Wireless Weekly, 6d. Net. Wednesday September 2nd 1925

# Wireless Weekly

Vol. 6. No. 22.

## A VISIT TO THE G.E.C. RESEARCH LABORATORIES

SPECIAL ARTICLE

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# A Short-Wave Problem

THE experiences reported by some of our readers who are preparing receivers for the tests from NKF serve to emphasise the importance of a problem which seems to be receiving too little attention from the experimenter upon short waves. When a short-wave receiver has been finished, quite a difficult problem is presented by its calibration, and the difficulty does not end here; in the Reinartz circuit (which provides one of the easiest methods of constructing an effective receiver for frequencies in the neighbourhood of 14,991 kc.), the calibration of the circuit depends to a noticeable extent on the setting of the reaction condenser and the number of turns in use upon the reaction winding, and it often happens that some change being made in the aerial system completely alters the reaction demands of the circuit, and when this has been corrected the calibration is found to be upset.

Considerable pains are usually devoted in special short-wave receivers to the reduction of all stray capacities, and when the set is operated at small condenser readings the inter-electrode capacities of the valve play a quite important part, and it is therefore within the bounds of possibility that the calibration which has been laboriously obtained may be lost by a mere change of valve.

Bearing these points in mind, and also the fact that the space occupied upon the dial of a condenser of convenient size by the signals of any one station upon the shorter waves is exceedingly small, it is evident that a wavemeter of some sort is practically essential if a great deal of time is not to be wasted in searching. Probably many experimenters feel that the calibration of any wavemeter which they may construct is a matter of prohibitive difficulty, but a little consideration of this point will show that the difficulty is, in reality, not a very serious one.

All that is required is a calibration of quite approximate accuracy, but of dependable constancy. There are at the present time a sufficient number of stations transmitting on accurately measured wavelengths which frequently announce the frequency or wavelength which they are at the moment using, and it is therefore a fairly simple matter to secure a calibration of sufficient accuracy for the ordinary purposes of searching.

The actual design and construction of a wavemeter for use upon these higher frequencies, however, is a matter which requires a good deal of experimental work, since the normal types of wavemeter become exceedingly inconvenient to use on such high frequencies. The buzzer wavemeter is, of course, practically ruled out in its conventional form for any really accurate work, while the heterodyne wavemeter becomes subject to many annoying defects upon such high frequencies as those equivalent to the 20-metre wavelength.

(*Concluded on page 713.*)

CONTENTS.





*September 2, Vol. 6, No. 22.*

# The G.E.C. Research Laboratories

*In view of the recent articles by Mr. Harris on the various research laboratories he visited during his tour of America, this description of a visit to an English research laboratory will be of particular interest. The article has been specially written by Mr. J. H. Reyner, B.Sc. (Hons.), A.C.G.I., D.I.C., of the Radio Press staff.*

*A recent portrait of Mr. C. C. Paterson, O.B.E., the Director of the G.E.C. Laboratories.*

FEW people realise the part which is played by research in the development of any new product. The valve as used to-day in all its multitudinious applications is, perhaps, one of the most striking recent examples of this.

From the point of view of the outside public the story is simple and somewhat uninteresting. In the early days of wireless broadcasting, immediately after the war, the only valves in use were bright emitters of the R type. There were one or two different types of valve, it is true, but very little was known about the design of valves to fulfil any given conditions, and, in addition, the price was 26s.

### Dull-emitter Valves

Then, after some years, the dull-emitter valve makes its appearance, and the principle employed is, in itself, so simple that the public asks why it was not thought of long before.

As a matter of fact, the dull-emitter valve was only made a practical proposition by the perfecting of the processes employed for the exhaustion of the bulb, and this work occupied several years of concentrated research.

The ultimate result is that these methods are applied to the manufacture of other classes of valves, and further improvements are made from time to time, with the result that the price of *all* valves is periodically reduced, and it is now possible to buy for 16s. 6d. a valve of the most expensive dull-emitting type (the 60 milliampere class), which does the same work as the 26s. bright emitter of a few years ago.

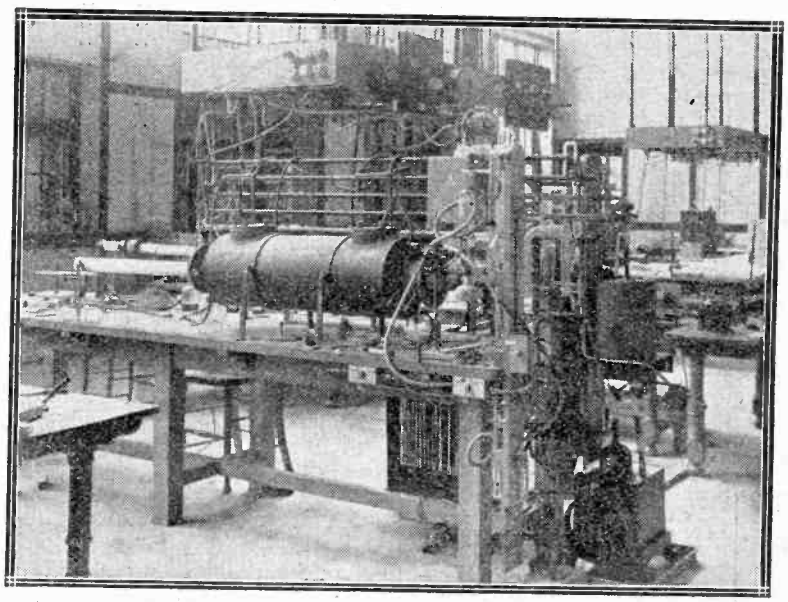
All this is the result of a few years' quiet but persistent research upon methods of valve manufacture, about which the general public heard nothing. This work, of course, was going on in all the chief works in the country, one of the most important being the General Electric Company, who have erected a large laboratory at North Wembley for research in lamp and valve manufacture, and other subjects of interest to that company.

### Glass Bubbles

Through the courtesy of Mr. C. C. Paterson, O.B.E., the director of the Laboratories, we are able to give a very interesting account of the work which is being conducted at this establishment.

One of the most important factors in the manufacture of lamps and valves is the glass which is used for the bulbs themselves. The physical properties of the various types of glass are therefore the subject of experiments, of which the following is one rather interesting example.

At one time in the past the occurrence of numerous bubbles in the glass tubing used in lamps and valves was a disturbing factor, since the bubbles, in addition to being unsightly, occasionally caused a breakdown of the glass and allowed air to enter the finished lamp or valve.



*A view of the electric furnace used for annealing samples of metal. The long tube on the left, with the coil sliding over it, is used to introduce the samples at a point some distance from the furnace itself, as described in the article.*

In order to obtain information on this point, therefore, a saturated solution of sugar is employed, which is mixed to have the same viscosity as the molten glass will have in the process under consideration. It is found, for instance, that for each value of viscosity there is a critical slope in the pouring process above which bubbles are obtained in the glass. The value of this slope and other relevant information can be obtained by a study of the appropriate sugar solution.

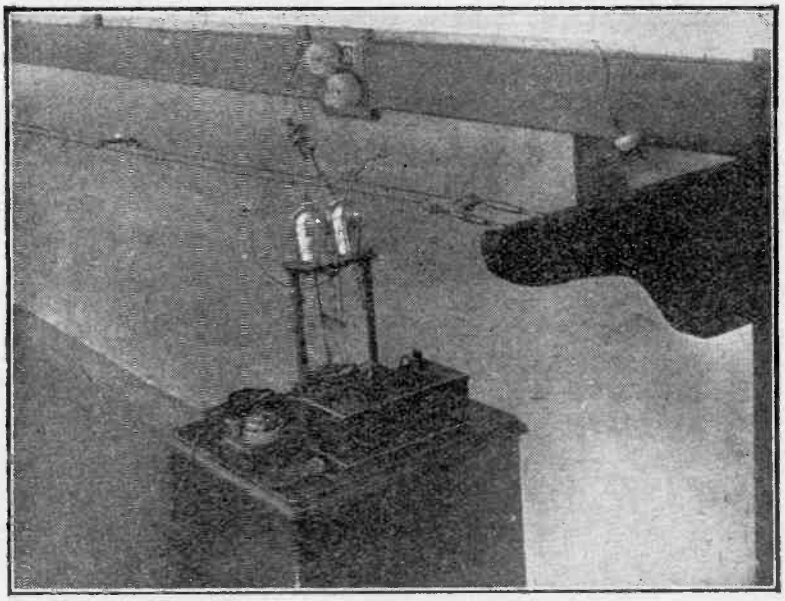
**Annealing in a Vacuum or in Hydrogen.**

Another very interesting process was that of the annealing of electrodes of valves or other specimens of metal in a vacuum or in an atmosphere of hydrogen. In the case of the larger valves the extraction of all the occluded gases in the anode and grid occupies some considerable time after the bulb itself has been exhausted.

**Occluded Gases**

In order to save time, therefore, these electrodes are often *annealed* before being inserted in the valve. The annealing process consists in heating the electrode in a suitable atmosphere, when the occluded gases are driven off by the heat, and may be extracted by the usual pumping methods.

An electric resistance furnace is used for this purpose. The furnace consists of a long tube, around one end of which is a coil of wire carrying an alternating current. The material to be annealed is placed inside the tube and is heated by radiation from the heat generated by the currents flowing through the coil.

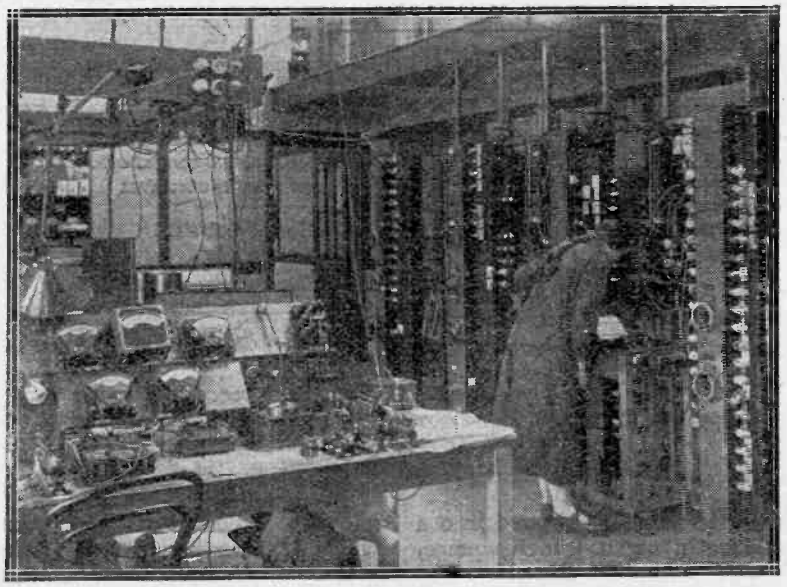


*The 150,000 kilocycle oscillator, coupled to a Lecher wire on which standing waves of 2-metre wavelength are produced. The test lamp can be seen lit up at the first current node.*

**Method of Introducing the Material**

The material, when annealed, must be cooled down before being taken out of the furnace, and this takes some time if it is left in the hot part of the furnace. The tube, therefore, is made long, as previously stated, and the material is introduced in a special boat of nickel to which a small piece of iron is attached. This boat is introduced at the cool end of the tube, which is then sealed up (to enable the air to be exhausted later in the proceedings), and the boat is moved into the hot end of the tube by means of a moving coil sliding over the tube. This exerts a magnetic effect on the piece of iron attached to the boat, and enables it to be drawn into any desired position.

A similar method is employed for removing the charge.

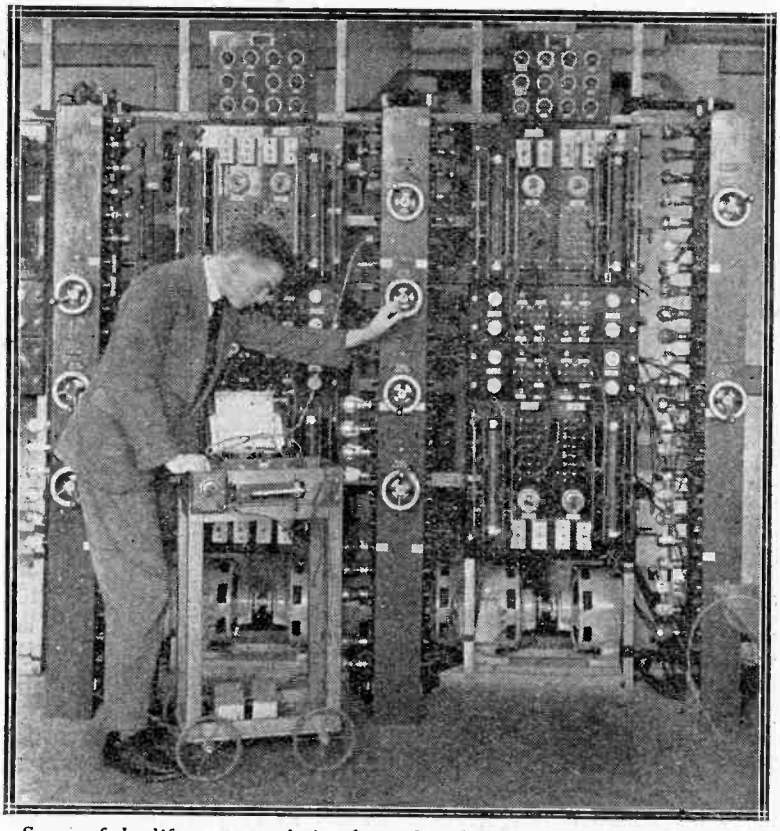


*A corner of the valve testing department, showing the apparatus for checking characteristics on the left, and the life test panels on the right.*

**Tests for Vacuum**

The method of measuring the vacuum inside a lamp or valve is of interest. It consists in sealing or otherwise connecting to the bulb under test a small bulb containing a filament of wire (an ordinary unmounted tungsten filament lamp serves for the purpose). The resistance of the filament is then measured, and it is found to vary with the amount of gas in the bulb. This is due to the difference in the convection of heat away from the filament by the molecules of gas, the more gas present the greater being the cooling, and thus the less the resistance. This device is known as a Pirani gauge.

These gauges are used to test



***Some of the life test panels in the valve department. A key to this photograph is given in Fig. 1 below.***

all the metal valves during construction. The most critical part of the manufacture is the sealing of the glass end on to the copper anode, and it is obviously uneconomical to continue with the manufacture of the valve if this part is faulty. Hence each valve, as it reaches this stage, is sealed on to a Pirani gauge and partially exhausted. The vacuum is then tested every day for a considerable period. If the resistance of the gauge remains constant throughout the test, then the glass-to-metal seal is considered sound.

### Filaments

Another very interesting example of the persistent research into minor points which makes all the difference between success and failure was found in the photo-micrograph department.

Experiments have been conducted now for a considerable period into the structure of filaments used in the manufacture of lamps and valves. The ideal filament, from the point of view of mechanical rigidity, is one which is composed of a single long, fine crystal.

Various methods of manufacture and treatment have been tried, and some results remarkably near the ideal have been attained. To examine the filament, the wire is dropped into a small bath, about $\frac{1}{4}$ inch square, containing molten glass. The glass is then rubbed down with emery cloth until the filament is exposed to the required depth, when the whole is placed under a microscope and examined. Photographs of suitable specimens are taken for record purposes.

### Life Tests

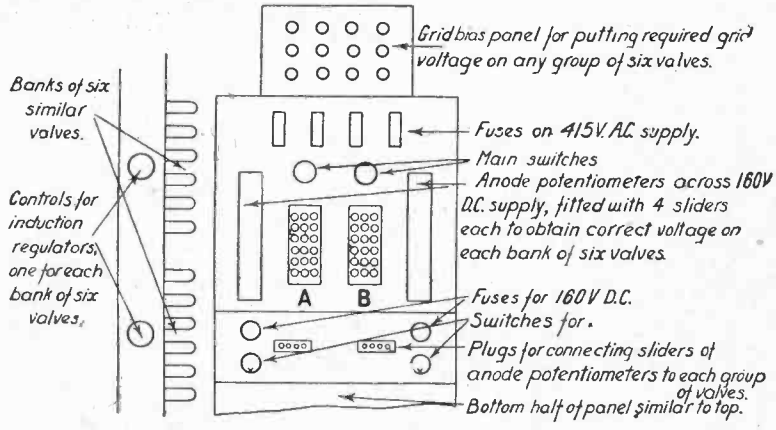
There is a remarkably comprehensive valve-testing department, two views of which accompany this article. Here the new valves are tested for characteristics and performance, and tests are made to see that existing valves are up to standard.

One of the most interesting features is the life test panel, in which valves of any type or make may be put on life test. Facilities are available for placing the requisite high-tension and grid-bias voltages on to the valves so that the tests shall be as fair as possible.

### A.C. for Filaments

It is interesting to note that the filaments are lit with alternating current on this panel. The reason for this is as follows:—If the filaments are lit with D.C. and the current is regulated with a resistance in series, then, if one of the valves burns out, the voltage on the remainder rises, because the current taken is less, and so the voltage drop in the resistance is less.

This means that before long another valve may burn out, which still further increases the voltage on the remainder, so that the effect is cumulative. It was not an uncommon experience to find a whole bank of six or more




*Panels A and B are the tappings from the filament transformer secondaries (see fig. 2). The plugs give 0, 2, 3, 4, 7 and 10 volts. Any intermediate voltage is obtained with the induction regulator.*

***Fig. 1.—Key to the valve test panel illustrated above.***

valves burnt out during the night from this cause.

### Induction Regulator

The method now adopted, therefore, is to use alternating current with an *induction regulator* to control the voltage.

This instrument is a species of variometer, and may be considered as a transformer with a variable transformation ratio (see Fig. 2). When the coils are helping one another the ratio is a maximum, while as the rotor is rotated relative to the stator, so the ratio decreases to a minimum.

