are bared to allow contact to be made in any circuit.

This should be used to find out which pair of contacts are in the house circuit, and which are in the main circuit. With both switches in the "off" position, try first touching both outer contacts with the ends of the flex; next, both inner ones, then each outer one in turn with the inner one of the other switch. In only one of these positions will the lamp light.

These contacts are the direct supply from the main. Mark them, and discover which is positive and which is negative by breaking the test lamp circuit and completing it through a damp piece of red litmus paper or salt water. In the latter test more bubbles will be caused by the negative lead, whilst in the former the litmus paper will turn blue. Label the two contacts negative and positive.

Connect one free end of the test lamp to the



nearest tap, and make the wire from the other side long enough to reach either switch. Touch this on each main contact in turn; the one on which the lamp does not light is "earthed" at the power station. Note whether this is the positive or negative for later use.

You can now put the cover on the "positive" switch and turn it on. In future we are only concerned with the switch to which the main negative is led and which must never be turned on once the accumulator is connected in the circuit to be described.

In towns which use the "three-wire" system, the polarity of the earthed wire varies in different houses, often on opposite sides of the same street, so that the works cannot give any information, and in advising a friend concerning this use of the mains, don't take it for granted that his case is the same as yours.

Heavy-gauge Wire

From the contact which you have labelled "main negative," take a well-insulated wire of heavy gauge (sufficient to carry the entire house current, say 3-18 gauge) to the negative terminal of your accumulator, thence to one of the free contacts of a single-pole double-throw switch. A two-way tumbler switch serves the purpose excellently.

The positive side of the accumulator is connected to the other free contact on the switch. The common contact—in a knife switch, the blade—or the two united contacts in a two-way tumbler—is connected to the

house contact of the "negative" main switch either by a special wire or through the existing negative house lighting wire in the room, the fuse in the negative lead to that room taking the full house current.

(Continued on page 398)

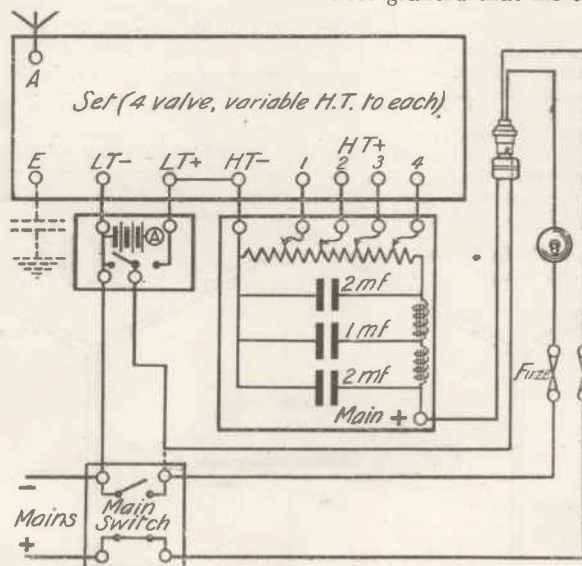


Fig. 1.—Complete H.T. and L.T. Circuits.



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bright emitter. Yet its wonderful economy of current will enable a six-volt accumulator (with its cells re-connected in parallel to give 2 volts) to give 70 hours' use where it gave but 9 before.

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In writing to advertisers, please say you saw the advertisement in THE WIRELESS MAGAZINE.

The special wire or wires from the main switch to the change-over switch should be very well insulated if the negative main is not the earthed conductor.

One of my early troubles resulted from the use of an "earth" return; but on wet days the potential of the non-earthed conductor to earth varied by approximately 50 volts each way in 210, so that at one moment the house lamps glowed dull red and almost invisibly, while on another occasion they all suffered a complete burn-out!

Burning Rubber!

Then again, on another wet night the dull glow aroused parental indignation, so I switched off the "charge" switch and turned on the main. (To turn the main on with the accumulator switch at "charge" short-circuits the accumulator.) A smell of burning rubber developed, for my special wire connected main switch to earth, approximately zero potential difference on dry days, but the shelter of the missing 50 volts when it rained!

These worries have been overcome by modifications in design which have resulted in the present trouble-free arrangement. Incidentally, the potential of the "earthed" side of the switch, to earth, can be used as an absolutely gratis source of current, but it is subject to remarkable fluctuations, which make it unreliable for charging accumulators.

This completes the accumulator-charging circuit, the accumulator remaining permanently connected to the set as usual. When using the set, or at any other time if the accumulator needs charging, and there is current being used in the house, the switch should be in such a position that the common contact is connected to the positive side of the accumulator, which is then on charge.

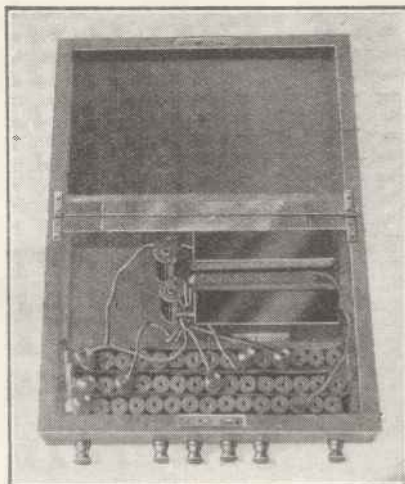
The vent plugs should be removed permanently, and as soon as the cells gas vigorously, the switch is thrown smartly over, the common contact then connecting to negative main and negative accumulator terminal, the positive accumulator terminal now being disconnected.

Obtaining Anode Potential

Anode voltage control is made possible by a series of resistance coils which, connected in series, form a potentiometer in effect. These coils can be obtained very cheaply

(ex-W.D.) in resistances of 200, 300, or 400 ohms each, wound on an insulated central brass tube, from which tappings are taken in the finished instrument by means of Clix terminals.

Forty-five 400-ohm coils or sixty

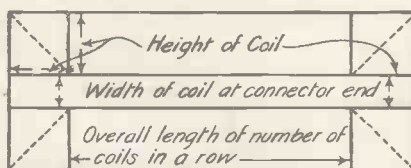


Plan View of Resistance Box.

300-ohm coils are needed for a 210-volt circuit (for other voltages the numbers are proportional), each tapping being then $4\frac{2}{3}$ or $3\frac{1}{2}$ volts respectively. I am quite satisfied with the $4\frac{2}{3}$ volt steps and use 400-ohm coils.

At this stage the box to contain the complete H.T. unit should be selected large enough to accommodate the coils, which are made up in rows in a manner about to be described, the smoothing circuit (to eliminate "commutator ripple") and wander plugs.

A deep, well-finished cigar-box will usually do. One side bears the terminals, wood being quite a satisfactory insulator in this case. The width of the box determines the number of coils to be arranged in a row, and a trough is made to hold this number vertically and in a straight line.



Folding Paper Trough.

The two connector tags are carefully bent flat, after which each coil should be tested for continuity with battery and phones, and afterwards placed in the trough, the connectors overlapping those of the coils on

either side, to which they are then soldered.

The end of the central tube is filed bright and tinned, a short wire connecting each central tube with one joint between connectors. To the two end connectors longer wires are taken.

A rough wooden trough with one end missing is now made, long enough and wide enough to fit the row of coils loosely with the connectors downwards, and a piece of brown paper is folded to fit it. There should still be room for the inverted coils inside the paper trough.

A quantity of pitch is broken up; some fragments are placed in the paper trough supported by the wooden one, and the whole placed in the oven until the pitch is melted. The depth of the pitch should be half the height of the coils. The row of coils is then placed in it with the connectors downwards, and the wires at each end turned up to the surface, pressed to the bottom, and, when cool, the paper trough and its contents can be slid out of the wooden mould at the open end.

This procedure is repeated until all the coils are set rigid in pitch surrounded by brown paper.

Coil Connections

The coil blocks are then placed in the box selected, and are connected in series by their end wires, two free ends being left. One of these ends is connected to a terminal, marked "main negative," direct. The other terminal is marked "main positive," and goes to one side of a 2-microfarad condenser, and to one side of a Fullerphone 1,000-ohm choke.

The free end of the choke is connected to a 1-microfarad condenser and another choke, the other side of which is connected to a further 2-microfarad condenser and the other free end of the series of coils. The free sides of the three condensers are all connected together, and taken to the "main negative" terminal.

As many more terminals are fitted as separate wander-plug tappings are required, and to each is attached a Clix on a piece of flex.

Using the Box

To use the box connect "main negative" to H.T. - on the set, and each H.T. + to a wander-plug terminal. From "main positive" a length of single flexible wire leads

(Continued on page 417)

American Types
C.T. 201A, C.T.199

British Types
C.T.25, C.T.08

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An every purpose Power volume valve.

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DISTANCE, tone, quality, selectivity, all depend on the valve. A valve receiver is no better than its valves, and valves backed by an iron-clad guarantee are the kind you want for proper reception.

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All radio valves vary slightly. Only by rigid inspection backed by a rigid promise to make good can this be cut to a minimum. Cleartron has made good because it fulfils these requirements. Every valve is truly tested; every valve carries an Iron-Clad Guarantee.

Cleartron valves come in four regulation types: C.T.08, C.T.15, C.T.25 and C.T.25B. They retail at 12/6 and 15/- each, performance guaranteed. If your dealer does not yet carry Cleartron, order direct from us provided you send your dealer's name and address.

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C.T. 25B and
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type
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BRITISH

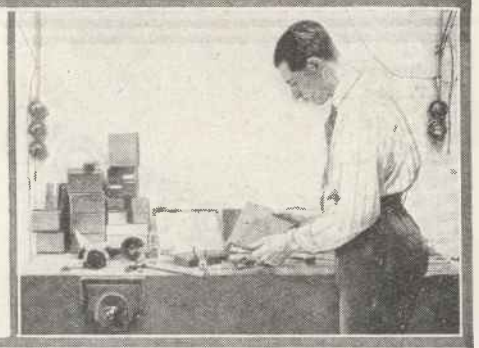


MADE

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How to Prepare Your Panels

The Second of Three Articles



Now as to the preliminaries to marking out and drilling a panel. There are three probable conditions. The first is that where the set is

building sets you will often see the instruction, "Hold the panel in the vice." You may not have a carpenter's vice, or the metal-working

do if a metal-faced vice were being used.

As will be seen by the photograph (Fig. 12), quite an expensive engineer's

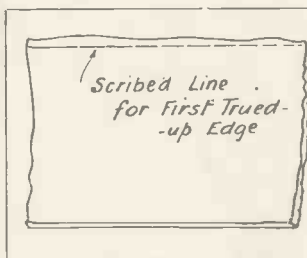


Fig. 13 (left).—Marking the first edge of a rough-cut panel.

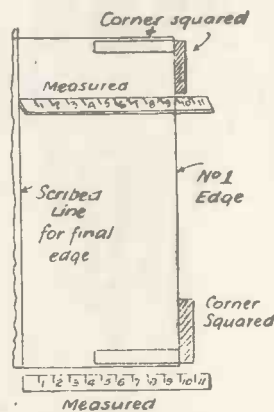
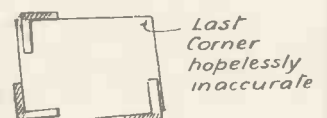


Fig. 14 (right).—Wrong way to square up a panel.

Fig. 15 (left).—Correct way to produce a square or oblong panel.



to be made up to a definite plan, with stated components, and where a full-size drilling template, such as the "Structographs" that are given as supplements to THE WIRELESS MAGAZINE, is to be followed.

In the second case it may be necessary to work from a small drawing, while the third contingency may introduce further difficulties; the chosen diagram may be the theoretical one—a circuit diagram without any reference to the disposition of the components and their dimensions.

Squaring the Edges

The initial problem will be to square the ebonite and to trim it true to size in a workmanlike manner.

In ill-informed descriptions on

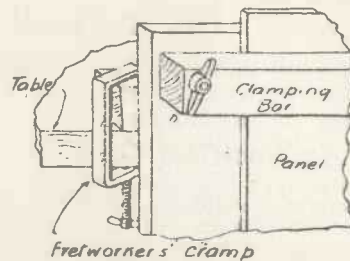


Fig. 10.—Clipping the Clamp to the table where screws cannot be used.

vice only holds a small panel, whereas the wooden clamp can be arranged to suit any size.

To trim up a rough-sawn panel, it is at first necessary to provide one straight edge, if it is not already there, from which the square can be successfully employed.

