

**BUILD YOUR OWN MOVING-COIL LOUD-SPEAKER**

# Amateur Wireless

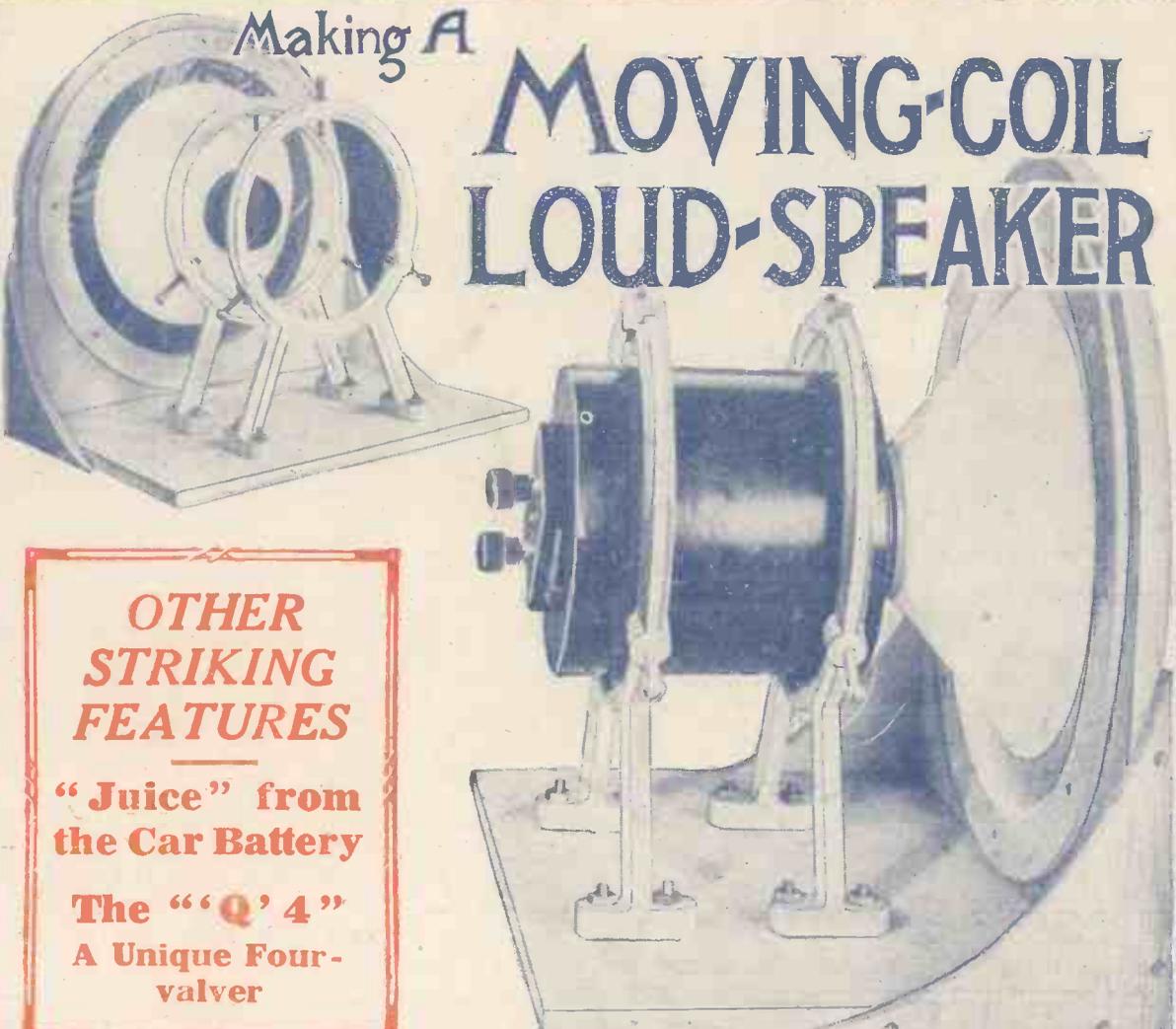
Every Thursday 3<sup>d</sup>  
And Electrics

Vol. XII, No. 307

Saturday, April 28, 1928

Making A

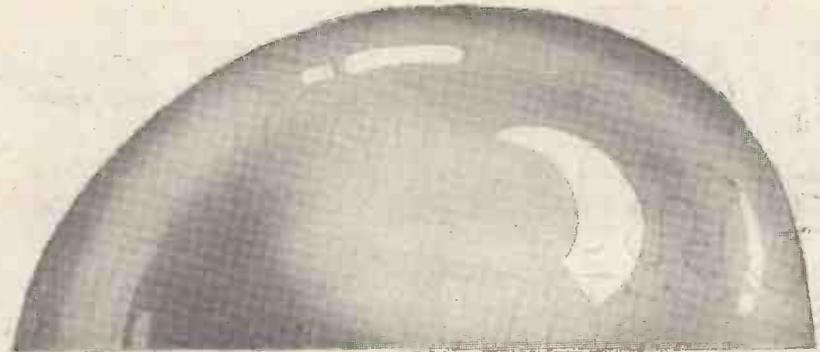
## MOVING-COIL LOUD-SPEAKER



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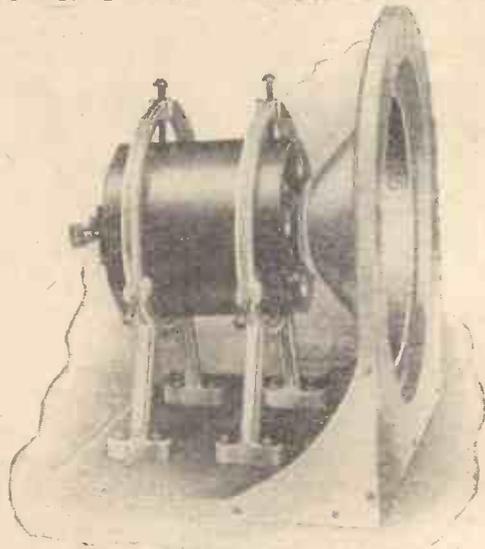
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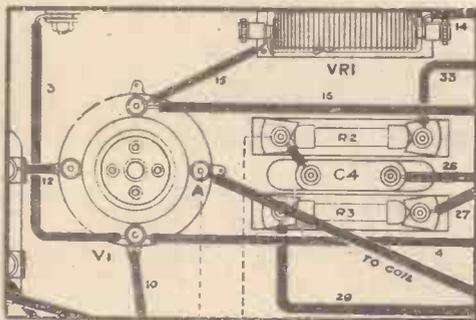
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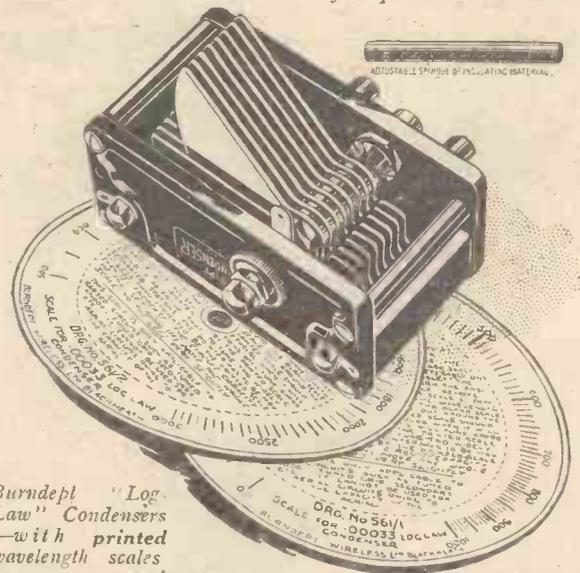
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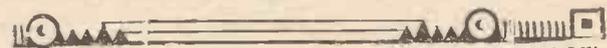
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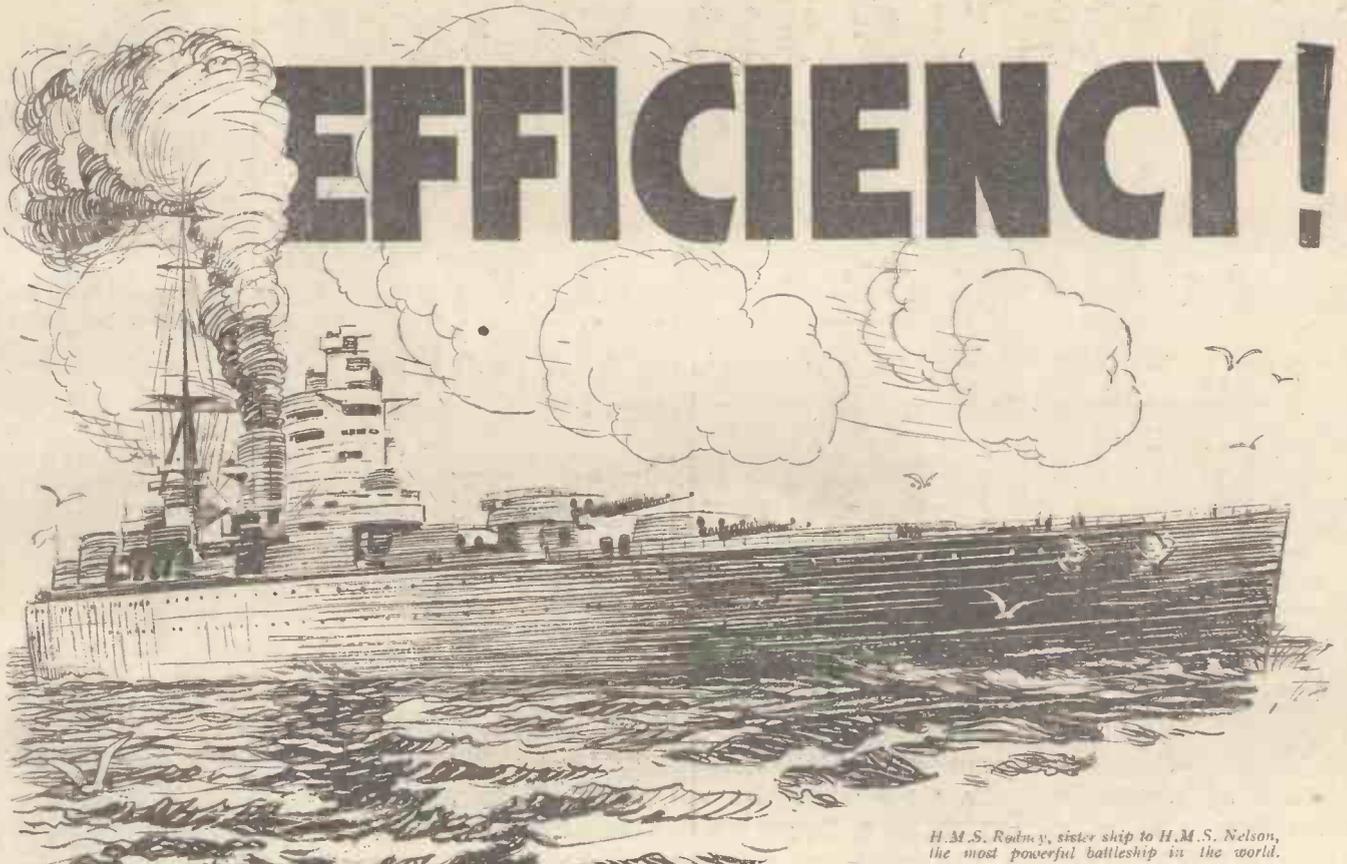
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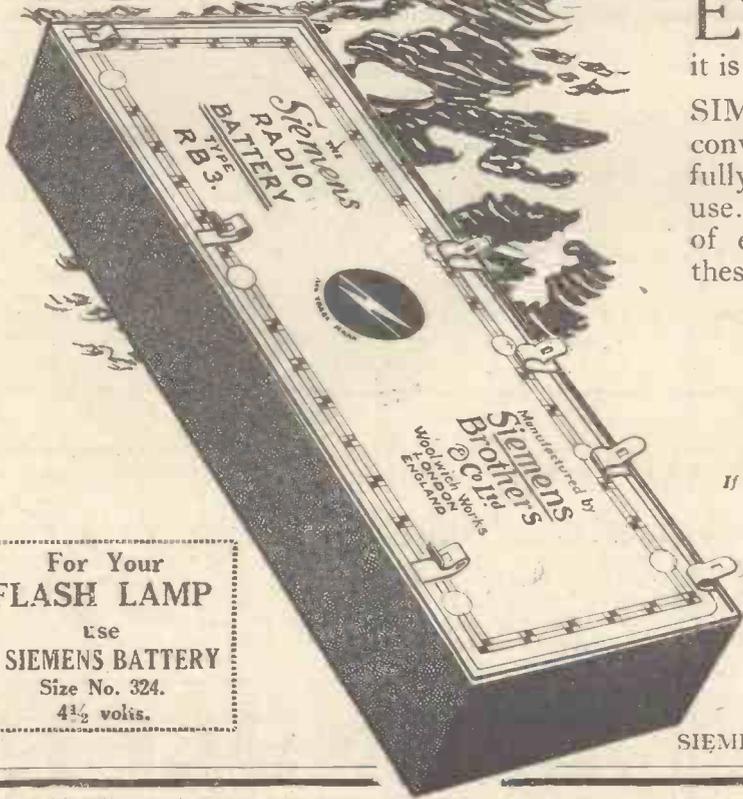
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# Amateur Wireless

and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

Technical Editor: J. H. REYNER, B.Sc.(Hons.), A.M.I.E.E.

