

"IS A LICENCE A LEGAL NECESSITY?" <See p. 527>

Amateur Wireless And Electrics

THE
B.B.Co.
AND ITS
CRITICS

Vol. II. No. 46.

SATURDAY, APRIL 21, 1923

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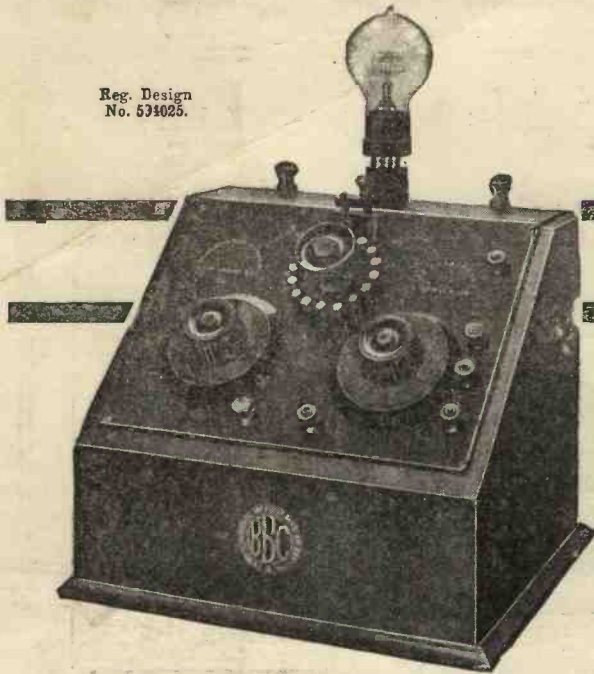
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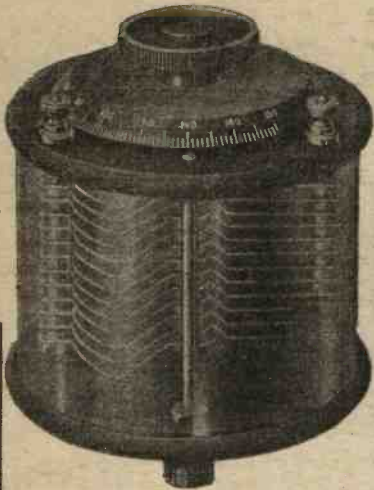
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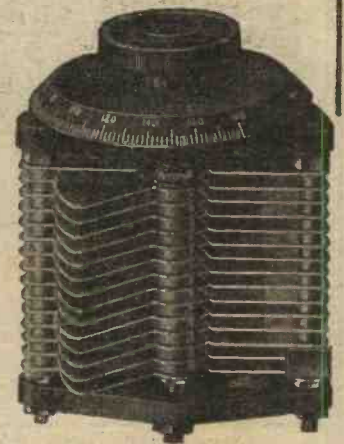
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Amateur Wireless

and Electrics

Vol. II, No. 46

April 21, 1923

Stunts With a Valve

FOR those of a scientific turn of mind perhaps the chief value of a valve set is not the listening to broadcast matter but the possibility it affords for experimental work. Sometimes very curious effects are produced. Below are given the result of a few experiments made by the writer which will be of interest to other experimenters.

Conduction Through the Human Body

We are often told that it is essential to solder all connections in a set, since the received currents are too small to be wasted by contact resistances. In general this is true, but if there is already a large resistance in circuit, as in the plate circuit of a valve, where we have the resistance of the vacuous space between filament and plate, it is not so important.

This was illustrated to me in rather a remarkable manner. My H.T. battery consists of torch-battery elements, with a wander-plug (a valve pin with the prongs hammered together slightly so that it slips on the brass strips of the batteries). In connecting up I happened to touch the battery with one hand and hold the plug with the other. To my surprise, signals came in almost as strongly as when the plug was on properly, although the current had to pass right through my body! There was not even a condenser across the H.T. at the time.

Dispensing with the H.T.

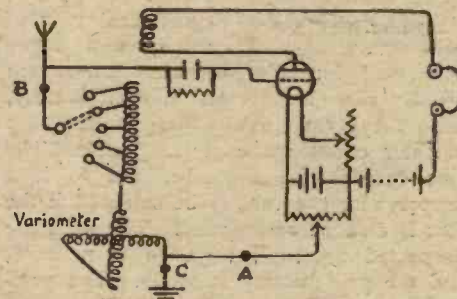
Speaking about H.T. batteries, have you ever tried doing without one? Recently I set out to find how small a voltage I could obtain signals with, reducing the H.T. from 50 volts by about 4 volts at a time until I had only about 4 volts in circuit. Then I cut this out, expecting signals to cease entirely. Strange to say, they did not, and I was able to hear 2 L.O.'s news bulletin quite clearly with the H.T. disconnected and the terminals short-circuited!

I would strongly recommend all experimenters to take the advice given recently in AMATEUR WIRELESS and connect a flash lamp in the H.T. leads to protect the filament in case of accident. But for this precaution I should have lost a valve the very first day I used it. In altering the set from crystal to valve, a wire was left connected which should have been removed. The result was that the H.T.

was shorted through the tuner and valve filament. The lamp was a perfect protection, for on plugging in it burnt out instantly, while the valve did not even light up.

Reception without Earth Connection

It is interesting to try the effect of interrupting the circuit at various points. With connections as shown in the figure I find that on breaking the circuit at the point marked A (between grid and fila-



Circuit Used for Experiments.

ment) signals still continue, louder than before if anything, but the hum of the A.C. mains also comes in strong.

On disconnecting at B (using a plain aerial and no tuner) 2 L.O. is still faintly audible, being evidently the strongest station transmitting within range. Even disconnecting at C (removing the earth) he still comes in if the inductance is increased slightly.

Experiments with the Grid Condenser

If you are using the usual single-valve circuit, with the grid connected to the negative side of the L.T., try shorting the grid condenser. You may find, as I did, that the set continues to work as though nothing much has happened. This means that the valve is working on the "rectifying" bend of its characteristic, whereas, for grid condenser rectification, it should be arranged to work on the straight part. The remedy is to connect the grid on to the positive side of the L.T., or, better still, use a grid potentiometer. I should mention that I was using a Mullard "Ora" valve.

Speaking of grid condensers, not many people realise the advantage of using a variable one. The idea is not so much to get the correct capacity, for this is not so

important, but to control reaction. A condenser of .0005 mfd. maximum capacity should be used, and the reaction coil adjusted so that the valve is near oscillation. Then on increasing the capacity of the grid condenser, it is easy to find a position where oscillation is on the point of commencing. This is the most sensitive adjustment for telephony reception.

Hearing the Valve Oscillate

Some interesting stunts may be performed with valves oscillating at audible frequency. There are three distinct ways of doing this. Firstly, two valves may be used and both caused to oscillate in the usual way but tuned to slightly different wavelengths, when beats are produced as in heterodyning continuous-wave stations.

Secondly, a valve may be caused to oscillate at an enormous wavelength by tuning with a very large capacity and inductance. To get a frequency of 3,000 which is easily audible, one must tune to 100,000 metres. This is quite possible by using iron-cored inductances (such as the secondary of a spark coil) and a large condenser.

This method was beautifully demonstrated at the recent Scientific Novelties Exhibition at King's College. A valve was caused to oscillate at audio-frequency by means of a large capacity and inductance, and the sound was amplified by two other valves so that a loud-speaker could be operated. Various filter circuits were provided, so that they were able to produce by this means a splendid imitation of the tones of a grand organ and other musical instruments.

A much simpler method than this is one which you may have produced unintentionally. With the usual one-valve circuit, if the reaction coil is coupled very tightly to the primary, a loud noise is often heard in the phones. This is called the hoot, and may come as a rattling or more usually as a musical note. It is caused by a grid-leak of the wrong resistance, and if the grid-leak is altered a different note is obtained. One of my acquaintances has constructed a "wireless piano" on this principle, a series of keys being provided which cut in different grid-leaks.

In these experiments with oscillating valves the aerial should, of course, be disconnected

E. L. S.

Power Amplification

The Use of High Plate Voltages in Note-magnifying Circuits

A GOOD deal has been heard recently of power valves and power amplification for actuating loud-speakers; but there is a disposition in some quarters to surround the subject with mystery and make it out to be something which only the real expert can handle, with the result that many amateurs and experimenters regard it as altogether beyond their abilities to

there is a good margin of safety against dielectric breakdown. A word of warning is here necessary. High-resistance loud-speakers can be used, but there is always a risk of a burn-out when 200 volts or more are passed through the windings, and it is advisable to use the low-resistance kind with a transformer.

The only other alteration to be made is the provision of means whereby a few cells can be tapped in on the inside - secondary (I.S.) side of the L.F. transformer to common negative. Four or five of the round cells, which are made for the long, cylindrical type of torch, will serve

is obtained when a separate power unit is made up, served by separate L.F. and H.F. batteries. Fig. 2 shows the circuit in this case, so that it can be added to any existing circuit. The advantage of a separate unit is that the transformer can be kept well away from other transformers in the main circuit, with a consequent reduction of noise due to interference. The power transformer may be of the ordinary kind, provided that not more than about 225 volts are to be used, and provided that the windings are stout and have been well tested by the makers with 400 volts or more. To give the best results the laminations of the core should be insulated from one another. For higher voltages the transformer is best made with an "open core," that is, with the core not bent round the windings.

H.T. Supply

The H.T. battery needs to have no special characteristics. Fifteen of the ordinary 15-volt strip units will serve very well, as will a couple of 100-volt plug-in batteries. The only special feature that need be included is a switch to cut out both poles when not in use. This should be well insulated, and the terminals that carry the high-tension supply should be well spaced and mounted on thick, matt-surface ebonite of good quality.

The circuit shown in Fig. 1 (when a Mullard "P.A." valve is used with about 250 volts on the plate) should give sufficient power, when used anywhere within fifty miles of a broadcasting station, to fill a small hall. In a fair-sized room, in the same circumstances, it gives the effect of the performers being actually in the room, and can be tuned down to be almost completely undistorted.

The addition of another ordinary L.F. valve before the power valve gives suffi-

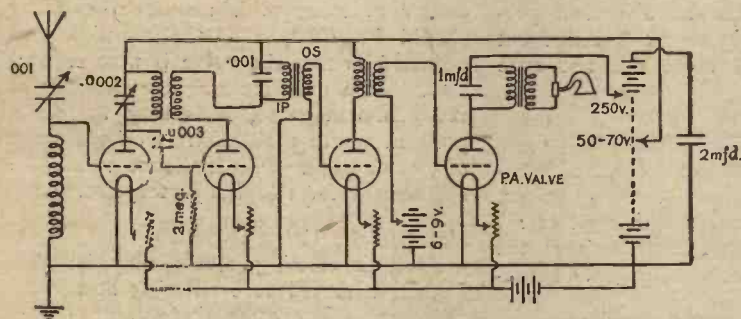


Fig. 1.—Circuit Diagram of Power Amplifier.

tackle. As a matter of fact, a power amplifier is simply an ordinary note-magnifying circuit in which a voltage of from 100 to 300 is applied to the plate of the valve, the circuit having a few refinements to enable the high anode voltage to be handled properly.

The advantages of power amplification are many; but the chief is that one valve and one intervalve transformer can be made to do the work of from two to four ordinary note magnifiers. This means a great saving of current for filament heating. It also means, and this is the real advantage, that the number of iron-cored transformer circuits is cut down to the minimum, thereby removing a great deal of the noise and other troubles which seem to follow naturally in the train of iron cores.

A power amplifier works at its best when supplied with signals that are already of considerable strength, far too strong, in fact, for ordinary, comfortable phone reception, and it therefore follows best after one efficient note magnifier of the ordinary kind. Fig. 1 shows a four-valve circuit, in which the first valve is the favourite and highly-efficient "tuned-anode" H.F. amplifier, so adapted that the last valve acts as a power amplifier.

It will be seen that the alterations to be made are few. In the first place the H.T. battery must be extended so that it will deliver 200 volts or more. A special tap is taken from the primary of the telephone transformer, or from the plate in cases where a high-resistance loud-speaker is used, in order that the plate of the last valve may be fed with the high voltage. This tap should be shunted with a condenser of about 1 mfd., well made, so that

very well for this purpose. There are usually three such cells in each battery, and they can easily be pushed out of their cardboard containing case. The zinc case is the negative, and to it a copper wire can readily be soldered if the zinc is cleaned and tinned. The cells are connected together, negative to positive, and the grid battery is ready. The positive is connected to the common negative lead and the negative end left free. A tap is provided on the lead from the transformer I.S., so that any number of cells up to six can be tapped in. The purpose of this small battery is to keep the grid at the right potential to enable the valve to work on the best part of its characteristic curve.

An ordinary hard "R" valve can be used as a power amplifier, and up to about 140 volts can safely be fed to the plate. Probably the whole five or six cells of the grid battery will be needed to enable the "R" valve to work properly. This should give about the power ordinarily obtained from two L.F. valves used in the ordinary manner. The best results are obtained from a valve, such as the Mullard "P.A.," which is specially made for the job. Such a valve will take up to 300 volts on the plate with safety, and the particular valve mentioned has the great merit that it works extremely well off a 4-volt accumulator on the filament. The filament of an "R" valve used for power amplification should be fed from a 6-volt accumulator.

Though an adaptation of an existing panel will give very good results, the best

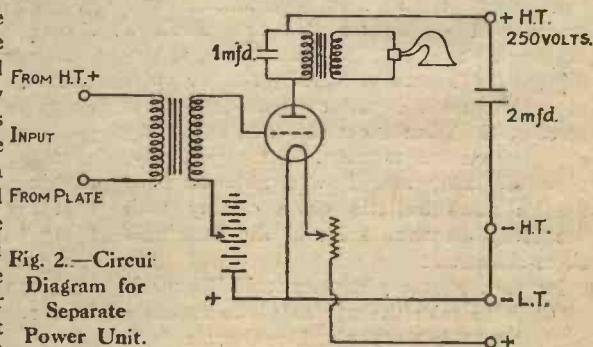


Fig. 2.—Circuit Diagram for Separate Power Unit.

cient volume to fill a small hall, and can be heard 600 yards from the loud-speaker. If a large hall is to be filled it is best to use two power valves and two or three loud-speakers in series.

ERNEST LANGMEAD.

The Radiola Station

THOUSANDS of wireless folk in this country tune their receiving sets nightly to 1,780 metres in order to be able to enjoy the magnificent concerts broadcast by Radiola, the transmitting station of the Société Française Radio-Electrique, some photographs of which appear on this page. The transmitting apparatus is situated at Lerabois-Perret, a suburb to the north-west of Paris, lying between Neuilly and Clichy, but the studio is some considerable distance away. It is installed in the basement of one of those large white buildings which line the Boulevard Haussmann, and the transmissions must pass over about three miles of "land line" before they reach the actual sending apparatus. Until recently the wavelength was 1,565 metres; now it has been increased to 1,780.

Those who know Radiola—and if you are not one of them you should take the first opportunity of becoming acquainted with the splendid entertainments—must often have wondered how much power he radiates, for his transmissions have obviously a great deal more behind them than those of our own B.B.Co. stations. On the writer's set they come in with rather greater strength than Birmingham, though the distance is more than thrice as great. They are heard well in most parts of England, and even in Scotland. The power radiated is about four kilowatts, nearly three times that of any of our stations. Mullard transmitting valves were in use at one time, and they may be still, though the writer believes that a French-made article is now used.

Of the programmes we may say that

famous composer is to be given the announcer usually gives a short, interesting talk concerning him and his art.

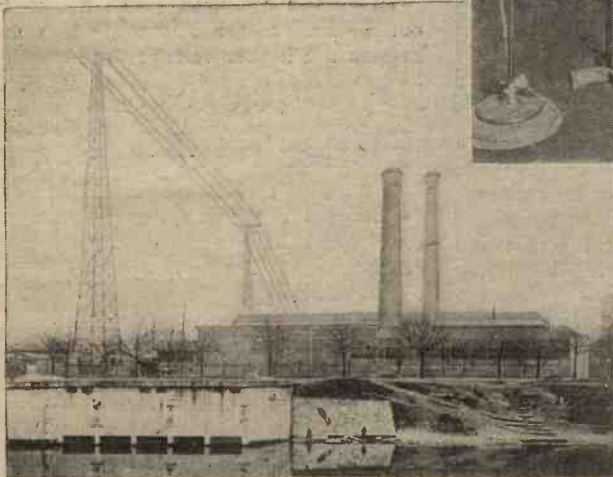
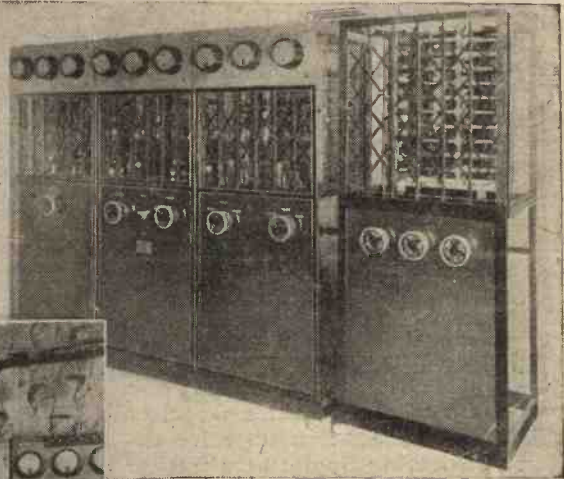
No singer or instrumentalist who is not absolutely at the top of his profession can hope to appear at Radiola; everyone, in fact, is from the Opéra, the Conservatoire, or has made a name in concert halls.