Method of Trimming

If all four edges are rough, scribe a line (see Fig. 13) along one of them as near to the lowest point as possible and then file to this mark. The file used should be an 8-inch or 10-in. "second cut" (a medium roughness) (see Figs. 14 and 15).

It is best to keep the panel well down in the clamping device so that the edge is supported.

(Continued on page 402)

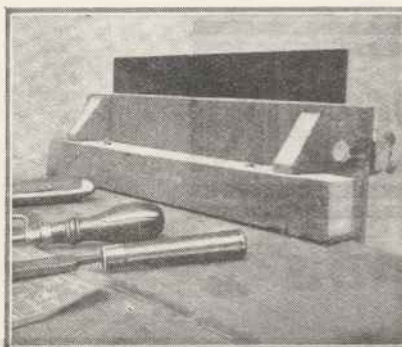


Fig. 8.—Bench Clamp for panels viewed from back.

vice may be absurdly small for such a job, even when the jaws are reinforced by wooden plates (see Fig. 12).

I have found it much more satisfactory, when a carpenter's vice is not available, to rig up a plank of wood edgewise on the face of the work-table (see Figs. 8 to 11), and to clamp the panel being worked on to the face of this plank.

The whole thing being made of wood, damage to the surface of the panel is not likely, although it is always as well to protect the ebonite by interposing a sheet of thick paper or cardboard, as one would obviously

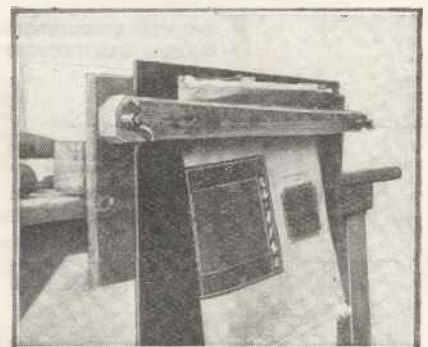


Fig. 9.—Bench Clamp with large Panel fixed.

Opinions of Famous Amateurs

GECOPHONE LOW LOSS-SLOW MOTION VARIABLE CONDENSER

Extract from report from
Mr. E. J. SIMMONDS,
M.I.R.E., F.R.S.A.

"I have now had an opportunity of testing the condenser and frankly have nothing but praise for its performance. The slow-motion is particularly good, and the absence of backlash allows of an accurate calibration on the short waves. I have been using geared vernier knobs for some time, but shall replace them by your new condenser at once.
"I shall be pleased to bring this to the notice of all my W.T. friends."
(Signed) E. J. Simmonds.

Station
G.20D.

AN advertisement, written not by us, but by some of the most prominent amateurs in Great Britain who have conducted independent tests of the GECOPHONE Low - Loss Slow - Motion Variable Condenser.

Extract from report from
Mr. J. C. Read, Vice-President of the Hounslow and District Wireless Society.

"When the condenser was placed in circuit there was a marked increase in signal strength and the receiver was much more sensitive. The hand-capacity effect is almost entirely eliminated and working on 30 metres it could be regarded as negligible. The micrometer adjustment is of a very convenient ratio, i.e. a large wave-length band can be covered quite conveniently and the most minute adjustments can be easily made. There is absolutely no backlash."

(Signed) J. C. Read.

GECOPHONE LOW LOSS-SLOW MOTION VARIABLE CONDENSER

Extract from report from
Mr. H. LITTLEWOOD.

"On the broadcast band of wave-lengths tuning is greatly improved, and stations are now received with the greatest of ease which, in the case of the ordinary condenser, were most difficult to tune in. Hand-capacity, the principal fault of many condensers, is entirely absent.
"When used as closed circuit condenser in a short-wave receiver the results were astounding . . . tuning was simply child's play. You have undoubtedly set a new standard in variable condensers which, in my opinion, will take a great deal of beating."
(Signed) H. Littlewood.

Station
G.2XY.

GECOPHONE LOW LOSS-SLOW MOTION VARIABLE CONDENSER

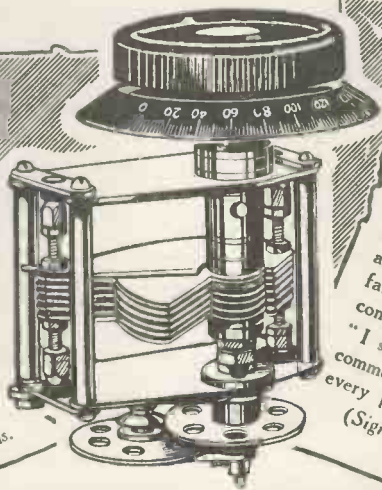
Extract from report from
Mr. C. G. WILLIAMS,
Wallasey.

"I feel impelled to write you regarding the outstanding qualities of your new GECOPHONE Low-Loss Slow-Motion Variable Condenser. The points that to my mind call for special note are:
(1) Dial revolves in same direction as rotor plates. (2) Accurate arrangement for centring of dial. (3) Bearing surfaces of dissimilar metals. (4) Stout bush for panel mounting.
These features are essential, yet until the advent of the GECOPHONE condenser not one of the condensers on the market embodied these greater length on write at much component, but this splendid component, but think it will be amply sufficient to describe it as the Best."
(Signed) C. G. Williams.

GECOPHONE LOW LOSS-SLOW MOTION VARIABLE CONDENSER

Extract from report from
Mr. S. MACDONALD ASH,
Rathmines, Dublin.

"I consider it to be a masterpiece of design and workmanship, and have already realised its great advantage on long-distance reception. The beautifully slow adjustment, which is perfectly smooth and without the slightest backlash, far surpasses that of any variable condenser I have yet tested.
"I shall have no hesitation in recommending this condenser on every possible occasion."
(Signed) S. Macdonald Ash.



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Sold by all GECOPHONE Service Depots, Wireless Dealers and Stores

Advt. of The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.

In writing to advertisers, please say you saw the advertisement in THE WIRELESS MAGAZINE.

How to Prepare Your Panels (Continued) ◇ Squaring the Edges : Trimming : ◇ Beveling : Marking-out

File to the mark, but not over it, and test for final straightness by laying a straightedge, as shown in Fig. 19 (here the 12-in. steel rule

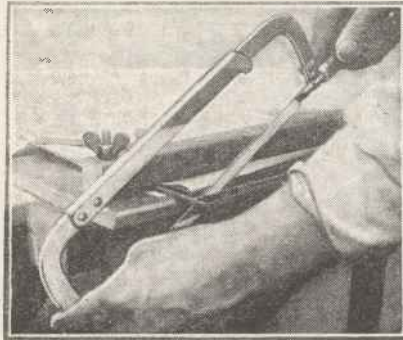


Fig. 11.—Enoch Clamp, fixed flat, and Panel being sawn to scribed line.

comes in handy), removing the humps which the more or less irregular streak of daylight seen through the junction of straight-edge and panel may reveal.

Finish by draw-filing; that is, by running the file, held at each end crosswise of the panel, backwards and forwards along the edge (see Fig. 16). Do not press too hard, but keep the file reasonably level.

The final surface is obtained by sandpapering. A piece of the abrasive should be wrapped round the file and worked up and down, as in the "draw-filing" operation.

Beveling

If it is desired to bevel the edge of the panel, as I generally do if it is mounted on the surface of a wooden case and not between the sides, file a local bevel, not quite to the full amount of the chamfer, at each end, (see Fig. 17.)

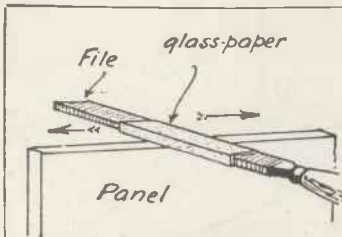


Fig. 16.—Draw-filing movement with glass paper round file.

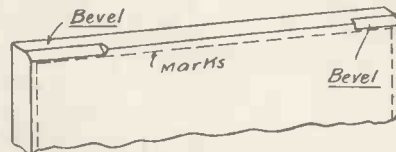


Fig. 17.—Beveling the panel edges.

This will give you a guide as to the extent of the beveling. Ebonite being a relatively soft material, it is so easy a matter to take off too much in attempting to file to defined limits.

Using the Square

Always use the square from the first straight edge or from one of the perfectly straight sides that may already exist. By working from a given edge, errors in squareness are lessened.

If the panel is squared up from corner to corner in rotation round the three edges, inaccuracies will be cumulative in degree. There is danger of a result such as that shown in an exaggerated manner in the sketch (Fig. 14).

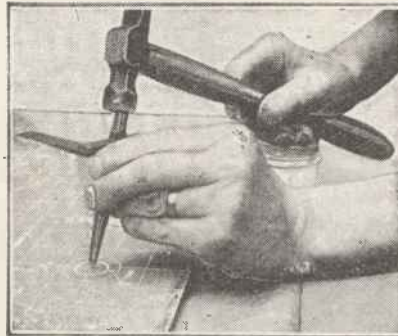


Fig. 21.—Pricking-off with a light centre punch.

The finally trued-up edge should be that on the side of the panel directly opposite to the first one. It

is best marked off by measuring an equal dimension at each end, as shown in Fig. 15. This will ensure a truly parallel panel with a maxi-

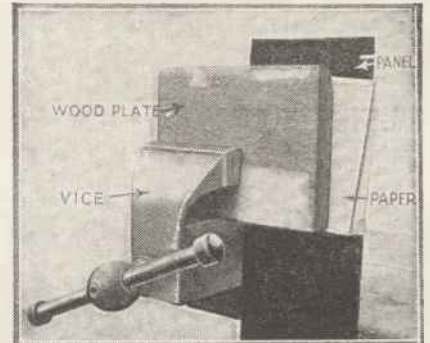


Fig. 12.—Engineer's Vice used with wooden extension and protective plate in the jaws.

imum of accuracy in the squareness of the ends (see Fig. 18).

With the panel cut to size and fitted into its place in the wooden casing, the next task is the marking off of the positions of the various components. Examine the full-size diagram, making sure which way it reads, and also that it is not the wiring diagram.

"Structograph"

The general practice of THE WIRELESS MAGAZINE is to issue "Structographs" showing the underneath of the panel with the components in position. Therefore the diagram should be laid face up on the underside of the panel to be prepared.

Fold the edges round the panel and fasten with paste or with postage stamp gummed edging at the back as illustrated in the sketch (Fig. 20). A notch should be cut out of the corner (Continued on page 417)

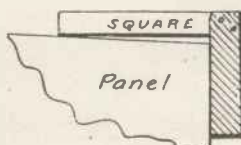


Fig. 18.—Testing the squareness of a panel.

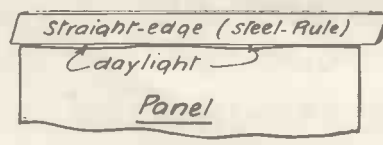


Fig. 19.—Testing the straightness of an edge with the steel rule.