Vol. XII. No. 307

APRIL 28, 1928

## New Radio Beacons—German Broadcast Veto—SOS!—Picture Telegrams—Atlantic Eavesdropping—B.B.C.'s Clapham Extension—The "Q" 2

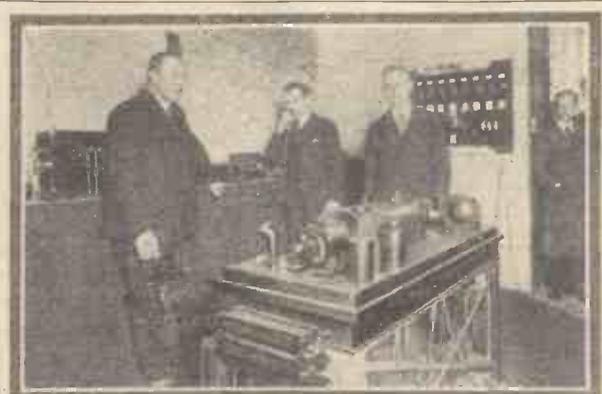
**New Radio Beacons**—An additional wireless aid to ships proceeding up the St. Lawrence River has been provided by the Canadian Government, which recently established three new radio beacon stations. One is at Belle Isle off the coast of Newfoundland, another is at Westpoint on the Isle of Anticosti in the Gulf of St. Lawrence, and the third is at Pointe des Monts, on the northern shore of the river in the Quebec Province.

**German Broadcast Veto**—The German Cabinet has decided not to permit radio to be used for broadcasting election propaganda in the General Elections which will probably be held in May.

**SOS!**—In an appeal recently broadcast from 2LO, Samuel John Brown was asked for, although he had not been heard of for thirty years. Yet, such is the efficacy of the broadcast appeal, within a short time a relative informed the B.B.C. that the particular John Brown wanted had died three years ago.

**Atlantic "Eavesdropping"**—According to a press report, the Post Office engineers have arranged the trans-Atlantic telephone circuits in such a way that eavesdropping by casual listeners, who happen to tune to the long wavelength used, will be rendered impossible in the future, owing to the inversion of the voice-frequency band. When approached by an "A.W." representative, however, the G.P.O. would neither confirm nor deny the report and refused to comment upon it. Inquisitive listeners will, no doubt, very soon find out for themselves if the conversations have been rendered unintelligible!

**Picture Telegrams**—The Engineering Department of the G.P.O. are now conducting experiments in sending telegrams in the form of a picture, so that it shall reach the addressee as a facsimile of the hand-



Our photograph shows the apparatus which has recently been installed in London by the Siemens Company for the transmission of press pictures to and from the provinces. Mr. L. Hermes, who is the London representative for the Siemens Company, is seen on the left

writing of the sender. "If the system is adopted," stated the G.P.O., "another form of charge will be substituted for the present rates, which are based on the number of words sent." Apparently the newspapers are not going to have phototelegraphy all to themselves. Or does this activity signalise an attempt to produce a novel form of 6d. telegram?

**B.B.C.'s Clapham Extension**—When the B.B.C. found that they needed more studios, not only for rehearsals, but for Daventry Experimental programme work,

they took over much of the floor space previously occupied by the Research and Development Section, who, perforce, had to seek outside quarters. They took over Avenue House, Clapham, but even with its twelve rooms, it has now been found necessary to build a workshop in the garden!

**Another Americanism!**—"He's never had a name to himself, except the pallid one of 'Listener-in' so America has found him one—a 'Shut-in.' You're shut in with the darned thing and you've got to take what's coming to you. That's how the Americans see it. Poor 'Shut-in!'"—*Evening News.*

### This Sunday Broadcasting—

Representations amounting almost to an agitation have been made in various quarters for an extension of the broadcast concert programmes on Sundays. The suggested re-arrangement would necessitate a broadcast religious service at about the same time as the normal evening services in the churches. The B.B.C. officially declare that they do not feel justified in over-riding the recommendations of the various religious advisory committees, who unanimously deprecate the idea of religious broadcasts at any time that would clash with normal religious services.

**The "Q" 2**—Full details of the second of the "Q"-coil receivers, designed and described by the "A.W." Technical Staff, will be available next week. An excellent opportunity will thus be afforded to a constructor of moderate means to make use of this latest development. The "Q" 2 is selective enough to separate the local station from 5GB and has the added advantage that without changing coils—just by turning a switch—the long-wave transmissions from Daventry 5XX and other powerful stations can be received with great ease.

### PRINCIPAL CONTENTS

	PAGE
Current Topics .. .. .	635
The German High-sea Broadcasting Service ..	636
The "A.W." Moving-coil Loud-speaker ..	637
"Juice" from the Car Battery .. .. .	639
Practical Odds and Ends .. .. .	640
On Your Wavelength .. .. .	643
Loud-speaker Facts and Fancies .. .. .	645
For the Newcomer .. .. .	646
Sending Power Along a Radio Beam .. .. .	646
Without Fear or Favour .. .. .	647
The "Q" 4 .. .. .	648
"A.W." Tests of Apparatus .. .. .	652
Our Information Bureau .. .. .	654
The "Companion Portable" .. .. .	661

# THE GERMAN HIGH-SEA BROADCASTING SERVICE

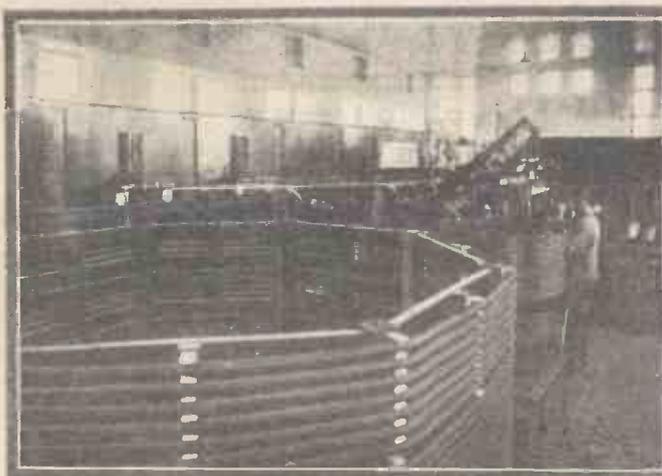
An Account of  
How the German  
Mariner is Assisted

By Dr. ALFRED GRADENWITZ

THE German High-sea Broadcasting Service, started in 1925, with a provisional 5 kw. transmitter, is now carried out by one of the 10 kw. transmitters of the Norddeich Coast Station, which in the case of boats equipped with multi-valve receivers, has a range of about 1,000 miles. It is chiefly intended for the benefit of smaller boats having merely a relatively simple type of receiver.

One of the main tasks the service has to accomplish is the giving out of nautical weather reports which, in conjunction with the German storm warning service, are likely to obviate many risks to ships. A special branch is the broadcasting of ice-bulletins relating to the Baltic. It is a matter of regret that the contemplated co-operation with neighbouring countries adjoining that sea should not yet have led to any satisfactory agreement. Summaries of ice conditions covering the whole of the Baltic were formerly given and though this part of the programme has temporarily been abandoned, it is hoped that it may be taken up again this year.

High-sea broadcasting is of particular importance to fishing boats on the high seas, primarily by the regular reports on sales by auction as given out twice daily



The 10 kw. Telefunken Valve Transmitter

from the more important German fishing centres, supplemented with those from Grimsby, Fleetwood, and Aberdeen.

The giving out of what are termed order messages to boats at sea is likewise part of the daily programme. Shipping companies are thus afforded an opportunity of transmitting instructions to their boats twice daily.

### The Transmitter

The 10 kw. transmitter at Norddeich, which is used for this service is a separately controlled intermediary circuit unit of about 9 kw. aerial output and is arranged

both for telegraphy and telephony. The service, however, is exclusively done by telephone. This transmitter comprises a rectifier system, the valve system, a controlling transmitter, and intermediary circuit, and aerial tuner. It has a wavelength range of from 1,000 to 4,000 metres.

The three-phase current system—3 by 220 volts, 50 cycles—provides the anode and heating energies through suitable transformers, 220-volt continuous current being used in connection with the auxiliary circuits of the transmitter. A balancing capacity serves to smooth down pulsations. While the three generator valves are designed for a maximum total output of 15 kw, they are made to yield only 10 kw. to the intermediary circuit. The heating output of each of them is 25 amperes with 22 volts.

The receiving sets installed on boats having to rely upon this broadcasting service are relatively crude and simple apparatus made of particularly sea-proof elements. While one stage of high-frequency amplification was used in the beginning, two stages have lately been provided. A point has, of course, been made of making these sets as easy to operate as possible.

## DRY-CONTACT RECTIFIERS

THE new copper-to-copper-oxide contact rectifier is the result of a casual discovery made by two American investigators who observed that when an electric current was passed through a copper disc coated with oxide, the resistance of the combination in one direction was much greater than in the reverse. This curious asymmetry grows greater as the applied voltage is increased.

For fractions of a volt the difference is as three to one; at one volt it is eight to one; whilst for an applied pressure of four volts the current passing in one direction is 12,000 times greater than in the other. This at once suggests the use of the combination as a means of converting alternating into direct current.

The new rectifier is of particular advantage to wireless users, since it is capable of passing a comparatively large volume with only a small active surface in operation, namely, 2 amperes per square inch of oxide.

Moreover, there is no filament to burn out, or bulb to break, no liquid to spill or evaporate, and no moving contacts to get out of order.  
M. A. L.

An official statement has been made by the Guernsey (Channel Islands) Postmaster to the effect that wireless instead of cable communication is to be instituted for the transmission of commercial and private telegrams between that island and Alderney. The step is to be taken in view of the many delays and serious expenses arising from damage to the submarine cable caused during the winter storms. If the venture is successful, it is expected that the system will be extended to Sark and that it may also lead to the opening of wireless communication between the main land and the Channel Islands.

Radio and electrical concerns own the largest number of broadcasting stations in Canada, while newspapers are second and the Canadian National Railways, with eleven stations, is third.

## BURY YOUR AERIAL!

IF you cannot get rid of atmospherics take your aerial down and bury it! That is not another way of saying that atmospherics cannot be got rid of, but a sound piece of advice.

Sixty to a hundred feet of wire, wound in a coil of one or one-and-a-half feet diameter, and buried not less than six feet down, will make an aerial which should give good results without atmospherics. The wire should be well insulated. Pitch, sealing-wax, or adhesive tape should be used to insulate the buried end of the wire. The other end goes to the aerial terminal as usual.

The deeper the aerial is buried, the better the results, and country dwellers who have a well handy can obtain an almost ideal aerial.

Excellent results are obtained with the coil of wire below the water. Of course, the wire should be rubber covered in order to keep the water out.

R. N.

# The "A.W." Moving-coil Loud-speaker

Constructional Details of a Modern Instrument that can be Built at a Minimum Cost—By J. SIEGAR.

THE moving-coil loud-speaker is now accepted as the best reproducing instrument, but the average enthusiast hesitates to construct one owing, first, to the "field" current necessary and, secondly, to the comparatively high cost.

Moving-coil loud-speakers in the past have been of the powerful type and no

consumption is only .5 ampere. It was realised that not everybody had mains supply and experience has proved the most useful voltage for the "pot" to be 6 volts. This can be obtained, of course, from an accumulator or from mains.

The principle of the moving-coil loud-speaker is fairly well known, but it may be advantageous to mention here that it consists of a coil of wire attached to a non-resonant free-edge diaphragm situated in the centre of a very strong magnetic field. The output from the set is led to this coil and the current variations cause it to move to and fro. When this happens, that is, when the diaphragm moves forward, air is compressed in front of the diaphragm and rarefied at the back and vice versa.