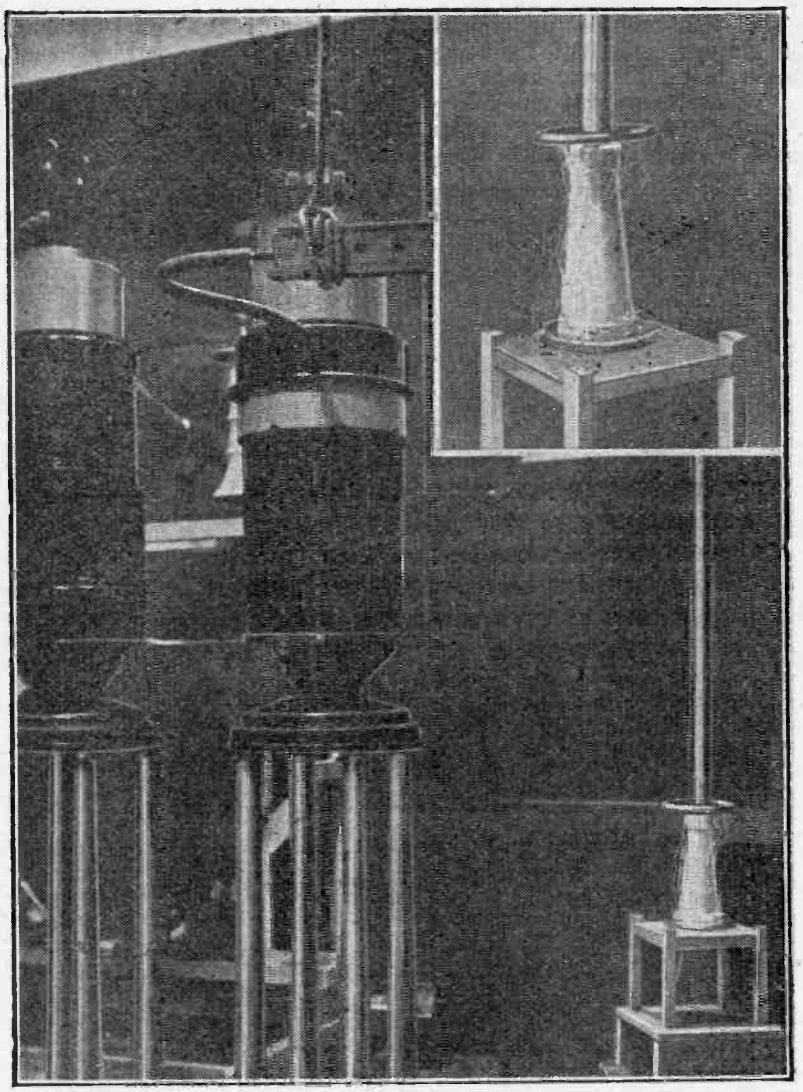
In this manner a continuous variation of voltage is obtained, and this voltage is independent of the current taken by the load, *i.e.*, the number of valves in circuit.

The grid bias is obtained from nickel-iron cells giving a voltage of 1.25 each instead of 2 with lead cells, so obtaining a finer control.

### Exhausting Processes

A walk through the exhausting room showed the usual forms of exhausting plant. The valves during exhaustion are subjected to heat in order to drive off all the gases occluded in the glass of the bulb and the electrodes themselves.

A photograph is appended showing a large metal valve undergoing exhaustion just after the glass has been sealed to the copper.



*A view of the high-tension testing apparatus, showing a flashover test on an insulator. Inset: A close-up view taken during the actual flash at 110,000 volts.*

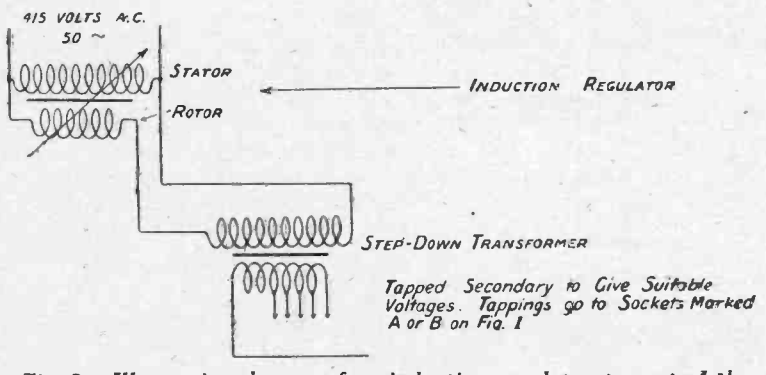



*Fig. 2.—Illustrating the use of an induction regulator to control the voltage on the valve filaments.*

This valve will then be tested for vacuum as previously mentioned, after which the top will be cut open and the grid and filament inserted. The whole is then sealed up again and finally exhausted. This time the oven is lowered over the valve, which is then raised to a fairly high temperature during the exhaustion. Current is also passed through the valve from filament to anode, which makes the anode red hot. This power is absorbed in the resistance mat, which can be seen on the left.

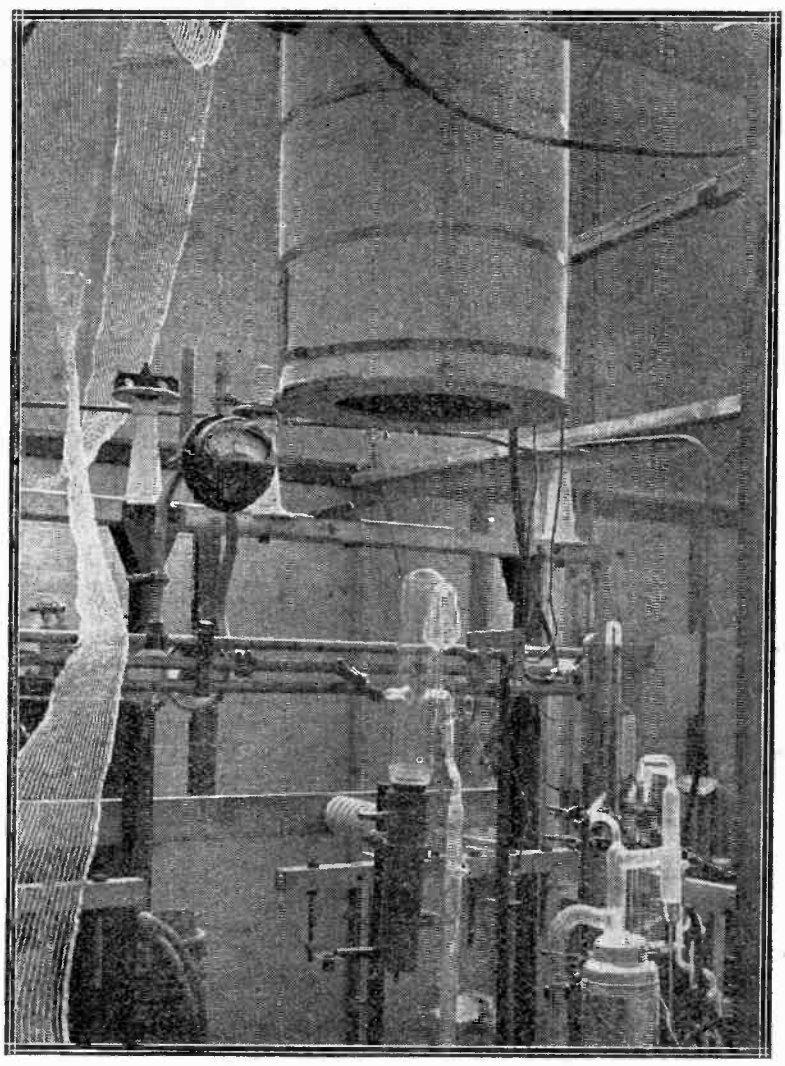
### 150,000 Kilocycle Oscillator

The radio department has several interesting instruments for carrying out the usual types of routine test, such as the measurement of the amplification per stage of a low-frequency amplifier.

An interesting feature of this section was the 150,000-kilocycle oscillator, of which a photograph is shown. The tuning coils of this oscillator are simply short lengths of straight wire, bridged across, and can be seen in the photograph on the second page.

The four spirals underneath the valves are high-frequency chokes in the filament leads.

This oscillator was coupled to a long "Lecher wire," which consists of two parallel wires connected at one end to a loop, magnetically coupled to the oscillator.



*A metal valve undergoing its first exhaustion to test the glass to metal seal prior to the insertion of the grid and filament. The resistance mat and the heating oven used in the final exhaustion can clearly be seen.*

The high-frequency oscillations set up "standing" waves on the Lecher wire of the corresponding wavelength, in this case 2 metres.

Current nodes are obtained every half wave, and a small pocket lamp bulb placed across the wires at these points lit up quite brilliantly. This lamp can be seen alight in the photograph, at the first node, one metre along the wire.

### High-tension Tests

A recent addition to the equipment is that of a high-tension testing plant for testing insulating materials. This plant, which is capable of producing voltages of 150,000 volts above earth potential, enables valuable information to be obtained concerning the breakdown voltages of insulators, etc.

It was demonstrated in a flashover test on a porcelain insulator of the type used for supporting bodies at high potentials. As the voltage was increased the insulator commenced to glow, indicating the presence of "brush" discharge, and finally flashed over with a roaring noise at the breakdown potential of 110,000 volts.

### Design of Transformers

The transformers used are interesting in one respect. In a high-potential arrangement like this the trouble is to maintain adequate insulation between the windings and the core, which is at earth potential. In these instruments, which were designed by Messrs. Haefely Bros., the transformers are insulated from earth by being mounted on wooden legs, so that the cores are themselves at a high potential, and the insulation required on the windings is much reduced. One of the photographs shows these transformers, and also gives a close-up view of the insulator flashing over.

### A Well-organised Library

Finally a visit was paid to the library, which is beautifully organised. In addition to books of reference, the leading periodicals are available, and a very complete card index system is in force enabling information on almost any subject to be obtained with a minimum of delay.

These are only some of the impressions gained during a comparatively short visit. The spirit of the laboratories was one of quiet enthusiasm, and I came away feeling that the position of English research is a great deal stronger than is popularly supposed.

# A NEW LOUD-SPEAKER CIRCUIT

By G. C. BEDDINGTON (Trinity College, Cambs.).

*This article describes an ingenious method of obtaining a trigger effect in low-frequency amplifiers which provides considerable experimental interest.*

THE method of amplification described in this article has been lying dormant and semi-incubated in various patent specifications for years, but it is only lately that any practical application of the principle has been developed. There are two principal patents which are concerned in this method. The first of these is due to G. W. Pierce (British Patent No. 15,681 of 1914). The essence of Pierce's arrangement is shown in Fig. 1. The second valve has a battery connected in the grid circuit, the circuit of this battery being completed through the anode-filament path of the first valve. Consequently the actual potential applied to the grid of the second valve depends upon the conductivity of the first valve. Thus as signals are impressed upon the grid of the valve V1, so the voltage applied to the grid of the valve V2 is correspondingly varied, and this produces changes of current in the telephones in the anode circuit.

This would at first sight appear to be a rather cumbersome method of coupling two valves in cascade, but it will be seen later that, provided certain conditions are fulfilled, a "trigger" action can be obtained.

## Gill's Limiting Device

The second patent concerned is due to E. W. B. Gill (British Patent No. 155,742 of 1921). The arrangement described in this patent is shown in Fig. 2, and will be seen to be similar generally to the previous patent except that the battery in the grid circuit of the second valve has been removed.

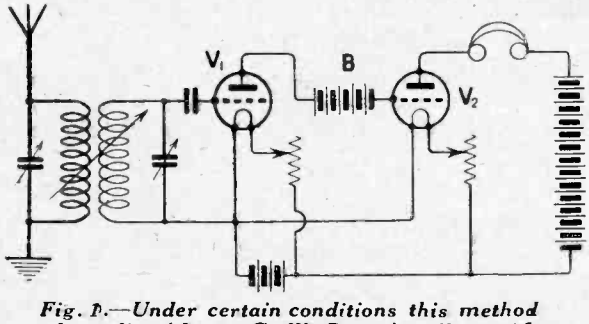



*Fig. 1.—Under certain conditions this method of coupling (due to G. W. Pierce) will provide a "trigger" action.*

If the current in the anode circuit of the valve V2 is plotted against the voltage applied to the valve V1, a curve of the nature shown in Fig. 3 is obtained. The exact effect will be described shortly, but the point to be noted is that the anode current of V2 decreases as the voltage on the grid V1 is increased. The curve only has an appreciable slope over a limited portion, so that a strong signal would be limited if passed through an arrangement of this sort. This was the advantage of the arrangement that was claimed by Gill in the particular patent specification referred to.

## Prince's Modification

Major C. E. Prince, of the Marconi Company, suggested to the author a circuit which is a development of the principles underlying the two

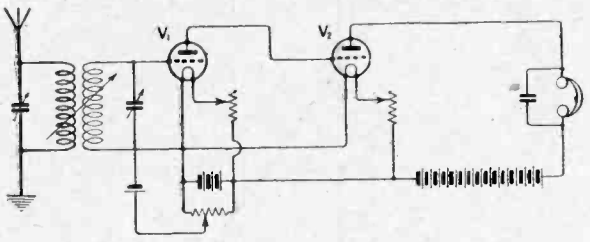



*Fig. 2.—The circuit of E. W. B. Gill's limiting device.*

previous circuits, but which takes advantage of the trigger action which can be obtained. Consider the circuit shown in Fig. 5, and assume that the voltage on the grid of the valve V1 is sufficiently negative to render the valve non-conductive.

Then to all intents and purposes the grid of the second valve is "free." This grid, therefore, will take up some fairly high negative potential, the value of which will depend upon the characteristics of the valve.

This is the normal condition, and the anode current under these circumstances will be termed the "normal current."

## Theory of Operation

If now the valve V1 is made conductive, then the positive end of the grid battery B will be connected to the filament through the resistance of the anode-filament path of the first valve. The effect of this will be to apply a large negative potential to the grid of the second valve in excess of whatever negative potential may already be in existence. This will cause a further reduction in the anode current of the second valve.

It will be seen that the circuit is almost identical with that of G. W. Pierce. The action, however, is different, in that, with the present arrangement, the valve V1 is normally operated at a point Z on the characteristic (see Fig. 4 (a)), such that the valve is non-conducting.

The normal working position of the valve V2 will be at some point such as X on Fig. 4 (b). It follows, therefore, that if the grid battery B has a voltage equal to, or greater than, Y in Fig. 4 (b), the anode current of the second valve

will be reduced to zero when the first valve becomes conducting.

### Trigger Action

The trigger action is due to the fact that with the normal currents carried by V1, the resistance of the anode-to-filament path of the valve is comparatively low, compared with the resistance of the grid-filament path of the valve V2. Consequently as soon as the valve V1 becomes conducting, practically the full voltage of the battery B is applied across the grid and filament of the valve V2, and the anode current of this valve is reduced to zero. By this means, therefore, a considerable reduction in anode current can be arranged, such reduction being many times greater than the change in anode current, which

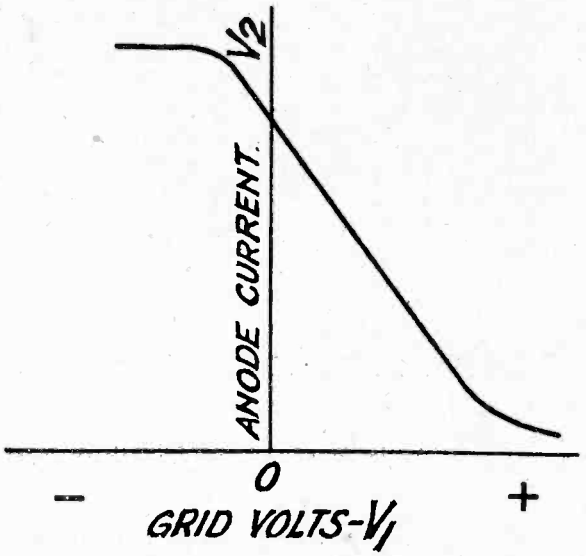



*Fig. 3.—The type of curve obtained with the Fig. 2 circuit.*

would result if the original voltage were applied direct across the grid and filament of the valve V2.

### Working Points on Characteristics

It follows, therefore, that in order to obtain the best results the valve should be operated so that the "normal current" of the valve V2 is fairly large. Thus when the voltages are applied to the grid of the valve V1 a fairly large reduction in the anode current of V2 is possible.

Moreover, at the end of each signal the grid will have been made excessively negative, and must recover its potential in time for the next signal. That is to say, the charge which has accumulated on the grid of valve must be allowed to leak away.

It is thus necessary to insert a suitable leak between the grid and the filament. A circuit incorporating this is shown in Fig. 5, and this circuit has been used on telephony with considerable success.

### Use of Soft Valves

It will be obvious that the "trigger" effect depends upon a somewhat sharp change from the non-conducting to the conducting state in the valve V1. This demands a characteristic with a very sharp bend at the point where the anode current falls to zero, and this condition is best obtained with a soft valve. Consequently the best arrangement is to use a soft valve for V1 and a power valve for V2 in order that the current

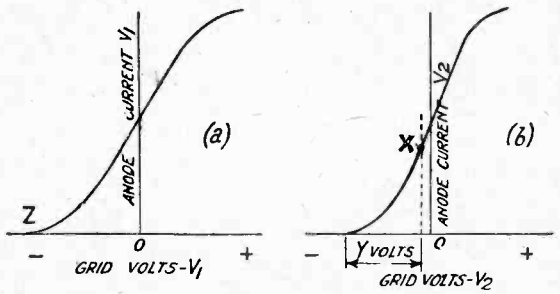



*Fig. 4.—The curves referred to in the discussion of the Fig. 5 circuit.*

controlled by the trigger valve may be as large as possible.

In the circuit shown in Fig. 5 a Phillips' soft valve was used for V1 and an L.S.2 used for V2. The valve V1 was provided with an anode voltage of about 36 volts, and was operated at about 2.5 volts negative potential on the grid.

### Strength of Incoming Signals

Provided the incoming signals are of sufficient strength to work the "trigger," practically the only limitation of the amplification obtainable is that of the high-tension voltage available and the type of power valve used.

If the signals are so strong that the power valve keeps on becoming paralysed (so that a speaker at the transmitting end seems to choke at every word), then the filament of the detector should be dimmed slightly, or else a smaller value of grid-leak should be tried. Grid-leaks of the interchangeable type are extremely useful for this purpose, and with the values shown in Fig. 5 about 5 megohms will generally be suitable.

### Practical Notes

It should be remembered that the first valve in this circuit must be arranged to work on or very near to the point of origin of its grid-voltage

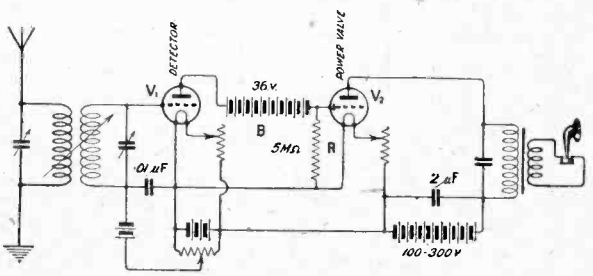



*Fig. 5.—The circuit suggested to the author, and used on telephony with considerable success.*

anode-current curve. To bring it to this point no amount of negative potential applied to its grid, if the latter be a fairly open one, is as effective as a smaller negative potential applied to a fairly fine-meshed grid.

As has been stated a soft Phillips valve gives very good results. A Q valve, having a much finer meshed grid, if used in this circuit with a 36-volt anode battery, will give excellent results, and requires only half a volt negative or even less on its grid.

### Quality of Reproduction

The thing that first strikes one most on hearing this circuit on good telephony is the extraordinary amount of energy handled by a single stage of amplification following the detector. The second surprising thing is the almost uncanny absence of distortion. The latter is often blamed to a great extent on to loud speakers, but if a really good loud-speaker is used this circuit will reveal how little it actually does distort.

This lack of distortion is chiefly due to the absence of any iron circuits in the amplifier, apart from the loud-speaker itself and the step-down transformer, if one is used with the loud-speaker.

### Signal Strength Required

A rough idea of the strength of telephony necessary to "trigger" this new circuit satisfactorily may be given by the following approximate gauges, which, however, are rated rather conservatively.