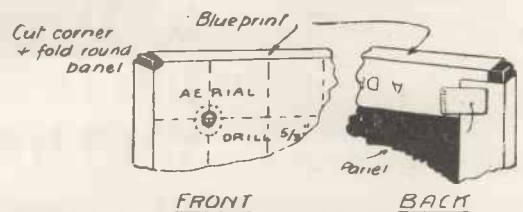
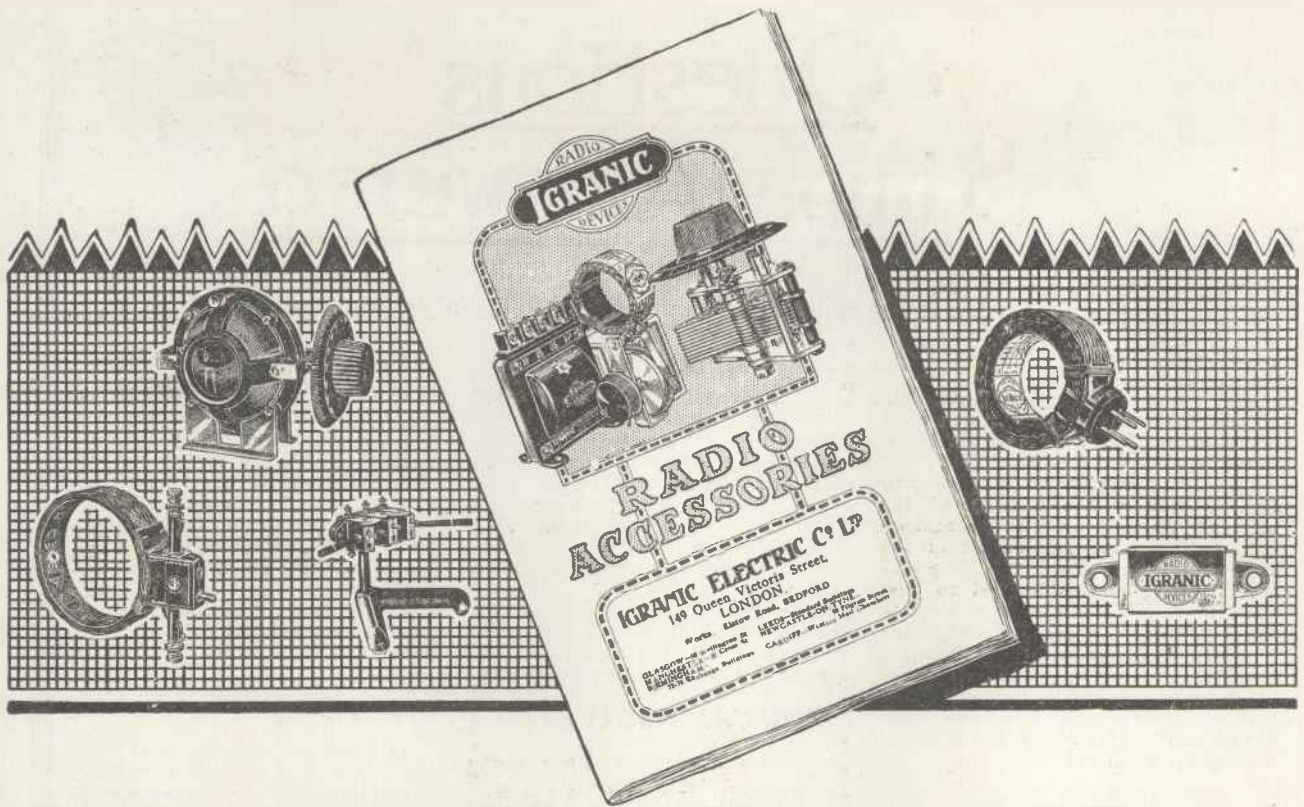


Fig. 20.—Fixing full-size Blueprint to panel for marking-off.



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Before you commence building your radio circuit, see that you have this latest Igranic List before you, for unless you have it you may build with components which are hopelessly out-of-date.

Intensive research work has been carried out in the past few months by Igranic radio engineers with the result that many notable additions have been made to the range of *Igranic Radio Devices*. Among the new components there are Combined Instruments

for filament and grid bias control, resulting in economy of space, and initial outlay—a highly efficient Earthing Switch, Lightning Arrester and Lead-in Tube combined in one device—the elegant Indigraph Knob and Dial—revolutionary designs in Variable Grid-Leaks and Potentiometers and a host of other components. These of course are in addition to the famous range of Igranic Honeycomb Duolateral Coils, Variometers, Transformers, Rheostats, Condensers, etc.

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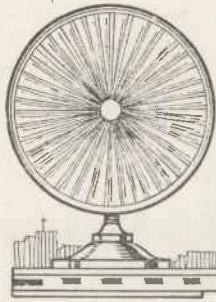
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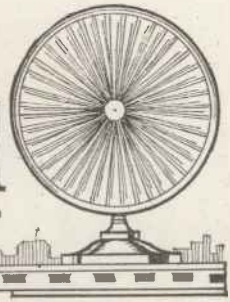
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Questions Simply Answered



Grid Bias

Q.—What exactly is meant by applying grid bias to a valve, and what action does it imply?—R. S. B. (*Scunthorpe*).

A.—This means the adding of a small battery between the negative of the filament, which is said to be at zero potential, and the grid circuit of the valve.

A negative bias is applied to low-frequency amplifiers in order to obviate distortion, but in some H.F. amplifiers a positive bias is used so that the resultant grid-current flow introduces damping and stabilises the receiver.

Positive bias is not to be recommended in any amplifier, however, as distortion will always ensue.—L. A. C.

Adjusting Valve Filaments

Q.—When switching on my valve set I find that after I have increased the brilliancy of the filaments (dull-emitters) to a certain value, no variation in signal strength is apparent over a fairly wide band of increase or decrease in the filament rheostats. Is this usual?—N. P. (*Cardiff*).

A.—It is usual, but on no account should any valve filament be forced to take more current than is necessary to give satisfactory reception.

At a certain brilliancy the valve filaments emit an electron stream sufficient for efficient working.

If the brilliancy is increased, the electrons are merely choked back, causing no increase but sometimes a decrease and, in addition, the life of the valve is considerably shortened.

Always reduce the filament current as far as is possible consistent with good reception.—X.

Condensers Across Transformers

Q.—Why is it that one often sees a fixed condenser across the primary of an L.F. transformer, more especially the first transformer of a multi-valve amplifier?—R. C. (*Doncaster*).

A.—The reason is that this condenser, usually of .0005 to .002 microfarad capacity, forms a bypath for H.F. oscillations which would otherwise traverse the primary of the L.F. transformer and cause distortion.

In addition, a small condenser usually improves the tonal quality of telephony signals.

It is sometimes an advantage to place condensers across each primary where more than one L.F. transformer is used.—L. A. C.

Voltage of Accumulator

Q.—I am using a 6-volt accumulator. What voltage should it read when fully charged?—W. P. (*Exeter*).

A.—An old accumulator (that is, one that has been charged a good many times) when fully charged may give as much as 2.7 volts per cell directly it leaves the mains, but this will drop to 2.2 volts for each cell after a few moments' rest.

A 6-volt accumulator should therefore read 6.6 volts on load. The volt-

YOU CAN'T SOLVE IT ?

You don't know to where that connection should go or why your set works well one day and badly the next ?

Well, why worry ? We keep a staff specially to solve such problems as yours. Let them have your queries.

Replies to queries of general interest are published each month on this page, but every querist is answered direct by post.

Please observe the following conditions :

Ask one question at a time ; write on one side of the paper only ; attach to your query the coupon on cover iii, and send it with a stamped addressed reply envelope to : The Editor, THE WIRELESS MAGAZINE, La Belle Sauvage, London, E.C.A.

Remember Our Query Service is Free !

meter test, however, is not very reliable and should only be regarded as accurate when used in conjunction with an hydrometer.—K. D.

Reinartz Reflex Set

Q.—Would it be practicable to use a valve detector in place of the crystal in the Reinartz One-valver with Reflex Action?—F. J. S. (*Glasgow*).

A.—We cannot advise such an alteration, as the damping due to the crystal detector permits adequate control over the receiver, whereas a valve detector, having practically no resistance, would render the set uncontrollable. We suggest you follow the published specification.—L. A. C.

Trigger Switch Relay

Q.—I find that the contacts on my relay tend to stick at times. Can you suggest a remedy?—R. F. (*London*).

A.—This is due to the surfaces of the contacts being a little rough. We suggest that you should clean and polish the active surface of each contact with very fine emery or a small oil-stone, taking care that oil and dirt are removed before reassembling.

The adjustment of the contacts may take some little time to effect, and this should be undertaken with patience.—X.

H.F. Chokes

Q.—Are the windings of H.F. choke coils critical as regards the number of turns required?—P. T. (*Cambridge*).

A.—The number of turns for such coils is not critical to within 50 turns of the optimum number required.

That is, suppose a 250-turn coil is specified, any number of turns between 200 and 300 may be employed with little or no apparent loss of efficiency.

In the case of very short-wave receivers, however, it is advisable to adhere to specific instructions.—L. M.

Resistance Amplifiers

Q.—What is the best value for the grid leak in a resistance-capacity coupled L.F. amplifier?—A. S. (*Norwich*).

A.—The value is mainly governed by the actual valve employed, but a variable anode resistance in place of a fixed grid leak will always be found satisfactory.

Only instruments of reliable make should, however, be used.—Y.

Plate Voltage of Valves

Q.—If the makers of a particular valve specify 50 volts H.T., is it sufficient only to employ a 50-volt H.T. battery?—D. P. (*Derby*).

A.—The voltage required depends entirely upon the circuit in which the valve is used. Certainly follow the makers' instructions, but it is not sufficient to employ an H.T. battery giving only the H.T. voltage specified for the valve.

Even when only the phones are wired in series between the battery and plate of the valve, a certain voltage drop is apparent, and it is here that a voltmeter (high-resistance type) is an asset.

Increase the voltage of the H.T. battery until the voltmeter registers the full plate voltage.

The voltmeter must be connected directly to the plate leg of the valve and negative H.T.—Z.

SEA SONGS AND SHANTIES



On the twenty-fourth of Feb-ru-ary, the wea-ther being

The next that came to our ship's side
It was the "Rose and Crown";
We fired into her a good broadside,
And quickly she went down.



This old
Trade Mark
really does
deliver the
goods

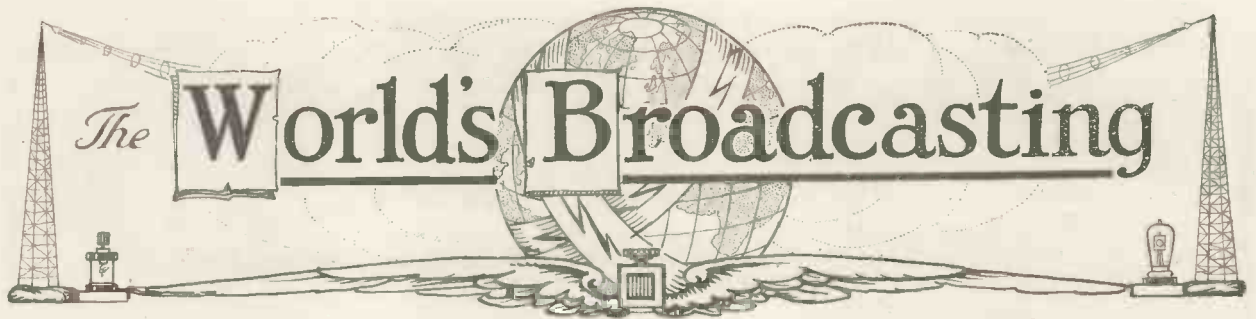
It must be Players

20 for 11^p
10 for 5¹/₂^p



PW 28

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MANY VOICES—MANY LANDS

PLAYING with a super-het the other night gave me the opportunity of hearing, in the course of a very short time, many voices from many different lands. Voices qua voices differ greatly, as you must have noticed.

When we heard Mons. Painlevé speak in an uneven high-pitched voice from a hall cursed with a persistent echo, it was difficult not to compare him with trained announcers such as we are blessed with in this country. For the matter of that, some of the foreign broadcast speakers are quite good, but they have not English voices; they are totally different.

My experience as a listener impels me to say that, from the broadcasting point of view, the English male voice appears to be the best. On the other hand, the female organ

does not carry so well and, in most instances, is not so distinct. French female speakers and singers give one the impression of possessing voices on the shrill side, but the lady announcer at the Rome station is exceptionally musical.

If you hear the German speaker you will notice that his voice is somewhat low-pitched and his delivery inclined to be monotonous. The Spaniard appears to be born a baritone, and there exists a certain breeziness about his speech—his voice spells sunshine and wine.

Notice the difference in the timbre of the voices you hear from foreign stations when you are next searching the ether; the first sounds will frequently indicate, without any name being mentioned, the country you have captured.

JAY COOTE.

It's so Simple!

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Accumulators yourself
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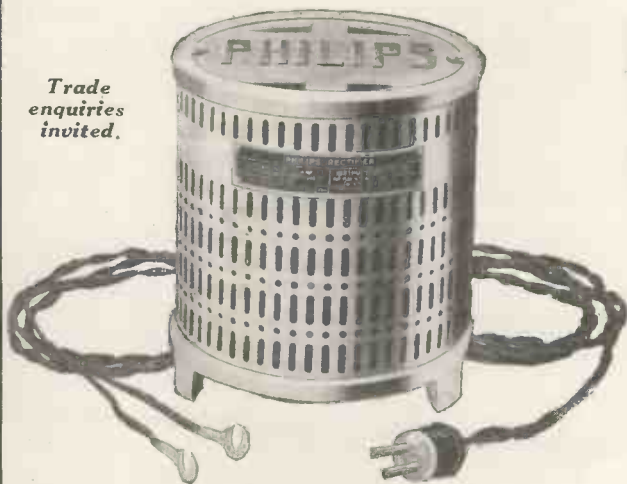
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Write for leaflet (W.M.) free on application.