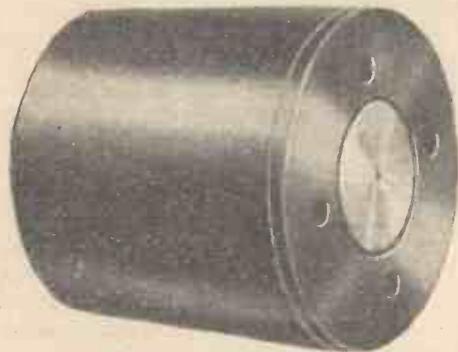
It will be noted that when the air is compressed in the front of the diaphragm the rarefied air at the back will tend to make the air in the front rush towards the back over the edge of the diaphragm. This causes a partial equalisation of pressure on both sides of the diaphragm and a reduction in volume, and for this reason a baffle is required. The baffle prevents circulation of air currents between the back and front of the diaphragm. The best size for this baffle, from a theoretical point of view, should be about 4 ft. square, but in the loud-speaker described here, the baffle has been made as a box which may be open at the back. This, while being nearly as satisfactory, is not so cumbersome as a flat baffle.

The pot has been specially designed to be small and to consume a small amount of current, and, of course, this reduces the cost. The pot consists of a shell of iron, the cover being a push fit secured to the shell by three equally spaced screws. The air gap between the centre pot and the shell has been reduced to an absolute minimum and is  $3/64$  in.

If the reader intends to wind the field coil himself it will be necessary to obtain a cardboard spool which must

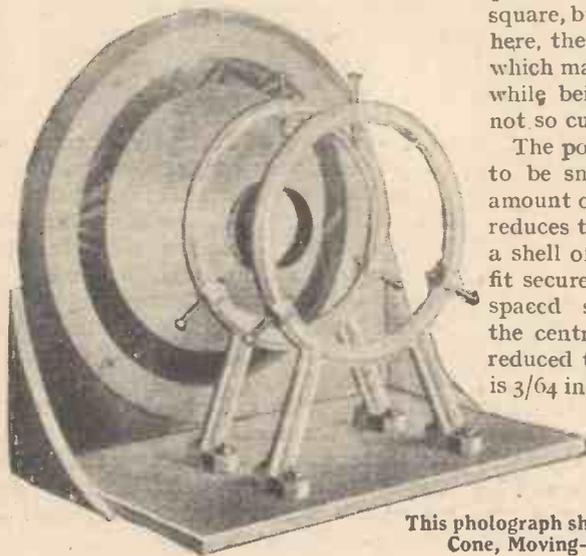
fit fairly tightly over the centre pole. This spool should be well treated with shellac before winding is commenced. The wire used is 20-gauge enamelled, and 1,500 turns are wound on in even layers. When completely wound the coil should be given a liberal coating of shellac and baked in an oven until dry. It should then be bound with Empire tape and well shellacked and baked again. The pot magnet, as used by the writer, was obtained already wound from Goodman's of 27 Farringdon Street, E.C.4.

It will be noticed that the framework is of original and simple design, and this can be obtained from Goodman's.

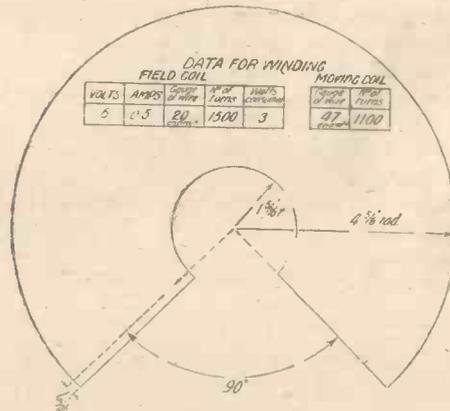


The Loud-speaker "Pot"

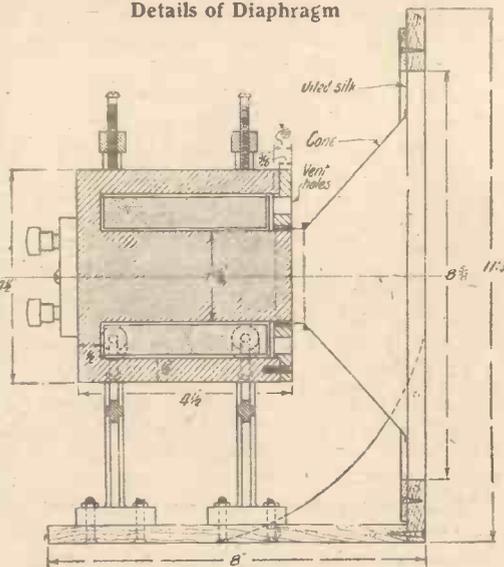
attempt has been made to design an instrument suitable for the average home. It has been realised that a loud-speaker capable of very loud reproduction is not required, but one that would reproduce well enough for an ordinary room would fill a long felt want. The loud-speaker about to be described is of much smaller dimensions than usual, while its field current



This photograph shows the arrangement of Cone, Moving-coil and Framework



Details of Diaphragm

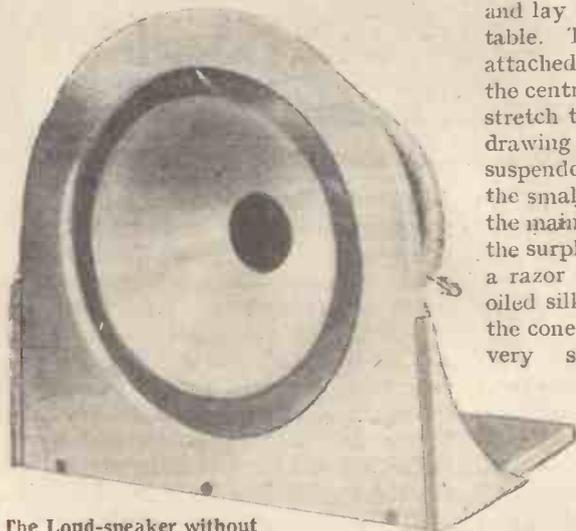


Vertical Section through Loud-speaker

## "THE 'A.W.' MOVING-COIL LOUD-SPEAKER" (Continued)

### The Diaphragm

The diaphragm is constructed from Whatman's "N" surface drawing paper, obtainable from any stationers. The shape of the diaphragm is a circular cone of 90 degrees with a diameter of 7 in. The



The Loud-speaker without the Case

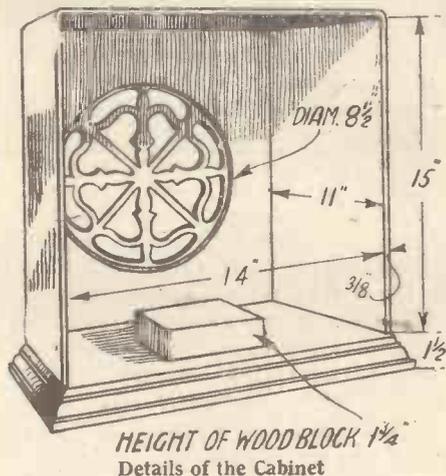
usual re-entrant cone has been omitted, as this has been found to be unnecessary and to make no difference to reproduction. The diagram shows the size of paper required and diameter of circle. When the paper has been cut the cone should be joined with Seccotine or Durofix along the overlapping portion. When sufficient time has been given for this cone to stick securely, the moving coil is fixed.

The cone is laid face downwards and the coil is placed on top so that its plane is exactly parallel with the flat base. Oiled silk, obtainable from any chemists, is used as a diaphragm suspension. A piece of oiled silk, 12 in. square is required. Take the diaphragm, slightly bend the edge all round and then make serrations about  $\frac{1}{4}$  in. apart. Apply Seccotine to this edge

and when "tacky" place the diaphragm face downwards on the centre of the oiled silk. A small weight can be placed on top until the Seccotine is thoroughly dry.

When dry, the diaphragm is ready for fixing to the frame. Remove the smaller ring of the frame by undoing the screws and lay the frame face downwards on the table. Take the diaphragm with oiled silk attached and lay, also face downwards, in the centre of the hole in the frame. Gently stretch the oiled silk and fix by means of drawing pins so that the diaphragm is suspended centrally in the frame. Now the small clamping ring can be screwed to the main frame, drawing pins removed and the surplus oiled silk can be cut away with a razor blade. It will be observed that oiled silk still stretches across the base of the cone. This should be cut away with a very sharp razor blade. We now have the diaphragm suspended by oiled silk.

It is only necessary now to fix the pot magnet to the stand before testing. This is accomplished by fixing the two metal pot carriers to the base of the frame. The centering screws should be carefully



HEIGHT OF WOOD BLOCK  $\frac{1}{4}$   
Details of the Cabinet

adjusted and the pot pushed gently in so that the coil on the diaphragm goes into the circular slot in the pot freely. The screws can be adjusted to a very fine degree so that it is impossible for the moving coil to touch the sides of the gap.

The loud-speaker is now ready for test.



The Complete Instrument

Connect the accumulator to the two terminals mounted at the back of the pot and connect the output of the receiver through a filter circuit or 1-1 transformer to the two flexible connections on the moving coil. Provided the set is of good design (at least two resistance-coupled low-frequency valves are required with a power valve in the last stage), the quality of reproduction will be amazingly life-like. It is absolutely essential that a baffle be employed. This can take any form of artistic design, such as the one shown in the photograph. The loud-speaker and frame are supported on a wooden block inside the cabinet so that the cone diaphragm faces the opening in the cabinet.

If, when in operation, a hiss is heard on certain notes this can be attributed either to the coil touching the sides of the gap or to the coil not being properly secured.

## "HALLO EUROPE!" A New Land-line Development

LAND-LINE relays from Liège and Cologne have already been achieved by the B.B.C. engineers, and all listeners will agree that the Cologne relay, especially, was so successful as to warrant an early repetition. Readers will remember that the B.B.C., in a statement to our own correspondent, remarked "No date has yet been fixed for a further relay, but listeners may look forward at no very distant date to a considerable extension of this new service."

The B.B.C. engineers are now aiming at an All-Europe S.B. switchboard at Savoy Hill with Berlin, Paris, Rome and other of the continental capitals available at

short notice, simply by plugging in just as is now done when a provincial station in the "S.B." network is required.

### A Forthcoming Conference

So far the obstacle has been the lack of efficient co-ordination between the Post-Office officials of the countries concerned. As the Liège and Cologne broadcasts conclusively proved, long-distance relaying over telephone wires is quite feasible, but under present conditions necessitates months of preparation. Great interest will be taken, therefore, in a conference to be held this month at the Hague where representatives of the Post Offices of the

chief countries of Europe will meet to discuss the various problems involved.

This Sub-committee of the International Consultative Committee on Long Distance Broadcasting, as it is called, will report its findings to the main committee, when it meets in Paris some time during June. Mr. Arthur Burrows, the British representative at Geneva, will be on this sub-committee.

The B.B.C. hopes that before the end of the year the ambition will be realised and that as a result of the Hague conference long-distance relaying of continental programmes will become an accepted part of the broadcast service.

Current for Heating the Valve Filaments

Current for the Moving-coil Loud-speaker

# “JUICE” FROM THE CAR BATTERY



By 5YM

ALMOST everybody seems to own a motor-car these days, and the majority of car owners are probably also owners of a wireless set; but very few seem to be aware that it is possible to charge L.T. accumulators from the car battery with ease and economy.

In the case of the car fitted with a 6-volt battery the best plan is to purchase a duplicate battery and use one for the wireless set—with 6-volt valves, of course—whilst the other is in the car. If they are changed about regularly neither gets into a run-down state and the cost of heating the filaments of the valves in the wireless receiver is nothing, unless one likes to charge up against the wireless set a small amount for interest on the money used in purchasing the duplicate battery.

The greater number of cars are, however, fitted with 12-volt batteries, and these are too heavy and of the wrong voltage for wireless use. Such batteries can be used to charge the ordinary 6-volt L.T. accumulator with very little trouble.

**The Charging Board**

First of all a small charging board should be made. The form this will take will depend on whether it is to stand on the running board of the car, or is to be fixed to the wall of the garage. It should have four terminals and a batten lamp-holder of the right size to take an ordinary car lamp. The connections of this very simple charging board are shown in Fig. 1. The negative input and output terminals are connected together and the two spring plugs of the lamp-holder are connected to the two positive terminals. This puts the lamp in series with the accumulator to be charged and allows it to act as a resistance to cut down the current to the correct value for proper charging.

Most small wireless accumulators should be charged at a rate of 2 amps. In this case a 24-watt lamp should be used in the holder. This will pass about 2 amps. and will probably not light to its usual brightness owing to the back pressure of the battery that is being charged. If the normal charging rate of the batteries is 3 amps. then a 36-watt lamp should be used.