If loud and strong telephony comes in on a good crystal detector without amplification then only the detector will be needed in front of the power valve, and the circuit of Fig. 5 will be suitable.

If signals are of such a strength that speech is received just loud enough to be heard clearly and distinctly without any strain on the hearing with the crystal set, then one stage of high-frequency amplification should be added in front of the detector, and the circuit of Fig. 6 will be suitable.

If speech on the crystal set is barely audible, then two stages of high-frequency amplification should be added.

### A Practical Circuit

In Fig. 7 is shown the circuit, with all values, of a set designed by the writer after considerable experimenting, which gives excellent results.

The unit used in front of the trigger circuit set consists of an aerial tuning coil tuned by a condenser followed by two stages of tuned-anode H.F. amplification. The set was designed for the reception of long-wave Continental broadcasting, especially before the opening of 5XX.

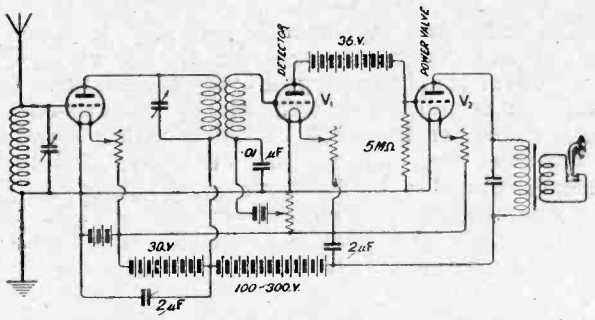



*Fig. 6.—A circuit suitable for loud-speaker work, when signals are normally heard clearly on a crystal set.*

### Self-oscillation Tendencies

The tendency to break into self-oscillation is extremely small owing to the use of V24 valves, which have comparatively little inherent grid to plate capacity; also in the designing of the set strong capacities and couplings have been most carefully avoided. Whatever slight tendency to instability there may be is very easily and smoothly controllable by means of the potentiometer P1.

Though the arrangement of a grid-condenser and leak in front of the first high-frequency valve is somewhat unorthodox, the writer has found that with it the potentiometer control is made infinitely easier and far less critical than when applied in the more usual way to stabilise two

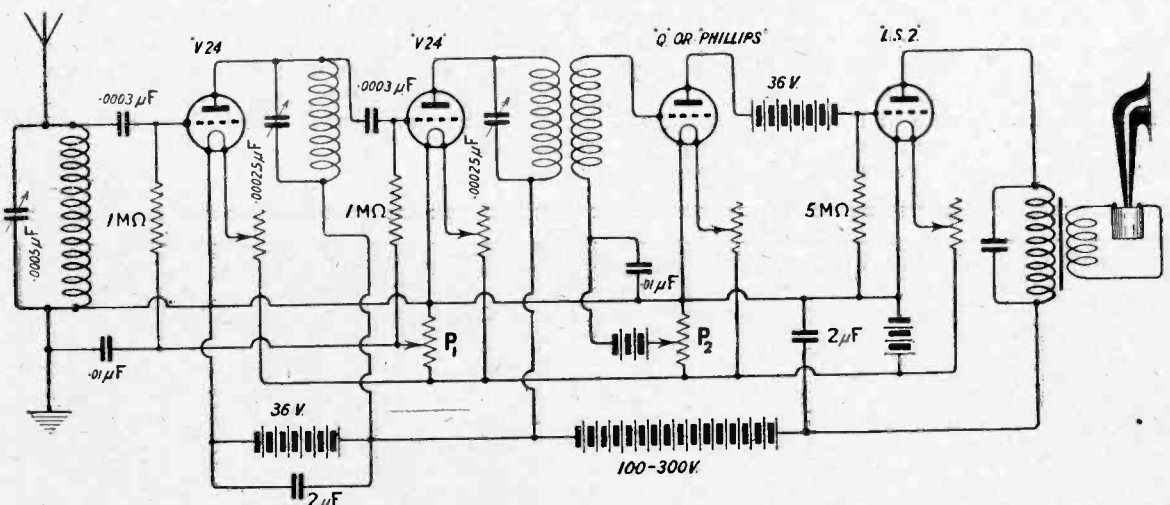



*Fig. 7.—A circuit used with success by the author for full loud-speaker reception of stations which are barely audible on a crystal set.*

high-frequency stages, one or both of which employs tuned-anode coupling.

### Results

With this trigger circuit, using only one valve following the detector, signals can be produced ideally free from distortion, which can be heard a hundred yards or more away from the loud-speaker, as a modulated output of as much as 7 milliamps. or more can be obtained.

The writer has experimented for the past year to find out the best values for the circuit in practice for telephony purposes. Once found these need not be altered, and the circuit has proved itself stable and foolproof. Publication has been delayed for two reasons, one connected with patents on further developments not yet disclosed, and the other that with the opening of 5XX at Daventry it is now possible to get the very best results from the circuit.

### Short Wavelengths

On short waves the circuit suffers to a certain extent from the fact that the inherent grid to earth capacity of the power valve, as well as stray capacities from the 36-volt battery to earth, tend to bring about paralysation of the power valve before full advantage can be taken of the cumulative effect.

One word of warning should be given to all who propose to make up this circuit. That is that as soon as the circuit is connected up, if one is used to ordinary circuits, it seems so utterly dead that one feels there must be a wrong connection somewhere. But the way the circuit jumps to life as soon as the right combination of adjustments is found is apt to be startling.

### Values of Components

For tuning-in purposes, to begin with, it is advisable to use head 'phones, and in place of the power valve an ordinary receiving valve with about 100 volts on its anode. A slight re-adjustment of the potentiometer will then be necessary when the power valve is put in instead.

Other values of components than those specified will work if correctly combined. The ones given in this article will not necessarily prove the best with all types of valves; in each individual case the best values should be found by experiment.

The writer will be most interested to hear from anyone using this circuit, and, through this journal, to give any help that he can. In conclusion he would like to add that he considers that the great advantage of the circuit is not so much range as unsurpassed quality.

## FOR SHORT-WAVE ENTHUSIASTS

It may be of interest to those engaged in short-wave reception to learn that the following message has been sent out recently :—

"CQ de RDW. We have an experimental transmission from 0100 to 0200 from 1220 to 1320 and from 2225 to 2325 GMT. Pse QSL to following address, Russia, Nijni Novgorod, Radio Laboratory."

This message was sent out in English, French, German and Esperanto. The wavelength used was in the neighbourhood of 30 metres (9994 kc.), I.C.W. being employed. On 2 valves (V-1) on an indoor aerial in the N.W. part of London, this station was received at R4-R8, there being a slight amount of swinging.

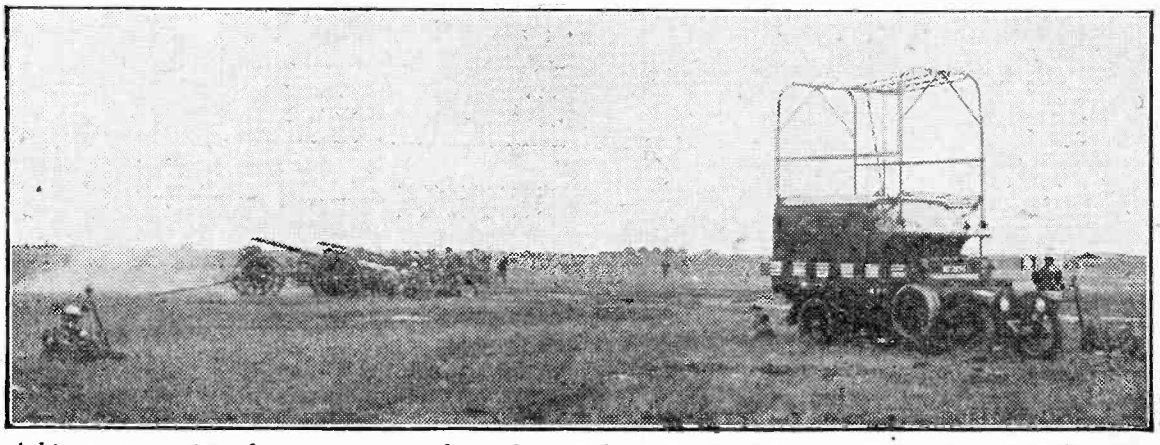
Other stations heard in the region of 25-30 metres are WQN and WIZ, both heard calling ABC, and sending V's.

### Americans on 20 Metres

Although the 20-metre wave is not supposed to carry well at night, U1II was strongly received recently on 2 valves at 11 p.m. G.M.T. He gave his wavelength as 20.8 m. (14414 kc.) and power 90 watts. His strength was R5-R7 on an indoor aerial.

When an American amateur gives a number before signing off this is his wavelength. The A.R.R.L. have established a number of official stations which send on certain wavelengths with an accuracy of a few per cent. This is a useful fact to remember when calibrating a short-wave receiver.

C. P. A.

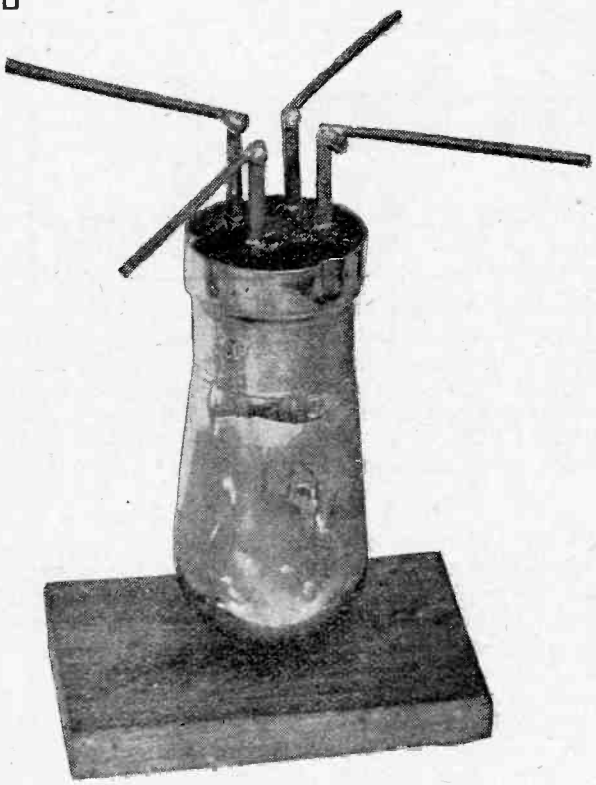


*A big concentration of troops is now taking place on Salisbury Plain in preparation for the forthcoming manœuvres. A battery of the R.G.A. is shown in action, directed by a travelling wireless station.*

# Mounting Valves for Short-Wave Experiments

By A. V. D. HORT, B.A.

*Some suggested methods of mounting four-pin valves for experimental work in circuits where the reduction of casual capacities to a minimum is desired.*



*Here the valve is supported in the receiver by the wires soldered direct to its legs.*

THE use of standard four-pin valves for reception on wavelengths around 100 metres (2,998 kc.) has for some time been known to be quite satisfactory. Even on the shorter waves, below 20 metres (14,991 kc.) or so, these valves will function well, provided that suitable precautions are taken in designing the receiver, as has been demonstrated by Stanley G. Rattee, M.I.R.E., in *Wireless Weekly*, Vol. 6, No. 12.

Whenever it is desired to reach the highest frequencies, it is essential to avoid unnecessary stray capacities in the receiver, and to reduce to a minimum those which cannot be altogether eliminated. Such experiments in this direction as are likely to lead to greater efficiency are well worth a trial.

## Valve-holder Capacities

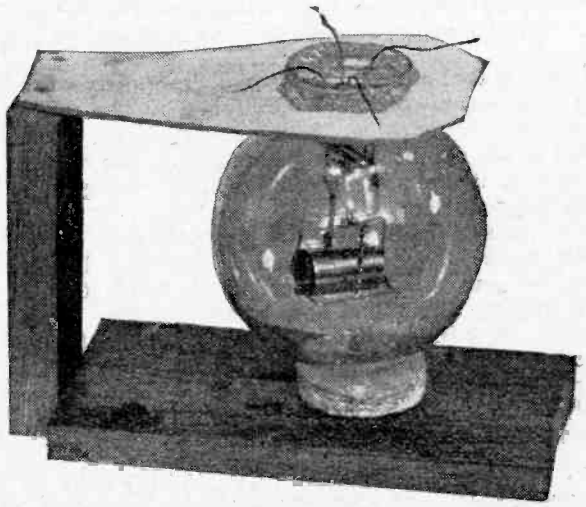
Any valve-holder for four-pin valves, however it is constructed, must add a certain amount of capacity to that already present between the legs of the valve itself. Even if the shortest and thinnest possible tubular sockets are used, their thickness will have the effect of bringing the leads from the electrodes closer together, and so increasing the capacity between them.

By soldering leads direct to the valve legs the holder can be dispensed with altogether, and an inappreciable amount of extra capacity will be introduced. This is illustrated in the photograph at the top of this page. A short length of stiff copper wire is soldered to each leg; the valve can then most conveniently be mounted inverted as shown, a hole drilled in a piece of wood accommodating the "pip" and keeping it steady. Alternatively, the pip may rest on a piece of sponge rubber. Connections are soldered to the outer ends of the stiff wires in the ordinary way.

## Valves with Base Removed

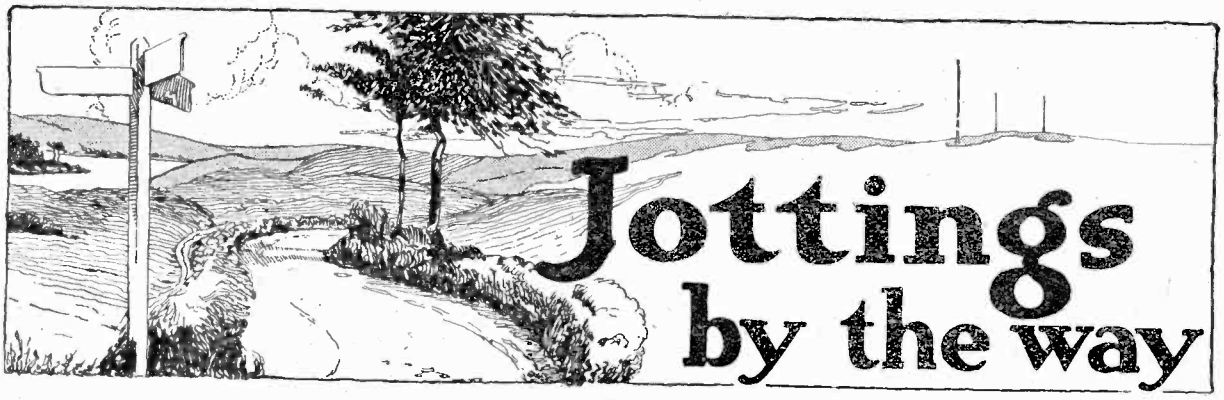
In order to reduce still further the capacity between the leads from the electrodes, the base of the valve may be removed, as described in last week's issue. When this has been done, the problem presents itself of mounting the valve for use. A suggested method of accomplishing this is given here, the photograph showing clearly the construction of the necessary supports.

This method of mounting, which is applicable either to bulbous or to tubular four-pin valves, is to invert the valve with its pip resting on a piece of sponge rubber glued to the baseboard of the receiver. A wooden upright, slightly shorter than the valve, has screwed to its upper end a piece of fairly stout cardboard about 3 ins. long. In this a hole is cut, so that it can be placed round the "neck" of the valve. The wooden upright should be made of such



*Care should be taken to see that the electrode leads are not crossed in the base of the bulb.*

height that the cardboard arm presses the valve downwards slightly, and so keeps it steady. At the same time the springiness of the cardboard and the sponge rubber will help to insulate the valve from mechanical vibration.



# Jottings by the way

## The Latest

I EXPECT that you were properly thrilled when you read in the correspondence columns of a morning paper of the horrid accusation that a lady has levelled against wireless. You and I know, of course, that wireless is responsible for most of the ills that assail humanity, from Bolshevism to bunions, from hay fever to hurricanes, from earthquakes to entertainers, from thunderstorms to taxes, from typhoons to typhoid, from shipwrecks to sea sickness, from plumbers to politicians, from

. . . *Effeminate men and mannish women* . . .

floods to foot and mouth disease, from dirty work at the cross-roads to droughts. The most eminent authorities have assured us, too, that it has the best of influences upon the young, and that it undoubtedly blights their young lives from the outset.

All these things, then, are perfectly clear to us. But there is one thing that I think we hardly realise, and this the writer of the letter that I am talking about has now brought home. In a word, she asserts that it is entirely owing to the devastating effects of wireless that men at the present time are growing more and more effeminate, whereas women are becoming daily more mannish.

## Decadence

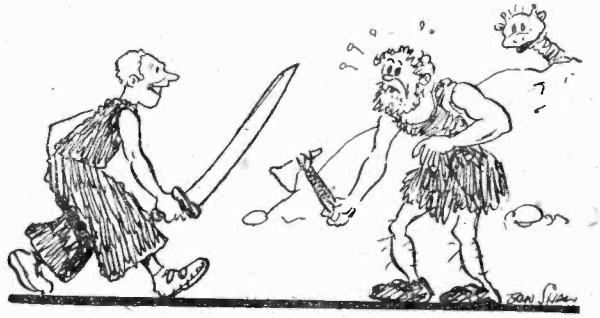
The way in which the thing is done, the writer tells us, is perfectly simple. Each human being —that, of course, includes you and me—has really two personalities, a male and a female. In the ordinary way in the he-man the male side predominates, whilst the female element is subconscious. But now mark what terrible things may happen. The etheric disturbances of wireless draw out and develop the subconscious part of the mind at the expense of the conscious. Thus it is that the he-man is transformed imperceptibly into a she-man who wears Oxford trousers, whereas the she-woman becomes a he-woman, who, if we are to believe the dear old ladies, goes on simply anyhow.

## A Precaution

I am going to leave woman to take care of herself first of all, because, so far as I can see, she is perfectly capable of doing so, and, secondly, because my better half usually reads these notes. But I propose here and now to strike a blow or two in defence of poor maligned man. There can be no doubt that for years and years and years we have been going to the bow-wows. Dear old Horace (I am talking now of the Latin poet, and not of Gubbsworthy) said so nearly a couple of thousand years ago, and ever since his time other fellows have been pointing it out to the world as fast as they jolly well can.

## Snaggsby Agrees

Having been myself educated at Eton, Harrow, Oxford and Cambridge, I can claim to speak with some authority upon all that appertains to masculine correctness. I am not saying that the greater public schools and the old universities are alone entitled to a voice in the matter. That would be simply snobbish. Snaggsby, for example, who was at Borstal and Dartmoor, both reputable seats of learning of the newer kind, has very sound views indeed. I find that he is quite in agreement with myself that the young man of the present day is neither more nor less degenerate than he was ten thousand years ago.



. . . *Armed with a bronze gizzard-slitter* . . .