Nothing could be finer than the trans-

sadly interfered with by stations sending in Morse on almost the same wave. On Sundays, however, a concert is given between 2 and 3 o'clock in the afternoon, as well as the usual one in the evening, and these are hardly ever jammed to any extent.

In France there is no such thing as a subsidy for the broadcasting company, and

Three Photographs of the Famous Radiola Broadcasting Station, Paris



Top
The Valve Panels.

Centre
Mme. Duttane, one of the Announcers.

Bottom
The Aerial and Exterior of the Station.

royalties are unheard of. Yet this powerful station is able to transmit programmes that are a sheer delight to all listeners-in, and to maintain a standard of excellence that has not been approached elsewhere.

The effect of its transmissions upon French interest in wireless has been immense. The industry over there is in a flourishing condition, and, as in America, the money invested in transmitting first-rate programmes without a charge of any kind all comes back in the form of profits from largely-increased sales. Across the Channel nothing has been done to hamper wireless; the result is general satisfaction, rapid progress, and the provision of entertainments that are always worth listening to. Would that we could say the same things of ourselves!

ENTENTE.

"THE Year Book of Wireless Telegraphy and Telephony 1923. Edition for Amateurs" (Wireless Press, Limited). This publication is an abridgment for amateur use of the larger publication, and contains a collection of data of considerable value to the serious experimenter. Although the book contains a large amount of information there are some omissions; for instance, in the list of periodicals we find no mention of AMATEUR WIRELESS. The system of paging and indexing needs improving, as the present one makes it a tiresome matter to find any specific information. The price of the book is 6s. net.

they have become, so far at any rate as Europe is concerned, the models of what broadcasting can and should be. The orchestra is first-rate, and the selections which it plays are chosen with taste and skill. If something from the works of a

missions themselves, for the modulation is so good that every syllable spoken or sung is clear and distinct, whilst music comes through pure and without the slightest trace of distortion. Unfortunately the evening programme on week-days is often

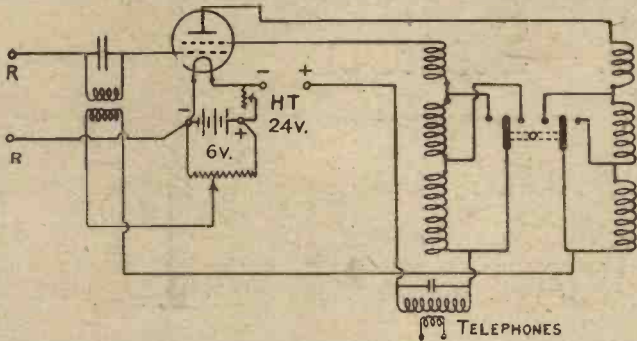


Fig. 1.—Marconi Type 91 Four-electrode Receiver Circuit.

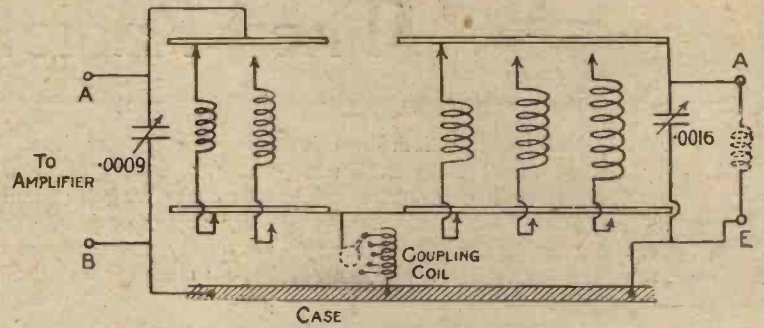


Fig. 2.—Tuner Circuit of Four-electrode Receiver.

The Four-electrode Valve Receiver

IT seems very surprising that so few amateurs use the four-electrode valve, when in a properly designed circuit one valve will give better results than three of the ordinary type. If the circuit is correctly designed the one valve can be made to amplify high-frequency, detect and amplify the low-frequency signals.

The writer recently became attached to a large passenger ship with the latest type of Marconi receiver, which consists of a tuner of 250 to 26,000 metres range, an oscillator and a four-electrode-valve amplifier. On leaving England the receiver circuits were set to 600 metres, and the noise was awful, as all the British coast stations were loud, and other stations and ships as far distant as Gibraltar were quite strong although it was daylight. The tuning, however, was so fine that an adjustment could be easily found so that any single station could be picked out.

Four-electrode Circuits

The circuits used by the Marconi Company in their instruments are shown in the diagrams. Fig. 1 shows the Type 91 four-electrode-valve amplifier. It will be noticed that three transformers instead of one are provided; either of these three can be used according to what wavelength is required. The ranges of these transformers are 250 to 450 metres, 450 to 800 metres, and 800 to 12,000 metres; the amplification falls off slightly beyond this last wavelength.

The terminals RR are connected to the tuner. The plate, outer grid and inner grid are indicated. The tuner shown in Fig. 2 has quite a lot to do with the good results obtained. In the actual instrument there are eight coils in the aerial circuit and five in the closed circuit. Any single coil can be put in circuit by pressing a switch, or two coils can be placed in parallel if desired. The coils not being used are entirely disconnected so that there are no dead-end effects.

The coil shown in dotted lines is a static leak and the other coil is the coupling coil.

Two switches, which place the condensers either in series or parallel with the coils, are provided for long- and short-

wave working. Fig. 3 shows the local oscillator which is only used to form beats for C.W. reception or to heterodyne spark signals. Two coils are supplied with the

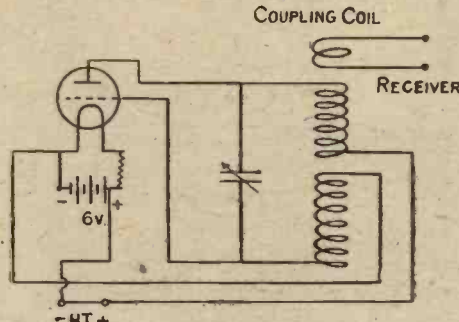


Fig. 3.—Local Oscillator Circuit.

instrument, one from 1,500 to 6,500 metres and the other 5,000 to 20,000 metres.

B. H. J. K.

When Filament Touches Grid

A FEW weeks ago there was an article in this paper describing how the filaments of old valves might be renewed. Another common fault with some types of valves is the sagging of the filament and its eventual fusing to the grid. This may be prevented by working the valve in a different position, so that the filament may be allowed to sag away from that portion of the grid to which it was likely to stick.

No doubt many experimenters have had the misfortune to discover that on the night that they most particularly wished to "listen-in" the filament has actually touched before it could be prevented. This was my misfortune on the night of the broadcasting of "Cinderella," and so I wondered if anything could be done. Of course, as is well known, the valve could still be used as a rectifier until the filament burnt out.

A Remedy

For the benefit of those who have had a similar misfortune, I will describe how to renew the valve. Take two wires from a two-volt cell of your accumulator and connect the first to one filament pin and the other to the second filament pin and also to the grid-pin. This will cause one side of the filament to light up and show where it has touched the grid. Allow it to burn for a while to warm the grid. Hold the valve so that if the filament were free to move it would fall away from the grid of its own accord. Then tap the valve on the under side and continue to do so until the filament burns duller than at first. This will show that it is no longer touching anywhere, but it may be still very close. The next step is to get it further away, and this is done by giving the valve short hard raps with the knuckles until the filament is seen to be well away. The wires can be now disconnected and the valve is as good as new. This can be repeated any number of times, as I have found by experience.

Two volts are used so as not to burn out the half of the filament, which might happen if a higher voltage were employed.

B. G. B.

Flattening Metal Foil

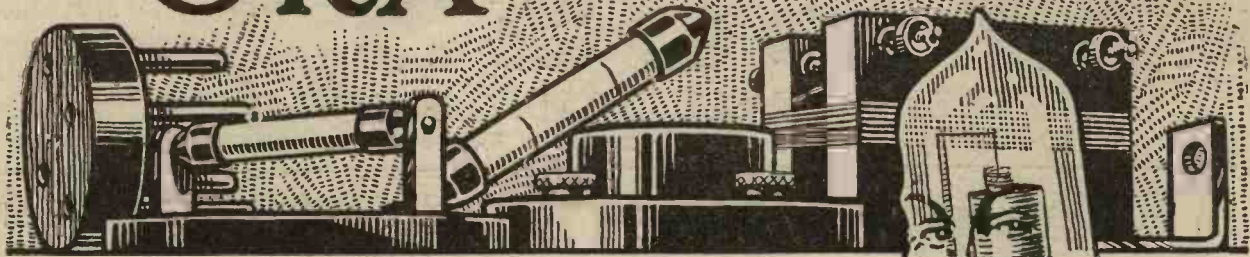
TO make tin or copper foil perfectly flat and free from the numerous creases, etc., which it generally has when purchased, the following procedure has been found successful.

The sheet to be smoothed should be placed on a clean smooth surface, preferably of glass. A smooth circular rod—a piece of glass tubing or a polished black-lead pencil will do nicely—is then held parallel and in contact with the edge of the foil, but leaving sufficient of the latter protruding to enable it to be grasped with the fingers and drawn steadily from between rod and plate.

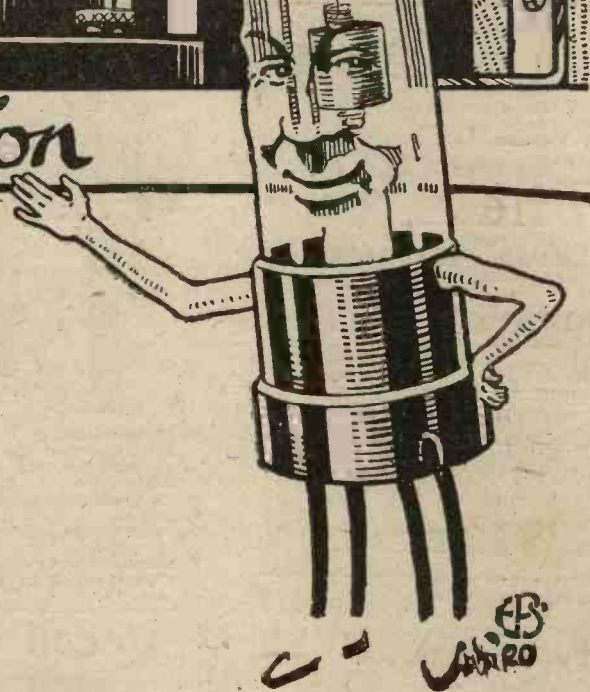
This operation may be repeated two or three times, reversing the foil for each drawing until it is quite flat and free from imperfections.

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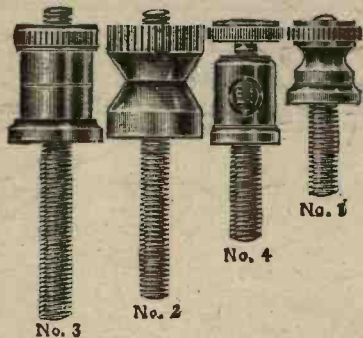
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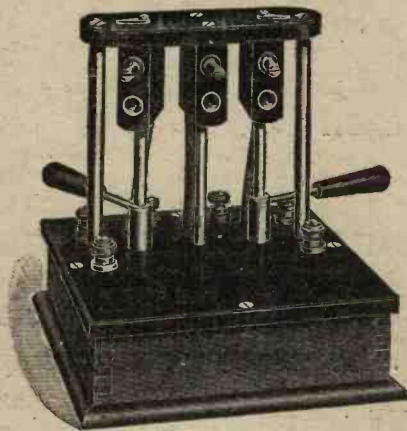
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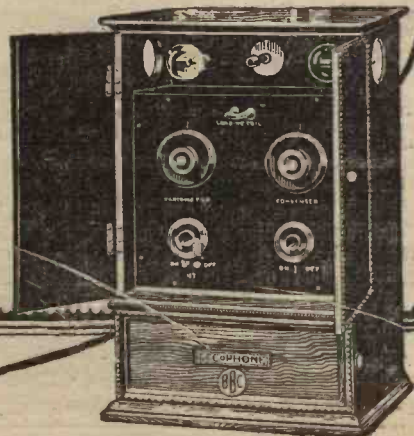
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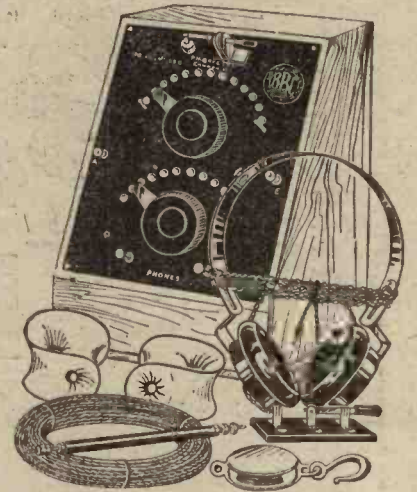
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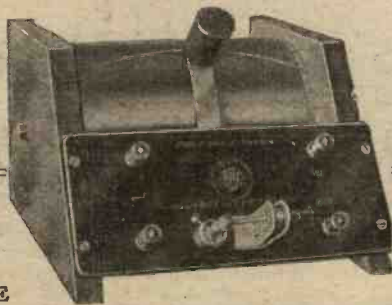
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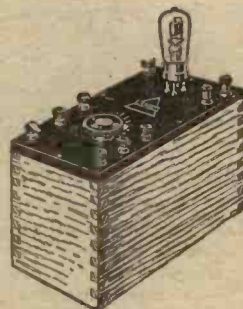
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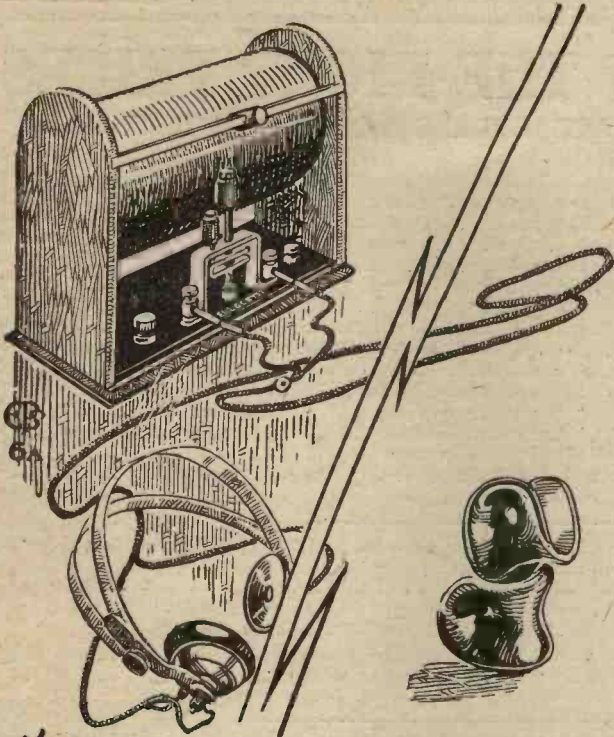


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Every set is tested and guaranteed to receiving broadcasting up to 15 to 20 miles, and Morse signals from much greater distance.

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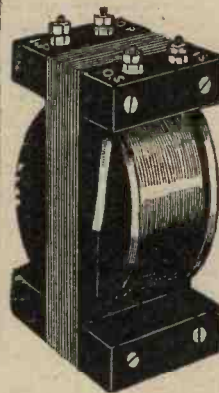
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On Your Wavelength!