If the car is provided with an inspection-lamp socket, and most cars have this fitting, a plug should be obtained that

fits this socket, so that connections can be taken from it to the charging board. If there is no inspection-lamp socket then a bayonet-type plug must be obtained to fit into one of the lamp-holders of the

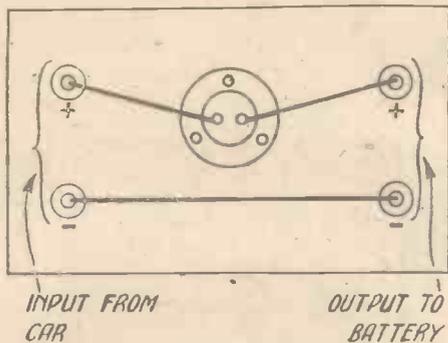


Fig. 1.—A Simple Charging Board

lighting set. In any case, it is necessary to find out which is the positive and which is the negative connection. This can be done by dipping bared ends of flex connected to the socket into a strong solution of salt in water, taking care that the two ends do not touch. The lead from which

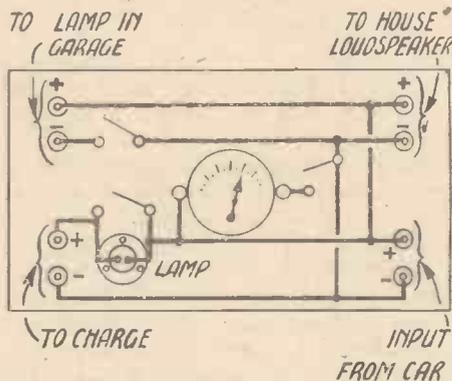


Fig. 2.—This Charging Board has several uses bubbles come freely is the negative one. When this is found out the connection should be marked for future reference.

Probably the ammeter on the car will be connected to the inspection-lamp socket. It will certainly be connected to the light-

ing circuit if that has to be used. This does away with any necessity for providing a separate ammeter, as the rate of charging can be read on the car meter.

When charging is to be done the positive terminal of the output side of the charging board is connected to the positive terminal of the battery to be charged and the negative to negative. The car plug is similarly connected and the appropriate lamp put into the holder. The plug is then inserted into the socket.

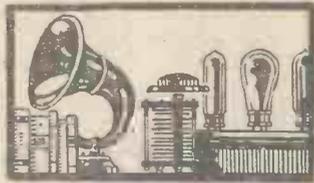
If the car battery is fully charged and in good order, and the wireless accumulator is well down the charging rate will probably be two amperes or a little under to start with, and will fall a little after a few minutes. After that it will remain constant.

Those who have many cells in use for wireless purposes will find that it is possible to charge five cells from a 12-volt accumulator at 2 amps. without using a lamp resistance. In this case the charging rate may be as high as 4 amps. for a few minutes when the car battery is fully charged; but it quickly falls to the normal 2-amp. rate. No harm is done by this initial high rate passing for a short time.

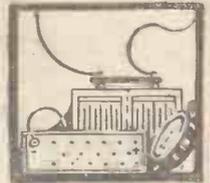
**For the Moving-coil Loud-speaker**

The man who has his garage fairly close to his house and who runs a moving-coil loud-speaker wound for a twelve- or ten-volt supply, will find in his car battery a convenient means of providing the current necessary for exciting the field of the pot magnet. In this case, it is necessary to take fairly heavy lead-covered cable from the garage to the house and to arrange a proper inlet through a convenient window. Because of the risk of fire and ruining the car battery should a short occur, this job should be done with as much care as would be given to the putting in of house-lighting wiring.

Fig. 2 shows the type of charging board I have found most convenient. This provides for a lamp to light the garage, leads to charge accumulators, a sensitive voltmeter to give an indication of the state of the car battery, and leads to the house for exciting the magnet of a moving-coil speaker. A switch is provided to short the charging lamp as it is sometimes required to charge a 10-volt battery.



# PRACTICAL ODDS & ENDS

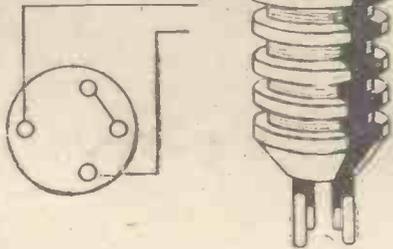


## Using old H.F. Transformers

IN the following way old H.F. transformers can be turned to very good use as H.F. chokes for up-to-date receivers.

All that has to be done is to connect the two windings in series which can be

### Connections



Using Old H.F. Transformers as Chokes

done by shorting the socket as shown. With the old barrel type of transformer wound in sections, this makes an efficient choke with the advantage that various values may be tried in a short time.

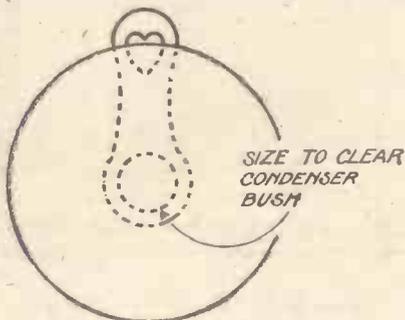
H. R. S. G.

## Dial Indicator

A GOOD dial indicator, which has the additional advantage that no holes need be drilled in the panel for its use, is shown in the drawing given below.

As it is mounted between the panel and the fixing nut of the condenser, its size depends on the dial used.

The indicator can be made from metal



An Easily made and Mounted Indicator

or even stiff white cardboard. Plate metal adds to the appearance or it can be blackened over with just a touch of white left on the point.

A. G.

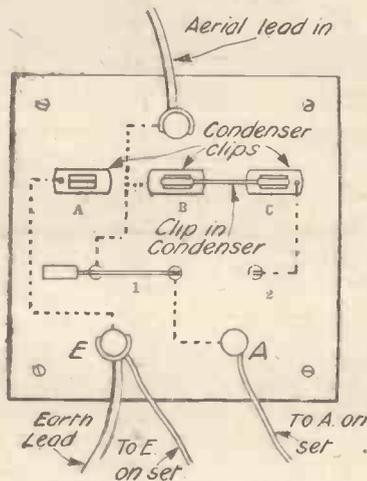
## A Handy A.T.C. Arrangement

THE following gives particulars of a very useful little device which can be made at home by almost any amateur, and will well repay the time spent upon its making.

The unit consists of an ebonite panel

about five inches by four, which is mounted on the wall as near as convenient to the set. The panel should be blocked off from the wall about three quarters of an inch so that there shall be no chance of the backs of the terminals and the wiring from touching the wall at any point. On the panel three McMichael condenser clips are mounted about one and a half inches from the top. A single-pole single-throw knife switch is fixed about one and a quarter inches below the clips. Three terminals are also fixed to the panel, one at the top in the centre and two at the bottom. Reference to the diagram will make the arrangement quite clear.

With this unit properly connected, a small fixed condenser can be used in series



A Unit for Better Tuning

or in parallel with the aerial at will. With the switch in position 1 and the condenser in clips B and C the aerial is connected straight through to the set, and with the switch in position 2 and the condenser in clips B and C as before, the small fixed condenser is placed in series with the aerial, which increases selectivity. With the switch in position 1 and the condenser in clips A and B the condenser is connected across the aerial and earth terminals which has the effect of increasing the capacity of the aerial tuning condenser.

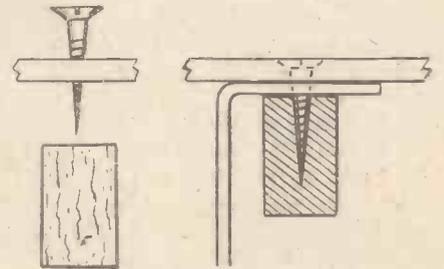
By moving the earth lead from terminal E to terminal A and placing the switch in position 1 it can also be used as an efficient earthing switch.

P. C. R.

LET "Amateur Wireless" Solve  
Your Wireless Problems

## Makeshift Bolts

ALTHOUGH there is nothing to equal the use of bolts or machine-screws for fixing components to a receiver panel, one often finds that in the absence of the right thing some suitable substitute must be



Useful Makeshift Bolt

devised. The sketch shows an idea which might help to solve such a problem.

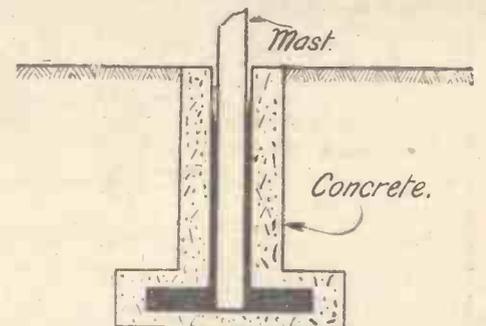
It will be seen that the improvised bolt is an ordinary woodscrew, and that a small block of hardwood serves as the nut. In place of the wooden block a "Rawlplug" might be used, this being gripped very firmly in the pliers when turning the screw.

O. J. R.

## Aerial Pole Erection

THE following idea will be found useful to amateurs erecting wireless masts.

In the usual way, when the pole is fixed and grouted with cement or concrete,

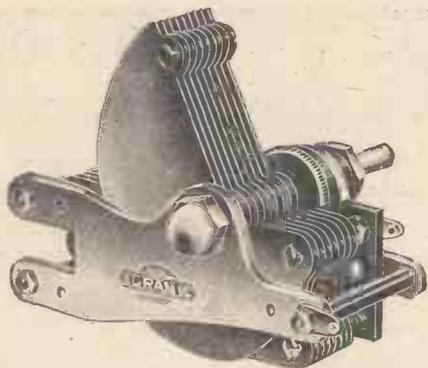


How to Secure the Aerial Pole

repairs, adjustments, and repainting make quite a big job. With the following idea a pole can be taken down and re-erected in a short time, with very little trouble.

A piece of heavy galvanised iron tubing, about 3 ft. long, with its inside diameter no less than the outside diameter of the pole, has a branch piece screwed to the bottom. This is grouted into the earth with concrete if possible, the top of the tube being at the ground level. When the grouting sets a sure and reliable base results.

A. N.



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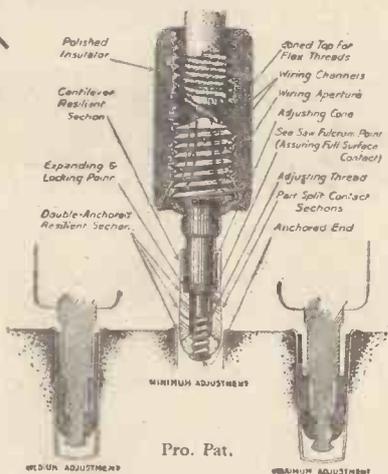


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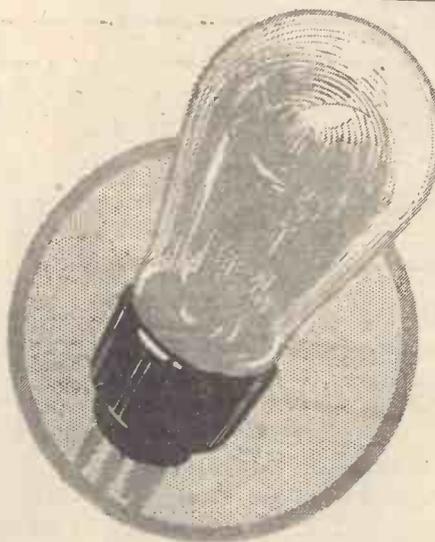
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# On Your Wavelength!

## Mains-supply Restrictions

I WAS talking to Mr. Reyner the other day and I happened to mention a paragraph I had seen in the paper concerning H.T. eliminators. Bangor (North Wales) Council have apparently decided not to permit the connection of eliminators to the mains supply unless they conform to the requirements laid down by their engineer. The report also states that the consumers will be required to give a written undertaking that the Corporation will not be called upon to replace D.C. types with A.C. instruments when the system is changed over. I asked him what he thought about it, as it seemed to me a rather high-handed action.

## Companies' Obligations

He told me that, so far as the first part of the report went, this was nothing unusual, and, in fact, he was in complete agreement with the Council. Any supply company is bound by its charter to supply energy to any consumer at its standard rates, provided that the apparatus is technically sound and free from danger. The first point covers any risk of avoidable danger to the company's plant due to the connection of unsuitable apparatus to the line, while the second point is naturally enforced in the interests of public safety.

## Possible Dangers

Now, with an A.C. eliminator utilising a transformer between the mains and the unit itself, the receiver is completely isolated from the electric-lighting supply, and there is little danger. The principal trouble here arises from the build-up on the condensers when the unit is switched off, and unless suitable safety devices are included it is possible to obtain a serious shock.

With D.C. eliminators, on the other hand (and some cheap A.C. instruments), the apparatus is in direct contact with the power circuit, and this may give rise to trouble. For example, where the positive main is earthed, as is often the case, a dead short-circuit on the system would result if the negative were also connected to earth through a wireless set.

## A Live Aerial

A more serious trouble, perhaps, is the possibility of making the aerial live. This difficulty also arises with the positive earthed main, and it is quite easy to have 220 volts between the aerial and the earth. Some unsuspecting person may catch hold of this, not knowing that it is connected to a power circuit, and may obtain an unpleasant or even serious shock inadvertently.