### Degeneracy in the Stone Age

I feel quite sure that when the first young gent appeared in a natty suiting of woad, all the old fellows of the tribe wagged their beards in horror and told one another, and the world in general, that things were not like that in their time, and that they did not know what was coming over the young men of the day. Imagine, too, the feelings of a Stone Age die-hard who found himself confronted in battle by an ultra-modern youngster armed with a bronze gizzard-slitter. Stone had been good enough for him and for his grandfather, and the use of that nasty sharp stuff in battle was nothing more nor less than taking a mean advantage, which just showed the degeneracy of the age.

### Bags

Somehow I had never before connected the Oxford trouser with wireless in a general way. But on thinking it over I believe that I can now see the connection between the Oxford trouser and wireless. It is all a question of wavelengths. In no nether garment do you get such beautiful sine waves as you do in the Oxford trouser as the wearer moves. But why should they call this habiliment effeminate? For the life of me I cannot say. So far as I can see, it is thoroughly masculine. Have not our noble Jack-tars worn Oxford trousers ever since the great days of Nelson? Possibly they have not, but I feel that you will not be any more definite on the point than I am. Anyhow, there can be no better example of the he-man than the sailor.

### A Great Help

Though I beg leave to doubt whether wireless is really responsible for the Oxford trouser, I can prove to you very simply that, in my case at

. . *Have not our Jack-tars worn Oxford trousers since the days of Nelson?* . .

any rate, the Oxford trouser is responsible for wireless. At the present moment my household is rejoicing in the reproduction of broadcasting given by a glorious five-valve set, which I owe entirely to the Oxford trouser. In days gone by I have been able to borrow here a valve, there a transformer, here a rheostat, there a condenser; but until these voluminous bags came along, that was really as far as I could go, as people usually discovered far too soon that borrowing had taken place.

But now, thanks to the Oxford trouser, things are very much better. The other day I was paying a visit to Admiral Whiskerton Cuttle, who desired to demonstrate the marvellous powers of the five-valve set which he had just constructed. As a rule, I am shown upon arrival into his drawing-room, which contains no wireless apparatus. A new maid, however, ushered me into his wireless den. There upon the table was the new set, which I promptly transferred to the floor, and covered with the flowing folds of my nether garments. Presently the Admiral entered.

### Rough on the Admiral

"My dear fellow," he said, "I am delighted to see you. I just want you to hear what my new set can do, so that you may get some idea of what a thoroughly efficient five-valver should be like." He moved across to the table.

. . . *He made a thorough search* . . .

"Hullo!" he said, "where have I put that set? I thought that it was here." He made a thorough search of the room and then went out to his workshop. Coming back, he reported that he could not find the set anywhere. "I quite understand," I said, "these wireless things are always getting lost. Only yesterday I mislaid a gridleak and could not put my hand on it for hours and hours." He searched and searched without success, looking simply everywhere for the missing set. Eventually he rigged up a three-valver and gave me a demonstration with that. I was quite polite about it, saying that it was not half bad, but if he wanted to hear results he had better come round the next evening to see what my five-valver could do.

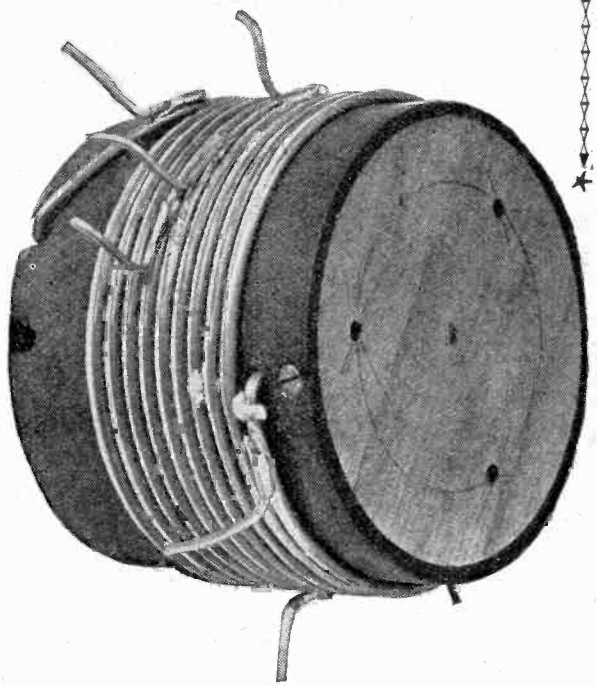
### A He-Man Feat

Thanks to the Oxford trouser and to a little skilful manœuvring, I was able to get away with it in the end, and I can assure you that we have simply revelled in broadcasting ever since. When the Admiral came to see me I gave him a jolly good demonstration. Naturally, I had taken the precaution to give the panel a coat of green paint and to effect certain alterations in the cabinet. He told me that it was rather queer that I should have produced identically the same design as his own, but I explained this away by talking quite a lot about telepathy and great minds thinking alike. If anybody wants to talk about the Oxford trouser being effeminate, just you send him round (provided that he is reasonably small) to see me. Personally, I think that it is the hall-mark of he-mannishness.

**WIRELESS WAYFARER.**

# An Easily Made Thick-wire Inductance

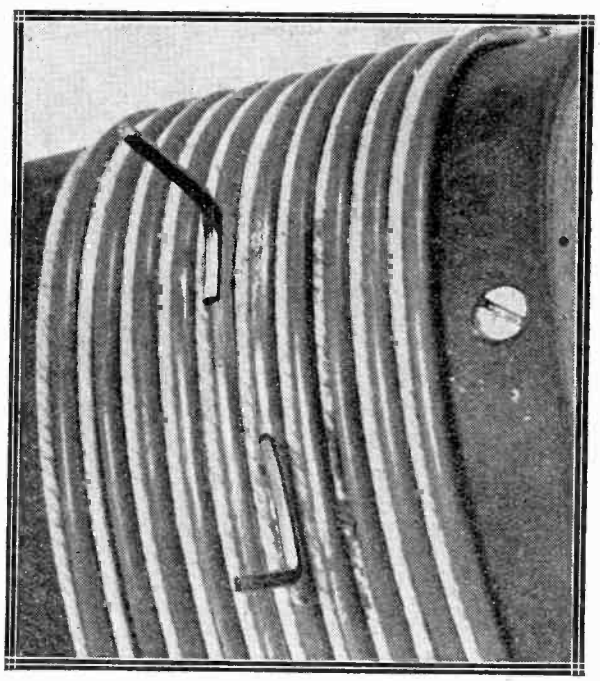
***Heavy-gauge wire is sometimes found troublesome to handle in coil winding, and these notes describe how coils of this type may be simply constructed and mounted.***



*A disc of wood fitted into the end of the former is used to mount the coil.*

IT is not always an easy matter to construct a rigid and robust coil of thick wire, especially if bare wire is used, for then the turns must be spaced so as to prevent adjacent turns touching.

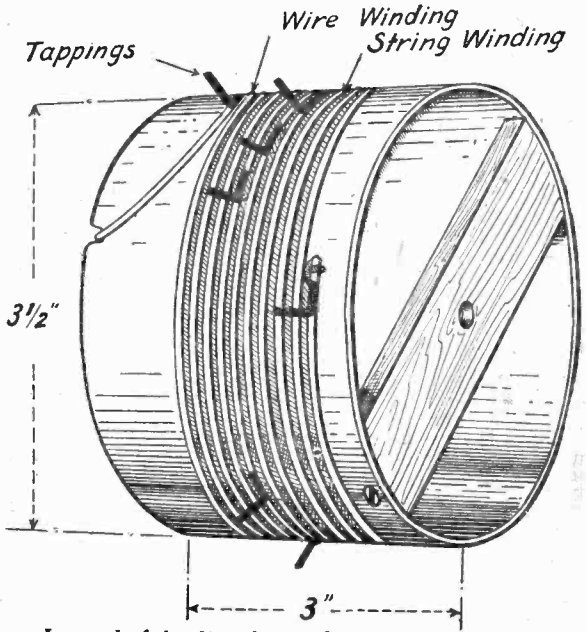
The coil shown in the photograph has the merit not only of being quickly made, but of being absolutely rigid, evenly spaced and easily mounted where desired. A piece of ebonite tube, about 4 in. in diameter, was used. A piece of



*Showing how tappings may be taken from the completed winding.*

wood was cut with a washer cutter to fit tightly into this, three holes being drilled through the wooden disc to allow of mounting the complete inductance. If a washer cutter is not at hand a piece of wood about an inch wide and half an inch thick may be cut with rounded ends so as to fit, the tube being held in position, as is the disc, by means of wood screws passed through the ebonite tube.

A hole is drilled near the edge of the tube and one end of the wire put through it, and the wire is then wound on together with some string of medium thickness to space it. The end of the winding is then dropped into a slot cut in the other edge of the former, and bent over with a pair of pliers to fix it firmly in position. The end of the string is fastened by drilling two small holes, threading it through and tying it. Short




*Instead of the disc shown above, a strip of wood may be held in position by screws at one end of the former.*

lengths of square wire to serve as tapping points may be soldered at convenient places, as shown in the photographs.

C. P. A.

# Constancy in Wavemeter Coils

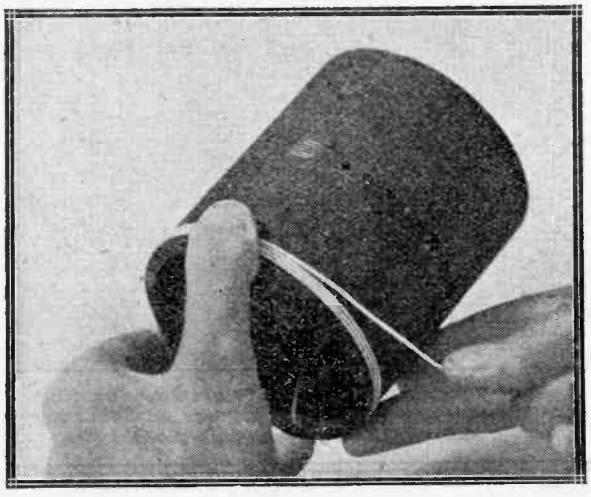
By G. P. KENDALL, B.Sc., Staff Editor.

*A much-neglected part of the average wavemeter is the coil, and this article shows that large variations in calibration may result from such lack of attention.*

MOST experimenters who feel themselves capable of building an effective wavemeter probably realise clearly the importance of securing the greatest possible constancy of calibration in the finished instrument, and it is usual to see due attention devoted to such points as the choice of a good and well-constructed variable condenser, the maintenance of uniform conditions for the oscillating valve, and so on.

Observation seems to show, however, that many people do not realise that although all these other points may have been attended to with great care, yet if the design and construction of the coil is not given equal consideration the result may be an instrument of quite hopeless unreliability. I have recently been carrying out some experiments with a view to determining just what factors in the coil and its design give rise to changes in the calibration of a wavemeter in the course of time, and it would appear that in everyday use these are as follow :—

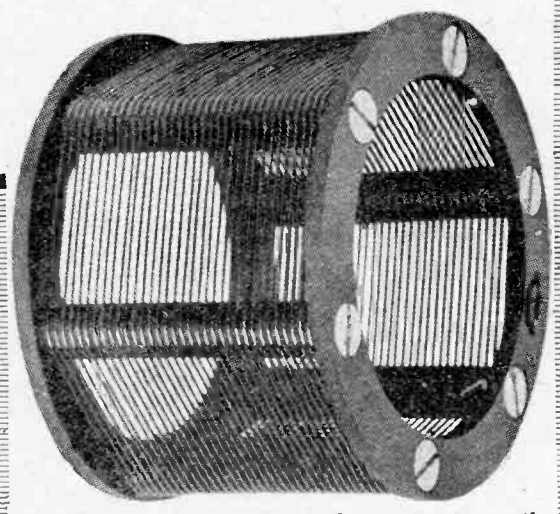
(1) Deformation of the coil as a result of the release of the natural springiness of the turns.



*Putting a winding on the type of ebonite former described. Cotton covered wire was used here so that it would show up clearly, though in practice enamelled wire is to be preferred.*

(2) The deposition of moisture in the covering of the wire or the former upon which the coil is wound.

(3) Chemical changes in the material used to impregnate the coil.



*Coils of this type can be used in wavemeters if the turns are firmly secured.*

A consideration of each of these points in turn should assist those who intend to design their own wavemeters to produce an instrument which can be depended upon to maintain something like a constant calibration.

## Coil Deformation

Certain types of coils are, I find, apt to produce quite surprisingly large variations in a given tuning adjustment, as a result of actual changes of shape taking place in their turns. In coils where the turns have been put on with considerable tension and no very definite means has been provided for securing them in position, the natural springiness of the wire will often lead to quite perceptible changes of shape after the coil has been mounted in the wavemeter. In a basket coil, for example, which had been merely tied up with string, and not impregnated with varnish, I recently observed a change in dial reading from this cause of one and a-half degrees on a .0003 $\mu$F condenser on a wavelength of 400 metres.

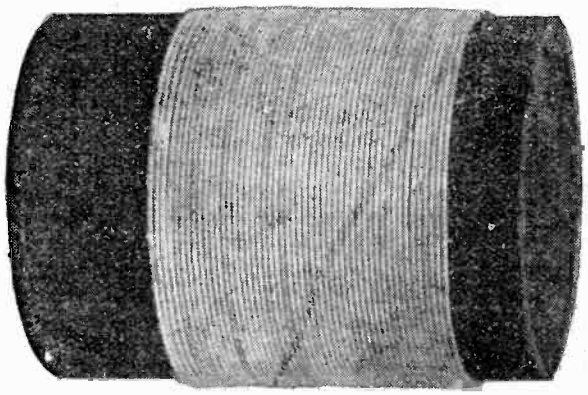
## Single-layer Coils

It is evident, then, that we must regard certain coils as being quite unsuitable for wavemeter use, and in general, we should make a point of employing some variety in which the turns are either very firmly secured in some way, or else are so arranged that they cannot spring out after winding. For example, a single layer coil whose ends are firmly secured is practically immune from such troubles. Since at the present time most of us are interested very largely in wavemeters for the broadcast wavelengths, I think it is safe to say that by far the best procedure is

to decide upon a single layer inductance, whatever type of circuit is used. Reasonable precautions in winding will then ensure that the coil will be fairly constant as far as any changes in dimensions are concerned.

### The Effect of Moisture

It may be remembered that I recently described in *Wireless Weekly* (Vol. 6, No. 6) the results of some experiments upon



***Coils of double cotton covered wire are best impregnated with a damp-resisting medium.***

the effect of moisture in a variety of different types of tuning inductances, from the point of view of signal strength rather than constancy of calibration. The results I obtained, however, will serve our present purpose quite well. It was shown that in all types of coils where wire with an absorbent covering such as silk or cotton was used, and in which the various turns press fairly tightly upon one another, the effect of moisture in such amounts as are met with in actual practice might be extremely serious. In some cases signal strength was affected to a very considerable extent, and the tuning adjustment of a station upon the broadcast band might be altered to seven or eight degrees on the dial of a .00075 $\mu$F condenser in series in the aerial circuit.

### Cotton-covered Wire

Such variations are, of course, entirely prohibitive in such coils as those in wavemeter circuits, but it is to be noted that in the case of single layer inductances the effect was much less noticeable than in true multi-layer coils. The effect upon signal strength of quite a considerable amount of moisture was in many cases only slight in such coils, although the alteration in tuning produced was such, again, as must not be allowed to occur in a wavemeter. No type of coil which I tested and which was wound with unprotected cotton-covered wire, was sufficiently impervious to the effect of moisture to be used in a wavemeter unless it could be enclosed in a hermetically sealed box, and it will therefore appear that when such wire is used some form of damp-proofing impregnation is essential.

### Shellac Dangers

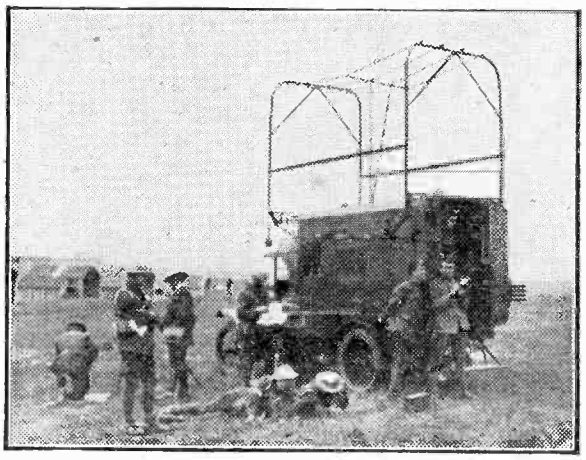
Experiments carried out at the same time upon shellac varnish impregnated coils were somewhat surprising in their results, since I found that the customarily recommended treatment with extremely dilute varnish was of very little service in preventing the absorption of moisture to a degree capable of considerably altering a tuning adjustment, and it would seem that in wavemeter coils the impregnation with varnish should be quite heavy, and usually extremely thorough baking is undoubtedly very important.

So far as constancy is concerned, I have obtained very much better results by means of a paraffin-wax protection, and this seems a desirable method to adopt. When a good grade of paraffin wax is used, it appears that the resulting coil becomes remarkably constant in its characteristics, and can be depended upon to be entirely trustworthy within the ordinary limits of amateur experimental work.

### Value of Paraffin Wax

From a practical point of view, such impregnation must be carried out at a reasonably high temperature in order that all moisture contained in the coil may be expelled, and it is imperative that a really good grade of wax should be employed. Paraffin wax as an impregnating agent, when used with due discretion in this way, is particularly valuable, since it enables us to use a cheap and convenient cardboard former for wavemeter purposes, which is otherwise a procedure strongly to be deprecated.

If shellac varnish is to be used, probably it is safest to make it a definite rule that only a good



***One of the wireless vans to be used for directing the gunners in the Army manœuvres on Salisbury Plain, which commence this month.***

ebonite former should be used for the coil, since shellac-protected cardboard has proved in my experiments to be an extremely risky material.

### Use of Enamelled Wire

An alternative method of overcoming the moisture difficulty is to use either bare or enamelled wire so arranged that adjacent turns do not touch, and I have succeeded in constructing an

exceedingly constant coil in this way. This coil is wound upon a threaded ebonite tube with enamelled wire, the former in question being obtained by stripping off the Litzendraht winding of a Mark III* coil. It will be remembered that these coils are obtainable from one of the Army crystal receivers, and they can be obtained from the majority of dealers who still have any Disposals Board stock in hand.

A photograph was specially taken to illustrate the use of one of these formers, and this appears in the second photograph in this article, where the operation of winding wire on to such a former is illustrated. For the purpose of the photograph cotton-covered wire was used, in order that its whiteness might show up clearly upon the former and show how the turns are spaced apart and held firmly in position by the thread cut in the tube. In practice, of course, enamelled wire is to be preferred, or bare wire if desired.