Filament Rheostats
Parasitic Noises
2 F Q

Low-temperature Valves
Wireless Punishment
The Pirates

LIKE everybody else, you have probably had trouble with filament rheostats, or if you have not the odds are that you will. Some of them are very badly designed. The arm which swings round to make contact with the coil of resistance wire may be secured to the spindle by a nut, which is sure to work loose. The best way of dealing with these is to adjust the tension and then to solder the nut into place. Another type of unsatisfactory rheostat has so low a resistance that it is impossible to regulate the filament current properly, since the valve blazes into white heat directly the knob is given the tiniest fraction of a turn from the off position. Here it is difficult to do much, but an improvement can be effected by winding sufficient Eureka wire to give a resistance of two or three ohms round a piece of ebonite rod and connecting it in series with the rheostat.

To those who live in remote country districts where it is difficult, or even impossible, to get accumulators charged it will be welcome news that low-temperature valves can now be run off dry cells. The ordinary dry battery will do if it is so designed that it will give a steady current, but batteries made specially for filament heating are now on the market. When a dry cell is in use bubbles of hydrogen collect on the carbon rod which forms the positive element; their presence increases the resistance within the cell, and there is a drop in its emission. To counteract this polarisation all dry cells are provided with a supply of manganese dioxide, whose oxygen particles combine readily with those of hydrogen, and form H₂O, or water, which serves to keep the cell in the necessary state of dampness. Cells intended only for bell work and the like do not need a very powerful depolariser, for as they are used only at intervals the bubbles have plenty of time in which to become absorbed; but with the filament-heating battery the case is quite different. The gas must be mopped up as quickly as it is formed.

It may be noted in this connection that some of the most popular types of British-made low-temperature valves have recently been reduced in price. They are still dear, but they are no longer quite such costly luxuries as they were in days gone by. If they are used throughout on,

say, a three-valve set it will be found that signals are slightly—very slightly—weaker than with the *best* ordinary valves; but this is amply compensated for by the increased comfort in working. I don't know whether everyone finds the glare of white-hot filaments as trying as I do, but I expect that most wireless people suffer from tired eyes if they sit for any length of time at the receiving set when high-temperature valves are in use. Low-temperature valves function best when their filaments are no more than red hot; there is a complete absence of glare, and one's eyes are not dazzled.

A friend tells me of a problem, for a long time baffling, that came his way recently. When first switched on, the set gave perfect reception, but after half an hour or so cracklings and scrapings began to make themselves heard. Once they had started they grew rapidly worse, until finally they drowned all other sounds. One would imagine in such a case that the H.T. battery was at fault, but tests made by substituting another showed that it was entirely innocent. The trouble was eventually traced to one cell of the 6-volt accumulator, which had developed a tendency to gas when it had been under load for a time, though it behaved perfectly for some minutes when first brought into use after a rest. A fair proportion of parasitic noises may be due to the accumulator. One or two makes are not satisfactory for wireless use owing to their habit of gassing during discharge. What happens during this process is that slight-current variations occur; the filaments are thus not maintained at a constant temperature, and the stream of electrons from them to the plate is increased and decreased in turn. The phones respond to the minute alterations of current by giving out noises which are not in the programme of the transmitting station.

2 F Q was going very strong on Sunday evening after broadcasting hours. It may interest him to know that though my station is some 45 miles from his, reception was so good that his excellent records could be heard all over the house. He was complaining bitterly of interference caused by someone in his locality with an oscillating set. I could sympathise heartily with him, for I, too, was suffering in the same way.

I see in the American papers that the low-temperature valve has made its appear-

ance in the States, and that there is quite a rush to obtain it. The model illustrated is unlike any English valve, yet, curiously enough, it is made with the 4-pin cap that we know so well. Americans use a valve mounting quite different from ours. Their valves have four very short studs, which make contact with springs when the "toob" is pressed into its bayonet holder and given a fraction of a turn.

M'yes. I have absolutely no sympathy with the person who deliberately evades payment of the licence fee, or with the man who knowingly uses illegal circuits to the annoyance of the whole neighbourhood in which he lives. But I can understand the plight of the fellow who does all that he can to comply with the regulations and then can't get a reply from the authorities. Had he been so situated your Thermion might—let us whisper it—*might* have been numbered with the buccaneers.

Did you notice a curious effect the other evening during 2L O's transmission? A singer had finished her ditty, and after a little pause there came three resounding thumps in the receivers. I thanked the powers that be that I was not wearing mine at the moment, for the set in use was a powerful combination, and my ear drums might have been stove in. Some of you probably suffered and said naughty words. What happened? Well, you know probably that the carbon granules in microphones have a habit of packing, hence to ensure good transmission the instrument is tapped sharply two or three times before speaking into it. If this is done with the control-switch open, all is well, but when in an absent-minded moment the announcer (I think C*pt**n L*w*s was on duty at the time) does his light-hearted tapping with the microphone connected to the 1/2-kilowatt transmitters he boxes the ears of all listeners-in, dealing out punishment to sheep and goats alike.

A man we know is an absolute stickler for every condition endorsed on the back of that remarkable document, the broadcast licence. He went into the showroom of a certain advertiser a fortnight ago. "I want a cat's-whisker," he said, "and it must be stamped B.B.C.!"

THERMION.

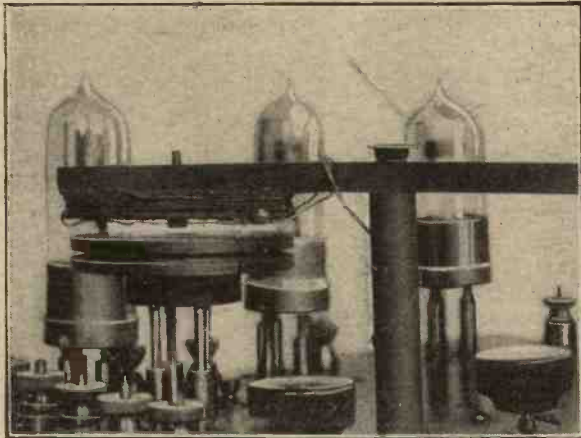


Fig. 4.—Photograph of Reaction Coil.

Building Broadcast Receivers

The Addition of a H.F. Amplifying Valve

THIS article shows how a high-frequency amplifying valve may be added to the apparatus already described in this series.

Material

One filament resistance.

1 valve (Marconi V24 or Ediswan A.R.).

1 H.F. transformer (4-pin plug-in type).

Odd pieces of brass for two-way switch.

As this valve performs a different function from either of the others already described, that is, it acts as an amplifier of high- or radio-frequency current, a separate filament resistance is required. This may be constructed as described previously or may be purchased. The valve used should be either of the types specified above. The writer has found that the Ediswan A.R. type functions exceedingly well as an H.F. amplifier, and has no hesitation in recommending its use for this purpose when cost is a consideration. On the other hand, many may prefer to use V24 valves or for the purpose of standardisation R valves.

H.F. Transformer

As regards the H.F. transformer, it is probably within the knowledge of the reader that many considerations are involved in the winding of these for a

formers already wound, as the cost is negligible. Such an one, to tune from 300 to 600 metres with a .0002 or .0003 mfd. variable condenser across the primary, can be purchased for 5s. 9d. from advertisers in this journal. Should, however, the experimenter desire to make the

a piece of 1 1/8-in. diameter ebonite rod on which may be wound a primary and secondary winding of 450 turns each of No. 36 or 42 s.s.c. wire. The ends of these windings may terminate on four valve pins screwed into the end of the rod and arranged to fit into a standard valve holder. This arrangement will tune from about 360 to 440 metres, so it obviously covers the broadcasting band of wavelengths.

After the purchase or construction of the transformer and filament resistance a small two-way switch should be prepared or purchased and mounted on the ebonite panel in the position allotted to it.

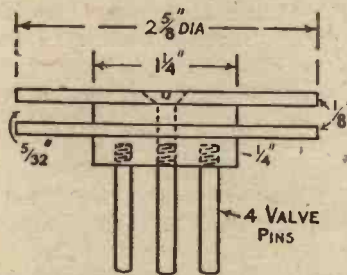


Fig. 1.—Details of Former.

transformer, the following particulars are offered as a guide, and the eventual result will be a matter for experiment.

Four formers should be prepared as specified in the drawing Fig. 1.

The windings consist of 50 turns of No. 44 s.s.c. primary and secondary for

Wiring the Panel

The panel may now be wired up as illustrated in Fig. 2. The photograph Fig. 3 gives an impression of the back of the panel when the wiring is completed. All wires should be kept as short as possible. The condenser shown on the right-hand side of the panel has been put outside by the author for the purposes of experiment. It is a telephone condenser of .003 mfd. capacity.

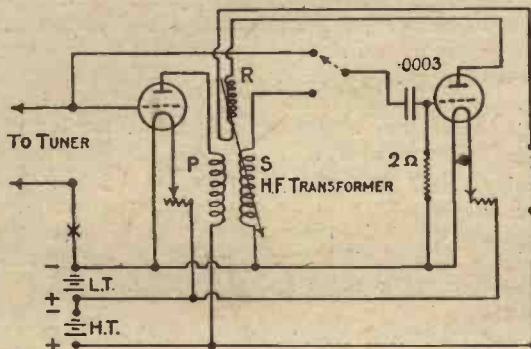


Fig. 2.—Circuit Diagram for H.F. Valve.

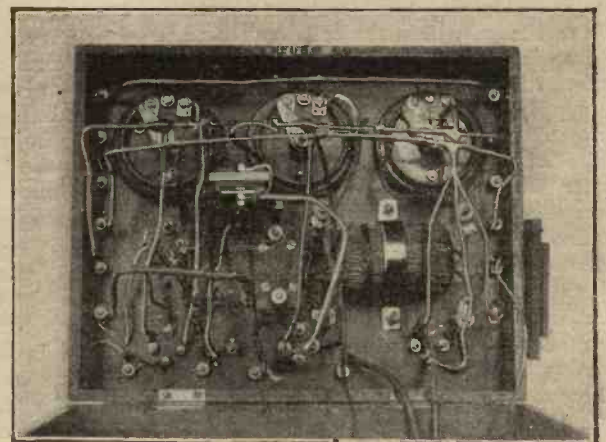


Fig. 3.—Photograph of Back of Panel showing Wiring.

specified wavelength. Whether or not the desired wavelength is attained depends largely upon the tightness of the winding of both coils (and therefore self-capacity), number of turns and diameter of former. For these reasons it is suggested that the constructor should purchase such trans-

No. 1, 100 turns of the same wire for primary and secondary of No. 2 former, 250 turns similarly wound for No. 3 former, and 400 turns for No. 4. Both windings should be put on in the same direction.

Alternatively the former may consist of

The operation of the H.F. valve may be improved by the impression of a small positive potential on the grid by means of grid cells, which should be inserted at the position shown at X on the diagram. The best value will be found by experiment according to the valve in use, and the

writer has found that + 1 volt is useful for this purpose, and effectually prevents self-oscillation of the valves.

Range

The set so far described will pick up broadcast telephony with a fair aerial within 100 miles of any broadcast station. In passing it might be stated that the writer has received excellent telephony on the H.F. and detector valves from Birmingham (112 miles from the set). Telephony has also been received from The Hague and Paris with the same aerial (28 ft. high and 70 ft. long, twin wire). 2 L O can be heard comfortably with the phones on the table with two valves (distance 12 miles). When the L.F. valve is switched in for the same station it operates a loud-speaker comfortably, the music being clear and every syllable of the spoken word distinct. The Newcastle broadcasting station (300 miles away) has been clearly received with the set. The French Ecole Supérieure has also been received on Tuesdays and Thursday regularly.

Possibly experimenters residing some distance from a broadcasting station will desire to use a loud-speaker, and they may find it necessary to add a further L.F. valve. This, however, should be avoided if possible, as iron-core transformers inserted in the circuit inevitably give rise to a certain amount of distortion. Although H.F. valves do not give the same amount of amplification valve for valve as L.F., they are preferable owing to the fact that iron-cores are not used in the transformers. It is for the purpose of these additions that the terminals are on each side of the panel and correspond one to the other, and by their use further stages of amplification may be added without modifying the wiring, so that the three-valve set is really the nucleus of a unit set which can be added to at will. It has probably been noticed that no mention has been made of reaction although terminals have been provided for it.

Reaction

The Postmaster-General forbids the use of reaction on broadcast wavelengths when it is applied direct to the aerial circuit, and therefore the experimenter should bridge the two terminals with a piece of strip brass when operating on these wavelengths. He may, if he desires, however, embody reaction in the instrument between the anode of the detecting or rectifying valve of the H.F. transformer. The photograph Fig. 4 shows a convenient method of doing this.

First obtain a piece of ebonite rod 2 in. long and 1/2 in. in diameter and bore a hole at each end and thread 1/8-in. Whitworth. Prepare a strip of ebonite 1/4 in. thick to the particulars given in the working diagram, Fig. 5. Now prepare a former either of cardboard or ebonite to the dimensions given and wind with about 100 turns No. 28 S.W.G. d.c.c. wire, bringing the two ends one to each of the

reaction terminals. Screw the reaction coil thus made to the ebonite strip and the ebonite strip to the 1/2-in. ebonite rod, which latter is secured to the panel in a vertical position by means of a screw put through from the under side. Two special terminals are embodied in the panel for this reaction coil, and if desired two wires can be taken from these to the reaction terminals already on the back of this panel via its under side.

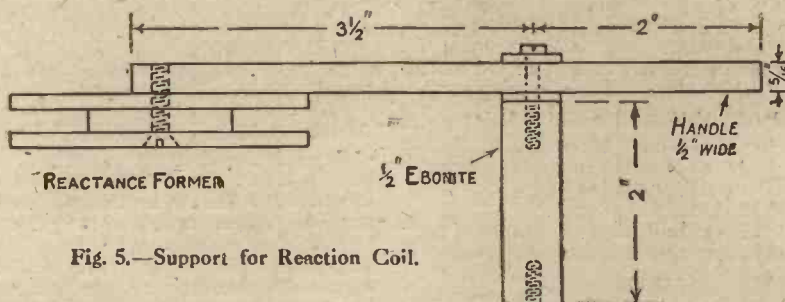


Fig. 5.—Support for Reaction Coil.

Using Reaction

In operation the reaction coil is swivelled to an angle of 45 degrees from the transformer when tuning in, and after tuning the coupling is gradually tightened by bringing the reaction coil closer to the H.F. transformer and if necessary over the top of it. Should the telephony become hoarse and distorted too much reaction has been applied, and the coils should be separated until the music is clear again. Reaction applied in this way does not cause interference with neighbouring listeners-in and is permitted by the Postmaster-General.

When using reaction for long wavelengths the broadcasting reaction coil can be disconnected and the reaction taken direct on to the aerial circuit via the terminals at the back of the instrument.

As regards tuning the H.F. transformer, this is done by means of a .0003 mfd. variable condenser across the primary coil. This condenser is not embodied in the instrument, but can be attached to it by means of two wires to

the terminals provided. These are the two top left-hand terminals looking at the panel from the front.

The constructor has now a three-valve set which he may use in any desired manner. He can, by altering the switching, use the detector valve only, or detector and H.F., or L.F., or all three valves together. Reaction is available for use of short or long wavelengths.

The detector-amplifier unit may be used in conjunction with the tuner already described under the title of Building Broadcast Receivers in Nos. 34-37 of AMATEUR WIRELESS. A. L. C.

A Substitute for Ebonite

A GREAT deal has been written on the subject of substitutes for ebonite in wireless apparatus. We have heard of old mahogany and oak and other varieties of hard wood, but so far nobody seems to have suggested using sulphur.

This element is a highly efficient insulator, and the experimenter can easily use it for fixing terminals and ensure their perfect insulation. For this purpose it is only necessary to drill a hole a little larger than the terminal almost through the wood in which the latter is to be fixed. A small quantity of flowers of sulphur is then melted (not boiled), and poured into the hole. The terminal is placed in the liquid and held there until the sulphur solidifies. If the sulphur sinks in the middle a little more can be poured in. An excess should be chiselled away when solid.

This method of insulation puts an end to all the troubles which arise from terminals working loose, for the sulphur is a splendid cement and it requires a heavy blow to disturb the terminal which has been set in

it. Terminals can, however, be easily removed if required by remelting the sulphur by means of a hot piece of metal.

The same method can also be used for fixing crystal cups or valve sockets, care being taken in the case of the latter to ensure that they are vertical.

The writer has built several crystal sets, in some of which ebonite has been used, in others hard dry wood, and in others sulphur. The best results have been obtained with the sulphur. On each of three crystal sets using insulation as explained above, with a single wire aerial 30 ft. high and 100 ft. long, 2 L O comes in quite distinctly from a distance of 50 miles. W. H. J.

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Q.—Please give me the size of coil and gauge of wire to give a maximum wavelength of 2,000 metres.—**BROADCAST** (S.W. 17).