## Safeguards Wanted

Mr. Reyner contended, therefore—and I must say that I agreed with him—that any Council would be quite within their rights in demanding certain technical requirements from any eliminator. Indeed, he suggested that the matter was one which should be taken up by the B.E.S.A. or some similar body with a view to the preparation of certain standard requirements for eliminators in order to safeguard the public.

## When a Change is Made

On the second point, however, he "registered amusement." (Since this conversation took place at our new film city, Elstree, I suppose I must use film jargon, and I believe this is the correct expression.) Any company which alters its system of supply is bound to replace any apparatus which will not work equally well on the new supply or to make suitable arrangements to enable the existing apparatus to be still employed.

In many instances this has already been done. He told me, for example, that his own company, the North Metropolitan, had, in one or two instances, made very fair arrangements to assist consumers who had been handicapped by a change of supply. "Personally," he said, "I should always welcome a change from D.C. to A.C., because the latter is so much more convenient; but that, of course, is hardly the point. We have A.C. here, of course." Anyhow, I gathered that in his opinion the attitude of the Bangor Council in this matter was not a very strong one and that the matter could be legally contested with a very fair prospect of success.

## An Accidental Experiment

I put an unintentional life test on a vacuum-type resistance the other day. This type of resistance has the conducting element sprayed around a glass rod, the whole being enclosed in a vacuum. Such resistances are marketed by the Loewe people and also the Ediswan Company, the actual test I made being on the Loewe resistance. I shunted it across the output from an eliminator with the object of producing a steadying load, for the eliminator was only supplying a very small current in actual use, and the voltage consequently was apt to rise to a rather high value. So far, so good. The instrument worked excellently as long as I had it on load, but when I switched the load off the drop in current caused a rise in voltage, which was too much for the resistance. The resistance material became red-hot and sundry flashings occurred inside.

## What Happened

I hastily switched off and investigated the matter, thinking that something had broken down, but I could find no trace of any external voltage, and so I switched on again cautiously, and this time was able to see exactly what was happening. The resistance material had become red-hot. This in turn had ionised the small trace of gas inside the glass tube, and a discharge through the tube followed. This was responsible for the "pretty lights." A small calculation quickly showed that the element was being used under very adverse conditions, for the current flowing through it was 16 milliamps, the voltage being nearly 400 volts. (Find the value of the resistance, showing your working. Time allowed, three minutes).

The resistance did not appear to be seriously damaged by the passage of the heavy current, but a further test indicated that it would not stand up to this treatment. It was left on for a few minutes, and at the end of this period it was found that the resistance coating on the inside glass rod had completely volatilised, causing the resistance, of course, to rise to a very high value. A very faint luminous discharge could be observed inside the glass tube. This treatment is, of course, quite unfair, for the resistance is not supposed to carry a heavy current of this order, but the action developed struck me as being rather interesting.

## One Grouch Less!

One big grouch I've had against the radio manufacturers for a long time looks like becoming a thing of the past. The public, the manufacturers, and even the wireless retailers are realising that the silly little H.T. battery eliminator with an output of two or three milliamperes is a complete "wash-out." Used in connection with two or more valves for supplying the H.T., these low-power eliminators limit the amount of anode current to the valves and act as common impedances in the H.T. supply. The natural result is the L.F. coupling of the valves, resulting in oscillation or strong L.F. reaction. The L.F. oscillation can be heard and interferes with reception, but the L.F. reaction effect cannot be heard, and is consequently far more dangerous. In any case, the quality of reproduction suffers very considerably, and is particularly noticeable when a high-quality loud-speaker is used.

## Cheapness That Doesn't Pay

The public naturally prefers to pay as little as possible for its wireless components, and if there is a component which

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**On Your Wavelength! (continued)**

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is inexpensive and which cuts out the costly maintenance problem of the dry H.T. battery, it buys it. The gadget probably works—after a fashion. If a poor loud-speaker is being used when the H.T. eliminator is attached, the added distortion may not be noticed.

The recent introduction of super-super-power valves has probably saved the situation. These valves take such a large current as to be absolutely beyond the capacity of the small H.T. eliminator, and the manufacturers have been forced to produce an article which will deliver the milliamperes in somewhat larger quantities. Needless to say, most of them barely deliver the amount required by the new power valves—and so the old "limiting" trouble crops up again. But the output is now quite O.K. for the old type of valve! Let us be thankful for that, at any rate!

**American Mains Units**

This particular department of H.T. supply units is one in which our manufacturers could very well copy the Americans. Over there, mains units are designed to give an output of 400 volts at 100 milliamperes! This output has practically become a standard output value of all American H.T. supply units. In some cases a special super-power output valve is mounted on the same panel as the supply unit, the whole assembly being called a "power pack." It should be pointed out that the whole of this output is not used by the receiving set and amplifier; the large factor of safety (available "juice" unused) results in much better quality, there being no possibility of L.F. coupling.

Compare this with the absurdly small outputs of many British H.T. supply units! Doesn't it make one blush for our manufacturers and blush still more for the salesman who sold something cheaper than he need have done? The small H.T. supply unit is a greater menace to good quality reception than the dry H.T. battery ever was. The minimum output for an H.T. unit should be, in my opinion, not less than 50 milliamperes at 200 volts.

**Another Quality Tip**

If your mains are not too noisy, here is a tip which may improve the quality of your set. Take the H.T. supply for the last valve direct from the mains (D.C. or rectified A.C.), so that the early valves only are supplied through the smoothing system. This will prevent coupling effects between the last valve and earlier stages, thus preventing L.F. reaction effects and their devastating effect on quality. It entirely removes any tendency of an amplifier to "motor-bike," "motor-boat," or whatever your particular school of thought calls that well-known and most objection-

able indisposition which sometimes attacks amplifiers.

Better still, though rather more expensive, is the great idea of having a separate smoothing unit for each valve supplied with H.T. from the mains. Quite small chokes may be used in early stages, telephone chokes being quite satisfactory.

**A New Station**

It is seldom that one picks up a telephony broadcast in a region of the waveband one usually associates with a plethora of Morse; yet this was my experience and no doubt that of many other wireless enthusiasts a few nights ago. Searching around the outskirts of 5XX (namely, between 1,500 and 1,650 metres) I picked up a call frequently repeated in Finnish, Swedish, and German; I heard the words *Lahti, Tammerfors, and Finland*, so with the usual curiosity inherent to every radiofan I hung on to that wave for dear life. The broadcast consisted of a series of gramophone records—the usual popular classical compositions one hears from restaurant orchestras—and between the items announcements were made in the aforesaid three languages. The German *Achtung, Achtung*, was specially prominent.

**What of 5XX?**

To cut a long story short; it was Lahti, the new Finnish high-power station which, in the near future, will relay the Helsingfors programmes. As the power is said to be some 20 kilowatts in the aerial this fresh arrival on the air will place the Finnish capital entertainments within easy grasp of listeners in the United Kingdom. By comparing the items I heard with those given in the programme broadcast by Helsingfors, I took it that the new transmitter was not being fed by the capital, but from the announcements I understood that it was relaying a transmission from the Tammerfors studio, to which, for the present, at least, it is linked. Since I first picked up this station I have heard it on two further occasions, both of them when 5XX was not working. Whether it will be easy to separate it from Daventry when the latter is in full blast I know not, although, perhaps, its power will assist. Finland uses two languages—namely, Finnish and Swedish—so announcements will remain bilingual.

**Power by Wireless**

A good many readers probably noticed in the lay Press an account of a new valve developed in the laboratories of the General Electric Company of Schenectady, U.S.A., which is specially designed to transmit upon wavelengths vastly shorter than the lowest at present in use for wireless communications. It is claimed that this valve may possibly show the way to

the solution of the problem of sending, not merely messages, but actual power by wireless. The idea is roughly this. For any substance to become a conductor of electricity it must contain a large proportion of electrons that are easily detachable from the atoms to which they properly belong. If all electrons are closely bound up to their atoms, as they are in materials such as glass, ebonite, or porcelain, then the substance made up by the atoms is an insulator.

**The Theoretical Idea**

In the ordinary way air is one of the best insulators known, since its electrons are very hard to detach from their orbits. In certain circumstances, however, air may become ionised, in which case electrons are, so to speak, easily torn out by the roots. In this condition air is a good conductor. It has long been known that ionisation of air can be produced by various kinds of ultra-short waves, such, for example, as those which we know as X-rays. Supposing that we have valves capable of transmitting waves of very short length and that we make use of the beam system, it may be possible to maintain between one place and another two parallel beams of radiations over the whole of whose path the air is strongly ionised. We should thus have two conducting paths through the air along which, in theory, at any rate, it should be possible to transmit an electric current. That is the scheme in baldest outline.

**Much Still to Do**

Do not, however, jump to the conclusion that within a matter of weeks or months you will be lighting your house and working your cooking range or heating your shaving water by means of electricity collected by a power aerial situated on the roof of your desirable residence. An enormous amount of experimental work will have to be done, for you cannot go monkeying about with these ultra-short waves until you know something about their little ways. It is stated, for instance, that during experiments at Schenectady electrical instruments at a considerable distance were damaged, whilst operators were seized with pains in the limbs and rats became greatly excited for a time and finally died.

**Real Interference**

The point that concerns us most as wireless folk is the effect that these beams might have upon transmission and reception. Being conductors, they would be impassable by wireless waves, upon which they would act as deflectors. If, then, the ray system became extensively used for the transmission of power, wireless reception might be very seriously interfered with in the neighbourhood of large industrial centres. However, I don't think that we need worry very much. THERMION.

# Loud-speaker Facts and Fancies

*A proper understanding of the functioning of a loud-speaker will do much to assist in the selection of the most suitable instrument and its correct operation*

This article by our Technical Editor explains many "Whys and Wherefores" of which you may not be aware

IT is an age-old axiom that a chain is as strong as its weakest link. A wireless receiving installation is composed of a large number of links. Indeed, if the sound is traced from studio to drawing-room, the number of links is so large that it is almost incredible that anything like purity of reproduction can be attained at all.

To review the whole subject in a brief article is clearly impossible and we can assume with every justification that the modulated output radiated from the stations of the B.B.C. is a true and faithful reproduction of the initial impulses received by the microphone. Further, the travel of the electric waves over reasonable distances does not introduce any distortion, so that we have an input to the receiving aerial system which can be assumed to be perfectly satisfactory.

## First Stages

In order to convert this into audible speech or music we have first of all to tune the aerial system, then to rectify the impulses obtained in the tuned circuit. Thirdly, we have to amplify the rectified oscillations, and then we have to apply the magnified impulses to a sound-reproducing apparatus. In certain cases additional processes are introduced, but the four operations just outlined represent the simplest means capable of giving loud-speaker reproduction and in every one of those four processes distortion can be introduced.

Modern science has indicated how to minimise distortion, or even avoid it altogether in the first three operations, and we are left with the actual sound-reproducing apparatus as the final link in the chain. Just as the best possible loud-speaker will reproduce very indifferently if the other three links in the chain are badly wrought, so the most carefully designed receiving and amplifying system will be entirely wasted if the actual methods

adopted for converting electrical oscillations into sound is of an unsatisfactory character. It may be remarked, in passing, there is one serious defect common to every form of reproducing apparatus so far employed, namely that of insensitivity. The actual efficiencies vary, but an average value is less than 1 per cent. That is to say, the actual sound energy radiated is usually less than one hundredth of the

in the direction of decreasing the efficiency in order to obtain adequate response at all frequencies. This means that the output from the amplifier must be increased and this in its turn introduces further difficulties into the design of the receiver.

One cannot help wondering whether some radical change in loud-speaker design is not required.

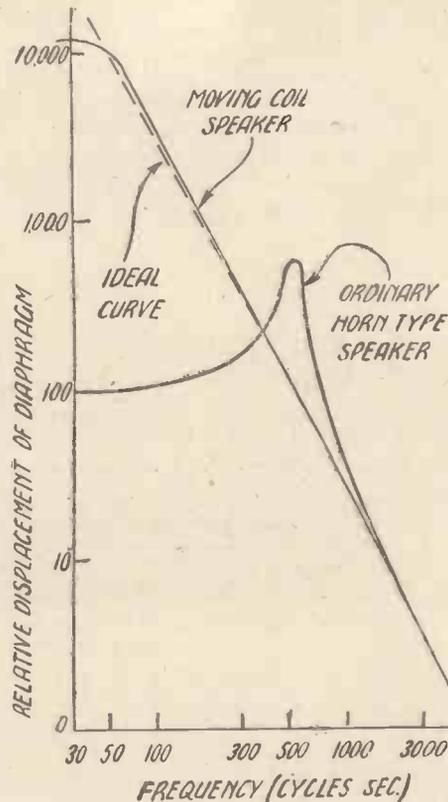
In the meantime, however, it is interesting to review some of the facts in connection with present methods. The principle usually adopted in order to convert electrical energy into sound is to cause the fluctuating currents to attract or repel a diaphragm of some suitable material. This diaphragm, in turn, produces motion of the air in the immediate vicinity which gives rise to a vibrating column of air. The vibrations travel outwards until they reach the ear drum where they produce the sensation of hearing in the ordinary manner.