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AT 2 SAVOY HILL, W.C.2.

A Page Specially Contributed by the B.B.C.

EXAGGERATED alarm was felt early in October among listeners in some of the relay-station areas, as regards Press reports that it had been decided to close down some relay stations. The rumour seems to have found its origin in a misconception of a talk broadcast by the chief engineer of the B.B.C. on the proceedings at the International Conference of Broadcasters.

The actual situation amounts to this: The wavelength tests which were conducted throughout Europe during the early days of September proved that although the clashing of wavelengths could, to a great extent, be overcome by some readjustment of wavelengths, circumstances, as they exist to-day, are so weighted against the broadcasting authorities that other means may have to be considered to solve the problem of jamming.

Increasing Number of Stations

Broadcasting stations in Europe are increasing in number to such an alarming extent that the national governments will find it impossible to fit all of them into a limited waveband, however elastic that band can be made, for the reason that other vital services must have their requisite share of the ether.

The alternative would be to prevent the erection of further stations and, if necessary, to close down some of the less important among existing stations throughout Europe.

This matter, however, was not officially discussed by the delegates at Geneva; and it is certain that no country would be asked to close down any station immediately. The idea is, indeed, unthinkable.

Broadcasting is only in its infancy, and services will be extended, rather than curtailed; but with the big developments in broadcasting that are in prospect, it may be found desirable, not only in the interests of governments and broadcasters, but of listeners as well, that the present large number of low-power stations should be curtailed and rigid adherence secured to the policy of fewer and more powerful transmitters.

Careful investigation at Geneva revealed the fact that in order to

give every existing station a separate place in the ether, all the space between 200 and 600 metres and also between 1,000 and 2,000 metres would be required for broadcasting.

On the problems of the future, but already to be contemplated, the broadcasting wavebands would need to be from 150-600 metres and from 800-3,000 metres. It is quite obvious that no government could possibly agree to allocate such an

readjusting wavelengths on rather different principles from those which were considered prior to the tests of September last.

Some of the factors to be taken into account in the scheme now coming into operation are: (1) The population of particular countries; (2) the geographical area; (3) the length of time that a broadcast service has been operating; and (4) language difficulties, such as cases in which two or more languages are used by the people of one territory.

* * *

The experiment of broadcasting from Daventry during the morning hours, which was carried out in October, is indicative of the coming era of alternative programmes. These will not be confined to the high-power station and 2 L.O., but will be a part of the regular activities of all main stations.

Alternative services must be made available to more listeners, and although the position is complicated by the fact that since the Daventry station was brought into service an increasing number of people have expressed the wish to hear as many London programmes as possible—a privilege hitherto denied them by geographical conditions, and the limited capacity of their sets—the 5 X X programmes will tend to become more independent by way of separate staff arrangements and separate organisation.

Possibilities of Development

The possibilities of broadcast development can be crystallised in the statement that not merely alternative programmes, but a choice of nine or ten programmes, can be given to listeners without insuperable technical difficulty. Such a development will come about by increasing the power of main stations, constructing another high-power station and duplicating the London station.

At the present stage of wireless discovery, the obstacle to the fulfilment of any schemes of this magnitude lies in the requirements of other vital interests, to which we have referred at different times in this page.

DO YOU WANT TO BUY A SET?

We shall be glad to advise you as to which types of sets are the best for your personal use.

Tell us how much, roughly, you wish to spend; where you are situated; what stations you wish to receive; whether you intend to use phones or a loud-speaker, and we will advise you as to the general lines of sets that will answer your purpose.

Send your enquiry with coupon (p. iii cover) and stamped addressed envelope to—

"Buyer's Advice Bureau,"

THE WIRELESS MAGAZINE,

La Belle Sauvage, E.C.4.

enormous band of wavelengths to broadcasting alone and, moreover, it is quite unlikely that any extension of the present waveband will be granted.

It may be said then that the day of the small relay and low-power station has passed; but the question of increased power for fewer stations is one for governments to settle. The immediate attempt that is to be made to alleviate the problem of interference will be along the line of

An Open Letter to every WIRELESS USER

An important WIRELESS DEVELOPMENT

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The determination to supply wireless users with valves combining the utmost efficiency and reliability with the lowest possible running costs has resulted after the most painstaking research in the production of a complete range of wireless valves embodying the very latest improvements.

These valves, which are marketed by The General Electric Co. Ltd., will in future be sold under the name **OSRAM**—a name known to everyone in connection with electric lighting and one which has always been associated with sterling quality.

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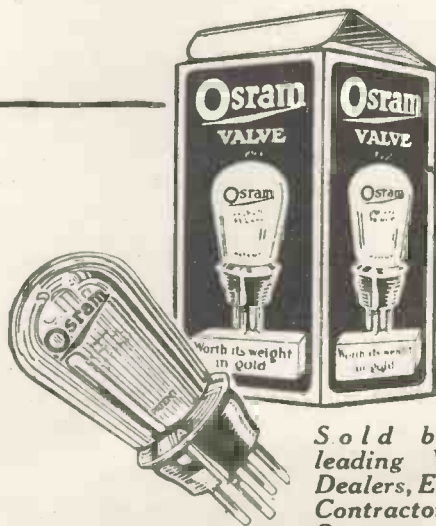
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Wireless Femininities

IT'S good news that of the four new studios under construction at 2, Savoy Hill one at least is to be reserved for the transmission of talks; and even better to learn that the new room is to be a "small cosy sanctum," with a comfortable chair, desk at the right angle for manuscript and an adjustable reading lamp.

This sounds like Paradise enow to those of us who have so often broadcast in fear and trembling in the vast desolation of the first-floor studio—a beautiful room in colour and decoration, but terribly unfriendly when peopled only by two or three other "performers," an announcer who usually paces in and out like a hungry tiger at the Zoo, and the microphone.

Rustling into Panic

To the lecturer, whose voice cannot drown opposition noises like the more powerful orchestra—at any rate, to his own hearing—either the silent concentration of a visible audience or the perfect quiet of an empty studio is really essential, and I feel sure talks will gain in confidence and clearness when the new studio is ready. But while thus quietening conditions for the deliverer of remarks, I do hope the B.B.C. will take the question of that terribly rustling MS. in hand.

Everyone knows, of course, that all talks are previously submitted in writing before being broadcast, in order to eliminate any possible controversial statements; and when one enters the studio a typescript of the chat is handed to one for delivery.

In vain for the talker, nervous enough with that last warning of the announcer's: "Remember, they can hear any rustling of the sheets," to try to deal with each in turn—without losing the even flow of her discourse—minus any noise; for the authorities have exchanged her typescript on thick, firm, non-rustling paper for a copy made on the thinnest and most crackly brand obtainable.

I've never discovered why it's done. But if listeners-in who complain of rustling could handle that paper for themselves they'd be more sympathetic.

Ideal Restaurant Music

When in the day (or night) is the so-called "heavy"—by which seems to be meant anything not dance—music, considered not too wearying for our ears? "Heavy" items have been condemned in the evening "when we are tired and want something light and cheerful"; on Saturday afternoons, "our only leisure and surely we're entitled to a little gaiety"—and now, forsooth, they ought not to be played at lunch time, because, says a listener-in, "They're too hard to digest."

Poor doomed "heavy" music! According to this latest complainant, the noonday concert relayed from a famous restaurant should consist only of dance tunes and light opera. Grand opera gives him "a turn" and marches are too rousing. Apparently the gentleman dines not wisely but somnolently!

My experience is that the sentimental song, jazz or old favourite seems to be always popular at meal times. And my opinion is that the best music of all to accompany food is simply that of cheerful voices in interesting conversation.

Reductio ad Absurdum

There seems to be a wide popular liking for indiscriminate noises per wireless, though the folks who listen eagerly to the scraping of chairs in a concert room or the puffing of an engine through their crystal set are apt to complain bitterly if they get those same noises as incidents in daily life.

One can imagine that the Mac-Millan Polar Expedition, cut off from all civilisation but that brought by wireless and buried in icy fastnesses for two or three years, may perhaps welcome the familiar noises of home; but it seems to me that the appetite for them in this country is akin to the eagerness with which men crowded round a geyser operating in a London shop window the other day. They can see the same thing in their bathrooms any day, but it doesn't thrill them then!



Anyway, I'd like humbly to offer a few suggestions for "stunt" programmes. One called, "The Tom-cat's Courting," with the usual vocal music, I'm sure would please, and it only means fixing a microphone on any old roof; while most little suburban villas will supply a first-class transmission of the famous theme, "Baby's Teething To-night," with baby as principal soloist.

Fashion and Wireless

It seems curious that *La Mode*, usually so apt to seize on wars, plays and every other event of public interest as an inspiration for a new fashion, should so far have utterly neglected wireless developments. Apart from the ear coils of hair which were much worn before shingling became ubiquitous and which were sometimes known as earphones, I cannot think of a single point in dress that is in any way connected with wireless.

Yet there ought to be a big field here, especially in millinery. Why shouldn't the earphone touch, in the form of circles of flowers, coiled ribbons or what not, become a feature of this season's hats?

Aerials, springing from the crowns of our headgear, would be striking, and no one can object that they would increase traffic congestion, for aren't we told that there's always room at the top? Why crystals haven't become the gems of the moment, and powder boxes cunningly shaped like loud-speakers aren't flooding the market, is a disappointing mystery. A. M. M.

THE FIRST WIRELESS LOUD SPEAKER WAS A Brown



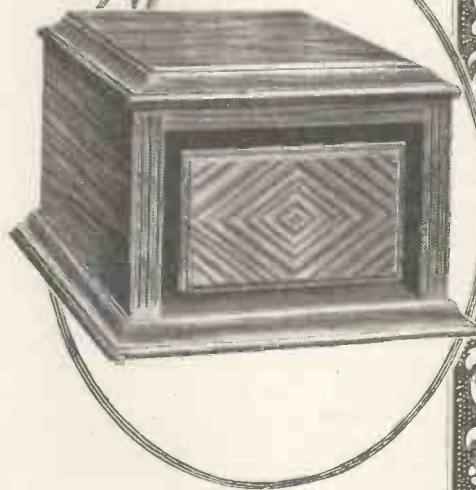
Another great triumph for the incomparable Brown

THE four entirely new Brown Loud Speakers further exemplify the fine spirit of progress which has always dominated the organisation responsible for the famous Brown H.1.

Each of them fulfils a different purpose. The Cabinet Model (illustrated here) will appeal to those who require an article of furniture to harmonise with the appointments of any room. The new H.Q. with its magnificent sweeping curves is based on the superb Brown Q—the Loud Speaker de Luxe. And the new H.3 at a cost of only £3 gives a volume obtainable only in other makes costing several pounds more. Finally, there is the little H.4—a Loud Speaker, only 10 inches high, yet equipped with the same standard Brown tuned reed movement as fitted to all the larger models. Whichever type of Loud Speaker you choose you will always have the satisfaction of knowing that—as a Brown—it is the finest in its class. All Dealers are now demonstrating these new Brown Loud Speakers.

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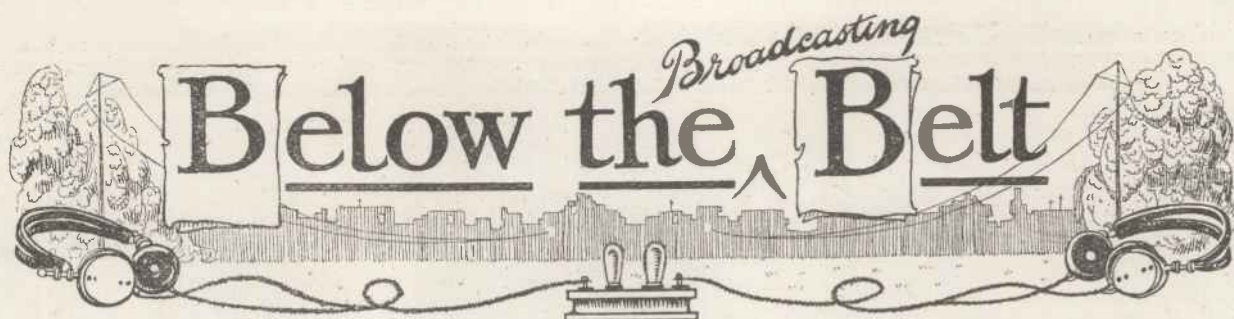
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THROUGHOUT

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"5XX TESTING" must seem a curious beginning for the first paragraph of this month's chat about short-wave work; but it really and truly comes into my province. I had heard a rumour, given me on very good authority, that the B.B.C. is about to start its longhoped for tests on the short waves. Remembering the denial—official and complete—that followed my last announcement that the B.B.C. was contemplating a descent to the short waves, I hesitated to say anything about it.