### Skeleton Formers

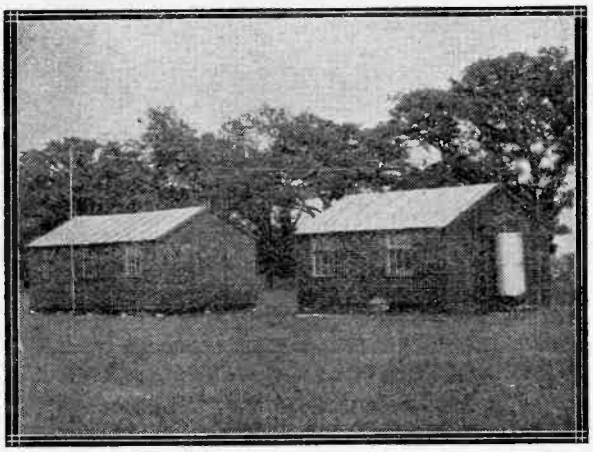
Another method of using enamelled or bare wire to produce a very dependable type of coil is to employ one of the Collinson skeleton formers which are now often used for supporting low-loss windings, and I have obtained quite good results in this way. The main difficulty consists in so winding the coil that all the turns are kept fairly well under tension, none being left slack. A certain amount of trouble is involved in doing this, and probably the easiest thing to do is to wind on the wire without very much regard to this point, and then go over the finished coil with a little really thick and tacky shellac varnish, running the varnish brush down each of the rods supporting the windings, so that each turn is properly stuck in position when the varnish has been baked.

### Chemical Changes

A little-suspected cause of variation in calibration was discovered accidentally in the use of some supposedly pure paraffin wax of doubtful origin. A coil had been impregnated with this material, and it was found that there was a progressive change in the dial reading of the tested wavelength, which led to the dissection of the coil. On scraping down into the impregnated cotton covering it was found that there was a distinct greenish tint developing in the wax, and it is therefore surmised that the material in question must have contained some animal fat, whose fatty acid content had attacked the copper. This should put the reader on his guard against any impregnating material except paraffin wax of the most dependable quality. Similarly, if shellac varnish is used, again only that supplied by reputable electrical firms should be used, since there are a number of disconcerting possibilities associated with the employment of the so-called shellac varnish which may be obtained from an ordinary paint and colour merchant.

### Conclusions

To summarise the results of the simple tests which I have been making, it seems to me that it should be decided that the single layer coil is to be regarded as a standard for the type of wavemeter which we are using for the broadcast band, that where possible enamelled wire should be used, so supported that the turns are relatively immovable, but that where this is not practicable, double cotton-covered wire impregnated with the highest quality paraffin wax may be substituted. Avoid all coils in which the turns are not firmly secured in position, beware of poor-quality paraffin wax or shellac varnish, and unless the paraffin-wax method of impregnation is used, choose a former for the coil which is known to be relatively impervious to the effects of moisture, such as a piece of ebonite tube.



*The receiving station at Hayes, erected by the B.B.C. for the purpose of picking up foreign stations to be re-broadcast.*

## A Short-Wave Problem

(*Concluded from page 697*)

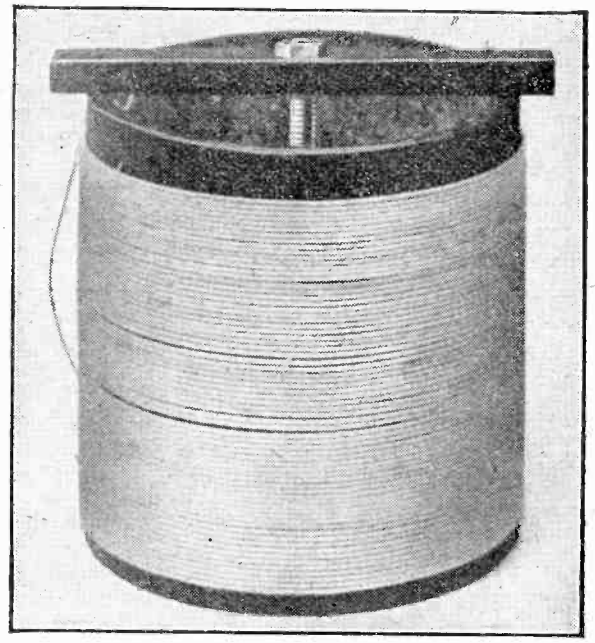
Probably the easiest wavemeter to use and the most promising from the point of view of experimental development, is the simple absorption type, consisting merely of a coil and condenser arranged to tune over the desired band of frequencies, and placed somewhere in the neighbourhood of the oscillating receiver. The familiar phenomenon of clicks denoting stopping and starting of oscillation indicate resonance between the wavemeter circuit and the receiver, and a quite useful effect can be obtained in this way.

Before such wavemeters can be really effective, however, one must overcome the difficulty of the strong "interlocking" effect of tuned circuits in close proximity, which becomes troublesome at these higher frequencies, since it is often found that a considerable variation will be observed in the reading of the wavemeter dial, depending upon the direction in which the reading is approached. A partial screening of the wavemeter coil is sometimes found helpful, and here there is an exceedingly promising field for research, requiring only simple apparatus.

# Mounting Some Types of Home-made Coils

*By C. P. ALLINSON (6YF).*

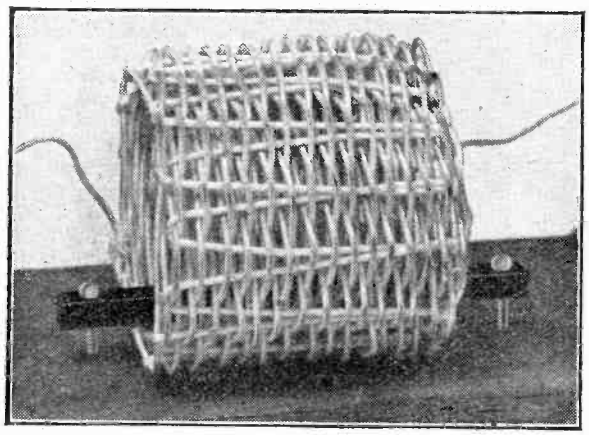
***Much of the advantage obtainable by using home-made coils may be lost by unsuitable methods of mounting them. This article describes some practical ways of treating coils of this type.***



*The screwed rod passes through the coil into the panel or baseboard.*

MANY constructors are building receivers which are designed with a view to covering only a certain fixed waveband, so that instead of plug-in coils being used one inductance only is sufficient.

Such an inductance may be a home-made single-layer solenoid, a basket weave or a spider-web. Whatever its form it will probably need to be mounted in some position, and methods suited to each type of coil are here indicated.



*A simple and secure method of mounting a basket-weave coil.*

The first illustration shows a convenient method of securing a single-layer coil wound on an ebonite tube to either a panel or a baseboard. A flat strip of ebonite has a hole drilled through the centre, through which a piece of screwed rod is inserted, which is then either screwed into the panel or the baseboard, according to circumstances. A nut and washer serve to clamp the strip against the coil, and thus the coil is held tightly in the desired position.

## Other Types of Coils

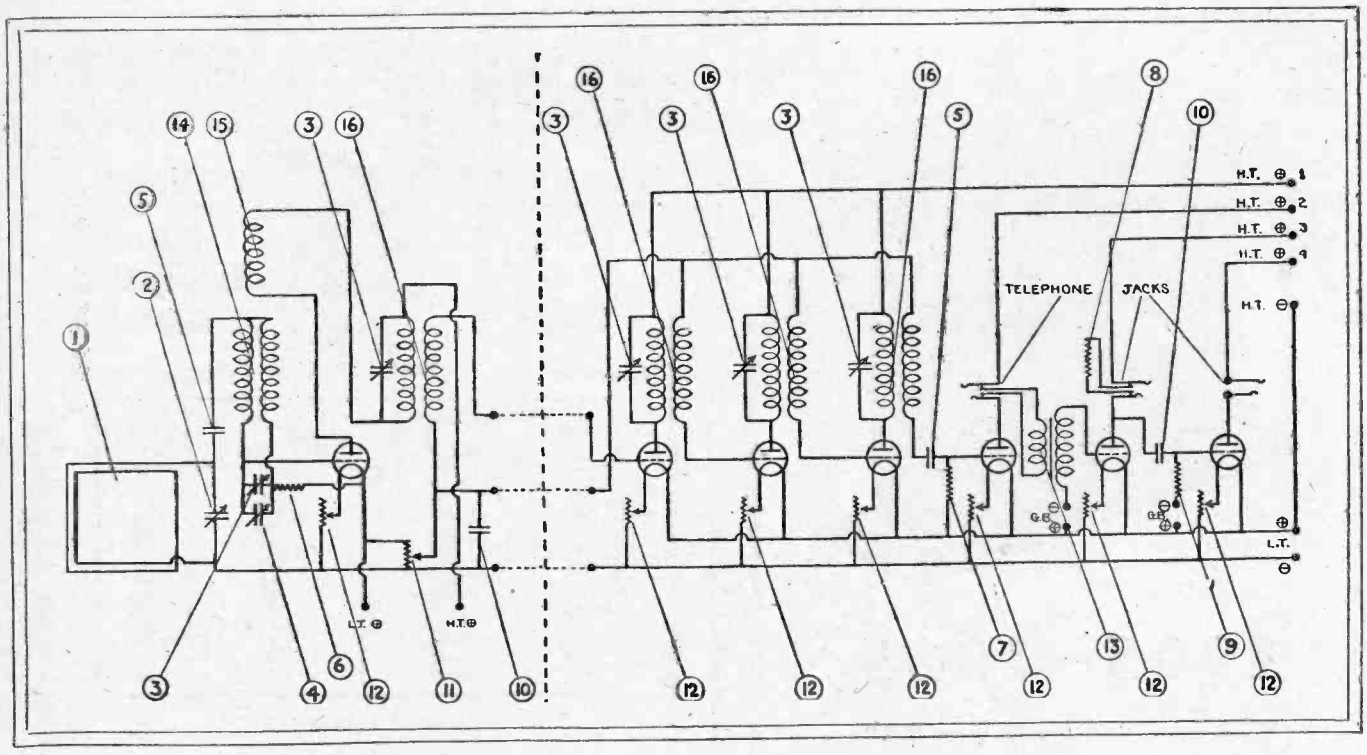
The illustration on the right shows the spider-web coil mounted by means of a small ebonite rod slipped through the spaces in the coil. The rod

*An ebonite rod pushed through the windings of a spider-web coil can be screwed or plugged into a hole in the panel or a conventional plug-in coil mount.*

is inserted in a hole drilled in the baseboard or panel, and firmly supports the inductance.

Lastly, the basket-weave coil may be mounted as shown. A slip of ebonite has a couple of holes drilled in each end, 4 B.A. clear being a suitable size. The coil can then be fixed either against the panel or baseboard as is convenient by means of a couple of screws through these holes. If desired, a second strip of ebonite may be used underneath the coil when the inductance is mounted on a baseboard, so as to lift the coil clear of it.

It is always advisable to remember when mounting coils to fix them so that metallic objects such as L.F. transformers or variable condensers do not come within the magnetic field of the coil.



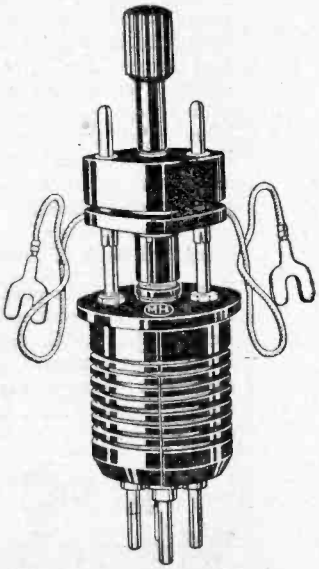

# Conversion of existing H.F. Amplifiers to the Supersonic System

THE Supersonic Set has come to stay, and although for the "Home Receiver" it will never supplant one or two stages of H.F. Detector and note magnification in conjunction with an aerial, the progressive experimenter and home constructor will feel that he must have one. Expense is the stumbling block.

(MH) Products in the form of the **A.7 Transformer, the Reactor,** and the **neutral point Autodyne** enable those in possession of "straight H.F. Receivers" to convert them at a modest outlay, the minimum of trouble and with the certainty of superlative results.

The diagram above shows on the right a conventional 6 valve receiver; should you possess one following the general arrangement shown it need not conform with it in detail. To allow of its conversion, (MH) A.7 Transformers are substituted for those normally used.

To the left of the diagram is shown an additional Valve "with the so-called filter transformer" (the (MH) A.7), the Autodyne Coil (the (MH) Neutral Point Autodyne) reacted on by the (MH) Reactor. This unit can be made up easily and inexpensively to precede your existing H.F. Amplifier, and you will then have both systems of reception at your command. The remaining details are self-explanatory.



**H.F. Reactor attached to H.F. Transformer.**

**INDEX to CIRCUIT DIAGRAM**

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| 1. Frame Aerial ... ... ... | — |
| 2. Variable Condenser .0005μF | 10/6 |
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| 4. Single Plate Vernier ... | 2/10 |
| 5. Mica Fixed Condenser .0003 μF ... ... | 1/9 |
| 6. Grid Leak 0.5 to 1 M Ω ... | 2/- |
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| 12. Rheostat: Bright, Dull, or Dual ... | Prices 5/6, 6/6, 7/6 |
| 13. Low Frequency Transformer | 21/- |
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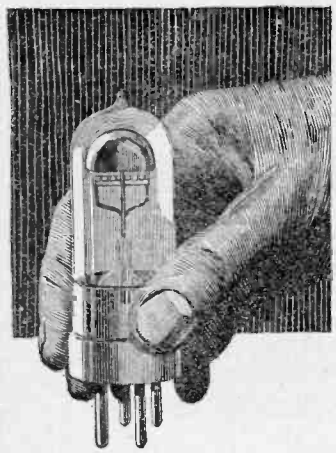
*Barclays Ad.*

# 130 HOURS OF BROADCASTING INSTEAD OF 17



This advertisement is directed particularly towards those tens of thousands of wireless enthusiasts who are still continuing to use bright emitter valves. Now that the wonderful Wuncell Valve has been reduced to 14/- there can be only two reasons why a man persists in using a bright emitter. He must do it either because he has never appreciated the tremendous economy that can be effected with Wuncells or else because he believes that not even Cossor can produce a dull emitter as good as the Cossor Bright Emitter. Here's our reply to both of these points.

The average bright emitter has a current consumption of ·75 amp.—a three-valve set consuming, therefore, about 2·25 amps. A six-volt 40 amp. hrs. accumulator for this set would last about 17 hours on a charge. Now substitute three Wuncells and see how many more hours you will get. The Wuncell works best at 1·8 volts and consumes ·3 amps. If the cells of the same accumulator are connected in parallel to give two volts its capacity will be 120 amp. hrs. Thus, with the three Wuncells consuming in all ·9 amp., and an accumulator with its capacity practically tripled, no fewer than 130 hours of broadcasting can be enjoyed without re-charging.

See how much Wuncells will save you in your own case—you will be astonished at the money you have wasted during the past few months.

But there are still those who assume that all dull emitters are inferior in efficiency to bright emitters—they think that not even the Wuncell can be as good as the Cossor P1 or P2. To these we say that the Wuncell is unique among valves. Owing to its special filament—the like of which is not to be found in any other valve—it is responsible for music and speech reproduction of rare beauty and mellowness. While the Cossor design permits practically the whole of the electron stream being used to obtain extreme sensitivity to weak signals. Take our word for it—the Wuncell is emphatically the equal of the Cossor Bright Emitter in every respect.

Eventually you'll use dull emitters—why not try out the Wuncell now and start saving money in accumulator re-charging from to-day ?

## Cossor Valves

*"Cost less to run—and last longer"*

Gilbert Ad. 3417

# Wireless News in Brief.

**Empire Wireless.** A great wireless development is expected in India as a result of the new work undertaken by the Indian Radio Telegraph Company. A licence was recently granted to this company to erect a beam station for direct communication between India and Britain. The British Post Office has sanctioned the erection of a reciprocal station here.

The transmitting station for India will be in the cantonment of Kirkee, near Poona, on the site of the old Marconi station, long begun but never completed. The receiving station will be at Dhond on the G.I.P. Railway. Land has been acquired and buildings are about to commence, and it is expected that the station will be ready for work by the middle of 1926.

* * *

The Polish Government intends to develop radio broadcasting, and stations will be erected at Krakow, Lwow, Poznani, and Warsaw.

* * *

**Amateur Radio in India.** We are informed that a Radio Relay League of India is being formed primarily for the mutual benefit of amateur transmitters. Wireless has developed very largely in India, and the Radio Clubs of Bombay, Calcutta, Madras, Poona, Baroda and Indore are co-operating very well, with the result that there is very little clashing of transmissions, and people can easily get into touch over the 2,000 miles that sometimes separate the stations and the receiving sets. The Madras Radio Club is quite amateurish, but its members are very enthusiastic. It has a very simple transmitting set, roughly assembled on a wooden bench, and although the input is no more than ten watts, the transmissions have been tuned in as far away as two hundred miles.

An amateur in Poona has succeeded in logging three or four short-wave amateurs in his attempt at securing KDKA's short-wave transmissions.

Another enthusiast succeeded in tuning in to the Calcutta and Bombay programmes from Madras, a distance of over 1,200 miles, on a four-valve straight circuit.

* * *

A new wireless service to Japan has been inaugurated by Marconi's Wireless Telegraph Company, Ltd., and is now available to the public.

* * *

**World Radio Conference.** The State Department in Washington has sent invitations to 42 foreign Governments to attend a Radio Conference next spring.

The main purpose will be to discuss the revision of the International Radio Telegraph Convention of 1912, and measures for the increased supervision of broadcasting, the handling of Press messages, radio telephony, and the elimination of interference.

* * *

New facilities for intercommunication between islands in the Faroe group have been provided by the installation of two small power duplex wireless telephone sets on the islands of Thorshaven and Nols. Each set, which is of the Marconi XP1a type, comprises a small power valve transmitter and valve receiver, worked entirely from batteries, thus obviating the necessity for a dynamo. With the aerial supported by masts 70 ft. in height, communication over a distance of 20 miles can be maintained.

* * *

Wireless telegraph and telephone installations are being fitted by Marconi's Wireless Telegraph Company, Ltd., for the Northern Lighthouse Board, on the Sule, Skerry and Monach Lighthouses, and also at Stromness. A third group of Trinity House Stations, based on Yarmouth, is being equipped also with telephone apparatus. A total of thirty-one British lightships, lightvessels and harbour authority offices will then be fitted with Marconi wireless telephone equipment.

* * *

Despite the unsettled condition of the country, broadcasting is making considerable progress in China. The principal broadcasting station is at Shanghai, and a full programme of news, talks, and concerts is sent out daily.

* * *

Investigations are being renewed by the London Midland and Scottish Railway into the possibility of establishing communication to and from moving trains by wireless telephony. Successful experiments with wireless telegraphy were made many years ago, but as a wireless telegraph service for trains had no particular practical value the matter was not proceeded with.