## Diaphragm Movement

Now the question of the actual movement of the diaphragm necessary in order to produce uniform response at all frequencies is an interesting one. What is required is that the sound energy radiated for a given energy input shall be the same at all frequencies. If we apply an alternating current of 5,000 frequency we shall get a high note in which the vibrations are exceedingly rapid, while if we apply a current at a frequency of 50 cycles per second, a very low note will be obtained with relatively slow vibrations.

Energy is a matter of actual work performed. If we lift a weight of 50 lb. a distance of one foot, we do 50 foot-pounds of work and this would require a definite expenditure of energy on account of lifting the weight. Alternatively, we could lift 100 lb. 6 inches, or 10 lb. 5 ft. The product of the weight and the distance through which it was lifted would be the same in

*(Continued on page 662)*



Amplitude Curves of Loud-speaker Diaphragms energy applied to the device in electrical form.

Moreover, developments which have been taking place recently have rather been

## AUSTRALIA BROADCASTS HINKLER

When Bert Hinkler reached Australia in his light aeroplane from England, the Brisbane broadcasting station at once arranged for a broadcast description of his arrival. Trunk-line circuits were arranged and stations 2FC and 2BL, Sydney and 3LO, Melbourne, were connected to Brisbane and a monster S.B. broadcast thus effected. In addition, 2FC, Sydney, arranged to broadcast the description on its normal 442-metre wavelength and on the short waves. This was the greatest "S.B." ever attempted in Australia, the distance between Melbourne and Bundaberg being 1,500 miles. The airman is seen with his mother in our pictures broadcasting from Melbourne.



## For the Newcomer to Wireless: *What Neutralising Means*

I AM always hearing and reading about neutralised wireless sets or about valves which render neutralising unnecessary. Could you tell me just what neutralising means?

Inside the valve, as you know, there are three electrodes, the grid, the filament and the plate.

The grid surrounds the filament and comes between it and the plate, doesn't it?

Yes. The plate is a metal tube, circular or oval in section and the grid is a spiral of fine wire, generally of a section similar to that of the plate, though, of course, with a smaller diameter. What is formed by two pieces of metal with a dielectric between them?

Why, a condenser.

Exactly. The plate and grid form between them a very small condenser.

Does this condenser affect the valve's performances?

Very much so, especially upon the high-frequency side, for the higher the frequency the more readily do impulses pass through a condenser of given size.

Just what happens?

When the grid and plate circuits of a

high-frequency amplifier are tuned to resonance, energy is fed back through this tiny inter-electrode capacity from plate to grid. It reaches the grid circuit in amplified form and is passed on in the normal way to the plate circuit, whence it is fed back after further amplification to the grid circuit. And so a building up process takes place.

Does it go on indefinitely?

In theory it might, but in practice what happens is that the valve bursts into oscillation immediately after the two circuits have been brought into resonance. The building up is thus definitely limited, which means that we are, or rather I should say we were, prevented from obtaining full amplification from the high-frequency valves.

How is the difficulty got over?

By the neutralising which you were asking about. By taking a tapping at a suitable point in the plate circuit, we can feed back deliberately to the grid, through a tiny variable condenser, impulses that are exactly out of step with those passing from plate to grid inside the valve.

What is the result of this?

The two sets of impulses being opposed to one another cancel out when the neutralising condenser is properly adjusted and the valve becomes stable.

How was stability obtained before neutralising was used?

The only way of doing it in the early days of wireless was to introduce damping into the grid circuit or the plate circuit or both. We used to hold down our H.F. valves either by giving their grids a positive potential and so causing grid current to flow or by introducing a certain amount of resistance into the coil windings. Obviously we could not get much magnification from each stage and for this reason there was no point in making valves with a big amplification factor.

Then modern H.F. valves are better than the old ones?

Very much. They have a far higher amplification factor of which we can make full use. In the last year or two fresh types of valves have been introduced which either neutralise their own inter-electrode capacities or are so arranged that a feed-back does not take place.

## SENDING POWER ALONG A RADIO BEAM

*Possibilities of a New Short-wave Oscillator*

ACCORDING to Mr. Phillips Thomas, Ph.D., of the Westinghouse Electric Co. of America, the time is not far distant when we shall be able to transmit power along a radio beam.

The idea of broadcasting power is not contemplated since the initial power would have to be colossal. The energy picked up would be required to do useful work, such as lighting the house, or running a motor, and it is obvious that the power received at any one point would be just as small a fraction of the total broadcast energy as is received when music and speech are picked up.

When, however, the practicability of concentrating message transmissions had been demonstrated by the success of the beam transmitters, attention was turned to the application of the beam principle to power transmission.

### Reflecting Waves

"Suppose," Dr. Thomas argues, "we have a wave of 10 centimetres, that is 4-in. wavelength. We could reflect this exactly as we do light beams. And suppose again, that we have a means of concentrating power in that beam, what effects should we expect? Quite reasonably we might

expect that the air in the path of the beam would become ionised, that is, it would change from the very good insulator it normally is to quite a fair conductor of electricity. We should then have the equivalent of a small copper wire, except that it would have no weight. No poles would be required to hang it on. It could be aimed at any desired point without allowing for range.

### Receiving Power

"Two such beams, along parallel paths, could have their reflectors connected to the high voltage terminals of the transformer, and a current would flow between the distant ends of the beams. If the two targets were metal plates connected to a transformer so arranged to step down the voltage, power could then be derived at the receiving end without any radio apparatus being required.

"The power to be sent would not have any necessary relation to the size of the radio apparatus at the receiving end, so that once we had the ionised paths the power sent along them could be many times that required to ionise them. The advantages of such a system of power transmission are obvious in, for example,

the case of a locality where the difficulty of erection or expense of high-tension cables would prohibit their use."

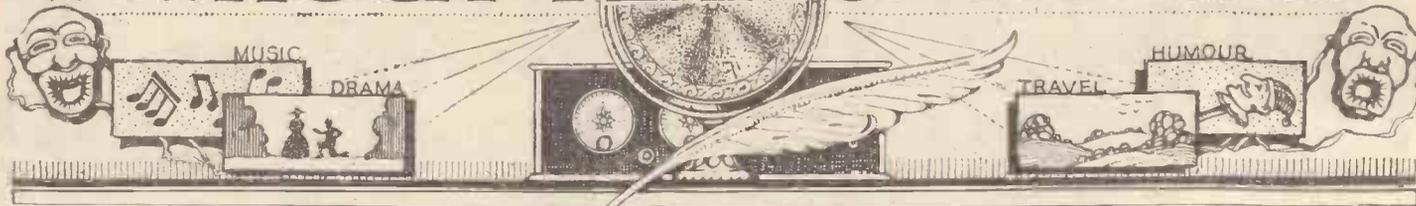
### A "Death Ray"

Such an apparatus, besides its peace-time uses, would be of tremendous value in war time, because it would be fatal to life to come into rays energised by high voltage, just as it is fatal to pick up a high-tension wire from the ground. It would in fact, constitute the much talked of death ray that up to now has been but a phantastic dream of inventors.

All this is quite feasible on one supposition, namely, that we have the ten-centimetre wave and sufficient kilowatts of radio power behind it. This supposition is, at present, impossible of realisation, due to the limitations of vacuum tubes of the standard type. It is not, however, such a large step from the present tubes to the type of tube required as it was from no tubes to the existing type. In fact, a type has been worked out theoretically and has been tried experimentally.

Thus, while power by radio is not yet an established fact, many people are intensely interested and are working hard at the problem.

# WITHOUT FEAR OR FAVOUR



A Weekly Programme Criticism, by Sydney A. Moseley

AFTER quite a decent interval the conflicting voices of those who want to be entertained and those who wish to be educated are being heard again.

You would have thought that with the introduction of the alternative programmes this would have been all done with. "If you don't like *this*, look on *that*!" It must be admitted that the alternative programmes are not necessarily contrasted programmes. Sometimes it is all "igh, 'igh, 'igh up in the 'ills."

No need to give instances. They abound. So that one has to ask whether it is an agreed plan to give all 'igh. The talks especially. The listener needn't probe very deeply to discover that things have been happening in this direction. No more "stunts," such as coffee-stall conversations, or hot-air talk in aeroplanes. "Not so 'igh as 'aughty," is the present-day motto. The syllabus of talks I have received looked to me at first as a programme of a University Extension Course. That is the worst of having "grewed up."

Yet one makes periodical spurts in concentrating on illuminating lectures—one, in fact, tries to recapture the youthful spirit. Alas!

When, then, I switch over somewhere where the balm of music is offered, I content myself with the reflection that, after all, the generation of young men and women are listening keenly to the pearls of wisdom I am missing. . . . Alas, again! They tell me the coming generation has no ear for "jogrefy," but jazz! Pity the poor B.B.C.

And, excuse these reflections! The fact is we have been treated—apart from the talks—to a week of fine music: ballad concerts, chamber music, and popular concerts. Take the last first. Relayed from the Kingsway Hall. Band of the Royal Horse Guards (The Blues) and Gatty Sellars. Gatty got there first, with three of his compositions out of a possible nine. The concert was arranged by him and he played on the organ. Mr. Ashmore Burch sang one of Gatty's songs, the band played one of Gatty's pieces, and Mr. Sellars played on the organ a piece by Gatty!

After a protracted funny item it was found that there was not enough time to play the remaining three items—these being by Gounod, Tchaikowsky, and—Gatty Sellars.

It was arranged, however, for us to have Gatty's piece. Mr. Gounod and his "Chorus and Processional March" were left in the cold, while Mr. Tchaikowsky's "Slavonic March" had no sooner gone a dozen paces when the voice of the commanding officer—from Greenwich—announced halt. Sellars. . . . Sold!

I must leave music for the moment and strike another note. In a variety show from Birmingham the other night a gentleman was telling a serial story of how one Jonathan applied for a verger's job and, because he couldn't sign his name, failed, of how, with a small sum of money given him by the churchwardens, he became a pedlar, a merchant, and finally a prince of finance. By the time the fourth chapter was reached I recognised it as a yarn I had told some years ago in one of my books, a foreign Jew being the hero. How stories do get round. And how they grow! I told it merely in a few words. . . . But when they emerge through the microphone they grow as big as a fisherman's catch.

Why not more popular operatic selections—vocal and orchestral? Failing any of the British stations, I reached out and got some French station giving a selection of *Cavalliera Rusticana*—on gramophone records! It was believed at first that

broadcasting would kill the gramophone industry—but isn't there a possibility of the gramophone industry turning on the hand that has fed it with such remarkable generosity? It's a point worth considering, my Savoy Hill magnates!

I met, by the way, one of the directors of 2LO for the first time.

"Good Heavens!" he said. "I imagined you in a top hat, a thin, austere person. But—you are just one of us!"

From whence, dear readers, did he get *that* impression!

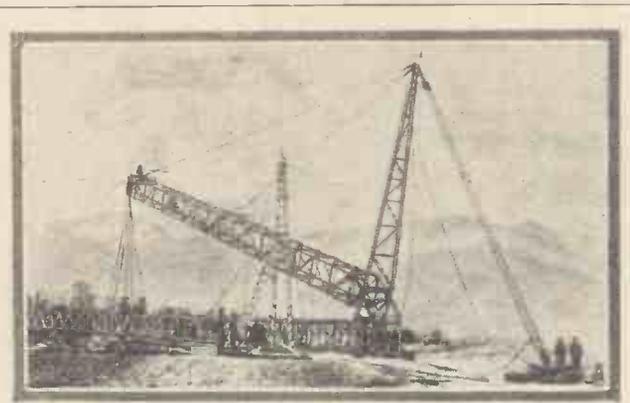
Wrong timing again! A programme by the Offenbach Follies which should have lasted 1¼ hours, finishes *under* the hour. However, the Wireless Orchestra more than made amends. Many thanks to you—both!

I had not space to say what I thought of the recent production of *Speed*. Effects good; too much sameness in incidents; we knew all the time what was going to happen. Propaganda? Well, of the right sort. I hear the public liked it—that is, those who troubled to write in.

*Lord Jim* has apparently got over without question this time. They weren't so certain last year, and I believed I was the only critic who publicly applauded the production. I don't quite like the opening. It doesn't shoot off fast enough. And I should close down on the dramatic point. Less artistic than the book, perhaps, but more appropriate for broadcasting. Congratulations to all concerned.

Oh, by the way. It occurred to me listening to *Lord Jim*, that the Gerschon Partington Quintet might have given us a little variation from the Hindoo song.