A.—Use a former 12 in. long by $\frac{1}{4}$ in. diameter and wind full of No. 22 enamelled-copper wire.—**B.**

H.T. and L.T. Voltages for Dutch Valve

Q.—I have a Dutch valve which gives a blue glow inside the bulb when I switch on the batteries, and signals are very weak. Why is this?—**H. J. R.** (London).

A.—You do not mention the voltage of your high-tension battery, but it is obviously too high. Reduce to about 25 volts and work the valve with filament a little more than red hot. These valves make excellent detectors when the correct filament and anode voltages are applied.—**P.**

Capacity of Telephone Condenser

Q.—What is the best value for a telephone condenser?—**H. F. L.** (Grimsby).

A.—For a crystal set a condenser of about .002 mfd. will be suitable, but for valve receivers a larger value is to be recommended. For one valve any value between .002 and .005 will give good results, but for two valves or more the size should be increased to about .01, and in some cases condensers as high as 2 mfd. will be found an advantage, especially where two or three stages of high-frequency amplification, followed by a detector, are employed.—**P.**

Eliminating Generator Hum

Q.—Please suggest suitable methods for eliminating the hum heard in the telephones due to generator noises from electric lighting mains.—**A. W. H. H.** (Ilford).

A.—It is not always possible entirely to eliminate these generator noises, but in most cases it is possible to cut down the interference to such an extent that weak signals or telephony can easily be received without undue strain. It is advisable to run the aerial lead-in wire and earth lead well clear of all lighting wires, and ensure a good clean earth connection either to a water-supply pipe or to a sunken metal plate outside the house. Poor or bad connections often intensify the generator noises. Should the interference be of such a nature that telephony is interfered with we advise the use of a balanced aerial-earth. By the latter the following is meant: Erect another aerial similar in design and exactly below your present aerial, preferably at a distance of between 10 and 20 ft. This should be insulated at each end and the lead-in wire from it should be connected to the earth terminal of your receiving set. The actual earth lead previously used should be disconnected and entirely omitted, the additional aerial acting to all intents and purposes as an earth. These two aeri-als act as the two plates of the aerial condenser, both being highly insulated from earth. The receiving-set tuning inductance being connected between the two aeri-als, forms the oscillatory circuit for the reception of signals. Received signals may be slightly weaker than was previously the case when using an ordinary earth connection, but it will be found that more selective tuning and less interference will be the result. It is advisable to have the two aeri-als equal in size, number of wires, etc., otherwise unbalanced tuning invariably results. When the receiver is not in use, both aeri-als should be earthed.—**C.**

Aerial Efficiency

Q.—I notice that my aerial wire is coated with a brown deposit through the action of impurities in the air, as I suppose. Does this make any difference to the strength of signals?—**F. D. L.** (London).

A.—The efficiency of bare wire aeri-als is supposed to drop about 5 per cent. per annum, but the writer cannot say that he has noticed any decrease in strength of signals on a bare copper aerial which has been in use for about four years.—**B.**

Aperiodic H.F. Transformers

Q.—Please give me some information regarding aperiodic high-frequency transformers for the broadcast wavelengths.—**QUERY** (Dover).

A.—On a bobbin $1\frac{1}{4}$ in. in diameter having a slot $\frac{1}{4}$ in. deep and $\frac{1}{8}$ in. wide wind on 50 turns of No. 44 Eureka c.c. wire for the primary. Then wind on a layer of silk thread and a further fifty turns of 44-gauge Eureka for the secondary. These transformers require no tuning condenser across the primary; being aperiodic they give good amplification over a fairly wide band of wavelengths on either side of the natural wavelength of the windings.—**P.**

Condenser and Grid-leak Values

Q.—What are the best all-round values of grid-leak and condenser?—**OHMER** (London).

A.—Two megohms for the leak and .0003 mfd. for the condenser will usually give good results. A good point to remember is, never be satisfied with the figures given but try out various values for yourself until you find those which give the best results with your own particular valves and circuit.—**B.**

Positive Plates Buckling in Battery

Q.—I have a large battery in my charge consisting of fifty-eight 33-plate 900-ampere-hour cells. All the positives have been renewed recently, but they are commencing to buckle, and in several instances are bulging very badly. Your advice will be appreciated.—**F. H. T.** (Lancing).

A.—There is only one thing likely to cause a new set of positive plates to buckle and that is continuous overcharging, or charging at too high a rate. This is not a matter, however, where advice can be safely given without a close examination of the cells and a fuller acquaintance with their history and treatment, and it is strongly advised therefore to arrange with the technical representative of the battery company who supplied the new sections to call round and investigate, as there is evidently something radically wrong either with the plates or with the treatment they are receiving. There is no satisfactory method of repairing a cracked glass-box, and the sooner it is renewed the better, as the crack is sure gradually to extend, and when the box does eventually collapse the mess it makes is so appalling that the outlay on a new box is distinctly preferable.—**Q.**

Size of Coil for Loose-Coupler

Q.—Please state the size of coils and gauge of wire for a loose-coupler to tune to 600 metres.—**TUNER** (Reading).

A.—The primary should be 7 in. long by 3 in. in diameter, and the secondary 6 in. long by 2 $\frac{1}{2}$ in. in diameter, both coils being wound with No. 22 c.c. wire. Or if it is intended to use a slider on the primary coil, the primary winding should be of No. 22 enamelled wire.—**P.**

Transmission Range of Spark Coil

Q.—What is the transmission range of a 1 in. spark coil?—**OPERATOR** (London).

A.—Between 5 and 10 miles, using an efficient aerial.—**B.**

Modifying Aircraft Receiver

Q.—I have bought an aircraft receiver; would you please give particulars for modifying it.—**J. K.** (Nottingham).

A.—This set was originally intended to make use of a valve of somewhat peculiar construction and soft vacuum known as the "White" valve, which probably accounts for the peculiar method of applying the incoming oscillations to the valve as indicated in querist's diagram of connections. It is thought that these sets are arranged to tune to a maximum wavelength of 1,400 metres. The switches B, C and D, as per querist's diagram, are evidently "wavelength" switches giving long waves in the "up" position, and introducing a series condenser for short waves in the "down" position. The switch A when "up" effects electro-magnetic coupling between the detector valve and a special tuned buzzer circuit, whilst the grid cells will be for the purpose of applying an initial potential to the grid to ensure operation at the critical point of the characteristic curve. Switches A, B, C and D could all be arranged so as to introduce extra inductance which, together with variometer as at present fitted, will form the A.T.I., the grid and filament of the valve being connected to the aerial end and earth end of aerial inductance respectively with the usual condenser and leak in the grid lead. Probably one of the other inductance coils shown can be made to answer as a reactance.—**K.**

Construction of L.F. Transformers

Q.—I wish to construct a low-frequency transformer; can you give me instructions and gauge of wire for same?—**TWO VALVER** (Canterbury).

A.—The core should be of iron wires tied together in a bundle 4 in. long by a $\frac{1}{4}$ in. in diameter. Wind on one layer of waxed paper or Empire cloth. The primary winding will consist of 1 oz. of No. 44 s.s.c. copper wire, and several inches should be left at the ends for connections. Next wind on another layer of Empire cloth to separate the secondary from the primary. The secondary winding of 3 oz. of No. 44 s.s.c. copper wire is wound on in the same direction as the primary, and when this is completed the whole of the windings should be bound round with good insulation tape. To improve the efficiency of the transformer the iron wires comprising the core may be about 10 in. long, and the 3 in. at each side of the 4 in. winding may be spread out like the spokes of a wheel and bent back over the transformer body and the whole covered with tape.—**B.**

Our Information Bureau—(Continued)

One Valve Set Howling

Q.—My set is very noisy, and sometimes I get nothing but a continuous howling note. The receiver is a single valve one, without reaction.—KERR (London, S.E.).

A.—Either there is a break in the circuit between the aerial and the grid of the valve or the value of the grid-leak is too high. If you find the circuit to be continuous from the grid to the aerial, reduce the value of the grid-leak by making a connection across it with several strands of wet cotton. If this cures the trouble, fit another leak.—B.

Removing Glossy Surface from Ebonite

Q.—I have bought an ebonite panel which has a very glossy surface and I understand that this surface must be taken off before using the panel for wireless purposes. How can I remove the polish without spoiling the appearance of the panel?—F. R. P. (Southampton).

A.—Rub off the polish with No. 1 emery-cloth, rubbing in one direction, until smooth. Then rub across the grain with No. 0 blue back emery-cloth until the scratches caused by the first rubbing are removed. Rub again with No. 0 blue back with a little thin oil until a polish is obtained.—P.

Resistance-capacity and Transformer Coupling

Q.—How does resistance-capacity compare with transformer coupling between high-frequency valves?—C. B. R. (Grimsby).

A.—For wavelengths under about 1,000 metres resistance-capacity coupling is not suitable and will be found to give very little amplification, if any. On the higher wavelengths, however, from 1,000 metres and upwards, this is a very convenient method of coupling high-frequency valves, and has the advantage that no change has to be made in the values of the coupling units when changing wavelengths. For the anode resistance use one of about 70,000 ohms, with a grid leak of 2 megohms and a grid condenser of .0003 mfd. The increase in the resistance of the anode circuit will necessitate increasing the voltage of the high-tension battery by about 50 per cent. For wavelengths under 1,000 metres, high-frequency transformers will be found to give a high degree of amplification, but it must be understood that the primary or secondary

winding must be tuned by a small variable condenser of about .0003 mfd. There is very little to choose between the two methods of coupling on wavelengths of 1,000 metres and upwards, but you will find that whereas a full range of transformers will cost about 50s., a resistance-capacity coupling unit may be bought for about 5s.—B.

Proximity of Telephone Wires to Proposed Aerial

Q.—I wish to erect an aerial in the garden but am afraid that some telephone wires which run across it will interfere with my reception; is there any chance of this happening?—F. C. (Southend).

A.—There is always the chance that the telephone wires will absorb some of the energy which might otherwise come on to your aerial, but if you erect your aerial at right-angles to the wires and as high as possible above them, we think you will notice very little, if any, reduction in your signal strength.—P.

Filament Resistance

Q.—How much wire and what gauge shall I use for a filament resistance on a single valve circuit?—FURES (London).

A.—Use 12 ft. of No. 22 Eureka wire wound in the form of a spiral on a pencil or a thick knitting needle. You will of course arrange a slider to make contact on the turns of the spiral in order to include all or part of the resistance in the circuit. You may also arrange the slider to move a little way past the end of the spiral; this will give you a switch for cutting out the filament current, and saves fitting a special filament switch on the panel of the receiver.—P.

Charging Accumulators from A.C.

Q.—I am supplied with alternating current at 220 volts, and wish to make a rectifier to charge 6-volt accumulators. Please give the necessary information.—M. W. (Harrow).

A.—A chemical rectifier or Nodon valve will be the simplest and cheapest kind of rectifier to fit up. It consists of four stoneware jars, quart size, each with a central $\frac{1}{8}$ -in. aluminium rod for one electrode, and a piece of $\frac{1}{16}$ -in. lead sheet bent into the form of the letter C for the other. The electrolyte consists of a saturated solution of ammonium phosphate. The ele-

ments are connected up with two leads in two of the cells connected together, and two aluminiums in the two other cells interconnected. These pairs form respectively the positive and negative terminals of the rectified or charging current. The two other mixed pairs of aluminium lead electrodes form the alternating current terminals. To limit the charging current a resistance consisting of carbon-filament lamps is put in series on the alternating supply circuit.—Q.

What Type of Aerial to Erect

Q.—I find I can erect an aerial about 60 ft. long, what type do you recommend?—L. McD. (Glasgow).

A.—The two wire type will suit you best, but separate the wires with spreaders about 6 ft. long, and put up the aerial as high as possible.—B.

Construction of Earthing Switch

Q.—Please give instructions for making a simple earthing switch.—E. L. J. (London, S.W.).

A.—Obtain a double-pole change-over switch; the porcelain-base type can be purchased very cheaply. Connect the aerial to one of the centre poles and the earth to the other. The right-hand pair of terminals may be connected to earth and aerial on your set, and the opposite poles may be short circuited. When the set is not in use, throw the switch arms over to the short-circuited side.—B.

Variable Grid Leak

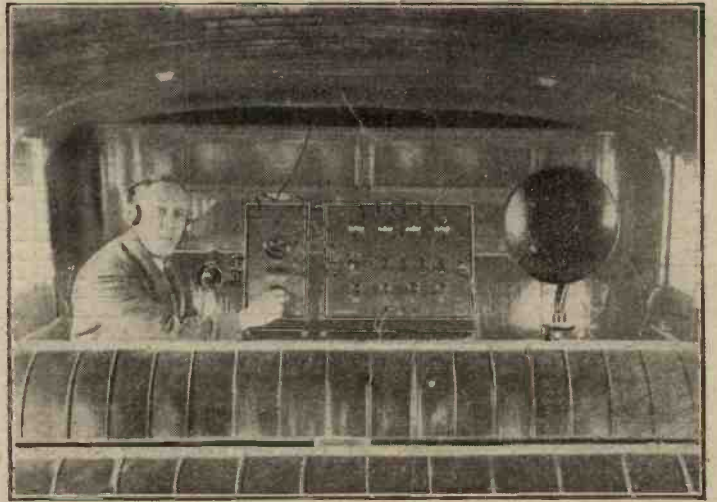
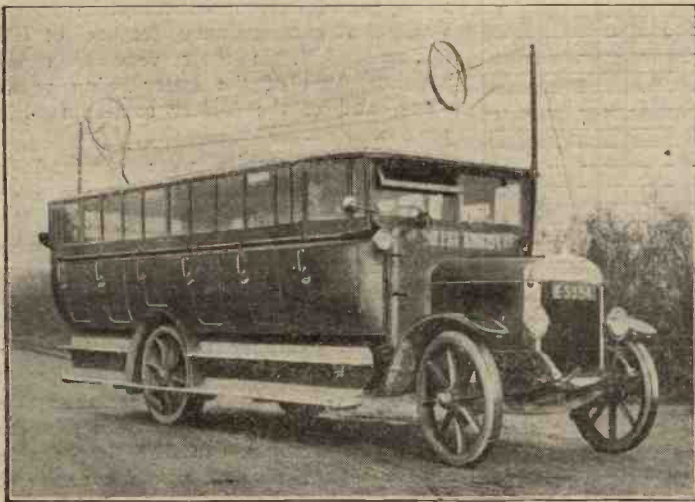
Q.—Is it possible to make a simple variable grid-leak?—LEAKY (Romford).

A.—Yes, make up a solution of cadmium iodide in amyl alcohol. Use cadmium electrodes arranged in the solution so that they may be moved apart. Experiment with the electrodes at different distances from each other to obtain best results.—B.

Connecting Two Pairs of Phones

Q.—I have one pair of 8,000-ohm phones and one pair of 4,000; can I use these together on a crystal set?—BEGINNER (Sutton).

A.—Yes, connect them in series. If they are connected in parallel you will find that the lower resistance phones will absorb most of the signal strength.—P.



AN ADDED INTEREST TO MOTOR-COACHING

Two photographs of a wireless-equipped Thornycroft motor-coach, owned by Mr. A. P. Sanders, Chasetown. The first picture shows the aerial arrangements and the second the four-valve Burndy receiver with loud-speaker.

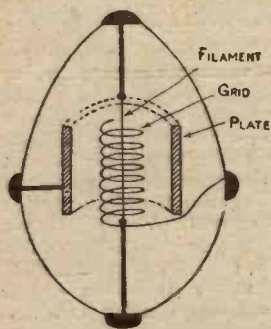


Fig. 1.—Diagram of Anti-Capacity Valve.

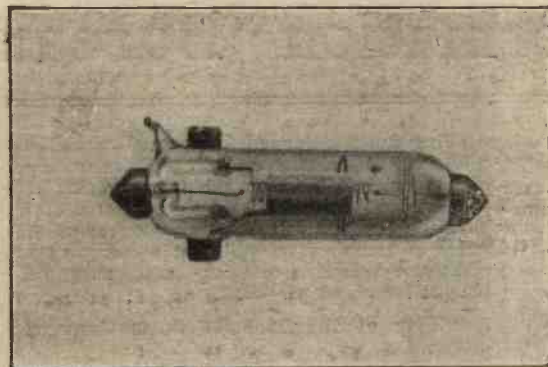


Fig. 3.—The "M.O." V24 Valve.

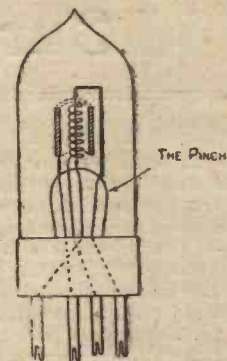


Fig. 2.—Diagram of 4-pin Valve.