No Mistake This Time

I didn't want to appear mistaken again. I believe I was the very first to mention the matter some months ago; but I shan't be the first this time, for a monthly magazine such as this has to go to press a good deal ahead of the publishing date.

The rumour I heard was to the effect that 5XX was shortly to begin tests on 45 metres, 90 metres, and somewhere in the neighbourhood of 200 metres. On the very eve of going to press I have ample confirmation of this rumour.

I had some experimental work to do on 45 metres and tuned-in on that wavelength. I chanced first of all on some excellent telephony from that well-known amateur 2UV (Two Uncle Vic), and then a little later I received even better telephony and to my surprise heard the magic words "5XX testing."

By the time you read this, my short-wave friends, those of you who know anything about short-wave work and have sets that work down to 45 metres will be besieged for information from your lucky friends. The man who has only hitherto worked with a B.C.L. set has a deal to learn before he can get the B.B.C. programmes on really short waves, hasn't he?

It seems likely that a big controversy is likely to be waged round the question as to whether a large or a small capacity tuning con-

denser is the correct thing to use for short-wave reception. One school of thought advocates a small condenser because, on really short waves, a large condenser makes far too big a capacity change with even a small movement, and the very sharply-tuned short-wave signals are liable to be run over. They say that a variable condenser of .00025-microfarads is the very biggest that should be used on wavelengths below 100 metres, and that really a much smaller condenser, say .0001-microfarads, is preferable.

They also hold that the most energy is transferred to the grid of the valve when the inductance is large and the capacity is small. Use a large coil and a small condenser, they say, and you are working in the very best conditions for short-wave work.

Other School of Thought

The other school of thought would have us use a big variable condenser as big as .001-microfarad maximum even on wavelengths so low as 20 metres. They say that, provided a square-law condenser of good make is employed, and that only the lower part of the scale is used, tuning is not unduly difficult. The advantage of using a big condenser is that if the moving vanes and frame are earthed, as they can be in the best modern condensers, hand and body capacity effects are entirely done away with without the trouble of lining the whole of the cabinet and panel with tin or copper foil, and earthing it.

There is undoubtedly something in this argument, but my personal experience is that there is really a big advantage in using as big an inductance as possible. Therefore I use the biggest condenser that seems to be convenient, bearing in mind that I need a big inductance as well. I find that .00025-microfarad will work well right down to below 20 metres with inductances of reasonable size. For work below 20 metres it really does seem necessary to use a

tuning condenser of much smaller maximum capacity. If you do not do so your inductance must be too small to be really efficient.

Short-wave Condenser Dials

Speaking of short-wave condensers naturally brings me to the subject of dials. It is generally admitted that some form of fine control is necessary on a short-wave set, unless the tuning condenser is very small indeed. The so-called vernier condensers or vernier plates incorporated with the main body of the condenser are not very useful because, though they give fine control they can never give the same reading on the main dial twice running.

In short-wave work the main tuning condenser is usually shunted across the grid coil, the incoming energy being picked up from a small coil in the aerial circuit. This means that the combination of coil and condenser can be calibrated with reasonable accuracy. That is to say, when you have the main tuning condenser at a certain setting you can say that the station being received is on so many metres, and you will be right within a very few metres. If a vernier plate is used, this must be set absolutely to a definite position when the main scale is calibrated and the readings will only be true so long as the vernier is in the position it occupied when the calibration was done. As the vernier is wanted for final fine tuning or, in the case of a large condenser, for actual searching, calibration is really impossible.

The ideal condenser dial is one fitted with some sort of gearing so arranged that quick or slow movement can be used as desired. There are such dials to be had but, unfortunately, most of them have gear wheels inside which are liable to cause most unholy clickings when the set is used just gently oscillating as it is for picking up continuous wave transmissions.

The very best arrangement I have yet come across for short-wave work is one in which a small additional handle beneath the dial works a lever that grips the main spindle fairly tightly, but not so tightly as to move the auxiliary handle when the main dial is moved for quick searching. The small handle moves all the condenser plates very slowly, and the main dial as well. Such a dial can be calibrated with sureness, for the position of the plates must agree with the position of the dial.

By the way, talking of calibration, if the condenser dial on a short-wave set is removed for any purpose, when it is put back the whole of the calibration will have to be done again. It is no use just putting back the dial in what you *think* is the same position as it formerly occupied. You will probably be very many metres out.

5 Y M

SUCCESS WITH YOUR VALVE SET

(Continued from page 372)

I have tested out I have found actually all values between nothing at all and .0008 microfarad.

So far as I can remember, not a single one of these cheap condensers had an actual value which corresponded with the figures that it bore. When you buy from a good maker you can be quite certain that this kind of thing does not happen. Further, there is all the difference in the world between "mica" and the best ruby mica. Mica is a substance whose dielectric efficiency varies enormously. By dielectric efficiency I mean its power of resisting losses. The poor quality stuff used in cheap condensers may have a dielectric efficiency equal to less than 40 per cent. of that of air, whilst in the best ruby mica its figure reaches 90 per cent. Bad condensers may be the cause of all kinds of faults in the set.

Again, do not go in for cheap grid leaks or anode resistances. In these also, if the quality is poor, the actual value is, as a rule, anything but what it is stated to be. Poor components of this sort are generally noisy and they cannot be relied upon, since after being under load for a time the original resistance varies considerably. Good ones cost very little more and they are well worth the extra money.

J. H. R.

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What Others Think.



IT would be easy for us to write an advertisement telling you all about the sterling merits of the M.L. Transformer.

We think it is the best transformer that has ever been placed on the British market. Perhaps that is only natural since we are so interested in it. But here is what someone thinks who has no interest in the M.L. transformer, other than that of a satisfied user.

His testimonial is entirely unsolicited. Here is what he says:—

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The 1:6 ratio is used for amplification after a crystal rectifier. The 1:4 ratio is used for single stage L-F Amplification. The 1:2-6 and 1:4 ratios are used respectively in the first and second stages of two-stage amplification.

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Choose your Programme and control your Set from any part of the House

The Polar-Four makes it unnecessary to have the SET in the room; gives you full control over volume and enables you to switch over from one station to another, through a unique system of "remote control."

THE Polar-Four can be locked up and kept in the Garage or box room. You only need to have the Loud-Speaker and the Control box present to obtain your Radio Music in any part of the house. A system of lead-covered wiring is employed, with a jack-box (small and unobtrusive) fitted at any number of points—in various rooms, on the veranda, even in the garden—and from any one of these jack-boxes you switch on and off, regulate the filaments of the four valves, and change over from one to the other of any two



The Remote Control Box

programmes at will. The Polar-Four is a highly-efficient four-valve Set, with duplicate tuning systems and a series of relays. It gives very loud reproduction when required, pure and mellow in tone, and embodies the newest developments. The Remote Control Box contains switch and filament control, and measures 5 ins. by 3 ins. by 2 ins.

Polar-Four Receiving Set

Supplied by all Radio Dealers. Price of Set alone, including Remote Control, two Coil Units, one jack and flexible leads. Royalty £32 : 10 : 0 paid.

Accessories—valves, batteries, loud-speaker, additional jack-boxes, etc., etc., extra. Write us for complete details; we will gladly put you in communication with the nearest Polar Service Agent who will undertake complete installation.



Radio Communication Co. Ltd.

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SAFEGUARD your Receiver and all its accessories in this **HANDSOME PIECE OF FURNITURE.** Best workmanship and **SOLID OAK** throughout. (Net weight from 56lbs.) Made in 3 standard sizes: 22", 25", and 36" inside width.

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1-Valve Amplifier, 20/6, both perfect as new; Valves, 4/6 each; smart Hiempses, 8/6 pair; new 4-Volt Accumulator, celluloid case, 13/6; new 60-Volt H.T. Battery, guaranteed, 7/6; 2-Valve All-Station Set, £4. Approval willingly.

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A LEAFLET describing the new G.E.C. slow motion, low-loss condenser may be had from the General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.

Details of new lines for the present season are contained in leaflets obtainable from the Radi-Arc Electrical Co., Ltd., Bennett Street, Chiswick, W.4.

C. S. Dunham, 234-6, Brixton Hill, London, S.W.2, will send a catalogue of complete receivers on request.

"Wireless Receiving Sets" is the title of the latest catalogue of the General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.

The new Radiolux-Amplion loud-speaker is fully described and illustrated in a booklet obtainable from Alfred Graham & Co., Crofton Park, London, S.E.4.

The latest catalogue of Burndept Wireless, Ltd., Aldine House, Bedford Street, Strand, London, W.C.2, is now ready, and a copy will be sent on request.

A. J. Stevens & Co. (1914) Ltd., Walsall Street, Wolverhampton, have issued lists giving particulars of their latest components and free insurance scheme.

The list issued by J. Dyson, 5-7 Godwin Street, Bradford, contains full particulars of Airmax 'bare-wire' tuning coils.

A catalogue and leaflets describing all types of receivers and components may be had from Peter Curtis, Ltd., 75a, Camden Road, London, N.W.1.

The latest publication of The British Thomson-Houston Co., Ltd., Rugby, deals with two-valve L.F. sets and one- and two-valve amplifiers.

"Components and Circuits" is a useful little handbook issued by The British L. M. Ericsson Mfg. Co., Ltd., 67-73, Kingsway, London, W.C.2, containing useful information.

A catalogue describing General Radio sets and components will be sent on application to the General Radio Co., Ltd., Radio House, Regent St., London, W.

All readers should write for these Catalogues, which will be sent gratis and post free if "The Wireless Magazine" is mentioned.

The wide range of receivers and components stocked by the Economic Electric, Ltd., 10, Fitzroy Square, London, W.1, is fully described in their new catalogue.

A new leaflet describing the Philips rectifier can be had from Philips Lamps Ltd., 60, Wilson Street, Finsbury Square, London, E.C.2.

Burndept Wireless Ltd., of Aldine House, Bedford Street, Strand, London, have issued a new catalogue describing their range of apparatus.

A postcard to Radio Instruments, Ltd., 12, Hyde Street, New Oxford Street, London, W.C.1, will bring by return of post a copy of their new season's catalogue.

A list giving full particulars of all types of tools suitable for wireless work will be sent on application to Richard Melhuish, Ltd., 50 & 51, Fetter Lane, London, E.C.4.

When You Are Invited to Broadcast!

(Continued from page 367)

to begin on rather a higher note than one naturally would, and occasionally to go back to or towards this note; for so often, when the voice is dropped, the words are almost inaudible.

Then there is health. Often we are annoyed by the queer sounds which people make when they suffer from catarrh; but that is only a small part of the discomfort of catarrh, which, by the way, is quite avoidable if the foods and drinks are right. The catarrhal tendency, and ill-health in general, will make the voice itself far from distinct. They will make it foggy, or even like wet and soggy cotton-wool soaked in ink.

Last of all, out of many other hints, I will mention just one more: namely, that people should try to feel what they say. One can go too

far in this direction, and get fearfully excited over nothing, as many operatic singers do.

We are very tired of the fictitious excitement of the tenor, for example. But it is possible to go too far in the other direction, and to speak as if the whole thing did not interest one in the remotest degree. There may be a certain amount of feeling in speaking, so long as it falls short of excitement.

Less Shy of Speaking

I am quite sure that if these and other simple principles of voice-production were an integral part of British education, thousands of people would be less shy of speaking, and would be less annoying and incomprehensible when they do speak.

ALL YOUR "JUICE" FROM THE MAINS

(Continued from page 398)

to one side of an adapter or wall plug. Plug this into a lamp-holder or wall socket, being sure that the switch of the light circuit is on. If this has no effect, turn the plug round. Suitable valves of high tension are readily tapped off by inserting the Clix terminals in the centre tubes of the series coils.