In my last week's notes I said one had enough of "small girl" monologues. We have since had another—a horrid thing about a rather horrid little girl. Helen Gardiner (and others) should cut it out. After all, breaking an old lady's jaw and hitting Tony over the head may well be left to the New Cut.



HOW AN AERIAL MAST IS ERECTED

The photograph shows the erection of one of the giant Masts at the New Teheran Broadcasting Station

WE have on more than one occasion referred to the efforts being made to increase the selectivity of broadcast receivers, so that the alternative programmes from 5GB can be received clear of local-station interference. It has also been pointed out that proximity to a broadcast centre necessitates rather special selectivity, of a kind not essential for the adequate separation of distant stations. Many listeners hesitate to complicate the tuning operation in order to eliminate the local station, when such complicated tuning is not really necessary for distant stations.

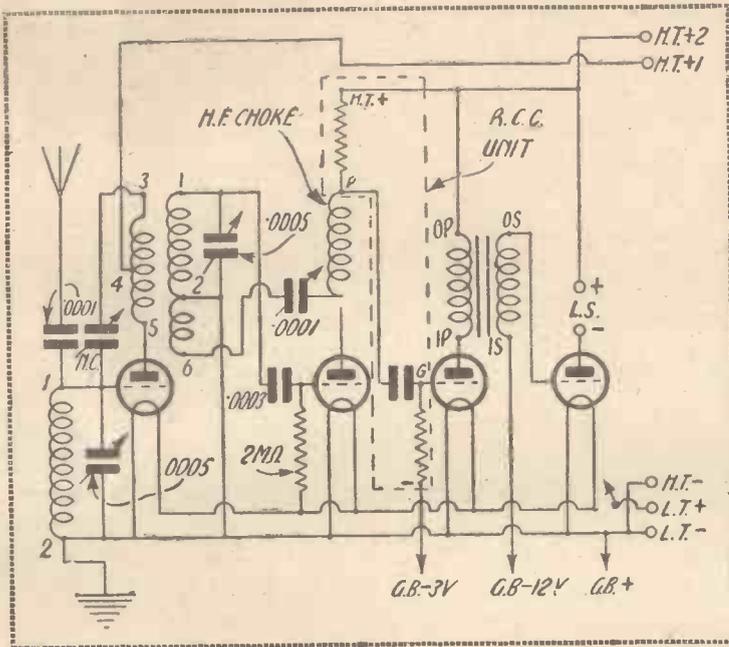
Up to the present we have had to compromise between ease of operation and

at. The "Q" coil has been exhaustively dealt with by Mr. Reyner in his special series of articles and its practicability has been demonstrated by the incorporation of one of these coils in the "Q-Coil Three," described in "A.W." No. 300, dated March 10, 1928.

For the benefit of new readers, it should be explained that the "Q" coil is a coil within a



H.F., DET. and  
2 L.F.  
NO COIL CHANGING



adequate selectivity, but with the coming of the "Q" coil, recently developed for AMATEUR WIRELESS by our Technical Editor, Mr. J. H. Reyner, the solution to the problem appears to have been arrived

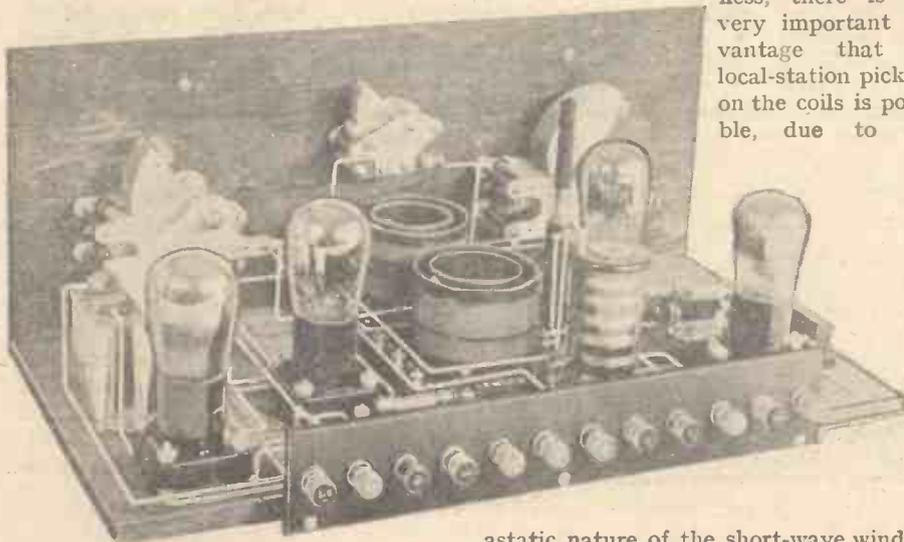
at. waves is controlled by means of a simple panel switch knob.

Apart from the obvious advantages of the "Q" coil, as regards greater efficiency, rapid change of wavelength and cheapness, there is the very important advantage that no local-station pick-up on the coils is possible, due to the

coil, in that there are two solenoid windings, which, on the short wavelength band, are connected in parallel to give an astatic effect and on long waves are connected in series in the normal manner. Switching from short to long

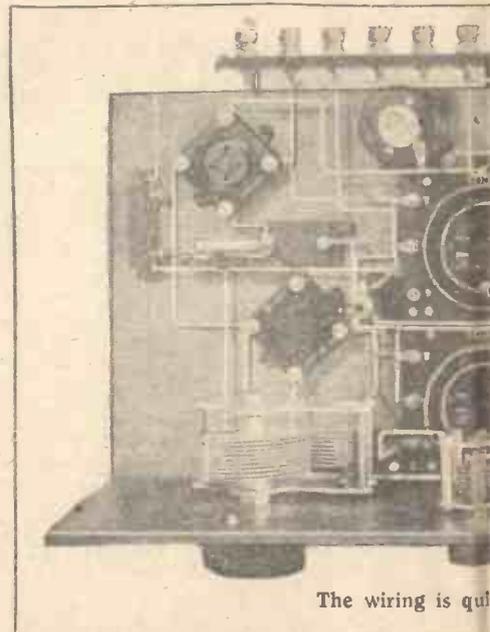
average selectivity, and if in these two circuits "Q" coils are used, we can arrive at an arrangement that will enable us not only to cut out the local in favour of the 5GB alternative, but also to pick up any number of stations on wavelengths quite close to that of the local.

"Q" coils readily lend themselves to "ganging" in that one switch knob on the panel controls the switch rod common to both "Q" coils. Thus for the first time it is possible to switch two tuned circuits from short to long waves by the simple manipulation of a single knob. In the "Q-Coil Three" a simple aerial coil is utilised in order to introduce the new coil to readers, but the "Q" principle is, of



The assembly is simple

astatic nature of the short-wave winding. With two tuned circuits we can get good



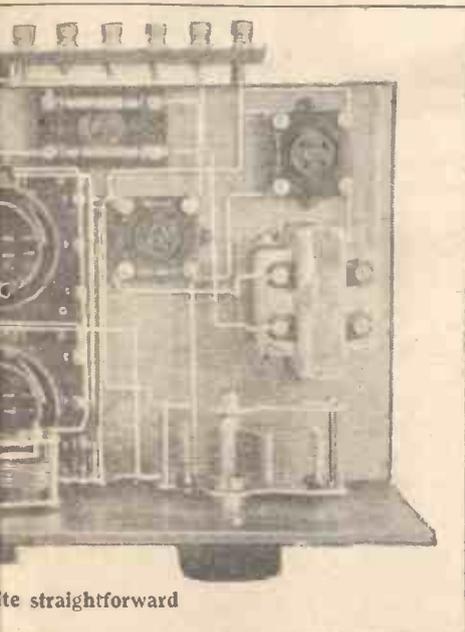
The wiring is qu



course, equally applicable to H.F. transformers. The latest Lewcos "Q" coil comprises all the essentials of the standard split-primary H.F. transformer, together with the additional "Q" winding to give an astatic short-wave transformer and a standard long-wave arrangement. This "Q" transformer, together with a Lewcos "Q" aerial coil, has been incorporated in the "Q" 4, illustrated and described in this article.

### The Circuit

The complete circuit is shown by the diagram, to which the reader is referred. As far as the diagram shows, the arrangement does not differ from the normal, and



te straightforward

requirements of enthusiastic DX listeners and fastidious local station listeners. There is an ample reserve of power for the loud-speaker reproduction of at least a dozen foreign stations.

Although "Q" coils are incorporated, the connections involved are exactly the same as with standard six-pin coils. The Lewcos aerial and H.F. coils of the "Q" type are provided with six numbered terminals, as indicated in the reduced reproduction of the blueprint and in the circuit

it will be noticed that the "Q" coils are represented as simply as possible; only those connections actually involved are indicated.

The experienced reader will see that the four valves are arranged in the sequence of H.F. amplifier, detector, R.C. coupled L.F. amplifier, transformer-coupled L.F. amplifier. Here is a combination of valves capable of satisfying the

numbers "1" and "2" being required. Across these terminals is connected a .0005-microfarad variable condenser for aerial tuning purposes. A .0001-microfarad fixed condenser in series with the aerial and the grid end of the aerial coil is indicated and should not be omitted if selective aerial tuning is desired.

As the special "Q" connections in the H.F. transformer have already been made by the Lewcos firm and only the standard six-pin connections have to be made by the constructor, we can regard the "Q" H.F. transformer in the same way as we should a standard H.F. transformer. Thus the primary is untuned and centre-tapped, the

### List of Components

- |  |   |
|--|---|
| Ebonite or bakelite panel, 18 in. by 7 in. by $\frac{1}{2}$ in. (Ebonart, Raymond, Becol, Pertinax). | Neutralising condenser (Gambrell, Igranic).   |
| Two .0005-microfarad variable condensers (Igranic, Burndept, Polar, Cydon, Ormond).                  | High-frequency choke (R.I. and Varley, Wearite, Lissen, Trix).  |
| .0001-microfarad variable condenser (Cydon, Bebe, Igranic, Bowyer-Lowe).                             | Resistance capacity coupling unit (Carborundum, R.I. and Varley, Lissen, Dubilier).   |
| Push-pull filament switch (Lissen, Bulgin, Trix, Wearite).   | Low-frequency transformer (Pow-quip—Orchestra, Ferranti, Igranic, R.I. and Varley, Lissen).   |
| Four anti-microphonic valve-holders (Benjamin, Wearite, Igranic).                                    | Connecting wire (Glazite, Junit).   |
| Aerial "Q" coil (Lewcos, Wearite, Colvern).  | Ebonite or bakelite terminal strip, 12 in. by 2 in. by $\frac{1}{4}$ in. (Raymond, Ebonart, Becol, Pertinax).                                 |
| H.F. transformer "Q" coil (Lewcos, Wearite, Colvern).  | 12 terminals marked Aerial, Earth, L.T.+ , L.T.—, H.T.—, H.T.+1, H.T.+2, G.B.+ , G.B.—1, G.B.—2, L.S.+ , L.S.— (Belling-Lee, Eelee, Igranic). |
| .0001-microfarad fixed condenser (Lissen, T.C.C., Dubilier, C.D.M.).                                 | Baseboard, 18 in. by 9 in. by $\frac{1}{4}$ in. (Camco).  |
| .0003-microfarad fixed condenser and combinator (Lissen, T.C.C., Dubilier, C.D.M.).                  | 2 Dial indicators (Bulgin).   |
| 2-megohm grid leak (Lissen, Dubilier, Mullard).  |   |

centre-tap going to H.T.+1 and the "free" end, that is remote from the anode end, is taken through a suitable neutralising condenser to the grid of the H.F. valve. The

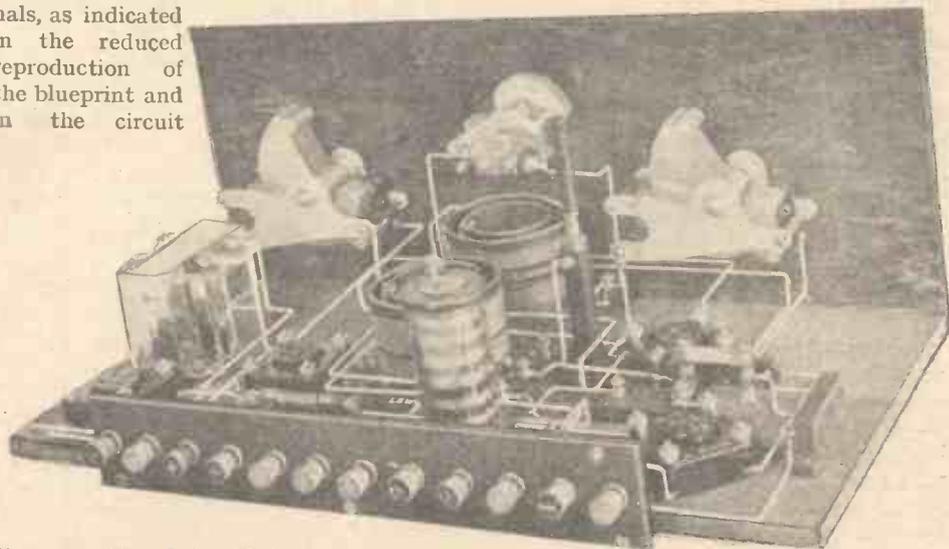
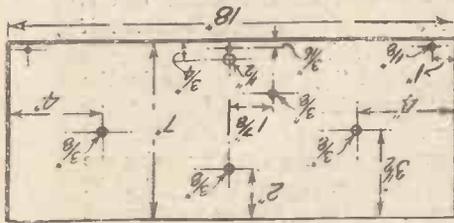


diagram. The aerial "Q" coil connections are, of course, extremely simple, only

The components are compactly arranged

"THE 'Q' 4" (Continued from preceding page)

secondary of the H.F. transformer, that is the section marked "1-2" is tuned with a variable condenser similar to that used for aerial tuning. Since there will be little



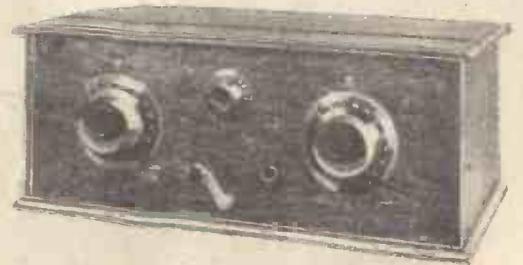
Details of Panel

variation of aerial tuning, caused by varying sizes of aerials on account of the series fixed condenser in the aerial lead, it will be found that these two similar

.0001-microfarad reaction condenser to the anode of the detector valve. An H.F. choke in the anode circuit of the detector valve, that is between the anode and the coupling condenser side of the anode resistance, has the effect of diverting the H.F. oscillations flowing in the anode circuit of the detector valve through the reaction system.