Finding the Best Valve

VIII—Anti-capacity Valves

ALL valves of the four-pin type have one great drawback. The two leads from the filament as well as those from plate and grid must pass through the narrow "pinch," as the glass support inside the bulb is called. Since they are close together and run parallel to each other an appreciable amount of capacity exists between them. There must also be capacity between the pins themselves and between the sockets into which they fit on the panel. If we add capacity to any circuit we increase its wavelength; hence valves of the usual type, owing to their own capacity, are not very satisfactory for work on the shortest wavelengths. To meet this difficulty special types have been designed, which are so constructed that they have no "pinch" at all. The idea that underlies all of them is illustrated diagrammatically in Fig. 1.

The valve has four small metal caps or bosses. Those at top and bottom are connected to the supports of the filament, whilst those at the sides form the plate and grid contacts. A special valve-holder with four spring clips is used for mounting.

A comparison of Fig. 1 with Fig. 2 will show at once how vastly inferior is the four-pin valve.

Few probably of those who use the well-known Mullard Ora valve are aware that it can be purchased for an extra sixpence in the anti-capacity form. In outward appearance the Ora "B" is exactly like the R.A.F. "D" valve, illustrated in a previous article, except that it has not the latter's enormous plate. The "B" valve has the same filament and plate consump-

tion as the Ora, and its curves are very similar. It does all that its four-pin brother can do, and is superior in its performances on short waves. This valve is not always easy to obtain, since the Mullard Company are so "snowed under" with orders that they concentrate most of their attention upon the ordinary pattern, which is more in demand, owing to the fact that it fits the standard holder.

V24, seen in Fig. 3, whose only disadvantages are the comparatively high voltage and large current needed by the filament. When a valve requires .75 amperes at 5 volts a fairly large accumulator must be used if satisfactory results are to be expected. The V24 has been designed primarily as an amplifier, for which purpose it works excellently on either high- or low-frequency sides. The internal impedance is in the neighbourhood of 40,000 ohms, and the magnification factor is 6.

The first rectifier designed for use in conjunction with the V24 and the Q., which requires the same voltage but considerably less current, the filament consumption being .45 amperes. It is quite an efficient rectifier, and as it has the amazing voltage magnification factor of 50 when used with 150-200 volts on the plate it makes a wonderful low-frequency amplifier. The Q.X. is a rectifier of rather more robust construction, with the same voltage and current consumption as the V24. An extraordinary feature of the Q. and Q.X. is their very high impedance, that of the latter being 70,000 ohms, and of the former something like 300,000.

Very good results were obtained by using V24 on the high-frequency side, Q.X. as rectifier, and either Q. or V24 as note-magnifier. When five valves were in use the ammeter showed that a current of close on 4 amperes was passing, which is a heavy drain on even a big accumulator. For ordinary use in cases where anti-capacity valves are desired either of the above combinations or a series of Ora B's can be recommended. With the V24 and Q.X. combination the low-tension battery should have an actual capacity of at least 12 ampere-hours per valve in use, for the voltage of the cells must be up to practically its full value for good results.

(Continued on page 530)

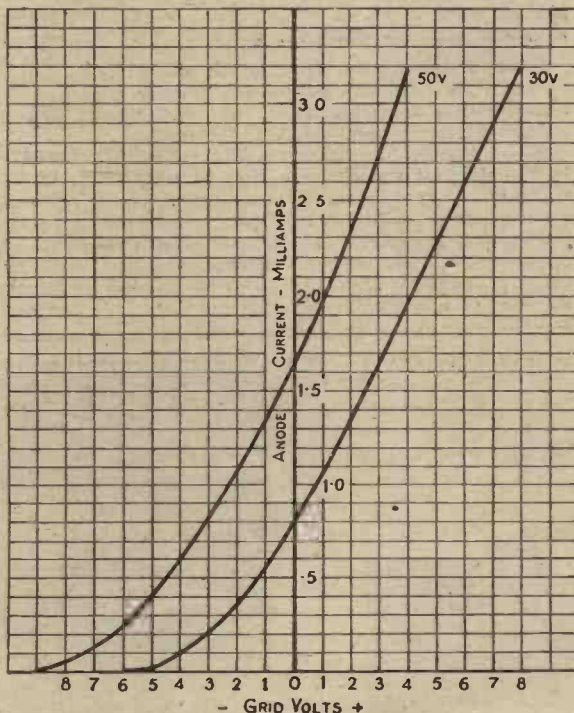


Fig. 4.—Characteristic Curve of "M.O." V24 Valve.

Still fewer people know that the same company has for a long time been making low-temperature valves working on .4 of an ampere at about 2 volts. Of these we shall have more to say later.

The best-known anti-capacity valve of the high-temperature pattern is the M.O.

Is a Receiving Licence Legally Necessary?

A Reply to a London Daily Paper

Exclusive to "A.W."
By a Barrister-at-Law

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| SPRING SEASON RENOVATIONS DECORATIONS ETC. MAPLE & CO LTD TOTTENHAM COURT ROAD, W.1 | LATE LONDON EDITION  NO. 7.168. |
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TODAY'S WEATHER.
MILDER. Bro

WIRELESS MONOPOLY MAY BE ILLEGAL.

EXTRAORDINARY POSITION OF THE POST
OFFICE AND THE BROADCASTING
COMPANY.

LICENCE UNNECESSARY?

"TRANSMISSION" ALONE MENTIONED IN
THE ACT.

An extraordinary and surprising point which, if words bear their apparent meaning, would make an end of the British Broadcasting Company's operations, is raised by a legal correspondent of the "Daily Express."
The whole fabric of the wireless broadcasting monopoly is in

A CONVINCING proof—if one was needed—of the universal popularity of wireless is to be found in the amount of space and prominence now being given to the subject by the daily Press. A London daily, on Tuesday of last week, made in effect a frontal attack upon the whole of the present broadcasting system, and declared bluntly that the monopoly claimed by the Postmaster-General is illusory, that the British Broadcasting Company has no legal standing, and that every penny extracted from the public for the privilege of listening-in amounts practically to highway robbery. The paper in question attempted to establish its point of view by citing chapter and verse from the Parliamentary Act which regulates the whole wireless position.

This kind of thing is amusing in a way. It shows at least that there are a sufficient number of people interested in wireless, either as a hobby or a recreation, to justify the experiment of a journalistic "stunt." On the other hand, it is likely to mislead a certain type of reader. There are many people who are too readily impressed by heavy type.

The Clause Relled On

The Act referred to is the Wireless Telegraphy Act, 1904, and the citation upon which the above extraordinary conclusions are based is a proviso, or subordinate clause, in sub-section 7 of the first part of the Statute. This proviso reads as follows: "Provided that nothing in this Act shall prevent any person from making or using electrical apparatus for actuating machinery or for any purpose other than the *transmission* of messages."

It is always dangerous to take a single passage of an Act of Parliament—or any other document—away from its context, and lean too heavily upon it. In this instance undue emphasis is laid upon the italicised word "*transmission*." Because the term "reception" has not been specifically mentioned, the conclusion is jumped to that it is therefore definitely ruled out. As a consequence it is argued that everyone is entitled to receive wireless messages without let or hindrance.

The Whole Position in Perspective

The most effective reply to this contention is to draw back a little so as to get a better perspective of the whole position.

In this country the sole right of carrying correspondence is one of the oldest monopolies of the Crown. Originally it lay in the collection and delivery of letters only, and was usually farmed out to a con-

tractor or to a Court favourite. In these more enlightened days it is vested in the Postmaster-General, and the revenue from it falls to the State. In the course of time the telegraph and telephone were evolved, and then wireless. All these innovations were in turn held by law to fall under the general monopoly of the postal service.

The Wireless Telegraphy Act of 1904 definitely lays down the law as regards wireless. The opening clause of the first section says: "A person shall not establish any wireless telegraph station or *work any apparatus for wireless telegraphy* in any place . . . except under and in accordance with a licence granted in that behalf by the Postmaster-General."

Attention is particularly directed to the words marked in italics. Nothing could be broader or more comprehensive. The prohibition not to "*work any apparatus for wireless telegraphy*" undoubtedly covers apparatus for receiving as well as that for transmitting.

In sub-section 7 (from which the proviso first mentioned is an extract), the following definition is given: "The expression '*wireless telegraphy*' means any system of communication by telegraph . . . without the aid of any wire connecting the points from and at which the *messages or other communications* are sent and *received*." If this is read in conjunction with the opening clause previously quoted it will be clear, in the first place, that wireless telephony is included—as well as telegraphy, and, in the second place, that receiving apparatus is covered as definitely as transmitting apparatus.

These two clauses govern the whole purport and meaning of the Act, and are obviously consistent with the general monopoly which rests with the State and

which embraces line telegraphy and telephony as well as wireless.

The proviso upon which the journalistic "scoop" is founded comes at the end of sub-section 7 (quoted above), and may now be repeated in its proper perspective. It reads: "Provided that nothing in this Act shall prevent any person from making or using electrical apparatus for actuating machinery or for any purpose *other than the transmission of messages*."

This was obviously inserted to prevent the Postmaster-General from claiming the sole right to control the use of radio apparatus when employed, say, for "distant control" work, such as the automatic steering of ships or aeroplanes by wireless, or it may be the use of radio-frequency generators for medical treatment, or, in fact, as it says, for *any purpose other than the communication of messages*. The word "transmission" here is obviously a generic one embracing both ends and any intermediate link, in the process of conveying a message.

There should then be no misapprehension on this point. Unlike France and the U.S.A., the ways and means of wireless in this country are by Statute placed definitely under the control of the State. The Postmaster-General is accordingly acting well within his legal rights in giving the British Broadcasting Company a licensed monopoly for the transmission of wireless telephony under stipulated conditions, and he is equally empowered to prosecute any person who listens-in to such transmission without having previously obtained a proper licence to do so.

The Bona-fide Experimenter

The one section of the Act which, more than any other, *limits* the monopoly rights of the Postmaster-General as regards wireless is of particular interest to the genuine experimenter. It is, in fact, a kind of franchise which puts him in the position—once he has proved his status as a *bona-fide* experimenter—of *demanding* a wireless licence practically as a matter of right and not as a favour. This section reads:

"Where the applicant for a licence proves to the satisfaction of the Postmaster-General that the sole object of obtaining the licence is to enable him to *conduct experiments* in wireless telegraphy, a licence for that purpose *shall* be granted (note that the Act says *shall* and not *may*) subject to such special terms, conditions and restrictions as the Postmaster-General may think proper."

Is a licence legally necessary? Yes!
BARRISTER-AT-LAW.

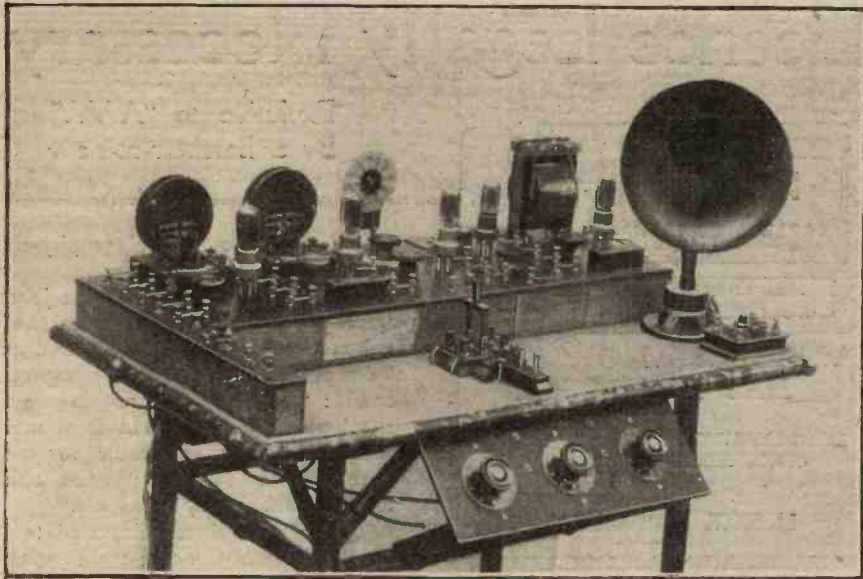


Fig. 1.—The Improved "A.W." Ideal Unit Set.

SINCE the series of articles dealing with the making of a unit receiving set appeared in AMATEUR WIRELESS a number of improvements have suggested themselves, and the set has been entirely re-designed, its final appearance being shown in the photograph (Fig. 1).

As originally built it worked extremely well—American broadcast items were picked up on it on more than one occasion—but it was felt that it could be bettered in several ways.

Modifying the Tuner Arrangements

The first step was to turn the table into the complete tuner seen in Figs. 2 and 3. One advantage of this arrangement is that any set can be placed on the table and wired up ready for action in a few moments; another is that as there are no condensers or other pieces of apparatus lying about loose, the table, besides looking very neat, provides ample room for experimental "hook-ups" of all kinds.

The terminal panel seen on the left is an oiled oak box 16 in. long by $1\frac{1}{2}$ in. wide and 2 in. deep. The leads from it to condensers, secondary tuning coil and H.T. battery are all taken along the under surface of the table, heavily insulated wire being used for the purpose.

The accumulator has retired to a corner of the room, where it now reposes on the floor, hidden from sight beneath a book-case. Its wires run along the skirting-board, supported on porcelain cleats, and terminate in a twin socket fixed to the wall. The L.T. leads from the terminal panel, which are of the heaviest kind of flex, carry a plug whose pins are of different sizes, so that no mistake can be made in inserting it into the socket.

A small series-parallel switch, mounted on the terminal panel, is found to be far handier than the original arrangement of

swinging arms fitted to the primary condenser. These little switches are rather expensive to buy, but they can be made quite easily at trifling cost in one's own workshop.

Two strips of sheet brass, each $1\frac{1}{2}$ in. long by $\frac{1}{16}$ in. wide, are cut out and filed up. The small bridge which connects them is made of $\frac{1}{8}$ -in. ebonite. In the middle of it a hole is drilled and tapped for a 4 B.A. screw, which retains the handle. The latter is simply a short length of

switch roughly on a piece of wood before drilling the ebonite panel. The arms are then swung first to one side and then to the other, trial marks being made with a pencil until it is discovered just where the studs must lie in order to make proper contact in each position. The next process is to measure them off and to transfer the markings to the panel.

It may be as well here to give a hint or two on working in ebonite. Never do your marking directly on to it with a

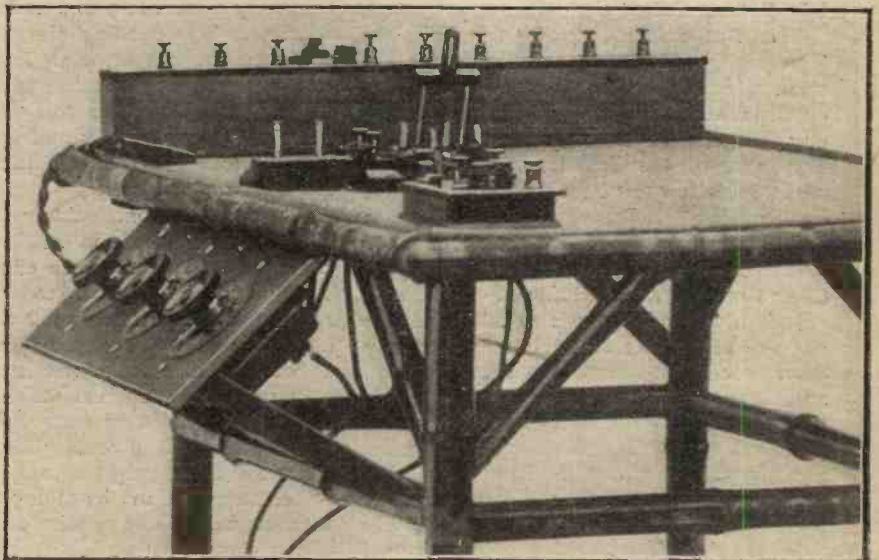


Fig. 3.—Tuning Devices Attached to Table.

ebonite tube countersunk at the top in order to allow the head of the screw to lie flush. The connecting piece is fastened to the brass arms by short 6 B.A. screws, whose ends are lightly riveted so that they cannot work loose.