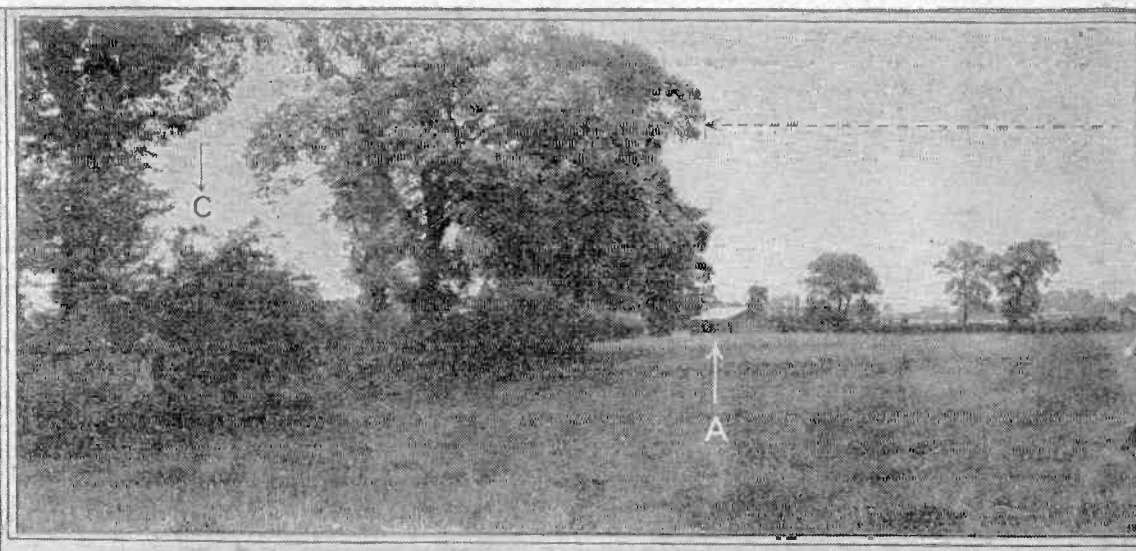
* * *

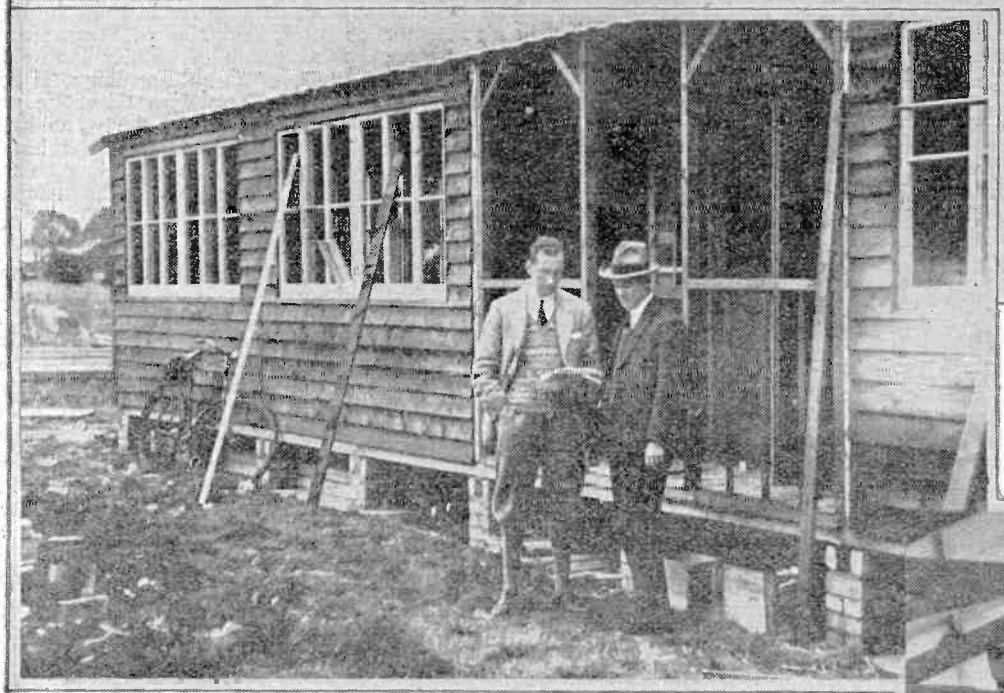
**New Call Sign.** The call sign 5VR has been allotted to the Edison Swan Electric Co., Ltd. Experimental transmissions will shortly commence on wavelengths of 23, 45 and 90 metres. The company intimates that reports of the reception will be greatly appreciated and acknowledged, and times of special tests will be sent to anyone on request.

* * *

**Re-Broadcasting WAP.** A recent experimental attempt to re-broadcast on 322 metres the 40-metre transmissions of music and Eskimo songs from the Macmillan Expedition in the

(*Continued on page 722.*)



# PRO

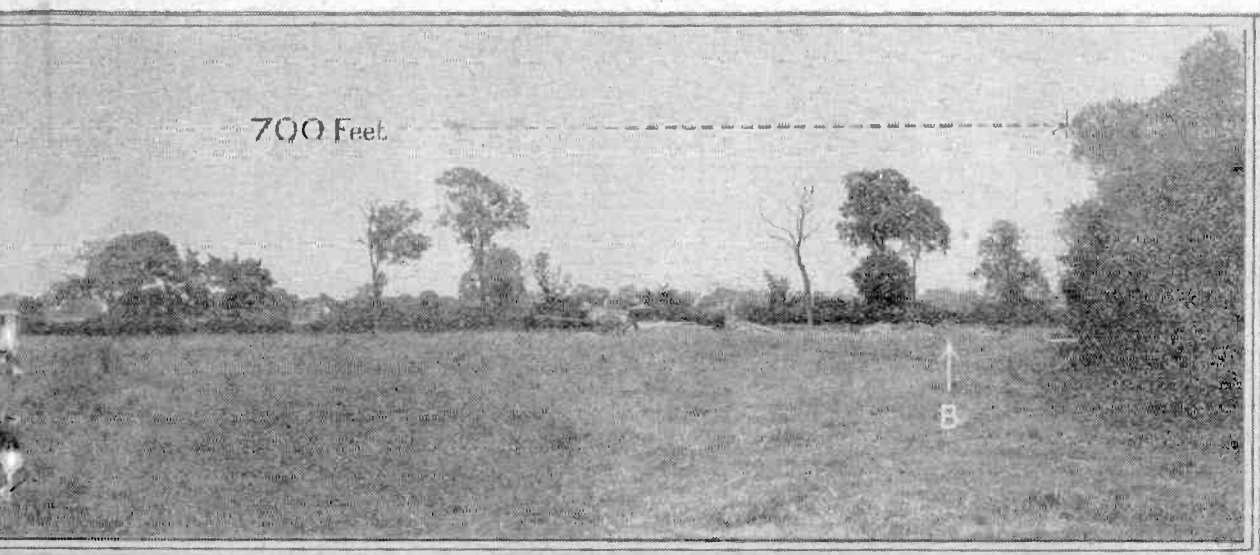
# ELS

*In order that the Ra developed as rapidl temporary buildings appear on these pag published showing th*

*No time is being lost in pushing forward the development of the first stage of the erection and organisation of the Radio Press laboratories at Elstree, and the photograph which heads these pages will convey some idea of the scale of the operations.*

*This first stage consists in the erection of a number of temporary buildings in order that the work of the laboratories may be unhindered by building delays, and the photographs show this work of construction at its commencement: considerable progress has been made since they were taken.*

*The upper view shows the piece of land which is being used for the initial developments, and it will be seen*




# GRESS
# AT
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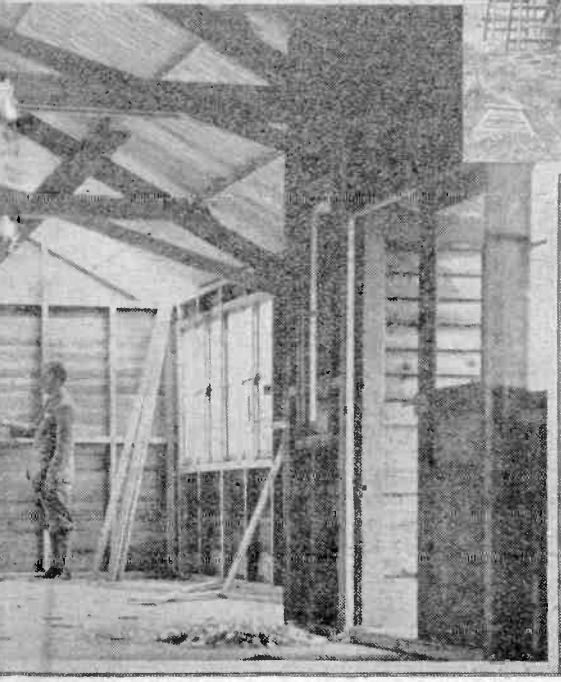
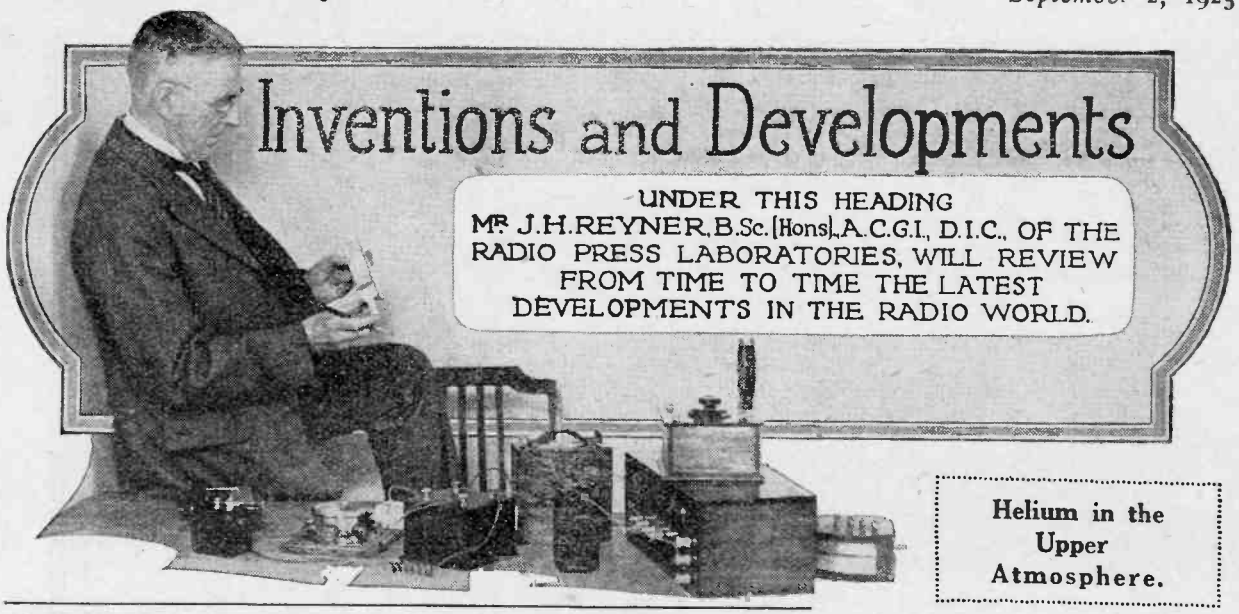
*dio Press laboratories may be y as possible, a number of are being erected, and there es the first photographs to be e work in its initial stages.*



*that it has a road frontage of seven hundred feet. A total of seven acres is available, and in addition to the area visible there are two further sites of considerable extent, one on the left at "C," and the other on the right.*

*The first building to be completed was the one intended for the Service Department, and this may be seen at "A," close to the road. When the photograph was taken the concrete foundations of the next building had just been finished, and these are at "B."*

*In two of the views Mr. Scott-Taggart (holding papers in the left-hand photograph) and Dr. Robinson may be seen discussing the arrangements.*



# Inventions and Developments

UNDER THIS HEADING MR J.H.REYNER,B.Sc.(Hons),A.C.G.I., D.I.C., OF THE RADIO PRESS LABORATORIES, WILL REVIEW FROM TIME TO TIME THE LATEST DEVELOPMENTS IN THE RADIO WORLD.

**Helium in the Upper Atmosphere.**

SOME of the most important information which we possess concerning the composition of astronomical bodies, and the upper atmosphere, is obtained from an examination, by means of a spectroscope, of the light which is emitted by these bodies. If, under certain conditions, white light is passed through a prism, the light is split up into its several components—red, orange, yellow, green, blue, indigo, and violet, and if the light from the prism is thrown on to a suitable screen, a continuous band of light is obtained, changing its colour from red to violet. This band of light is termed the spectrum.

### Nature of Spectrum

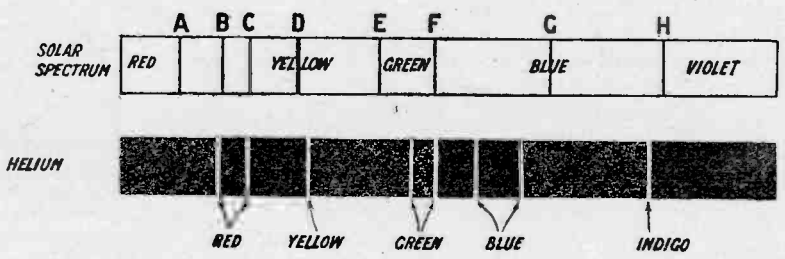
Now this complete spectrum containing all the colours previously mentioned is only obtained from what is generally termed white light. If some element is raised to incandescence and emits light in consequence, the spectrum of this light will not be found to contain all the colours, but only certain definite bands.

For example, the spectrum obtained from incandescent sodium consists simply of two bright yellow lines close together, the remainder of the spectrum being absolutely black.

### Black Lines

Again, if white light is passed through the vapour of some such element on its way to the prism, the light which would normally be emitted by the particular element is under certain conditions absorbed from the white light, with the result that the spectrum is lacking in these particular colours. This manifests itself as black lines in the appropriate portions of the spectrum.

If, therefore, we obtain the spectrum of the light from some particular star, and we find that it contains black lines in certain parts, then by examining exactly where these lines occur, we can say that the light in its journey from the star to the earth has passed through certain vapours which can be determined exactly from the position of the black lines in the spectrum.




*The positions of the main black lines in the solar spectrum are shown in the top drawing, while the line spectrum of helium is shown below.*

### The Aurora Borealis

By this means scientists are able to say with considerable certainty exactly what elements are present in the upper atmosphere. It has been found, however, that when examining the light from the Aurora Borealis, there were certain green lines which were unexplainable. There are in this spectrum several bands of black lines, which indicate that nitrogen and certain other elements were present in the atmosphere, but the green lines could not be produced artificially by any known means, and did not correspond with any known elements.

Another peculiarity of the green lines was that they could be obtained from any cloudless sky during the night, irrespective of the direction from which the light was obtained.

Professor McLennan, however, has now discovered the origin of these green lines, and has shown that they originate in highly rarefied oxygen, the brilliance of the lines being considerably intensified if helium is added to the oxygen. By making quantitative experiments, Prof. McLennan estimates that the light from the Aurora comes from regions some 60 to 100 miles above the earth, and his experiments also indicate that at this height the atmosphere contains 20 to 30 times as much helium as oxygen.

(*Concluded on page 722*)

# Broadcasting Below 300 Metres

*By D. J. S. HARTT, B.Sc.*

***There is much of interest to be heard below 300 metres, which was formerly considered the lower limit of the usual "broadcast" band. Some suggestions for adapting sets which do not already tune below this wavelength are given in this article.***

UNTIL more recently, when we spoke of the "broadcast band" of wavelengths, we were accustomed to think of the 300- to 500-metre (1,000 to 600 kc.) band, since the majority of stations were then operating within these limits. Now, however, we find that the band has been somewhat extended on the lower range, particularly between 250 and 300 metres (1,200 and 1,000 kc.). There are, for instance, about six Continental stations operating in this band which are frequently heard very well in this country.

## Higher Frequencies for Broadcasting

Now, if the positions of the European stations, including, of course, the British stations, are in

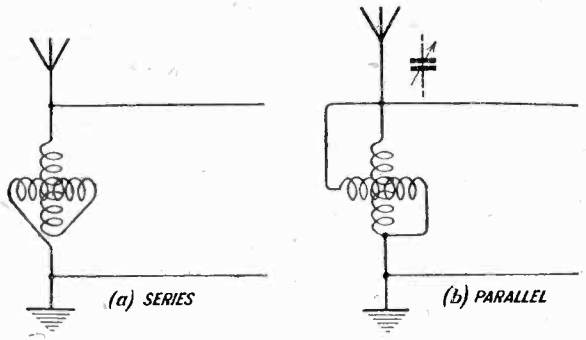



***Fig. 1.—In variometer tuned sets a lower minimum wavelength will be obtained by connecting the windings of the variometer in parallel as at (b).***

the future allotted in the broadcast band uniformly on a frequency separation basis between, say, 1,200 and 600 kilo-cycles (250 to 500 metres), it is obvious that we shall have more stations operating between 250 and 300 metres. Thus the tendency will be for the frequencies to be increased, that is to say for the wavelengths of the stations to be lowered.

## Practical Difficulties

It has even been suggested that all broadcasting should be done on frequencies above 1,500 kc. (wavelengths below 200 metres), but there are obvious practical difficulties, apart from any other influences, which render this out of the question, for some time to come, at any rate.

Another instance of this tendency to broadcast on higher frequencies is given by the recent tests carried out by the Eiffel Tower station on 200 metres (1,500 kc.) and 64 metres (4,685 kc.). All are familiar, of course, with the broadcasting from KDKA, Pittsburgh, on about 68 metres (4,409 kc.). In addition, there is a fair amount of amateur telephony transmission on 200 metres (1,500 kc.).

## Tuning Range Limitations

Thus there is plenty of speech and music to be heard below what used to be considered the lower wavelength limit of the broadcast band. The question of the design of receivers to include these transmissions naturally arises. Apart from special home-constructed sets, it may be asked how many commercial receivers can be used or adapted to tune successfully down to these wavelengths?

Inquiries as to the lower limits of wavelength to which some commercial receivers would tune showed that a few of these had serious limitations in this respect. In some tuning was carried out with fixed coils and variable condensers; in others, variometers and fixed anode tuning units were used, in most cases with loading devices for extending the tuning ranges on the upper limit to include the high-power stations.

## Effect of Casual Capacities

In a few cases, however, the obvious advantages of interchangeable tuning units had been neglected, and it would not have been possible to tune down below 300 metres (1,000 kc.) without partially rewiring the set and the substitution of new

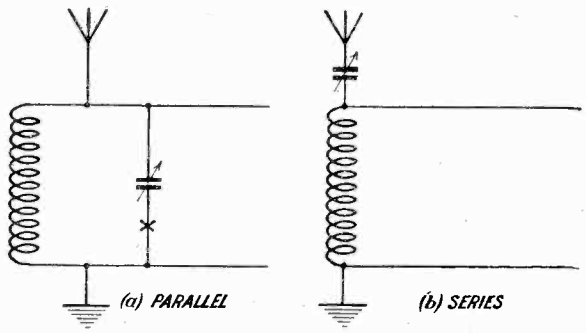



***Fig. 2.—To obtain a lower minimum wavelength the tuning condenser may be used in series by breaking the connection at X and attaching the aerial to the condenser.***

inductances. It is in the question of tuning ranges, particularly on the lower ranges, that casual capacities are an important factor. Those who have read my article in *Wireless Weekly*, Vol. 6, No. 20, will have realised how seriously a total stray capacity of 50 to 100 $\mu\mu$F in parallel with the main tuning condenser can restrict the range at the lower end.