Important Notes

The earth lead to the set should be completely disconnected in most cases, and only connected through a condenser in others.

All condensers mentioned in this article must be able to withstand the voltage of the mains for indefinite periods.

If loud cracklings are heard in the phones when the set is in operation, and the ether is believed to be fairly free from atmospherics, the fault probably lies in one of the condensers. D. S.-S.

Preparing Your Panels

(Continued from page 402)

to expose that of the panel. In forming the folds make certain that the edge of diagram coincides with the square edge of the panel itself.

The next operation is pricking off. Use a sharp, light centre punch for this (see Fig. 21), laying the panel on a flat table or bench cleared of all dirt and chippings—from metal filings and drillings more particularly.

The bench should be as firm and level as possible, otherwise there is always danger of cracking a panel, especially in cold, frosty weather. Therefore, don't be too forceful with the hammer. HENRY GREENLY.

(To be continued)

THERE is a probability of a shortage of jazz musicians for broadcasting. This should be good news for unemployed riveters, tinplate workers, and other noise merchants.

A LOT of listeners have complimented the B.B.C. on their recent innovation, the Grand Good Night. But our housemaid and her young man still hold the record, easily.

Baby Grand
No. 1 15/-
(for 1st stage)

Baby Grand
No. 2 15/-
(for 2nd stage)



A real Eureka for 15/-

HERE'S a real Eureka Transformer guaranteed to contain all the essential features of construction of the larger Concert Grand at a price within the reach of all. The same non-laminated core—the same exclusive method of winding—the same hermetical sealing to protect the contents from the action of the atmosphere—the same coppered steel case to prevent interaction—in every respect identical in design with the famous Eureka Concert Grand long ago accepted as the country's standard for volume and even amplification at all frequencies.

The manufacture of Eureka Transformers is a whole-time all-the-year-round job. It is directed by a group of engineers whose experience in the design of low-frequency transformers is absolutely unrivalled. When they say that the new Baby Grand is worthy of the name Eureka, you can rely on their judgment.

Don't judge the Eureka Baby Grand on its price—there is no transformer at anywhere near its price which can approach it for volume or mellowness of tone.

Other Eureka Transformers:

Concert Grand 25/- No. 2 (for 2nd stage) 21/-

Eureka Reflex (for all reflex circuits) - - 15/-

Portable Utilities Co. Ltd.
Eureka House, Fisher St., London, W.C.2

EUREKA

WIRELESS WONDERS OF TO-MORROW

(Continued from page 332)

The method of securing this result is to feed the amplified low-frequency currents from the receiving set into a network of wires set below the carpet or flooring of the room. These currents create fluctuating electric fields which extend sufficiently far upwards from the floor network to induce corresponding currents in the windings and connecting headband of the telephone earpieces. The latter accordingly reproduce the original music, at a strength only audible to the actual wearers of the phones.

"Bottling" America

Attempts have been made, from time to time, to reproduce American transmissions directly in this country. Whilst the technical difficulties of eliminating the effects of atmospherics and fading from transatlantic reception may be successfully overcome in due course, the difficulty still remains that, owing to the difference in local time between the two countries, English listeners must either wait up until the early hours

of the morning or else forgo the fascinating experience of hearing America speak directly across the ocean.

A solution to the latter difficulty may be found in what has been called "bottled wireless." A record of the received signals is taken in the form of a magnetic image impressed upon a steel ribbon, which is then stored away.

At any subsequent time the recorded signals can be reproduced by unrolling the ribbon before the poles of an electromagnet included in the grid circuit of an amplifying valve.

The impressed image on the steel induces currents in the pole windings of the magnet, and these, in turn, create corresponding voltage fluctuations on the grid of the valve, and so reproduce the signals in their original form.

Distant Control

In conclusion there are many other interesting aspects of wireless utility which should not be overlooked in considering the possibilities of future

development. Among these may be mentioned the application of wireless methods to the location of mineral deposits and to prospecting in general, the distant control of moving vehicles, ships, and aircraft, and the supervision of stationary apparatus, such as automatically regulating and setting clocks by periodic wireless transmission direct from Greenwich.

Only a few of the more practical possibilities have been dealt with in this review—there are many more that could be guessed at, but exigencies of space force us to leave the reader to dream of these for himself.

WIRELESS dealers are selling licences in Canada. That's nothing to the stuff some of them think they can sell to listeners over here.

A NEWSPAPER recently published a photo of a bathing belle that had been transmitted by wireless. This is a distinct improvement on the usual custom of publishing last year's photo with an amended caption.

DON'T BLAME THE SET!



Nine times out of ten there is a fault in the circuit which can be put right in a minute or two with the aid of FLUXITE.

Solder all joints with FLUXITE, and they cease to be joints, but become one unbroken piece of metal.

No chance of leakage there! It's so easy, too. A child could do it. No wireless enthusiast should dream of making joints any other way.

Ask your Ironmonger or Hardware Dealer to show you the neat little

FLUXITE SOLDERING SET

It is perfectly simple to use, and will last for years in constant use. It contains a special "small-space" Soldering Iron with non-heating metal handle, a Pocket Blow-lamp, FLUXITE, solder, etc., and full instructions. Price 7/6. Write to us should you be unable to obtain it.

Price 7/6



FLUXITE SIMPLIFIES SOLDERING

All Hardware and Ironmongery Stores sell FLUXITE in tins, price 8d., 1/4, and 2/8.

Buy a Tin To-day.

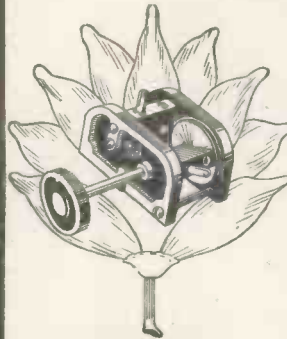
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ANOTHER USE FOR FLUXITE. Hardening Tools & Case Hardening. ASK FOR LEAFLET on improved methods.

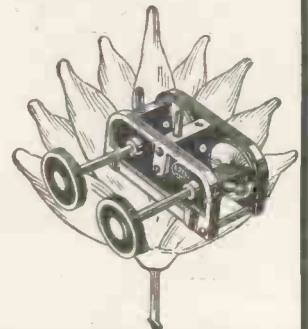
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FIT THE "LOTUS" COIL-HOLDER

and Realise what Perfect Reception Means.



THE "LOTUS" cut gear Vernier Coil-Holders are fitted with Vernier movement actuated by three sets of encased precision cut gears representing a reduction of 8 to 1.



Moving Block CANNOT FALL. Made from Bake-lite Mouldings with Nickel-Plated Parts.

Retail Selling Prices:

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With 6-inch handle for inside mounting

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EDISWAN is the connecting link between your home and far-distant lands.

If you cannot get abroad—travel in your armchair with an Ediswan Loud Speaker—and reach still further with Ediswan Valves.

The era of general long-distance reception is here, and with the aid of Ediswan Valves the possibilities of your Set are unlimited.

Even if you have to replace inferior valves with Ediswan, the outlay will be worth your while—the mere turn of a condenser dial will “bring in” stations previously out of range.

Be proud of your Set—and make it worthy of your pride by adding the name of quality—

EDISWAN *The First Made and Still the First* VALVES

P.V. 5 D.E.	22/6	..	Fil. Volts	5·0
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A.R. (L.F. or H.F.)	..	8/-	4·0
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Continental Notes

BY the time these columns are in print, it is quite possible that the B.B.C., following the plan adopted by some U.S.A. stations and later copied in Berlin, may be broadcasting early morning "physical jerks." If so I'm real sorry I returned to London. I admit that I anticipate this sorrow at the moment of writing but, believe me, it is just as deeply felt.

Try to realise what this means. Scene: Early morning—very early, in my opinion. A voice—the Voice: "Wake up, darling. 2 L O calling." A grunt. I turn over on the other side. "Diddums then! Did 2 L O want to reduce his little tum-tum?" As the French say, I ask you

* * * * *

This continual changing of wavelengths is positively becoming a nuisance and I do hope that by the time winter has set in all stations will have definitely been allotted their position in the ether. The fact that one finds now and again a difference of two to three metres does not constitute a hardship, but when, as in the case of Radio-Toulouse, there is a jump from 273 to 431 metres, well, one might quite as easily find a needle in a hay-stack.

Of course, the advent of new transmitters—and they are shooting up like mushrooms—constitutes a serious problem for the Geneva bureau.

I truly believe that if these changes continue to be frequent, similar to the Shipping List issued by Lloyds for the notification of all movements of steamers, it will be necessary to publish a stop-press column in the evening editions, stating the latest wavelengths. Shall we hear: "6.30 speshul. To-night's list of alterations. All the broadcast news"?

* * * * *

Talking of Toulouse (I am sorry I digressed), I like the speaker's clear announcements. He repeats the call-sign before each item of the programme. Have you noticed how he asks you "to have the kindness to listen to the next number"? There is no "You will now hear" on the take-it-or-leave-it principle.

It is truly remarkable how this 2-k.w. station, lying as it does well

to the South of France, gets over the ether. It comes into my house with the same strength as many of its high-power confrères, and although the programmes are not exceptionally brilliant they are quite interesting in their way.

The station is run by an association of wireless clubs, with the result that local interest is preponderant. The French are particularly keen on *sociétés* of every description—dramatic, choral and instrumental; they all have their badges, caps and banners. In those little provincial towns one must belong to them to be in the swim.

Of course, at Toulouse each of these wireless clubs, in turn, is anxious to appear before the microphone. Why, even the local fire-brigade possesses its brass band, and—would you believe it?—when business is slack they all turn up at the studio in full uniform!

* * * * *

The advent of shorter days and, consequently, longer evenings, has come as a boon and a blessing to all wireless amateurs. All those distant stations which, during the summer

months, appeared to have vanished into *die Ewigkeit*, have again returned to us and most of them with stronger voices.

During the last six weeks I have logged more transmissions than in the course of the entire summer. Many of last winter's friends have again put in an appearance and new calls have been heard from distant lands. Our circle of acquaintances is daily becoming greater.

It is curious how these dark nights facilitate reception. In August, many of the Spanish stations came through in a whisper; in some instances I could not resolve the carrier wave. To-day I tune them in quite easily and, what is more, hold them for quite a long period.

Reception of distant music or speech is a fascinating game, and I, for one, experience quite a thrill if I can listen to an entire act from an opera relayed, say, from the Gran Teatro del Liceo at Barcelona. I admit that it may not be as good or as pure as a relay from my local station of the Royal Opera House, Covent Garden, but the fact that such a great distance separates me from the performers and that it requires some little skill in accomplishing the deed, adds, in my opinion, considerable charm to the entertainment. (Loud cheers.)

JAY COOTE.

The Truth About Russian Broadcasting

(Continued from page 363.)

memory of the *Great Man* and the latter in commemoration of the red-letter month in which the Bolshevik revolution started.

The Young Lenin broadcast might, to a point, be compared to the Children's Hour on this side, but some of the principles advocated would probably not meet with the approval of British parents.

As regards the "October Pioneers," the lectures are for youths in their 'teens and are, according to the Soviet mind, of an "educational and instructional nature." The Pioneers are of an impressionable age, and it is in the course of these broadcasts that an endeavour is made to mould them into shape.

On the lighter side of the programmes we find dance music of the type popular in this country, also Slavonic "steps," to which strains the population can disport itself

almost nightly. Some of the most favoured items consist of folk-songs to the accompaniment of the accordion, the only musical instrument to be heard in the most remote villages of the country. The balalaika, known to us all, belongs to the cities and towns.

In the course of 7 months, 250 loud-speakers were installed at Moscow alone, 1,030 in other cities, and over 500 in distant villages. In some instances, the public-address system has been adopted for squares and open places in order to cope with large crowds. The system is being extended all over Russia, and it is fully expected that within the next few months Sovietland, by this method, will count a larger army of listeners than any other country in which broadcasting has been introduced.

And that is the truth about broadcasting in the Soviet Union!

Wireless Cross-words

CROSS-WORDS have not died out, but are still flourishing all over the Continent. Some of the German and Austrian stations have broadcast the skeletons, leaving the listener to fill in the words. Apart from that, this pastime has permeated the columns of most foreign wireless journals.