The exact positions of the three studs are best ascertained by making up the

Improving Ideal U

Specially
contributed to
"Amateur Wireless"
by
R. W. Hallows

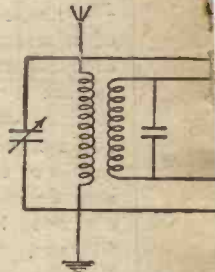
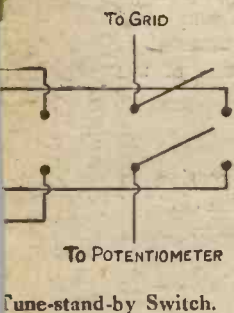


Fig. 4.—Wiring of

the "A.W." Unit Set



The first of a very short series showing how the author has improved and elaborated his excellent set described in Nos. 25, 26, 27, 28 and 30.

Tune-stand-by Switch.

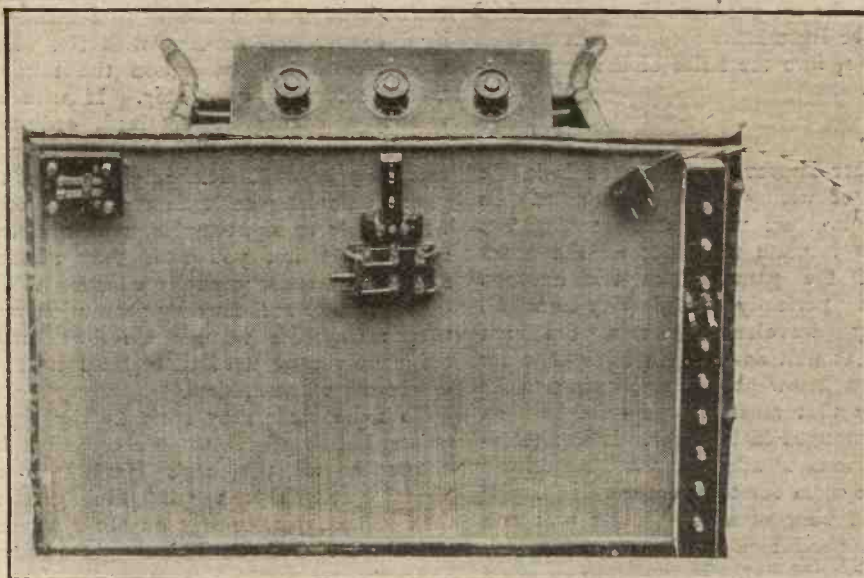


Fig. 2.—View of Top of Tuner Table.

weird ways when wet. By far the best way is to paste a thin sheet of paper on to the panel and then, when it is dry, to mark out the position of every hole on it with set-square and foot-rule. Ordinary flour and water paste will stick quite well.

To make terminals doubly secure it is as well to tap the holes made for them and to screw them in. Ebonite is very easy to tap provided that the tool is removed and cleared from time to time as it is being turned in. A little turpentine

ebonite is apt to get hotter than is desirable.

The three tuning condensers are mounted on a kind of sloping shelf in front of the table. The shelf was first held in place by means of brass strips bolted to it and to the table, but these were not found satisfactory, since they were so near both condensers and leads that capacity effects were observed at high frequencies. Strips of best ebonite were therefore used to replace them. Ebonite

most handy little instruments, only an inch in thickness, and they have been found perfectly satisfactory in use. A great feature of them is that to go from minimum capacity to maximum the knob must be turned through no less than 330 degrees, hence very fine adjustments are easily made.

In the middle of the front part of the table is a tune-stand-by switch, and at the far end is seen a small panel containing a switch for cutting out or reversing the reaction coil.

Tuned-plate Units

When two or more tuned plate units are in use, the tune-stand-by switch is almost an essential; if desired transmissions are to be picked up quickly. Thrown over towards the terminal panel, it cuts out the secondary coil and condenser, connecting the aerial directly to the grid of the first valve and earth to the slider of the grid potentiometer. One has thus only the primary condenser and those of the tuned plates to adjust. As soon as the signal has been tuned in the switch is turned right over, bringing the secondary circuit into play. The wiring of this switch is shown in Fig. 4.

In the photographs only a stand for a single tuning inductance is shown; it happened that it had been in use for some experiments just before the pictures were taken. Normally a double coil-holder is used carrying primary and secondary inductances. Except when receiving continuous waves or very faint telephony, reaction is not employed, since it is found to be quite unnecessary. On the rare occasions when it is used a second coil-holder, carrying tuned anode and reaction coils, is placed near the loud-speaker.

The tuner-table is certainly a most useful piece of apparatus, for it saves any

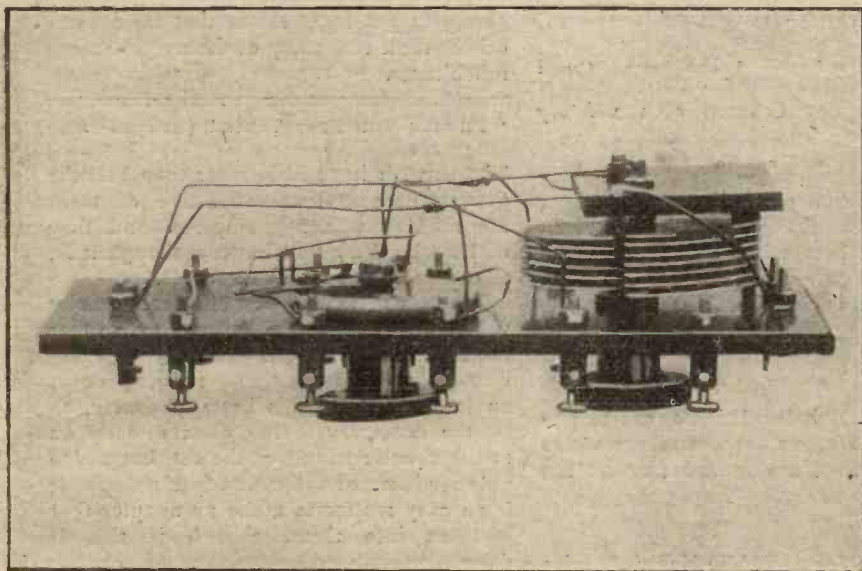


Fig. 5.—Profile View showing Wiring.

should be used to lubricate both drills and taps. If, by the way, a hole is inadvertently made in the wrong place, it can be concealed very neatly by being stopped with black sealing-wax. Always use blowpipe solder when fixing wires to studs, valve-legs or terminals; ordinary solder has so high a melting point that the

can be bent if it is first immersed for a short time in boiling water, the heat making it almost as soft as putty. In addition to these strips wooden struts are fixed between the cross piece of the table and the outer corners of the shelf (Fig. 2).

The condensers themselves are of the "Polar" mica-dielectric type. They are

amount of trouble. Everything is ready to hand when one wants it, and to connect up the set one need do no more than slide five little brass rods, as will be seen in Fig 1, into the holes of the upper terminals.

Wiring

Another improvement effected is in the system of wiring the various units. In the original set "Systoflex" tubing was used to insulate the leads on the under side of the panels from one another. Though perfectly satisfactory on all ordinary wavelengths, this did not answer as well as it might have done for reception below 300 metres, owing to the capacity that must always exist between wires arranged in this way. It was therefore decided to adopt bare wiring on the bridge system for the new set. Fig. 5 is a profile view of a tuned-plate unit and gives a good idea of the way in which this is carried out. If you wish to make your wiring look very professional you can bend it on formers, making all corners exactly square. The writer did not strive after a high degree of neatness, and right-angles were avoided as far as possible, since it is doubtful whether they agree well with high-frequency currents. Every effort was made to keep grid and plate wires as far apart as possible and to avoid

having them parallel to one another even for short distances.

The best wire to use is that made of hard copper and covered with tin. Besides preventing oxidation the tinning makes soldering very easy. If wire of this type cannot be obtained, ordinary copper wire such as all ironmongers stock will do quite well. It should be of No. 16 gauge. So long as leads cross as nearly as possible at right-angles, with a clearance of 1/2 in., you need fear neither short circuits nor capacity effects.

One further anti-capacity precaution was taken: Separate valve-legs screwed into the panels were used throughout instead of ebonite valve holders.

To some these may seem finicky little points, but they have made a considerable difference to the set's performances. Signal strength is a good deal greater than it was, particularly on short waves, and there is now no difficulty in getting down to any amateur transmissions.

In the next article the various panels forming the units of the set will be described in detail. There are now seven of them: two transformer-coupled H.F., three with tuned-anode, a rectifier and a note magnifier. Five are generally used at one time, that being the maximum capacity of the tuner-table. R. W. H.

(To be continued)

Recently the Mayor of San Francisco, when broadcasting an inaugural address of a new station, invited all his listeners-in to send him telegrams (paid on delivery!) so that he could find out how far his voice carried and how big his audience was. Those cables, paid on delivery, cost him £1,200!

The committee appointed by the theatrical managers, actors and authors have decided that the broadcasting of plays and other entertainments from theatres is gravely prejudicial to the interests of the theatrical profession.

The site for a broadcasting station in the South of England has not been decided upon yet owing to the geographical peculiarities of the South Coast. A position must be found so that no screening effects will be experienced from surrounding ranges of hills. A position at sea has been suggested.

M. Belin, a French experimenter, has established three stations in France for the photo-telephonic transmission and reception of photographs.

On May 1 at 2 LO the Grenadier Guards' band will broadcast selections from their repertoire.

2 LO's new studio at 2, Savoy Hill is a sound-proof chamber 19 ft. by 36 ft. A clause in the lease states that no concert echoes shall reach any of the neighbouring inhabitants.

"FINDING THE BEST VALVE" (continued from page 526)

The Ora B's have little more than half the current consumption—with five of them the reading was 2 1/4 amperes—and they will work off a 4-volt battery, though it is, of course, better to have a 6-volt.

Whatever the type of anti-capacity valve chosen, it should be mounted so that the filament is vertical, in order that there may be no danger of its sagging down on to the grid. It is best, of course, to fix the necessary spring clips directly on to the ebonite panels of the set, but where valve-holders of the ordinary type exist it is an easy matter to make an adapter that will fit into them, though if this is done inter-pin capacity is, of course, introduced. For this purpose the cap of an old valve of the four-pin type will be found to serve admirably. To its top is fixed an ebonite disc on to which are fastened with screws clips cut from thin springy brass for the grid, plate and lower filament connections. The upper filament clip is mounted on a length of 4 B.A. screwed brass rod, a nut above and below it serving to keep it in place.

R. W. HALLOWS.

(To be continued)

RADIOGRAMS

AN interesting arrangement was made for last Saturday afternoon (April 14). Madame Payling was to give a recital at the Albert Hall. After her first item she would go to 2 LO and broadcast an item back to the audience, which, on being received, would be accompanied at the piano by Mr. L. Stanton Jeffries. A land line had been laid down from 2 LO to the Albert Hall, and two special loud-speakers had been installed to receive Madame Payling's song.

Captain Eckersley is to broadcast a weekly entertainment from 2 LO. This will be good news to those who used to listen-in to Captain Eckersley in the old Writtle days. The "Wireless Follies" are also in the process of formation.

Mile End Infirmary is to have a four-valve receiver for the entertainment of the inmates.

A high-power station to be constructed in Germany will use two mountains (Mount Hertzogstand and Mount Steen) as aerial masts. The aerial will be 1 1/2 miles long and 5,680 ft. high.

RADIO.—Please forgive, I was hasty. Can I listen-in again?—REPENTANT WINNIE.

From the Agony Column of the *Daily Mail*.

In the absence of their own preacher, the Methodist Episcopal Church, Belmont, Mass., listened to a sermon by the Rev. A. E. Conrad, who was at a Boston Congregational church. The whole service, including hymns, was received by wireless.

It is stated that the B.B.Co. are to pay authors' royalties to authors whose works are broadcast. No standard amount has been fixed.

The United States Public Health Service has added seven new stations for broadcasting health bulletins. People are informed on the prevention and cure of all prevalent diseases in the district. There are now fifteen of these stations

Hornsey Borough Council has suggested that wireless concerts should be given by means of loud-speakers installed in the new bandstand in one of the recreation grounds.

The B.B.Co. Meets the Critics

ON Tuesday of last week the British Broadcasting Company, Limited, invited the Press to meet its officials at the company's new headquarters, 2, Savoy Hill, London, W.C.2. In the chair was Mr. J. C. W. Reith, the general manager of the company, and supporting him were Mr. Godfrey Isaacs, of the Marconi Company, Limited, and Mr. Pease, of the Western Electric Company, Limited, both of them directors of the Broadcasting Company. Mr. Reith made a long explanatory statement in answer to certain newspaper criticisms that had appeared, and he was followed by Mr. Godfrey Isaacs, whose speech was supplemented by explanations by Mr. Pease. Discussion became general, and many representatives of the Press asked questions which officials of the B.B.Co. very courteously answered. We propose in this place to present the B.B.Co.'s case as it was followed at this meeting, rather than give detailed reports of the various speeches and replies. It must be clearly understood that all the following statements emanate from the B.B.Co., and are not the expression of the AMATEUR WIRELESS point of view.

Constitution of the B.B.Co.

Newspaper criticism had been very largely devoted to the constitution of the B.B.Co. and its sources of revenue. To understand those one must review conditions in May, 1922. Over twenty companies had applied to the Post Office for leave to broadcast. The P.M.G. invited them to a conference and explained that they could not all engage in broadcasting and neither could the Government undertake it. He invited them to discuss the matter themselves, and a committee of seven was elected, with the President of the Institution of Electrical Engineers as chairman. There were continuous meetings of the committee and with the Post Office until an agreement was reached. Invitations were then sent to four hundred manufacturers of wireless apparatus to meet and discuss the matter, and three hundred accepted. Membership of the company is open to any *bona-fide* British manufacturer of wireless apparatus.

Foreign Parts Banned

As a return for the capital risked in launching the new enterprise the P.M.G. promised protection for two years; this protection takes the form of regulations that only sets made by members and approved by the P.M.G. should be used in conjunction with the broadcast licence, and that no foreign material be used in such sets. The greater number of foreign sets, if this protection were removed, would come from Germany and Austria, where, owing to the fact that wages had not improved in the same ratio as the

¶ The Company's Position Explained and Discussed

¶ News of the Third—the "Constructor's"—Licence

¶ What We Think

exchange had depreciated, sets could be manufactured at a fraction of the corresponding cost in this country. The other licence—the experimental licence—remained available for the genuine experimenter, whose operations (subject to restricting the use of reaction in broadcast hours) were unimpeded—that is to say, the experimenter could make, buy and use what he liked. The protection for the limited period justified the originators in undertaking the commitments of the broadcasting service and in laying out capital in new production, as well as in providing capital for the company. It must be emphasised that the company is of public utility. It is not allowed to make a profit other than a definite maximum percentage upon its capital, all additional profit being applied to the improvement of the programmes or to the reduction of the company's royalties. Even the stations have been erected by the various contracting companies, themselves members of the B.B.Co., without profit.

Many questions were put with the object of eliciting how much money the B.B.Co. would require per annum. Replies were to the effect that so far everything was estimated and nothing definite was known. A preliminary figure was that the necessary revenue would be in the neighbourhood of £160,000 per annum.

With the establishment of broadcasting wireless became immensely popular. The Press of all sections taught how to make up simple sets, hundreds of firms came into existence, and more, with no previous interest in wireless, opened new departments. Widespread evasion of any licence ensued, and widespread infringement of the terms of the licences. Companies with no part in launching the enterprise reaped the benefit.

"Four thousand firms" are now said to claim a revision of the constitution of the company. Where were these firms eight months ago with respect to wireless?

There is no monopoly. Already practically six hundred companies have either joined or their applications are in hand.

The "Constructor's" Licence

The B.B.Co. have no desire to impede

the inventive and constructive tendency of the individual. They draw a line, however, between the experimenter and those who only call themselves experimenters consequent on the inception of broadcast programmes. They recognise that many people are willing to pay but, having infringed the regulations, have no means at present of doing so.

In view of the conditions which arose, the B.B.Co., although entitled to expect that this agreement with the Post Office would be carried out, agreed to new regulations being made to cater for the man who wished to make up his own set. The delay in issuing these new regulations does not rest with the B.B.Co. In agreeing to them, the B.B.Co. members recognise that a great deal of the trade which they were entitled to under their agreement passes into the hands of those who did nothing to launch broadcasting and have no responsibility.

The third licence would, in all probability, be known as the "constructor's" licence. It would cost £1 per year, of which 15s. would be paid by the Post Office to the B.B.Co. Under this licence the holder would be enabled to construct, from raw material, any wireless receiver, provided that finished components bought by him were stamped "British manufacture." This suggested licence has been approved by the National Association of Radio Manufacturers and by the Radio Society of Great Britain, the latter representing 160 wireless societies.