### Designing Suitable Receivers

There are two solutions to this problem in designing receivers which are intended to cover a wide tuning range. The first is to disregard these stray capacities and employ a number of interchangeable tuning units, and, secondly, where a number of such units is not desired—as, for instance, in a complete and totally enclosed set—to make every effort to reduce such casual capacities to a minimum, and so enjoy the benefit of a larger tuning range.

This latter method will, no doubt, result in a greater measure of efficiency all round, and, for this reason, is the more desirable.

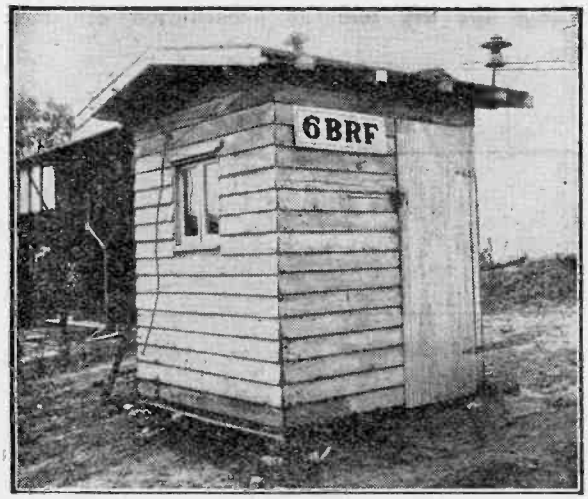
At some future date I propose to give some practical details and figures to show just how large a range it is conveniently possible to cover using only one tuning unit.

### Adapting Existing Receivers

The most convenient method, however, of adapting an existing set to tune below 300 metres (1,000 kc.) will naturally depend largely on the type of tuning already incorporated. If the aerial is variometer tuned a slight alteration in connecting up the windings of the variometer in parallel, as in Fig. 1 (b), will often enable the receiver to be tuned down to about 250 metres (1,200 kc.), where the normal minimum was, say, 300 metres (1,000 kc.). If this is not possible, a series condenser connected in the aerial lead outside the set will give further assistance.

### Series or Parallel Aerial Tuning Condenser

Where the set employs a fixed coil with variable condenser in parallel the desired decrease in the minimum wavelength may be effected by breaking that connection from the condenser to the earthed end of the coil, and attaching the aerial to the condenser at this point, thus putting it in series, as shown in Fig. 2.




*It is claimed by the operator, Mr. N. R. Wimer, that this station, situated at Los Angeles, California, is the smallest amateur transmitting station in the world.*

Where a fixed coil is used in a tuned anode, practically nothing can be done except to tap off a portion of the coil or substitute another for it. If high-frequency amplification is employed, and it is desired to convert the set for use on the short waves, say, 60 to 100 metres (4,997 to 2,998 kc.), it is recommended that the H.F. valves be completely cut out of circuit by withdrawing them and taking a lead from the grid socket of the first to the side of the grid condenser remote from the grid of the detector valve. If plug-in coils are used the further necessary changes can be made by winding a special auto-coupled coil or using a semi-aperiodic aerial circuit.

*Mr. Collins, of Cedar Rapids, Iowa, recently picked up messages transmitted on a 16-metre wavelength from the Macmillan Arctic Expedition at Etah, in Greenland.*

For more complete information as to how to effect these changes, the reader is referred to the article on "Adapting Your Receiver for KDKA," by G. P. Kendall, B.Sc., in the June, 1925, issue of *Modern Wireless*.

Sufficient has been said, however, to indicate that in many cases a modification of design is necessary to enable the tuning range to be extended, at any rate, down to about 250 or 200 metres (1,200 or 1,500 kc.).

# Random Technicalities

By PERCY W. HARRIS, M.I.R.E.
Assistant Editor.

*Some Notes of Interest to the Experimenter and Home Constructor.*

ONE thing which has impressed itself upon me very strongly since my return from the United States is the poor quality and general inefficiency of the average British condenser dial. Note that I say *average*, for there are one or two good ones. The average dial is too small, the knob is uncomfortable to hold, the degrees are badly marked, a lot of them stand away from the panel so far that the reading depends upon the angle at which you look at it, and, just to round off their other qualities, many of them wobble on the shaft. In any case, I think it time we gave up the old-fashioned three-inch dial marked as if it were graduated in 180 degrees, but actually divided into half that number, sometimes reading in one direction and sometimes in the other. What is the use of developing low-loss sharply-tuned circuits if we cannot control them with a good dial?

I have lost count of the number of radio sets I used in the United States, but I do not think that at any time I used a dial as small as three inches, or a knob as uncomfortable as the conventional knob we use here. A four-inch dial with a nice large knob, bevelled at a comfortable angle, is a joy to use, and can be adjusted more accurately than many of the single-plate vernier arrangements which are so rarely satisfactory.

* * *

I do not think that the losses in condensers are anything like so great as many people would have us believe, but I do know that far too many condensers have imperfect contact in them, which make them very noisy when used in a circuit where continuous oscillations are taking place. The usual trouble is the rubbing contact. All rubbing contacts are by no means unsatisfactory—if they are properly made mechanically they can be very good indeed—but in general a pig-tail connection will give better contact than the ordinary frictional arrangement. Even the pig-tail scheme needs to be well carried out, and particularly on short waves can be very noisy if two parts of the coiled spring touch one another intermittently. When the central shaft is drilled, and a vernier shaft passed through it, and when we have still another frictional contact in parallel with the first, we are asking for trouble, and frequently get it. If the vernier shaft is sufficiently free it is often wobbly, and, on the other hand, if it is too tight, as usually happens, the main shaft and the vernier shaft will not move independently of one another.

* * *

There is an inherent disadvantage in the single-plate vernier arrangement, which is not generally realised. I heard of the fact that on a low setting of the main part of the condenser the increase of capacity due to introducing the single plate is very appreciable, whereas when we are using a good part of the main condenser the effect of the vernier is not so noticeable. For this reason, I am inclined to think that vernier dials are a much better solution of the problem of fine tuning. On the one hand we avoid electrical difficulties such as may arise from additional rubbing contacts, and on the other the condenser is easier to calibrate. There is room for a great deal of ingenuity in the designing of vernier dials, and there is no reason why they should not be as neat-looking as the non-vernier dials, for it is possible to conceal the vernier mechanism beneath the knob, and between this and the dial itself, as is done in several American patterns. I cherish

*Jack Hobbs recently broadcast a talk from 2LO after scoring his record number of centuries in first-class cricket.*

particularly pleasant memories of a super-heterodyne I used in my room in the Pennsylvania Hotel in New York. This had two vernier dials with a three or four to one ratio between the knob movement and the dial movement. There was no arrangement for changing from vernier to full motion, nor did there seem to be any need for one, and although the instrument was exceedingly sharp in its tuning —far sharper than any other super-heterodyne I have used— there was no difficulty whatever in stopping exactly where one wanted to stop, on either of the dials concerned.

* * *

In constructing a vernier dial the greatest care must be taken to avoid back-lash, for neither comfort nor accuracy can be obtained if one has to turn the dial a degree or so in either direction before the condenser moves. Quite a number of the American vernier dials are defective in this respect, and there are only three or four which really satisfied me in this regard. I hope British manufacturers get out a good vernier dial quickly, for this is a type of component which can be imported without restriction from the States, and, in fact, is imported already.

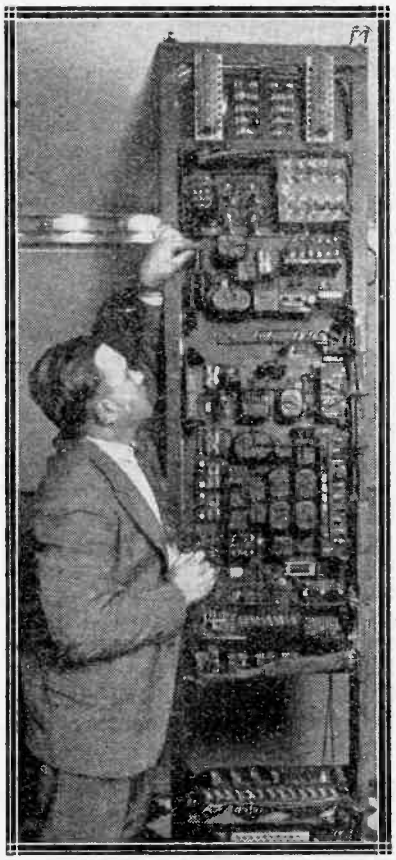
* * *

I was very pleased to find that we have nothing to learn from the Americans in regard to audio-frequency transformers. The average American transformer is by no means a high-grade instrument, and now good modulation is obtainable from a number of their stations, the American public are beginning to wake up to the fact. It is quite surprising to find a number of otherwise excellent sets fitted with quite inferior audio-frequency transformers. I found about three really good instruments on sale as components, and one or two more which are not sold apart from the set. Our transatlantic friends are just beginning to realise that we know something here about the audio-frequency side, and British loud-speakers are very popular. I have before me as I write a pamphlet issued by a Chicago firm to popularise a particular circuit with their set of components. They go out of their way to refer to the Amplion as being particularly suitable for this set.

* * *

Speaking of audio-frequency matters reminds me that the British Broadcasting Company is by no means careful to keep its modulation up to a high standard these days. 2LO in particular varies a great deal. The difference in quality may not be noticeable on badly-designed sets, but is very annoying when one has taken trouble to get out a really good receiver for high-quality reproduction.

It may be fancy on my part, but I am under the impression that there has been an improvement in the reproduction of the Savoy Band in the last few weeks, possibly due to an alteration of the microphone.



*This compact switchboard at WRNY, the "Radio News" Station in New York, is used in controlling outside broadcasts.*

## Wireless News in Brief

*(Concluded from page 715)*

Arctic was successfully carried out by WJAZ, the Zenith station in Chicago, in conjunction with the Zenith Arctic Experimental Station 9XN. The test of relaying the broadcast was not contemplated and was attempted as an eleventh hour conclusion with makeshift emergency connections. The success of the tests assured the officials and engineers present that the relaying was practical, and it was decided to make further attempts while the expedition is still in the Arctic.

* * *

Test transmissions from European broadcasting stations, in connection with the re-allotment of wavelengths suggested by the International Conference at Geneva, are to be carried out to-night and on September 4, 7, 9 and 14, between the hours of midnight and 2 a.m. British Summer Time. Listeners are requested by the B.B.C. to take note of any interference between stations which they may observe, and to send in reports to the B.B.C. Headquarters, 2, Savoy Hill, W.C.2, on the day following the test.

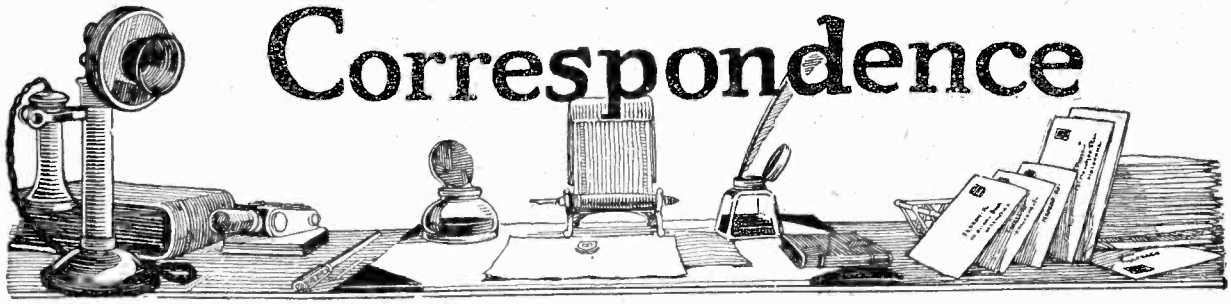
Everybody will, of course, appreciate the fact that the success of these transmissions in furnishing information about interference between the various broadcasting stations depends to a large extent on the listening public who are earnestly asked by the B.B.C. to refrain from oscillation.

## INVENTIONS AND DEVELOPMENTS

*(Concluded from page 718)*

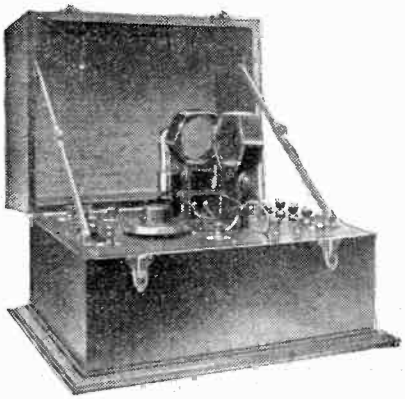
### The Heaviside Layer

This discovery has considerable bearing upon the question of wireless transmission round the earth. As is well known, the theory of the Heaviside Layer has been somewhat severely tried of recent years, and there are those who suggest that this layer, if existent at all, has no appreciable effect upon wireless transmission. This proof, however, of the existence of a fairly concentrated atmosphere of helium at this height above the earth, certainly lends support to the existence of the Heaviside Layer, and it is probable that further researches will be forthcoming which will do much to clear up this point.




### ENVELOPE NO. 9

SIR,—I herewith beg to enclose a photograph of the Single-Valve Receiver (Radio Press Envelope, No. 9), which I have made throughout, including the cabinet, having no previous knowledge of wireless valve sets. I am very pleased with results obtained. I have used a .06 dull-emitter valve (Mullard) with dry batteries. I have also included the two-phone arrangement given



***The Single-Valve Receiver built by Mr. Woodward from Radio Press Envelope No. 9.***

in *The Wireless Constructor* for August (page 892).

I can get Daventry as strong as Birmingham with two pairs of 'phones; these stations are very strong. I have also received at fair crystal strength on one pair of 'phones:—Manchester, London, Bournemouth, Stoke and Notts, and two French stations come in on two pairs of 'phones strongly.—Yours faithfully,

EDWIN WOODWARD.

Rotton Park, Birmingham.

### AN APPRECIATION FROM MALTA

SIR,—I thought it might perhaps interest you to know my results with the "Family" Four-Valve Set. Although I have read numerous reports about this wonderful instrument, I think that another one added to the list will not be out of place.

I wish to congratulate Mr. Percy W. Harris for the wonderful circuits and the clear instructions he gives in Radio Press Envelope No. 2. The results obtained are as follows: Rome, Radio Toulouse, Breslau, 5XX, Radio Paris, all at full loud-speaker strength; Rome could sometimes be received on an indoor aerial; Zurich, Petit-Parisien, London, Bournemouth, Vienna, Madrid and two unknown stations at very good telephone strength. I use Cossor valves and basket coils for low wavelengths. My aerial is 80 ft. long, 20 ft. lead-in and 15 ft. high on roof.

I also beg to state that your journals are very popular in Malta, and you will find them in the hands of every wireless amateur.

The best point about this set is the clarity of reproduction, and I consider that it is the best all-round four-valve set.

All my wireless knowledge had been gained after reading your papers, and I have also constructed many other three and four-valve sets described in your journals from time to time. I am only 18 years old, and began radio a year ago, but I now find no difficulty in building any set described in your papers.

Finally, I once more wish to congratulate Mr. Percy W. Harris on this wonderful circuit, and to wish further success to your excellent three journals, of which I am a regular reader.—Yours faithfully,

ANTHONY PELLA.

Sliema, Malta.

### A JUNIOR READER'S EXPERIENCE

SIR,—I have recently completed the "All-Concert de Luxe" receiver, as described in Envelope No. 4 by Mr. Percy W. Harris. I am only 15, but thanks to your diagrams and instructions the construction was easy.

I have had all the B.B.C. main stations; also 2LO, 5IT, 5SC, 6BM, 2ZY, and 5NO on the L.S.; 5XX (Daventry) comes through very strongly. There is little difference in the strength on two valves. Daventry is strong on 'phones with no aerial or earth.

I have so far received all the relays except Plymouth and Dundee. 5NG is very loud on the L.S.

I have had two U.S.A. stations—WBZ and WEAF. From the Continent I get Lyons, Toulouse, Radio Paris, Ecole Superieure, Petit-Parisien, Hilversum, Munster, Hamburg (and relays), Voxhaus, Rome, Madrid and Koenigswusterhausen.

Hoping this may be of interest to you.—Yours faithfully,

T. C. HART.

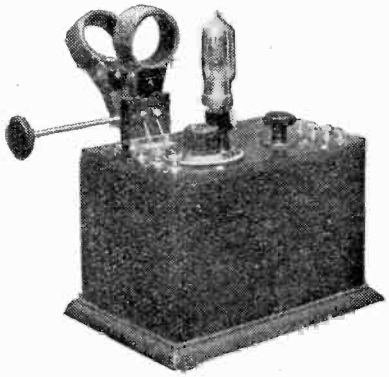
Broughton, Kettering.

### A "SINGLE-VALVE RECEIVER FOR BRIGHT OR DULL EMITTER VALVES"

SIR,—I have constructed the "Single-Valve Receiver for Bright or Dull Emitter Valves" exactly to the design in *Wireless Weekly*, October 15, 1924, by Mr. Stanley G. Rattee, M.I.R.E.

With this set I have up to the present received the following stations: Bournemouth, London and 5XX, the latter being at excellent strength. The valve in use is an Ediswan A.R.D.E.

With best wishes to your journals,



***Mr. Bate's Single-Valve Receiver, with which satisfactory results have been obtained.***

of which I have been a regular reader.—Yours faithfully,

A. C. BATE.

Hove, Sussex.

### RECEPTION OF NKF

SIR,—With reference to your articles *re* short-wave signals from NKF, I am enclosing herewith particulars of reception from that station. I would like here to remark that the listening amateur, as distinct from the transmitting amateur, is rather badly placed with

regard to reporting reception of signals. He patiently searches the ether for hours, and particularly in the "small" hours, and jots down call signs, wavelengths, QRM's, etc., and, where possible, he writes out detailed reports and forwards them to the experimenters who require them. The only reward he seeks is a QSL card or short letter to show that his work is appreciated, but even these are seldom forthcoming. Months ago, when NKF first asked for reports on their signals of different frequencies, I received a very complimentary letter from Dr. Hoyt Taylor. With this as an incentive I was continually watching for his signals and forwarding reports. When the 20-metre transmissions commenced I was one of the first in the British Isles to "log" them from NKF, and from four or five American amateurs.

As a contrast to the indifference shown by some transmitting amateurs I feel I must mention the different attitude of the officials at the Radio Laboratory. Nijni-Novgorod, Russia (call sign RDW). I sent them reports last March on their 100-metre transmissions. In return they were almost lavish in their letters of thanks. When they have special transmissions they notify me through the post-office by telegram. At present they are transmitting on wavelengths varying from 20 metres to 30 metres, from 0100 to 0200 hours, from 2225 to 2325 hours and from 1220 to 1320 hours, G.M.T. I have received their 30-metre signals on 15 metres, using a badly screened indoor aerial in conjunction with three valves in daylight. I do not know a word of Russian, and all my reports are in English.