Foreign Puzzles

For those amateurs, in this country, who are sated—have you ever met it?—with the daily “emu,” “seer,” “ova” and “ort” variety, considerable amusement should be derived from an attempt to solve puzzles published in other languages.

Our French friends call them mots en damier (draught-board words), the Germans Kreuzwortraetsel, the Austrians Radioraetsel or Kombinations-problem—as an abbreviation—but the greatest credit is due to the Magyar who, in a Buda-Pesth journal, heads his effort “Radiokeresztrejteny.”

J. G. A.

A “Self-starter” Three-valver (Cont. from page 358)

it is essential that the aerial current rectified by the crystal should be as large as possible. *It must be noted that the “self-starter” will not function efficiently outside the range of strong crystal reception.* A common earth may be used for both purposes. Aerial, earth, H.T., L.T., grid bias, loud-speaker and distant-control switch leads are connected up to their respective terminals or sockets and the receiver tuned in the usual manner to the local station. It is advisable to use dull-emitter valves, necessitating a 2-volt cell for filament-current supply. Bright-emitter valves with a 6-volt accumulator, however, may be used.

By tuning the “self-starter” aerial coil to the local station, the valve filaments will be switched on automatically, and on the cessation of broadcasting they will be automatically switched off.

Another Amazing Offer

A FOUR-VALVE SET WITH THREE VALVES

GRAND THREE £11 : 17 : 6

Inclusive of Marconi Royalty and H.T. Battery.

Usual Price £19 : 2 : 0.

Undoubtedly one of the finest sets on the market. Mounted in a beautifully finished cabinet with folding doors it presents a handsome and attractive appearance. By a highly ingenious arrangement the power of a four valve set is obtained though only three valves are actually used. This set should give satisfactory Loud Speaker results in all parts of the country.

Fill in the coupon below and post it to us with your remittance. We will then forward you the set packing free, carriage forward on seven days' approval. Money returned if not satisfied. Every set guaranteed.

Grand Three complete with H.T. Battery, 6-v. Accumulator (25/-), 3 Louden Valves (4/6 each), 1 pair of Headphones (11/6), Aerial and Insulators (3/6), and Marconi Royalty paid.

Usual Price £22 : 16 : 6. **£14 : 10 : 0**



LITTLE GIANT ALL STATION TWO VALVE SET £3 : 15 : 0

Inclusive of Marconi Royalty.
Usual Price £5 : 15 : 0.

Easy to tune. Simple to operate. One of the most useful sets on the market. Fill in coupon and post it to us with remittance. We will then forward set fully guaranteed, packing free, carriage forward on seven days' approval.

Set complete with H.T. Battery (9/-), 6-v. Accumulator (20/-), Aerial, Wiring and Insulators (3/6), 2 Louden Valves (4/6 each), and FELLOWS JUNIOR LOUD SPEAKER (19/6), and inclusive of Marconi Royalty

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LONDON—20, Store Street, Tottenham Court Road, W.C.1.
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NOTE.—These goods can be obtained at these wonderfully low prices direct from us only and from no other source.

SAVE 6/8 IN THE POUND
on your Wireless Goods. Send for Special Catalogue.

To THE FELLOWS MAGNETO CO., LTD.,
Cumberland Avenue,
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Name.....

Address.....

Herewith Remittance value.....

Please forward me.....

on conditions as per your advertisement.

W.M.N.

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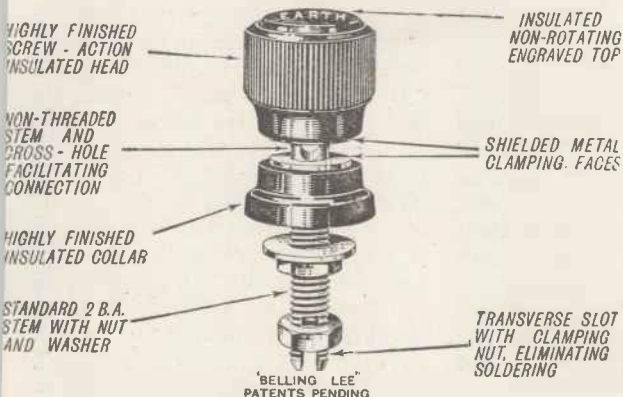
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PLUG & SOCKET TERMINALS (M.K. PATENT)

1. Give seven points of contact.
2. Have no loose parts.
3. Soldering lug on socket; will also grip a sub-connector.
4. Indicating rings are dome-shaped.
5. All metal parts are nickelled.



DIAL INDICATORS



Solid cast metal, with raised, polished letters showing white on a black background. Single hole fixing, complete with nut. Stocked in Tuner, Filament, Reaction, Aerial, Anode, H.F. Tuner, Secondary, Rejector

Price - - 6d. each.

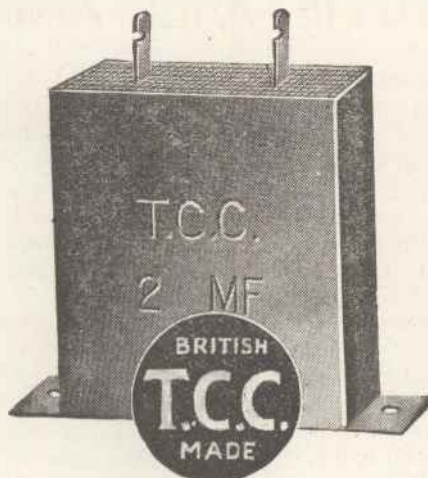
SUB-CONNECTORS

Eliminate Soldering

Perfect connection; lowest possible self-capacity; low resistance; connection changed in an instant. Tapped to screw on to 2, 4, 5 and 6 B.A. threads; also T connectors for joining wires.



Price 1d. each.



In almost every issue of this Magazine you'll find T. C. C. Mansbridge Condensers specified---

THESE familiar little green condensers have won such an enviable reputation for accuracy and dependability that it has become second nature for radio journalists to use them in their experiments and recommend them in their articles.

The word Mansbridge is a term given to a condenser manufactured in a certain way. In the Mansbridge Condenser metal foil is deposited direct on to its paper dielectric. This permits a compact condenser of large capacity being assembled rapidly, accurately and economically. Any one can make Mansbridge Condensers provided they own the right kind of machinery and possess the requisite knowledge. Any firm can build motor cars—but some build them better than others. Some possess a greater fund of experience; some place greater importance on a high standard of accuracy; some are concerned with building a good name slowly but surely. These are the firms which succeed where others fail. T. C. C. Condensers are made by a firm who have specialised in condenser building for 20 years. They are recognised as the standard Mansbridge Condensers, used everywhere and sold everywhere.

Telegraph Condenser Co., Ltd.
West Park Works, Kew, S.W.

T.C.C. genuine Mansbridge Condensers

Every high-class dealer stocks them, but in case of difficulty send to BELLING & LEE, Ltd., Queensway Works, Ponder's End, Midx.

In writing to advertisers, please say you saw the advertisement in THE WIRELESS MAGAZINE.

Gilbert Ad. 3559

THE WILL AND THE LAW (Continued from page 348)

shudderingly recalled the sight of a sheep the dog had once slain.

I dashed to my feet and tried to force them apart but the maddened animal refused to own me as his master. Another mighty bound from the great brute brought Porter to the ground, and then I shot Pharaoh and wept as I saw him die, his iron jaws still snapping.

Even as I pulled the trigger I triumphed over my fallen foe, and muttered "the dog is a good dog and can be trusted to do his work."

Kneeling, half-crazed with fright, lashed and stung by the rain, I watched Porter as he went on with his awful drama, glad to think I was now out of it. He seemed to have recovered from his fight with Pharaoh and was taking little runs to and fro as though searching for something. Presently he found it, for with his eyes riveted to a spot on the ground he advanced, fascinated, much as a rabbit creeps, mesmerised, into the serpent's coils. He stretched out his hand, crouched, and touched something which I

myself could not see, and drew back as one bitten, crying, "My God, the cold hand."

He stared at his own hands, and down at his clothes, then, whilst I backed away, he came over and deliberately wiped his hands on Pharaoh's body. *He was cleansing himself of my blood.* I could bear no more. I fled back to the station a badly-scared man and flopped into a chair in the operating-room.

Suddenly I was horribly startled by another crash and the window was smashed in. The aerial had carried away, bringing its heavy insulators with it, and as I contemplated the raffle of wire and rope, thinking bitterly of the morrow's task of re-fitting a four-wire aerial, Porter strolled in, wet but otherwise normal.

"What made you bolt like that, just as I was in the middle of a yarn?" he queried. "And fancy the poor old pup being struck by lightning at our sides. Aerial down again, I see."

"Oh, yes," I replied, feeling rather

dizzy. "Poor Pharaoh was struck by lightning. I'll get up early and bury him." Porter lit his pipe and sat on the table swinging his legs. "By the way," I asked, "what was that yarn you were telling me?"

"Hang it, man, do you want me to go all over it again? I was only saying that I found in the records of the lighthouse yonder an account of a murder which must have been done near this site. A gambler who had lost all his property to some Moorish johnny, brought him up here and stabbed him, and the foreigner's dog killed him in turn. I was thinking that some of to-night's circumstances tallied a little with that . . . cards, wine, thunder and lightning, dog and all that. Well, I'm going to turn in. I feel a bit fresher now."

"Now that you are no longer a highly-organised part of a condenser-plate," I broke in.

"What do you mean by that?" he asked.

"I—I don't—I'm not quite sure," I said, and felt my chest throb.

(Continued on page 426)

Electrifying Time

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(described in this Issue)

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12 2 ft. lengths bushbar, necessary fixing screws, nuts, panel transfers, etc.	1	11
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1 Polished Mahogany Cabinet	18	6
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Where a complete Kit of components together with a drilled and engraved panel is purchased, Marconi Royalties amounting to £1 5s. 0 are payable, and must be added to the prices quoted above.

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THE WILL AND THE LAW (Continued from page 424)

"I should think you weren't. The storm seems to have affected you, old man."

"It has affected somebody," I replied. "What's the Spanish for 'cold hand'?"

"Don't ask me. I can't even tell a *senorita* I fancy her, yet. I despair of ever picking up the lingo."

I buried Pharaoh the next day before Porter was up. He said he was sorry he had not attended the function as he had never known a dog he had liked better.

Such are the facts. To deny them would be to call Porter and myself irresponsible persons. Our stories dovetail exactly and the circumstantial evidence is strong. There is Pharaoh in his grave with a bullet in his heart; the story of the actual tragedy can be read in the lighthouse log. Porter saw the bruises on my chest the day after the storm and asked me how I came by them; his scratches, inflicted by Pharaoh, he attributed to his rocky climb in the dark, for volcanic rock is as prickly as a bramble-bush. I came out of

the affair with a wholesome respect for the ether, mingled with something of dread. Suppose that Porter's pipe had been a knife!

.....
 An item of the good
 fare in the
CHRISTMAS
 :: NUMBER ::
 will be another
 article by
F. W. THOMAS
 (The "Star" Humorist)
 ON SALE NOVEMBER 25
 ORDER YOUR COPY NOW!

Can the ether reproduce oscillations caused in it by thought, if by chance there should arise, in similar collocation, circumstances similar to

those which first caused the brain-particles to vibrate at a frequency conducive to certain motor effects . . . murder, for instance? I don't know. You may take the facts and play with them jigsaw fashion and weave them into a theory fit for an F.R.S., but for me, I have done with speculation on the subject.

*There was a door to which I found no key,
 There was a veil past which I could not see.*

Here is a hotch-potch of fact with a seasoning of suggestion, and it is for whoever will to render the whole palatable.

As for myself, I am quite content to wait and wonder. On ground where the mental and material seem to merge, where the human mind acts like an automaton and one man identifies himself with another long since dust, apes his movements, speaks his tongue, and sins his sins, and where the forces of Nature appear to demonstrate their power to have in subjection the soul of man, I will not willingly tread again.

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A RADION PANEL—with its sleek polished surface—is a joy to behold. But the wireless enthusiast knows that its advantages are more than "skin deep." Its superior insulation qualities are even more important than its handsome appearance. In every way it proves itself the "panel de luxe."

Radion is available in 22 different sizes in black and mahogany. Radion can also be supplied in any special size. Black 1d. per square inch, mahogany 1½d. per square inch.