Programmes

With regard to the criticism of programmes, it was pointed out that the company had been working under adverse conditions—in a studio only 18 ft. square; that in its new studio at Savoy Hill (connected up to 2 L O by cable), which would come into use on May 1, there would be room for a much larger orchestra, and more ambitious programmes could be transmitted. For instance, the Grenadier Guards' band had been engaged to broadcast on May 1. Many contracts have been made or are in progress which will allow of better programmes being transmitted than in the past. Existing interests were sometimes in the way of progress, difficulties and obstructions being placed in the company's way, although it was pointed out that no existing interest will be prejudiced by the company's activities. Attempts, for example, had been made to obtain permission to broadcast the forthcoming wedding of the Duke of York; the Duke himself had expressed his willingness, but the Dean and Chapter of Westminster Abbey had refused permission.

"Freedom of the Air"

"Freedom of the air," by which appar-

ently is meant the right of any company to start broadcasting on its own, would mean, the company said, chaos. If everybody was allowed to do as he liked, any broadcasting programme would become impossible of reception.

Copyrights

The company denies that in transmitting any musical or other work it is infringing any copyright, but without prejudice to the rights of anybody concerned it is prepared to make reasonable terms with any representative body.

What We Think

WE may reasonably comment upon some of the B.B.Co.'s statements. Whether an industry—in this case, just a part of an industry—should be protected against foreign imports ought to be a matter for Parliament to settle. It should be impossible to obtain a measure of protection by means of a deal with one of the Government departments, as in this case.

One gains the impression that the B.B.Co. were quite unaware of the existence of home-built sets until some time after they had received the Post Office licence. As a matter of fact, however, the home-built set was a factor last September, at a time when negotiations with the Post Office were still in progress and long before the actual terms of the Post Office licence were settled. Everybody remembers the disappointment felt by wireless amateurs in general when it became known that the home-built set was barred except to the holder of an experimenter's licence.

The B.B.Co. speak of "widespread evasion." There has been some evasion, we have no doubt; possibly it is widespread, but as to that nobody can have definite knowledge. But our point is that the greater part of this evasion is not deliberate; it is absolutely unavoidable, due entirely to the arrangements made between the B.B.Co. and the Post Office. Those concerned in the negotiations—at the time we pointed out that the public interest was not represented—shut their eyes to the existence of the home constructor, and more or less they have themselves to blame.

"There is no monopoly." Neither is there, in the sense in which the B.B.Co. interpret the situation, but the terms of the broadcast licence give the public the impression that a monopoly is intended. If the constitution of the B.B.Co. were adapted to allow dealers as well as manufacturers becoming members, the idea of monopoly would be less insistent; perhaps this is another way of putting a suggestion which we aired last week when we spoke of the desirability of the B.B.Co. royalties going by the board and all firms engaged in making and selling wireless goods contributing 5 per cent. of their turnover to the B.B.Co.

With regard to the constructor's licence,

we feel that if the authorities insist upon finished components bearing the stamp "British manufacture," further troubles will arise, and while the present difficulties will be alleviated to some extent, we are pretty certain that in a few months' time the problem will reappear in perhaps just as awkward a form. It will be difficult to define what is a "finished component."

At the moment of going to press we do not know whether this licence will receive the P.M.C.'s approval, but we understand that the P.M.G. will not sanction a higher licence fee than 10s.; however, something on these lines will be approved, in fulfilment of our very humble attempt at prophecy, which was, as a matter of fact, in print before the B.B.Co.'s meeting was held. No specific statement was made with regard to the position of wireless amateur already owning home-built sets, but from the tone of the replies we may reasonably assume that the intention is that all existing home made sets will be covered by the proposed "constructor's" licence, whatever conditions will apply to sets made after the issue of the new licence.

We feel that the B.B.Co.'s position in relation to its programmes is a good one. We honestly believe that they have done their best under great difficulties. They have had to bring into existence what is, in this country, a new form of entertainment, and the public must be patient while they learn by experience. Much has yet to be done in the way of discovering the best forms of instrumental music and the best kinds of voices for broadcasting. We are content to believe that the B.B.Co. will intelligently experiment, and that in the end they will provide the best wireless programme in the world. The company has many technical and legal difficulties to meet, among which the copyright question is by no means a small one. Much of the criticism that has been levelled against the company is ill-informed and beside the point.

"Easy Garden Carpentry"—seed frame, pea and bean hurdle, plant guard, planter, rake and foot-scraper—is well illustrated and described in the current issue of "Work" (3d.). Other articles in this issue are: "Some Finishes for Brass," "Materials Used in Mortar," "Creasing Cardboard for Box-making, etc.," "The Shearing Cut"—showing the practical application of a valuable principle, "Telephones without Batteries," "Gauge for Setting Lathe Tools," "Re-enamelling a Cycle," "A Simple Commutator for Motor or Dynamo," and "A Home-made Banner-screen."

We have received from the General Electric Company, Limited, a copy of a leaflet descriptive of the Geophone two-valve cabinet listening-in set. Copies of the leaflet can be had on application to Magnet House, Kingsway, mentioning AMATEUR WIRELESS.

Barefaced Evasion

SOME people have a curious idea of the proper way in which to observe conditions. Take, for instance, condition No. 2 on the back of the broadcast licence: "Any receiving set, or any of the following parts, namely: Amplifiers (valve or other), telephone head receivers, loud-speakers and valves, used under this licence, must bear the mark shown in the margin."

The mark referred to is, of course, the well-known B.B.Co. stamp familiar to everybody. We heard the other day that a shop was making a speciality of selling little discs of the regulation pattern already for affixing to sets, and we at once proceeded to test the matter for ourselves by sending a junior member of our staff to a shop in a London suburb where, simply by paying 2s. across the counter, he obtained what appears to be an excellent specimen of the B.B.Co. stamp.

We shall not affix the stamp to any set; rather, we are presenting it, together with the name and address of the dealer, to the B.B.Co.

A Receiving Set in a Cigarette Case

THE construction of what are generally termed "freak type" receivers has exercised the ingenuity of a number of enthusiasts during recent months. On the cover of this issue is shown a particularly neat example, that of a receiver contained in one side of a cigarette-case. The outside dimensions of the case are $3\frac{1}{2}$ in. by $2\frac{1}{4}$ in. by $\frac{1}{2}$ in. The tuning coil is wound on a piece of $\frac{1}{8}$ -in. ebonite, size 3 in. by 2 in. The tuning contacts and terminals are of hard-drawn copper, and the crystal cup is made from a condenser-spacing washer accommodated in a recess in the ebonite. The aerial, earth and phone terminals are indicated in the photograph by the letters A, E and P respectively. Quite good results are obtainable at a range of about 10 miles from the broadcasting station. The total cost of this receiver, exclusive of the case and phones, was 9d.!

"WIRELESS COMPONENT PARTS And How to Make Them"

A practical, thoroughly useful Handbook

1/6 net

CASSELL & CO., LTD., LA BELLE SAUVAGE, LONDON, E.C.4.

BROADCAST TELEPHONY

Some of these transmissions are commercial or official. Wavelengths and times are liable to alteration without notice.

London B.B.C. Station (2 L O), 369 metres. Weekdays, 11.30 a.m. to 12.30 p.m., concert; 5.30 p.m. to 6.15 p.m., children's stories; 7 p.m. to 10.30 p.m., concert and news. Sundays, 8.30 p.m. to 10.30 p.m., concert and news.

Manchester B.B.C. Station (2 Z Y), 385 metres. Weekdays, 11.30 a.m. to 12.30 p.m., concert; 5.30 p.m. to 6.15 p.m., children's stories; 6.30 p.m. to 10.45 p.m., concert and news. Sundays, 8.30 p.m. to 10.45 p.m., concert and news.

Birmingham B.B.C. Station (5 I T), 420 metres. Weekdays, 11.30 a.m. to 12.30 p.m., concert; 5.30 p.m. to 6.15 p.m., children's stories; 7 p.m. to 10.30 p.m., concert and news. Sundays, 8.30 p.m. to 10.30 p.m., concert and news.

Newcastle B.B.C. Station (5 N O), 400 metres. Weekdays, 11.30 a.m. to 12.30 p.m., concert; 5.30 p.m. to 6.15 p.m., children's stories; 7 p.m. to 10.30 p.m., concert and news. Sundays, 8.30 p.m. to 10.30 p.m., concert and news.

Cardiff B.B.C. Station (5 W A), 353 metres. Daily, 11.30 a.m. to 12.30 p.m., concert; 5.30 p.m. to 6.15 p.m., children's stories; 7 p.m. to 10.30 p.m., concert and news.

Glasgow B.B.C. Station (5 S C), 415 metres. Weekdays, 11.30 a.m. to 12.30 p.m., concert; 5.30 p.m. to 6.15 p.m., children's stories; 7 p.m. to 9.30 p.m., concert and news. Sundays, 8.30 p.m. to 10 p.m.

Croydon (G E D), 900 metres. Daily. Eiffel Tower (F L), 2,600 metres. Daily, 6.20 p.m. to 7 p.m., concert, and 10.10 p.m. to 10.20 p.m., concert (weekdays only).

The Hague (P C G G), 1,050 metres. Sundays, 3 p.m. to 5.40 p.m., concert. Mondays,

8.40 p.m. to 9.40 p.m., concert. Thursdays,

8.40 p.m. to 9.40 p.m., concert.

Paris, Concerts Radiola, 1,780 metres. Daily, 5.5 p.m. to 6 p.m., concert; 8.45 p.m. to 9.55 p.m., concert; also concert from 2 p.m. to 3 p.m. on Sundays.

Rome (I C D), 3,200 metres. Daily, 10 a.m. **Königswusterhausen (L P),** 2,800 metres.

Daily, 4 p.m. to 5.30 p.m. **Amsterdam (P C A),** 1,800 metres. Daily, 1.10 p.m.

Haren (O P V H), 900 metres. Daily, every hour from 11.20 a.m. to 4.20 p.m.; 12 noon and 4.50 p.m., weather report on 1,100 metres.

Ecole Supérieure des Postes et Télégraphes 450 metres. Tuesdays and Thursdays, 8 p.m. to 10 p.m., concert. Saturdays, 2.30 p.m. to 6 p.m., educative lectures and concert.

CORRESPONDENCE

Wireless and Native Operators

SIR,—In your issue of January 27 there was a small paragraph reading as follows: "Natives are being trained in India as wireless operators aboard ship."

As a result of this statement we have made inquiries in various quarters, and to date we have not been able to obtain confirmation of this.

It is a well-known fact that a certain number of natives are being trained as wireless watchers for service aboard ship, but as it is possible for a watcher to qualify in a day without having any previous knowledge, there is, of course, no

(Continued on next page)

A TEN-GUINEA PRIZE COMPETITION for all READERS

A PRIZE of Ten Guineas is offered for the best description or explanation (preferably with illustrations) of

any idea or device that will cheapen, simplify or assist the reception of wireless programmes

transmitted from a distance exceeding the range of normal reception.

Readers will recognise that almost any serious improvement of a receiving set comes within the terms of our offer. The Editor, or any expert appointed by him, will be the judge, and his decision is final. The Editor will not reply to any letters relating to this competition until after the closing date.

AMATEUR WIRELESS will be free to publish the competitive efforts in any way it pleases.

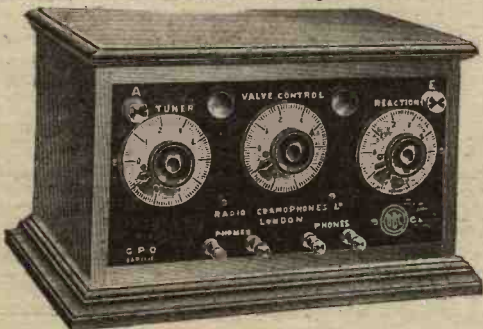
This competition closes on Saturday, May 12. Entries should be addressed: Competition, The Editor, AMATEUR WIRELESS, La Belle Sauvage, London, E.C.4.

The Glasgow Licensing Court looks with strong disapproval on the installation of wireless receiving sets in public-houses.

An Appreciative Letter relating to one of the products of

RADIO GRAMOPHONES LIMITED
30, 31, 32, BOLSOVER ST., LONDON, W.1.

Illustration of the 3-Valve "Midget" set referred to



Polished Mahogany Case—Variometer tuned—has an approximate range of 150 miles for Telephony, and is suitable for working a Loud Speaker within 50 miles of any Broadcasting Station.

PRICE ready for use—with Headphones, Accumulator, Battery and all necessary Wires ... 19 Guineas
READY FOR IMMEDIATE DELIVERY

ADVERTISING NOVELTIES, LTD.
ADVERTISING SPECIALISTS. DEALERS IN WIRELESS APPARATUS, ETC.
REGISTERED OFFICE & SHOWROOMS
8, SOUTH ESK ROAD, FOREST GATE, LONDON, E.C.7.
4th APR 23 1923.
RECEIVED
5 APR 23
Checked by J.A.
Radio Gramophones Ltd., 30 Bolsover Street, W.1.
Dear Sirs,
It will probably interest you to know that when carrying out tests on your Three-Valve MIDGET Set on Good Friday night last the 30th ulto: at Leindon in Essex on a 100 ft. Aerial about 12 feet high, I was able to tune in Glasgow and all the other British Broadcasting Stations, Birmingham 5 I.F. being especially clear, nearly up to the strength of London 2 L.O. It is indeed very gratifying to get such good results and if this letter is likely to be of any use to you you may make use of same.
Yours faithfully,
For and on behalf of
ADVERTISING NOVELTIES LIMITED
J. G. Jellings, Manager.

Enquiries are Invited for Agencies.

CORRESPONDENCE (continued from page 533)
comparison between the two. As a matter of fact, the watcher system has been admitted to be inefficient.

Possibly the paragraph quoted above should have referred to wireless watchers. If this is so, we should esteem it a favour if you would correct it, as it is likely to give a wrong impression to your readers.—Yours faithfully, H. ROBINSON (Association of Wireless Telegraphists), Branch Secretary.

Polished Ebonite

SIR,—Our attention has been called to some comments on page 447 of AMATEUR WIRELESS of the 7th inst., which may lead people to suspect the polished surfaces of the ebonite panels used in our Aristophones. These panels are first given a matt finish in order to remove the polish which is given to the ebonite during its manufacture. The panels are then polished by a special mechanical process which in no way affects the insulating qualities of the material.

Your readers will probably like to know

that where troubles do arise through polished ebonite, this is owing to one of two causes. The polished surface which ordinary ebonite has when first purchased is often obtained by pressing the ebonite when hot on to a flat plate of tin, and in this process a very fine film of metal is sometimes brought away. The presence of the metal cannot be detected by the eye, but it is often sufficient to cause bad insulation, and this polish should therefore invariably be removed. The other source of trouble that people find comes from the use of black compounds, such as graphite, for the purpose of obtaining a polish upon ebonite without the use of the costly process which we employ.—Yours faithfully, C. F. ELWELL, LTD.

American Stations

SIR,—Referring to letter from your correspondent F. L. H. (2 S H), Highgate, in your issue of March 3, regarding reports of receptions from American stations, I think it is more than likely that the sundry stations were only W G Y and

W J Z, as he suggests, the former being the General Electric Company's station at Schenectady, N.Y., and the latter that of the Westinghouse Electric Company at Newark, New Jersey, both being powerful stations. My object in writing you is to suggest that the American custom of pronouncing "Z" as ZEE is no doubt the explanation of the error in the reception of the call letters. With regard to F. L. H.'s reception of broadcasting from an American station last October, when he heard "K" but not the other call letters, this, no doubt, would be K D K A, the Westinghouse Electric Company's station at East Pittsburg, Pennsylvania, which also is one of the most powerful stations.

We have installed here a "Federal" two-circuit four-valve set, combined with a Western Electric Company's loud-speaker, and tune-in these stations on practically every occasion, and it occurred to me that it would interest your correspondents to be enlightened in regard to these three particular stations.—F. W. P. (Cienfuegos, Cuba).

PURE VALVE RECEPTION



Is obtained through using the
FILTRON
Results of rectification by valve are then more pure than crystal reception

VARIABLE GRID LEAK

Obtainable from all reputable dealers or direct from Sole Manufacturers and Patentees at **5/-** each post paid.

RADIO SPECIALITIES 57A, DENBIGH ST., PIMLICO, S.W.1.

S.F.R. HEADPHONES S.F.R.

18/- PER PAIR 18/-
POSTAGE PAID

4,000 ohms, double receivers, single steel head and finished nickel—adjustable, light and comfortable. The S.F.R. Matched tone head-phones were first made in 1908. The fact that they were designed perfect soundmates—matched in tone so as to catch even the faintest signals—solved the first and foremost problem of radio.