The amateur transmitter may reply "via the ether" when necessary and know that his reports have "got there," but we who are not amongst the lucky ones must play a patient game and plod along doing our best in our own small way. Let the English-speaking experimenters awaken to the fact that many of us amateurs are without transmitting gear, not because we lack enthusiasm, knowledge or initiative, but for other divers insurmountable reasons. When reports are wanted common courtesy demands an acknowledgment of receipt. Realisation of these facts will bear fruit by bringing information galore to those who require it.

**SHORT-WAVE SIGNALS FROM NKF.**

| Date. | Time, G.M.T. | Wave-length. | Nature of transmission. | Strength of signals. | "Fading." | Remarks. |
|---|---|---|---|---|---|---|
| 19/3/25 | 0200 | 41 m. | 4 DU U NKF | R3-4 | Slow "fading" | — |
| 1/4/25 | 1745 | 20.8 m. | 5 LF U NKF (clearing traffic) | R5-6 | No "fading" | — |
| 28/7/25 | 0100 | 41 m. | WNP de NKF (Copies of messages are in my possession) | R5 | Slow "fading" | No reply heard from WNP as about 10 amateurs in U.S. were calling him and "jamming" was bad. |
| 16/8/25 | 0110 | 20.8 m. | WAP U NKF (giving WAP "K") | R7.9 | Irregular "fading" | Signals generally unsteady and tending to wobble. Unusual for NKF. |

*Details of Mr. Paul Marshall's recent reception from NKF on various wavelengths.*

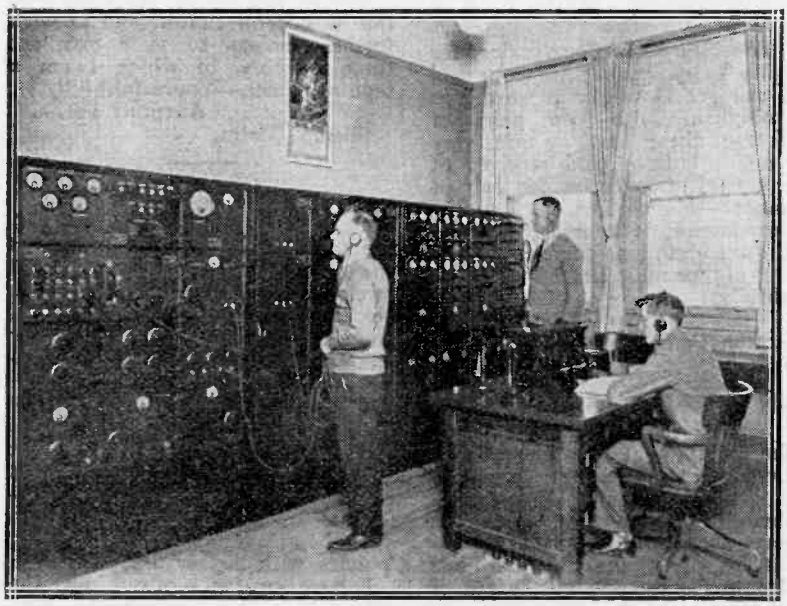
I enclose tabulated details of my reception of NKF on various dates. The transmissions on 71 metres are always of good strength and need no comment, as they can be received at any time during the night and for long after complete daylight in the mornings.—Yours faithfully,

Dublin. PAUL MARSHALL.

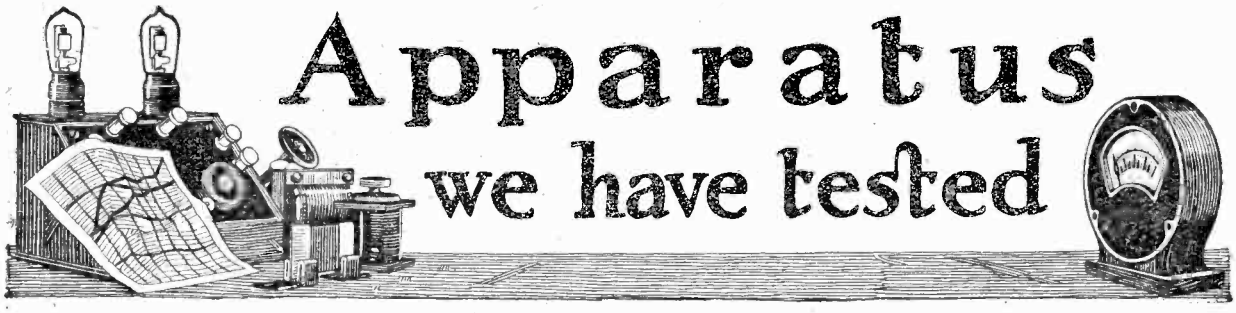
## A PORTABLE RECEIVER IN CORNWALL

*From Earl Russell.*

SIR,—Your readers may be interested in my experience in Cornwall with a three-valve (O-V-2) travelling set. The aerial was 100 ft. of electron wire, and its height above the ground was only 8 ft., and not more than 80 ft. of it was effectually in use. My earth was a connection on a water-pipe, but merely a loose rubbing one, and my position was almost at Land's End. I received 5XX regularly and steadily at about R5, but could not get either Bournemouth or Cardiff sufficiently loud to identify them, only catching a word here and there. The results were, of course, poor, but in view of the supposed badness of Cornwall for reception, the very poor aerial I was using, and the faulty contacts of my coil-holders, I thought they might be worth while recording. Since the set returned home, having travelled 600 miles in a motor-car, it has been receiving 5XX at full loud-speaker strength, having suffered no damage by the journey. I am quite clear that with a proper aerial I could have received Bournemouth at about R4.—Yours faithfully, RUSSELL.



*In the control room of the General Electric Company's station KGO at Oaklands, California. The operator on the right is listening on 600 metres for distress signals at sea.*

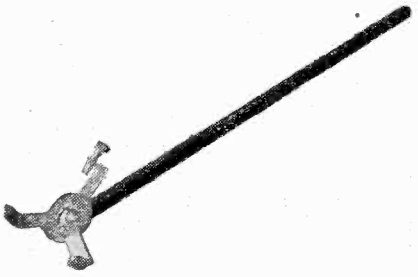


# Apparatus we have tested

*Conducted by A. D. COWPER, M.Sc., Staff Editor.*

### An Anti-Capacity Handle.

A useful anti-capacity handle, suitable for applying to any knob of the standard type and readily moved from one tuning-point to another, is that sent to us for comment by Messrs. Burwood Electrical Supplies Company (1924). This is an insulated handle some 6½ ins. long, and at the end of this a metal star fitting with hooked ends and a set-screw for applying to the common pattern of 1½-in. diameter ebonite knob. On trial it was found to fit securely on the standard knob for fine adjustment of a tuning condenser or variometer, and it could be applied or removed in a couple of seconds. The long handle facilitated fine tuning up to the point determined by the shake in the control spindle, and practically eliminated the risk of hand-capacity effects. For application to an existing receiver, where provision has not been already made for fine tuning, this accessory can be recommended.



*The "anti-capacity" handle supplied by Messrs. Burwood Electrical Supplies.*

### H.T. and L.T. Supply Unit

The claims for the Dynamergy Mains Supply Unit, which has been submitted for test by Messrs. Dynamergy Mains Supply, of Teddington, are that it enables both H.T. and L.T. batteries to be dispensed with where D.C. house mains are available. A maximum L.T. current of .5 amps. is supplied, while the model submitted for test gave a single H.T. supply of 80 volts. The L.T. current is provided by means of a suitable resistance, such as a lamp, being placed in series with the mains, and in series with this is a special cell, the

terminals of which go to the L.T. terminals on the unit. No acid is used with it, distilled water only being needed with which to fill it up from time to time.

*The complete H.T. & L.T. Supply Unit.*

The H.T. supply is obtained by means of a form of potential divider and will supply sufficient current to work a multi-valve set. Chokes and condensers assist in eliminating any hum and reducing current variations.

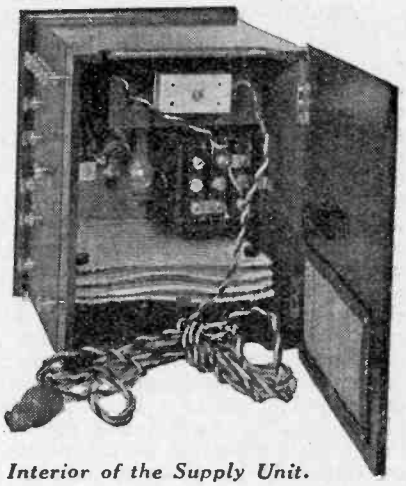
The unit was used with a four-valve set, 2 H.F., detector and 1 L.F., headphones being worn so that any hum present would easily be detected. Three .06 and one .12 ampere valves were used in the set, taking a total current of .4 amps., which is well within the capacity of the instrument. The unit was found to be exceedingly silent in operation, the amount of hum noticeable being no more than that usually experienced owing to induction from the house mains. Since the unit is designed for 3-volt valves, such as those in use, filament resistances are not really required and, further, whether one or four valves (or more if the .06 type are in use throughout) are employed, each will burn at the correct temperature, so that if three of four valves are turned off, no difference in the brilliance of the remaining valve can be detected.

80 volts is, of course, a little high to use on H.F. as well as detector and L.F., and a certain amount of reaction backlash was noticed. It is understood, however, that another model giving three H.T. voltages is available.

Terminals are provided on the unit to which the aerial and earth leads are affixed, two other terminals being connected to the aerial and earth terminals of the set. This protects the mains from accidentally being earthed and so blowing a main fuse and perhaps damaging valves. The output may similarly be connected to special terminals so as to isolate the 'phones from the H.T. supply proper, thus obviating any possible risk of shock to the user.

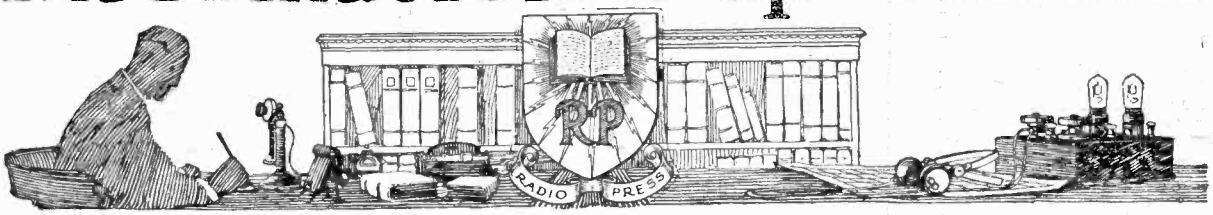
This unit was also tried on a three-valve set, using Wuncell valves, which take from .18 to .2 amps. each, and it was found to give sufficient current to run these, notwithstanding that it was slightly in excess of the rated output. Altogether, the unit can be recommended as being quiet in action and delivering its rated current, while the fullest protection against any possible damage to valves or house wiring is provided.

C. P. A.



*Interior of the Supply Unit.*

# Information Department




**E. A. H. (NOTTINGHAM) has been experimenting with various sizes of condensers connected in parallel with his loud speaker for "tone control" purposes, and asks us for an explanation as to the manner in which they alter the quality of the received signals.**

The theoretical reason for the quality being changed when a condenser is placed across the loud-speaker winding is fairly evident when certain underlying principles are grasped. The impedance offered by an inductance increases with frequency whilst that of the condenser varies inversely; that is, the higher the frequency the lower will be the impedance of the latter. It follows therefore that where the high notes tend to be accentuated this tendency may be counteracted if a condenser of suitable value is placed in parallel with the loud-speaker windings, due to the fact that the higher musical frequencies will then tend to pass through the condenser and not affect the loud-speaker. By this means apparently more uniform reproduction is obtained. The value of the tone control condenser will generally be found to lie between .001 $\mu$F and .01 $\mu$F. The greater the value of this condenser the more "mellow" will be the tone, until a point is reached where this becomes "woolly" and "fluffy" in nature, which is as much to be avoided as the over-emphasis of the higher frequencies, resulting in "tinniness." In some cases no "tone control" condenser is necessary, whilst in others one even above .01 $\mu$F will improve quality.

**D. A. V. (SWANSEA) has constructed the Single-Valve Reflex receiver described in Radio Press Envelope No. 8, and states that the crystal detector is to all intents and purposes a "passenger," since he can lift the catswhisker from the crystal and still receive signals.**

With Reflex receivers employing crystal rectification the trouble our correspondent is experiencing is by no means unusual, and in extreme cases it may often be found that the set will not work satisfactorily unless the catswhisker is raised. All that is wrong is that the dual valve is working on the part of its characteristic curve which gives rise to rectification effects, instead of working on the correct straight portion for amplification at high and low frequencies. Increasing the applied high tension and very carefully adjusting grid bias will almost always remedy this trouble. When doing this it is necessary to make certain that a sensitive spot has been found on the crystal.

## Wireless Weekly Small Advertisements.

HEADPHONE REPAIRS.—Rewound, re-magnetised, readjusted. Lowest prices quoted on receipt of telephones. Delivery three days. Est. 26 years.—Varley Magnet Co., London, S.E.18.

TELEPHONE RECEIVERS and Loud Speakers Rewound, 2,000 ohms, 3/6.—A. Roberts & Co., 42, Bedford Hill, Balham, S.W.12.

FRENCH manufacturer requires all parts British Isles travellers on commission dealing exclusively in Wireless material; write stating com., ground covered and references to T. F., c/o W. H. Smith & Son, 19, Craven Road, W.2.

WYRAY CRYSTAL as tested and reported on in "Wireless Weekly," August 26th.—Write for samples and terms to—F. R. Hickson, 16, Dartmouth Park Hill, London, N.W.5.

FIRST-CLASS WIRELESS SALESMAN wanted. Practical experience and technical knowledge of all leading makes essential, also experience in designing and supervising installations, and testing and adjusting for faults.—Address, with details of experience and copies of testimonials, Mann, Egerton & Co., Ltd., Norwich.

2 VALVE Amplifiers, 35/-, use one or two valves; also 1 Valve Amplifier, 20/-, both perfect as new. Valves, 4/6 each. Smart Headphones, 7/6 pair. New 4-volt Accumulator, celluloid case, 13/-. New Dura 60-volt H.T. Battery, guaranteed, 6/-. 2-Valve All-Station Set, works speaker, £4. Approval willingly.—W. TAYLOR, 57, Studley Road, Stockwell, London.

**RILEY'S BILLIARD TABLES** *for the home.*

Riley's "Home" Billiard Tables-To fit conveniently on any dining table.

*Send for FREE Price List*

Prices from £7 or in monthly instalments. Riley's "Combine" Billiard and Dining Tables to suit any room. Prices from £22 10s. or in monthly payments. *7 days' Free Trial and Carriage Paid.*—

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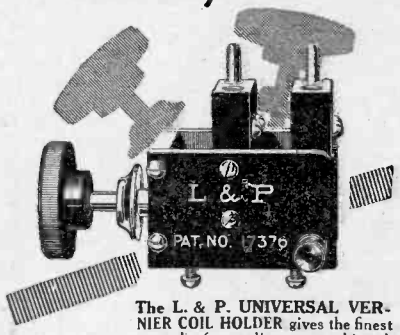
## MOUNTS IN MORE WAYS than any other




**The L. & P. UNIVERSAL VERNIER COIL HOLDER** gives the finest control of coupling ever achieved.

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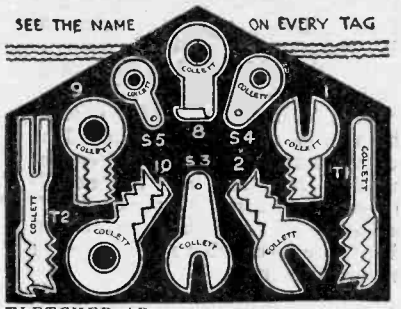


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Major James Robinson, D.Sc., Ph.D., F.Inst.P.
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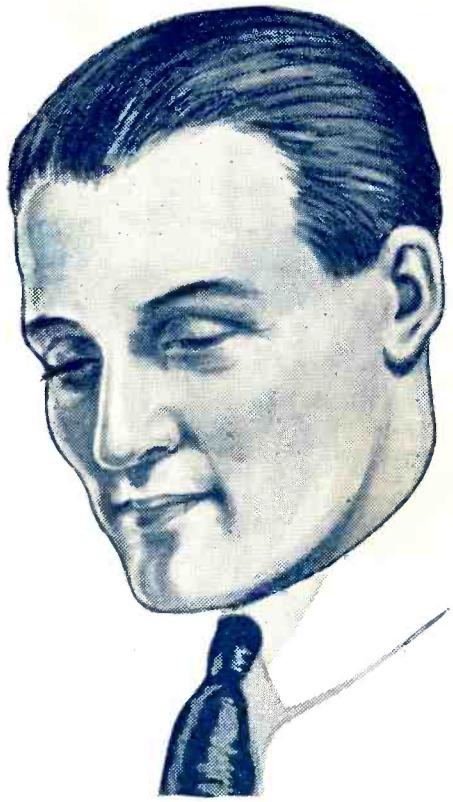

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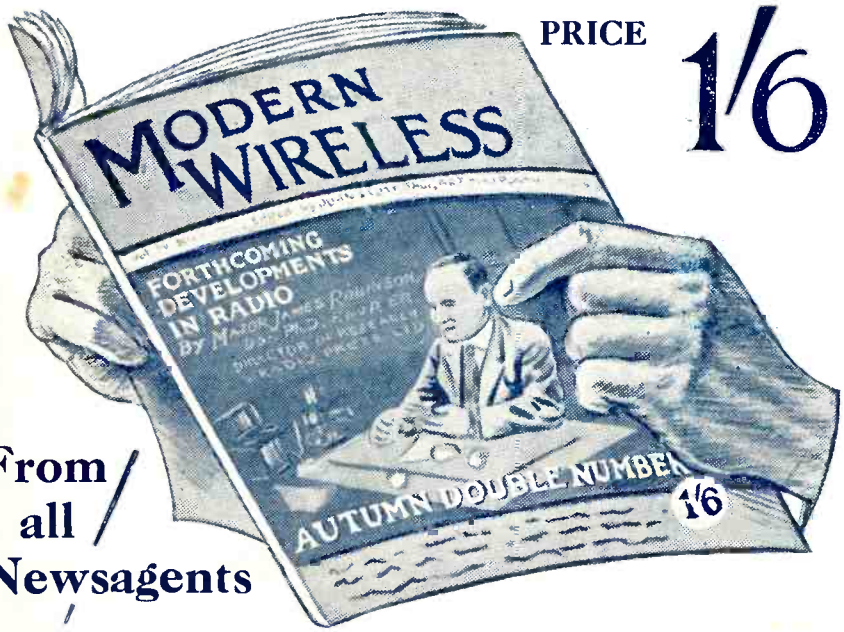


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