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THE SUPER COIL

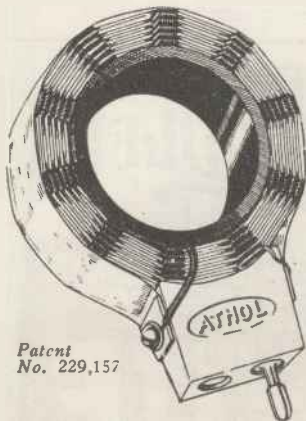
A revelation in tuning-coil efficiency. Wound on ebonite former with bare wire—every turn air-spaced and each layer spaced by means of ebonite spacers. The metal fittings are also air-spaced.

The Athol is a true low-loss coil which offers perfect selectivity and is an indispensable aid in the search for distant stations.

Not only does the Athol Coil enhance the appearance of any set, it is so obviously practical in design that it commands the attention of every experienced amateur. In actual work it is a delight to the most critical.

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Patent No. 229,157

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Jottings on the Month's Progress

New Static Eliminator

AN ingenious method of getting rid of the effect of atmospheric has recently been invented by M. de Bellescize, the well-known French radio engineer. The received signals, after rectification, are fed to a final amplifying valve across two coupling circuits arranged in parallel.

One of the coupling circuits consists of inductance and capacity alone, so that it passes both the desired signals and atmospheric alike. The other circuit comprises a delicate electromagnetic relay acting upon a diaphragm, the natural elasticity of which is so damped by friction that it cannot vibrate to the regular or periodic frequencies corresponding to the true signals. The impact of a strong atmospheric however overcomes the frictional resistance of the diaphragm and a corresponding current is then passed through.

The upshot is that the first circuit passes both signals and disturbances, whilst the second circuit passes the disturbances only. By opposing the output coils of these two circuits it will be seen that the "disturbance" component can be balanced out, leaving the signal currents alone to act upon the grid of the final amplifier.

Another Death Ray

The search for some method of dealing death and destruction in wave form still appears to exercise a strong fascination over the inventive mind. In the latest attempt to solve this problem radiant energy of extremely high frequency is employed, the wavelength being less than that of ultra-violet light.

An intense beam of this nature is created by subjecting a radio-active body to an oxy-acetylene jet. The beam is focused by means of

powerful reflectors, whilst the whole generating system is placed in a strong electrical field, preferably of an alternating or oscillatory character built up and controlled by resonance effects. By using two or more such beams, arranged to converge on a given point, the inventor claims to be able to fire explosives from a distance, and even to destroy animal life.

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Polarised Signals

Professor Alexanderson, the Chief Engineer of the American Radio Corporation, has been investigating the peculiar properties of a new type of transmission. By utilising a

(Continued on page 430)

The Secret of Better Reception

Every day more and more wireless users are finding out what an immense improvement in reception is effected by the new GECOPHONE Super-Capacity H.T. Radio Batteries. These Batteries are the latest development in BRITISH battery manufacture and are distinguished for

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Super-Capacity High Tension RADIO BATTERIES.

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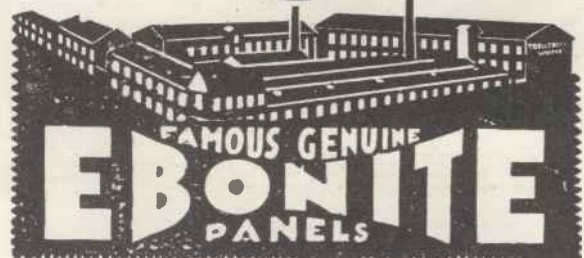
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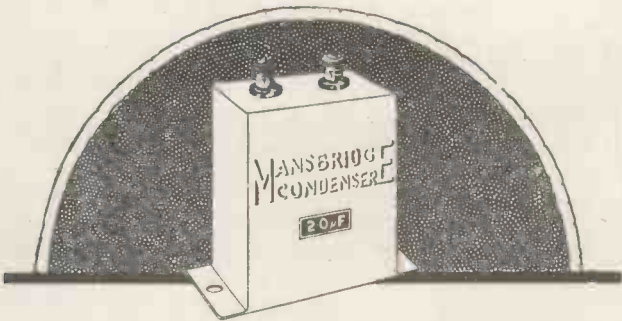
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THE Mansbridge Condenser

WE have pleasure in announcing that the genuine Mansbridge Condenser, originated and designed by G. F. Mansbridge, Esq., over 20 years ago, will now be manufactured by the Mansbridge Condenser Co., Ltd., under the aegis of G. F. Mansbridge, Esq., himself, and marketed with the full backing of the Dubilier Condenser Co. (1925), Ltd.

No Condenser of the "Mansbridge" Type is a genuine Mansbridge product unless the words "Mansbridge Condenser" are plainly embossed on the metal case. The colour of the case is maroon.

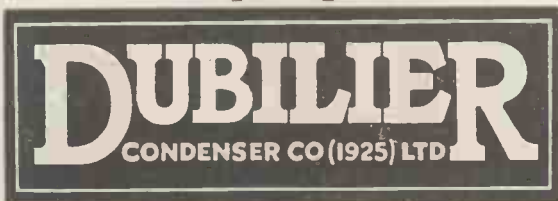
The capacity is plainly marked and is accurate to within fine limits, and nickel plated screw terminals are provided for making connections.

In your own interests you should see that when you require condensers of this type you

Specify Mansbridge

Prices and Capacities

Capacity	Prices
0.05 mfd	2/6
0.10 ..	2/6
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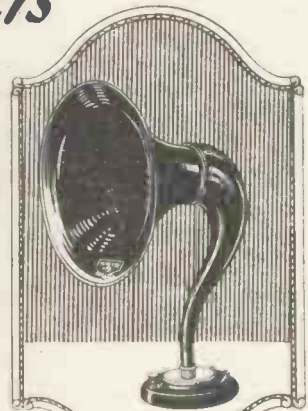
GOOD HEADPHONES ensure the greatest pleasure from your set. Efesca headphones are light and easy to wear, exceptionally clear and evenly matched in tone, and provide faithful reproduction with full volume of sound.

The magnets are of cobalt steel, ground perfectly true, diaphragms of stalloy, and headbands of polished duralumin. 4,000 ohms, with 6 feet of flexible cord, 18 - per pair.

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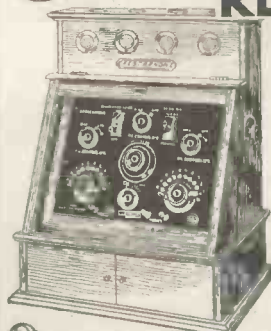
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For power and purity of reproduction the Efesca Puravox Loud Speaker stands supreme. It is so constructed that the relation of the magnets to the diaphragm is capable of very fine adjustment, allowing the utmost volume of sound to be obtained. The horn is acoustically perfect, and the whole instrument is most handsomely finished with a crystalline surface. Puravox Standard Model 80/-, Junior 48/-, Miniature 25/-.



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Sold by all Wireless Dealers. Write for new catalogue No. 559, describing EfescaPHONE Sets and Efesca Components.

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 and at Glasgow, Manchester and Birmingham.

Jottings on the Month's Progress (continued)

special aerial system, consisting of a closed network of wires, arranged in hexagonal form at a considerable height above the ground, he transmits wireless waves which are polarised in the horizontal plane. Strictly speaking it is the electrostatic component which is confined to the horizontal plane, the electromagnetic component being of course at right angles.

Waves transmitted from the Alexanderson aerial do not follow the curvature of the earth's surface, as is the case with ordinary long-wave transmission, but are projected upwards at a considerable angle to the horizon. They travel in this direction until they meet the Heavyside layer, where they are bent around in a more or less curved track and finally strike the earth's surface at a considerable distance away from the transmitting station.

By adjusting the angle of projection at the transmitting end, the point at which the waves return to ground can be controlled so as to energise a selected receiving station at maximum strength.

The Alexanderson system of transmission is also stated to be free from pronounced fading effects. It is generally supposed that "fading" is due to changes in polarisation of the original wave form caused by reflection or refraction at the Heavyside layer. By using waves that are already plane polarised, fluctuations of signal strength due to this cause are largely avoided.

Meshwork Aerial

A similar idea underlies the arrangement proposed by M. Lucien Levy. In this instance a horizontal meshwork of transverse wires is supported at a height above the ground equal to half the wavelength to be transmitted. The up and down leads from the exciting generator are arranged close together, and neutralise each other, so that radiation takes place entirely from the elevated meshwork.

A stationary wave system is stated to be formed upon the aerial network, from which horizontally-polarised waves are radiated. B. A. R.

FOR THE WIRELESS BOOKSHELF

COMPILED primarily for the use of those engaged in wireless telegraphy as a profession, volume III of the Electrical Engineers' Data Books, which is entitled "Radio Engineering," contains much information of use to the serious amateur.

Reliable and authentic treatises on the science are somewhat expensive and in most cases are entirely beyond the comprehension of those to whom wireless is merely a hobby. It is with the sole object of placing the information contained in such treatises within the reach of those who would otherwise be denied it that these publications have been compiled.

The latest volume "Radio Engineering" is concerned with wireless calculations and measurements and contains valuable information on all phases of the science. The volume is published by Ernest Benn Ltd., London, price 15s.

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The Low Price of the KING SUPER TRANSFORMER is no indication of its sterling worth. A Patent Improved Method of Winding the Cotton Covering on the Enamelled Wire known as "Spirilla" Winding is responsible for Quicker and Cheaper Production with added Efficiency. Spirilla Winding ensures maximum Air Space Insulation between the wires, totally eliminates Self Capacity and Inter-Action, and gives perfect Clarity of Reproduction without noise. Safe for High Voltages and Heavy Loading.



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Prevents accidental Short-Circuits. The Plate Socket is indicated by Red and is shorter than the others.

PRICES:

With terminals for surface wiring - 2/3
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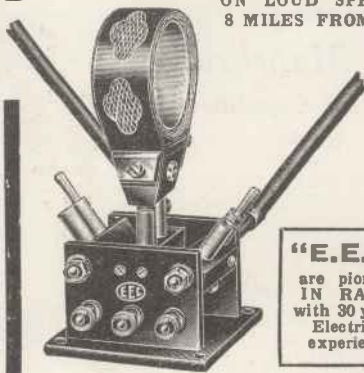
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Red " - 0.5 " "
Green " - 0.75 " "
Black " - 1.0 " "

PRICE 1/6

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This detector is unsurpassed in sensitivity by any other crystal detector at any price. Fitted with our super-sensitive crystal "RECTARITE." (No battery required.) Ebonite base 2 1/2 in. by 2 1/2 in. by 1 in. Ball and socket adjustment, 4-jaw chuck for contact wire, glass dust shield. Finest instrument finish. 7/6

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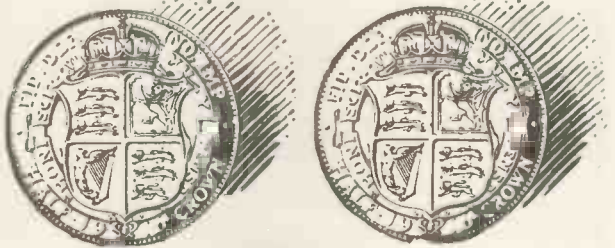
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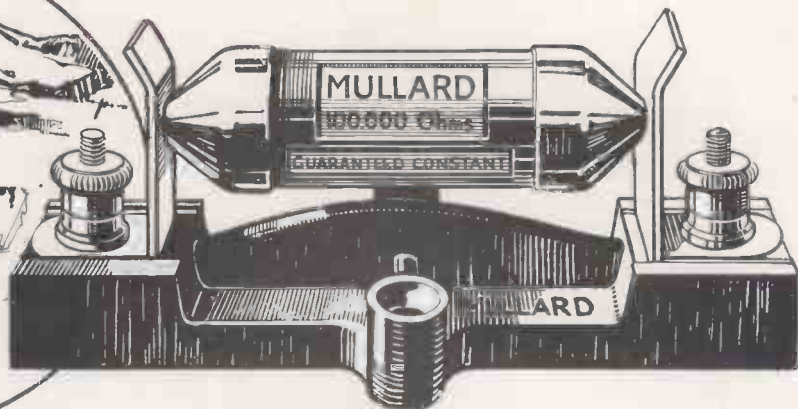
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"The Wireless Magazine" Buyers' Guide

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