The S.F.R. headphones were indispensable when radio was in its infancy—they have grown more and more essential as time has gone on and the Radio industry has expanded.

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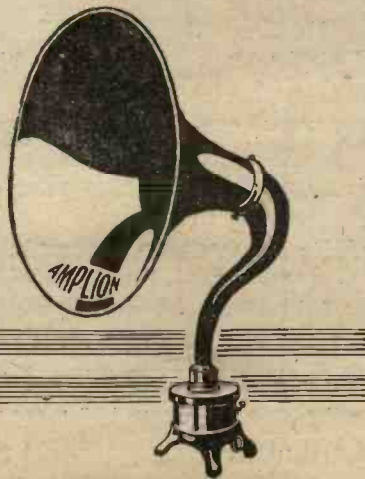
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CLUB DOINGS

Portadown (Ireland) Radio Association.

Hon. Sec.—W. A. HAYES, Moyallon, Portadown.
The first general meeting of the above association took place on March 15, Mr. W. M. Clow, J.P. (president) in the chair. The chairman gave a very interesting address. There was, he said, no such thing as finality, and that people looking back twenty-five years hence may laugh at what we now look upon as the wonders of science.

On March 15 the secretary gave an interesting statement as to the initiatory and subsequent work in connection with the association. It was inaugurated at the end of 1922 soon after permission was given to amateurs in Northern Ireland to experiment in wireless. Previously they had had to be content to watch, with no little envy, the unhampered progress of fellow experimenters in England and Scotland. After giving an account of the difficulties encountered in getting the association going, erection of aerial, etc., he said that although the broadcasting of music and news was a great attraction the association should devote a great deal of its time to experimental work and the furtherance of the science of wireless. They were looking forward to the time when the Northern Government would permit experimenters to hold transmitting licences.

The Beckenham Radio Society.

Hon. Sec.—J. T. BUTTERFIELD, 10, The Close, Elmers End, Beckenham.

A LECTURE was given by the secretary, Mr. Butterfield, on March 22, and his subject was the diagram of the society's new five-valve set.

In closing the meeting the chairman outlined a scheme whereby it was thought possible to raise funds for the building of this instrument. He also mentioned that the secretary would be very pleased to receive any subscription for that purpose.

Mildmay Wireless Club.

Hon. Sec.—E. DU VERGIER, 34, Newington Green, N.16.

This above club has recently been formed under the auspices of the Mildmay Radical Club and Institute, and full particulars may be obtained from the secretary.

Ipswich and District Wireless Club.

Hon. Sec.—H. E. BARBROOK, 55, Fonnereau Road, Ipswich.

At a meeting held on March 25 the competition for the best home-made wireless receiving set, for juniors only, was decided. On this occasion the judging was carried out by Messrs. Walsh, Akester and Bird. Each competitor was asked to supply a paper showing diagram of wiring and any other points relating to their entry. Masters J. Mayhew and Douglas Barbrook each entered a single valve panel and two-valve set, entirely made by themselves at home, and submitted written papers, showing such a grasp of the subject and lucid exposition of the means whereby the results were obtained that it was almost impossible to prefer one to the other, but on points of originality the first prize was awarded to Master Mayhew and the second to Master Barbrook, the third being given to Master A. Tonkins for a two-valve cabinet.



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- H. T. BATTERIES, 36 volt, with wander plug .. carr. paid 7/9
- H. T. BATTERIES, 60 volt, with wander plug .. carr. paid 13/-
- AERIAL WIRE, 7/22 copper stranded, 100 ft. .. carr. paid 3/9
- FILAMENT RESISTANCE for 2 valves each .. carr. paid 3/6
- FILAMENT RESISTANCE for 3 valves each .. carr. paid 4/6
- SPECIAL RHEOSTAT, guaranteed 7 ohms each carr. paid 5/-
- SWITCH ARMS, extra quality with 4 leaf laminated blades .. each carr. paid 2/-
- NUTS. 2 & 4 BA. .. carr. paid, per gross 3/3
- CRYSTAL DETECTOR, horizontal type, Dust-proof each carr. paid 5/9
- CRYSTAL DETECTOR on Ebonite, extra quality carr. paid 3/3
- EBONITE VALVE HOLDERS, 8 nuts, best quality each carr. paid 2/-
- ASSEMBLED VARIABLE CONDENSERS, •001 each carr. paid 7/9
- ASSEMBLED VARIABLE CONDENSERS, •0005 each carr. paid 5/9
- ASSEMBLED VARIABLE CONDENSERS, •0003 each carr. paid 4/9
- SPACER WASHERS, LARGE, carr. paid per gross 3/3
- SPACER WASHERS, SMALL, carr. paid per gross 2/6
- ACCUMULATORS, 4 volt 40 amps., carr. paid 22/6
- ACCUMULATORS, 4 volt 60 amps., carr. paid 32/-
- "BRUNET" pattern Headphones, carr. paid pair 27/6

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 Saturdays 9 to 5 p.m.

M. RAYMOND
 27, LISLE STREET, W.C.2

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EVERYBODY

Come along everybody. This is the place for the right goods at the right price. No rubbish offered.

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| AERIAL WIRE 7/22 | per 100 ft. | 2/4 and 2/9 |
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| FILAMENT RESISTANCES, extra special offer, our usual 3/- line | | 2/6 |
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| SCALES, 0-180 | 3½ and 4d. | |
| INTERVALVE TRANSFORMERS. Guaranteed efficient, 5-1 ratio, splendid value | each | 14/6 and 16/- |
| BASKET COILS. 7 in set, 3/6. "OOJAH" set | | 5/- |
| CRYSTAL DETECTORS on Ebonite | | 2/- |
| CRYSTAL DETECTOR, glass covered, dustproof | | 4/6 |
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| CRYSTAL DETECTOR, extra special | | 2/6 |
| CONTACT STUDS, highly finished | per dozen | 5d. |
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If you are thinking of building your own Set, or of improving your present one, then you must have a copy of this new book.

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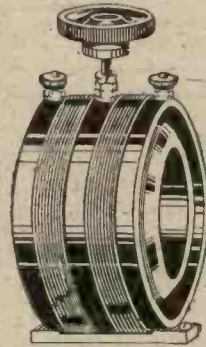
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are just the ideal thing for amateurs building their own Crystal Sets. They cover all broadcast bands, and being a complete unit deal away with all the trouble of connecting studs or sliders.

Post 10/9 Free

With wiring diagram, only crystals and terminals required to complete set.

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We wish to draw attention to the error in our last week's advertisement avertising the above phones. Only Ericsson Cont-nental were intended to be included, at the price of

196

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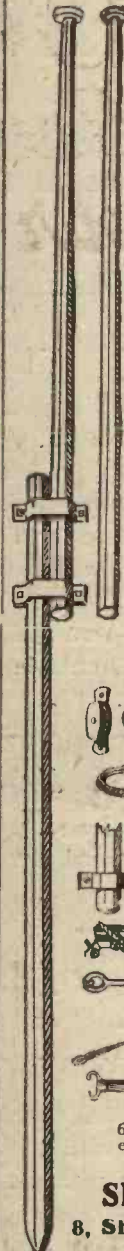
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Designed by Naval Experts.

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Wire rope, galvanised strand, per 100 ft. 3/0

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Send Postage. Galvanised plates for wall or wood 7-in. 1/6 and 2/0

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Double Steel 3-way wall bracket (2 cwt. strain), any projection to 18 in. 13/9

Solid oak posts, metal shoe and ferrule, 2 ft. 6 in. by 2 1/2 in. ... 1/11

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6 ft. Columbian pine Spars, aluminium ends, 2 1/2 lbs., strain 1 1/2 cwt. ... 5/9

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The demand for these cards is very great, and we urge you, in your own interest, to apply at once.

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The neatest and most efficient Crystal set as yet offered to the public at the price. As illustrated and with the following accessories:

1 pair 4,000 ohms British made double headphones, with 6 ft cords, 100 ft. 7/22 copper aerial wire, 40 ft. insulated lead in-wire.

Price £4 5s. complete.

Receiver consists of sloping ebonite panel in Oak Cabinet with lid and clip. Double tuner wound to 9.0 metres, consisting of tappings taken to 2 sets of points, thus

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The **RELIANCE A.1.** Crystal Receiving Cabinet.

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Absolutely the cheapest receiver ever put on the market. Designed for efficiency, simple to operate, with nothing to get out of order.

Consists of Ebonite Panel in oak case with lid and clip and plated fittings. Tuning coil wound to 9.0 metres. Our patent Crystal Detector, consisting of copper spring in arm, ball joint action with variable pressure. Silicon crystal and the whole totally enclosed in dust and damp-proof glass tube. Not a toy but a well made and extremely efficient instrument. A guaranteed range of 15 miles and will take 2 pairs of double headphones.

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No other firm can offer a receiver with this specification at anything approaching our price. Headphones and aerial equipment extra.





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| <p>SPECIAL FRENCH HEADPHONES 4,000 ohms 17/6 per pair.</p> <p>GENUINE FEDERAL PRO ES 4,400 ohms 26/- per pair.</p> <p>CRYSTAL SETS from 19/6.</p> | <p>CELEBRATED BRUNET HEADPHONES 4,000 ohms 24/6 per pair.</p> <p>ERICSSON CONTINENTAL B.H.C. STAMP 4,000 ohms 21/- per pair.</p> <p>VALVE SETS from £8 6/3.</p> |
| <p>Aerial Wire, 100 ft. 7/22 ... 2/6 Lead-in Wire ... 4d. yd. Silk (covered) twin flex ... 4d. yd. gross yds. 21/-</p> <p>Enamelled wire 20 22 G 2/6 per lb. " " 24, 26 G 2/9 " " " " 28 G 3/- " " " " 36 G 3/6 " " D.C.C. " 18, 22 G 2/6 " " " " 24 G 2/9 " " " " 26 G 3/- " " " " 28 G 3/6 " " " " 36 G 8/- " " D.S.C. " 24 G 6/- " " " " 30 G 8/- " "</p> <p>All reels by post 3d. extra.</p> <p>Switch Arms complete ... 1/- each Filament Resistance ... 2/6 Fixed Condensers from 1/4 " Condenser Dials, best quality, engraved ... 2/- " Basket coils 250 to ... 4/9 per set 5,000 metres ... 4/9 per set</p> | <p>Valve holders ... 1/- each " legs ... 9d. doz. " pins ... 6d. "</p> <p>"Brunet" Intervolve transformers ... 15/- each "Polar" Condensers 14/- " Crystal detectors, complete in glass ... 2/6 " Hertzite Crystal, large size, from ... 9d. " Condenser plates ... 1 1/2d. per pr. Contact Studs ... 6d. doz. 2 B.A., 4 B.A., 5 B.A. nuts ... 4d. " Threaded brass rod 2 B.A., 4 B.A. ... 4d. ft. Shell insulators, large size ... 6d. each Ebonite cut any size 4/6 per lb. Knobs, bushed and threaded 2 B.A. ... 4d. each Lead-in tubes, 6 inches 10d. " " 11 inches (Ebonite) 1/4 "</p> |

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All kinds of Accumulator.
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A few of our standard high grade, low priced lines
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They are cut to any size required in special Wireless Grade Ebonite: 1/2 in. thick, 3/4 sq. superficial inch; 1/6 in. thick, 1/2 sq. inch. Sent Post Free.

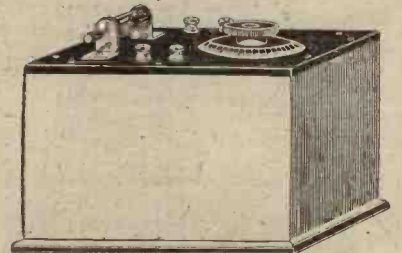
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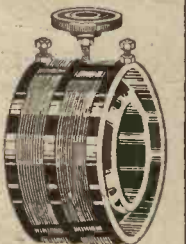


A COMPLETE SET OF PARTS ready for simple assembly comprising: polished mahogany cabinet with ebonite top panel. Variometer wind for wave-lengths from 300 to 50 metres. Crystal Detector with crystals enclosed in dust-proof glass casing. Ebonite knob and dial engraved 0-180°. Aerial, earth and phone terminals. Fixing screws for panel and instructions for complete assembly. (Terminals and all exterior metal parts are nickel-plated.) 25/- ea., post 1/-

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CRYSTAL DETECTORS, comprising: two crystals enclosed in glass casing and mounted on ebonite base with terminals. 3/- ea., post 3/6

POLISHED MAHOGANY BOXES, inside dimensions 4 1/2" x 4" x 4 1/2" deep. 3/6 ea., post. 4/-

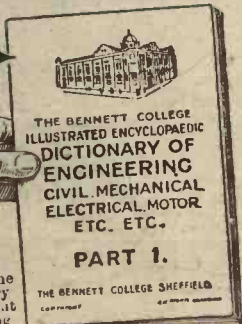


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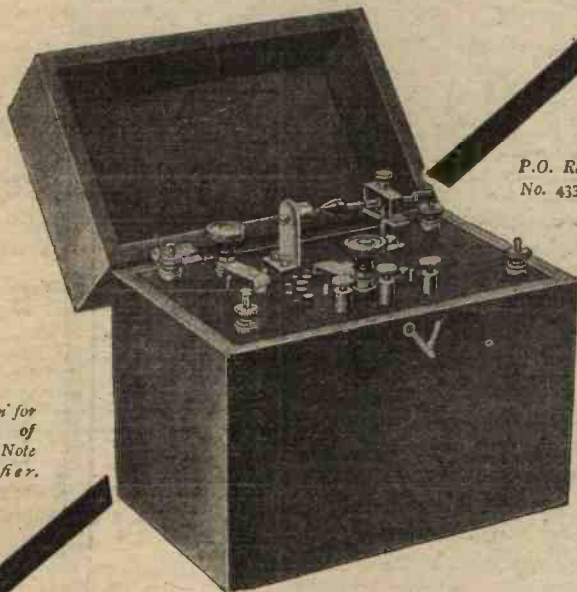
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| 4,000 OHMS pair | 30/- |
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All size Accumulators ready charged.

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DUTCH VALVES 10/- each PLUS CARR.

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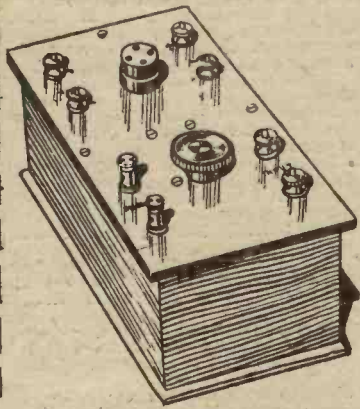
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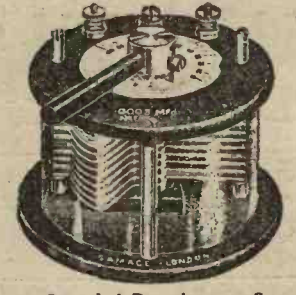


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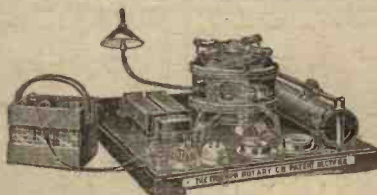
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Advertisements in the Miscellaneous Sale and Exchange column must be prepaid. The rate is 4d. per word; minimum 4/-.

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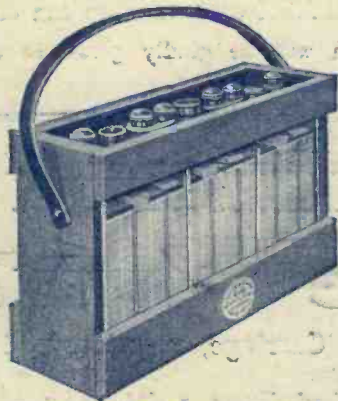
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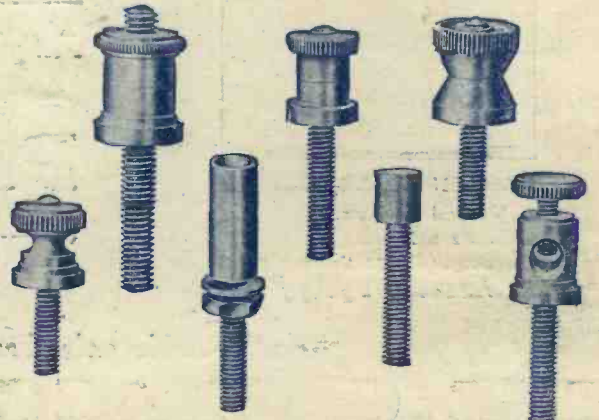
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