The L.F. transformer connections are, of course, perfectly straight forward, and it will be sufficient here to point out that the O.P. connection from the primary winding is taken to H.T. +2, in common with the anode leads from the detector and second L.F. amplifying valve. H.T. - is connected to L.T. -, conforming with standard "A.W." practice. The remaining

were not considered to be necessary for the successful operation of the receiver. If, however, the constructor should use valves with a filament voltage rating appreciably



The Finished Receiver

lower than that of the accumulator, a suitable rheostat or resistance capable of carrying the total current consumption of the four valves actually used should be incorporated.

Construction

The components are disposed as indicated in the various photographic views and in the reduced reproduction of the full size blueprint, available price 1s. 6d. from the Blueprint Service, AMATEUR WIRELESS, 58-61 Fetter Lane, E.C.4. To combine ease of operation and symmetry of layout is not always a simple matter, but in the "Q' 4" a perfectly symmetrical panel arrangement is obtained by balancing the "Q"-coil switch knob with the filament on-off switch.

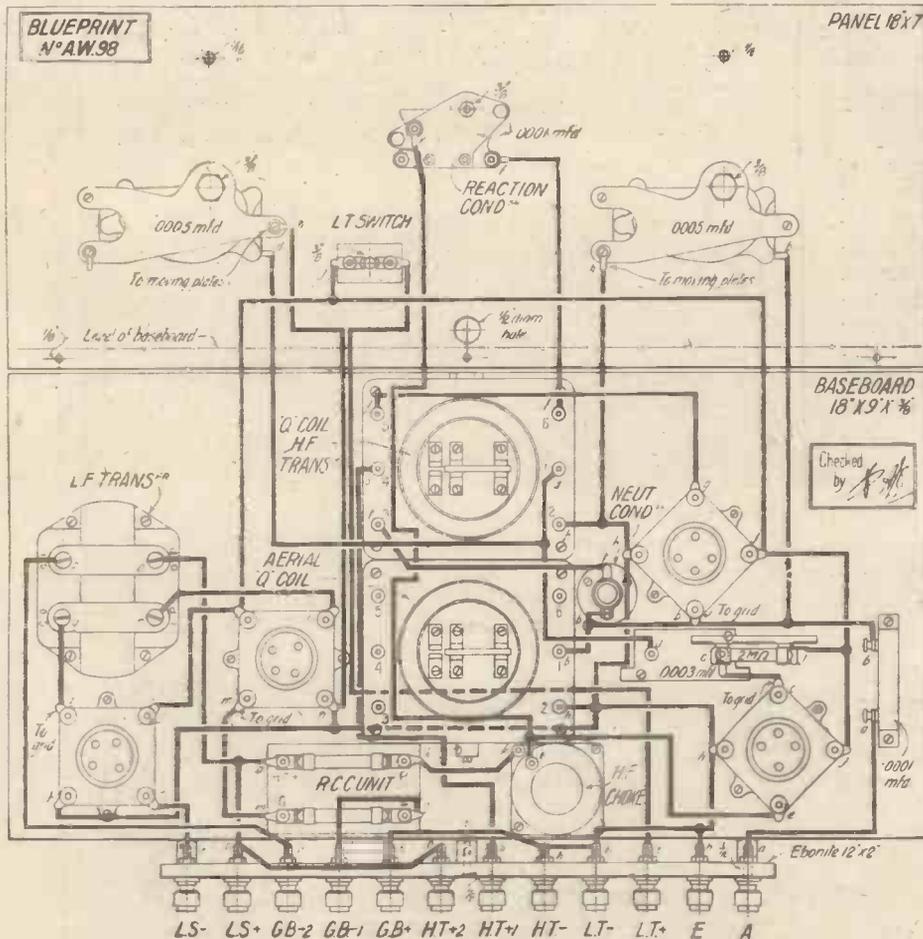
These two controls are shown low down in the panel and above and between them is the small knob of the reaction condenser. At the left-hand end of the panel is the aerial tuning condenser, and at the right-hand end the H.F. transformer tuning condenser. Besides its neat and business-like appearance the panel layout adopted makes for easy operation, as will be appreciated when the complete receiver is tested.

The main baseboard components are, of course, the two "Q" coils, arranged side-by-side in the centre of the baseboard so that the switch rod from the knob on the panel passes through the two bases to a clamping bolt of the outer side of the H.F. aerial coil base.

Take care when screwing these coils to the baseboard to see that they are the right way round. Looking from the back of the receiver the left-hand terminal numbers on the bases should read 3, 4, 5 in each case.

The four valve-holders, L.F. transformer, R.C. coupler, H.F. choke, neutralising condenser, fixed condensers and grid leak are then mounted in approximately the positions indicated. The terminal strip at the back carries all the receiver terminals including those for aerial, earth, loud-speaker and batteries.

(Continued on page 655)



The Wiring Diagram. Blueprint available, price 1/6

tuning condensers give approximately similar readings—a factor that contributes to the ease of operation in long-distance reception.

There is another winding marked "2-6" on the main secondary, which is used in conjunction with a .0001-microfarad variable condenser to give Reinartz reaction. It will be seen that the free end of this reaction winding, marked "6" is taken through the

battery connections consist of the two G.B. negative leads, one from the free end of the grid-leak of the first L.F. amplifying valve, the other in the I.S. connection of the L.F. transformer and G.B. plus from L.T. —

A filament switch in the L.T. positive lead gives an on-off control of the filament current of all four valves. There are no filament resistances of any kind, as these



# A SEASIDE BROADCAST

*A Link with your Holidays ahead—  
song, laughter, dance and jest.*

There are holiday concerts to come, broadcasting with the sound of the sea in it. You want pure HT. current for this, and you can be sure of getting it if you always use a Lissen New Process Battery in your set. For the Lissen Battery yields an energy which is clean and steady flowing, which is noiseless and long lasting, which is smoother than any other form of current available to you. The cells are big, they have a remarkably large oxygen content, they have a low internal resistance which remains low. Not only that, but there is a new process and a new chemical combination used which is embodied only in the Lissen New Process Battery. If you would like to hear your seaside broadcast clearly and distinctly all the time, no matter how far away the concert may be, use a Lissen New Process Battery. Ask for it at any one of 10,000 radio dealers. Say "Lissen New Process Battery" and show clearly by the way you ask that you mean to take no other.

60 volts (reads 86)	..	7/11
100 " " 105)	..	12/11
60 " Super Power	..	13/8
0 " Grid Bias	..	1/8
4 1/2 " Pocket Battery	..	5d.

LISSEN LTD., 16-20 Friars Lane, Richmond, Surrey.

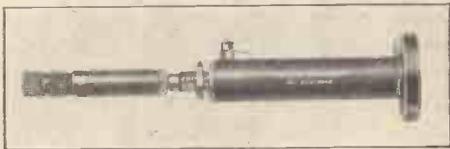
Managing Director: Thomas N. Cole.

## "A.W." TESTS OF APPARATUS

Conducted by our Technical Editor, J. H. REYNER, B.Sc. (Hons.), A.M.I.E.E.

### Gambrell Neutrovernia Condenser

A POOR adjustment of the neutralising condenser will often cause very noticeable defects such as instability and "ploppy" reaction. Under such circum-



Gambrell Neutrovernia Condenser

stances, a slow-motion neutralising condenser, as the Gambrell Neutrovernia, is certainly a boon. This condenser has been carefully designed. In the first place, it has an ample range extending from 2 micro-microfarads to 38 micro-microfarads, which makes it suitable for use with any type of existing valve. Secondly, six complete turns of the operating handle are required to cover the full range, and in consequence, very accurate adjustment is possible.

The component consists essentially of a metal plunger which can slide up and down, but cannot rotate. The ebonite operating handle is fixed to a screw-threaded rod, which runs through the centre of the plunger and causes the latter to move either up or down, according to the direction of rotation of the handle. The plunger forms one plate of the condenser whilst the other plate is the circular metal shroud into which the plunger fits. It is impossible to short-circuit the condenser internally. External protection is afforded by an insulated sleeve which covers the body of the component. A circular insulated disc is provided for mounting to the baseboard, or if desired, the component can be fixed to the panel by drilling a single hole. The unit is made by Gambrell Brothers, of 76 Victoria Street, S.W.1.

### Hovey Indoor Aerial

THERE are large numbers of people who are not in a position to erect an outside aerial and have, therefore, to rely upon some form of indoor aerial. In these circumstances, a frame aerial is certainly a possibility, but suffers from the disadvantage of being a poor collector of radiated energy.

Some time ago we tested a Hovey indoor aerial which could be slung up in a room, but occupied a fixed span. The makers have now designed a new pattern which is adjustable for span to suit different rooms. It consists of a coil of heavy gauge nickel-plated wire which can be extended to the

required length and is held in position by two string leads which are fixed at either end of the room. The aerial is, therefore, self-supporting. The supporting string terminates in narrow ebonite strips, at one end of which there is a terminal for connection to the down lead. A heavy rubber ring is fixed to each ebonite strip and forms a suitable method of attaching the aerial to a hook or cable at each end of the room.

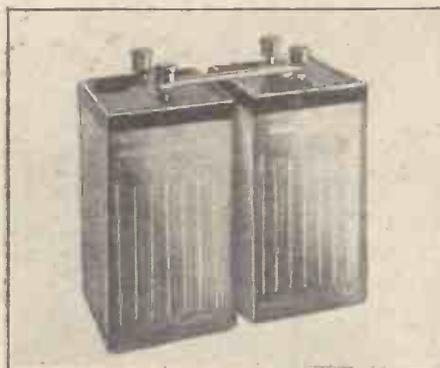
When tested in our laboratories, the aerial gave quite good results. At a distance of 12 miles from 2LO it was possible to obtain good loud-speaker strength on an ordinary two-valve receiver.

### Ediswan Loten Accumulator

TWO-VOLT valves occupy such an important position and are so universally popular, that the single-cell accumulator is much in vogue. Since modern receiving valves consume a very small current, such accumulators are expected to retain their charge for long periods.

We recently received for test a Loten two-volt L.T. cell, made by Edison Swan Electric Co., Ltd., of 123-5 Queen Victoria Street, E.C.4. The cell has external dimensions of 4½ in. by 4¾ in. by 9 in. high over all, and a rated capacity of 15 actual ampere hours. The positive and negative plates are housed in a glass container and separated by infernal projections on the glass, thus giving a low internal resistance with free circulation of acid. The glass container, although adding slightly to the weight of the completed article, is leak-proof and is, therefore, a safeguard against accidental damage due to spilt acid.

The terminals have a black and red



Two Ediswan "Loten" Cells Linked Together

insulated covering and are raised well above the top of the accumulator in order to lessen the possibility of corrosion. This cell is intended for heavy duty work and has sufficient electrical capacity to heat the

filaments of a multi-valve receiver. So that the cells may be used to form larger accumulators, suitable lead connecting links are supplied by the makers.

### Amplion Vivavox Pick-up

GRAMOPHONE pick-ups are popular at the present time, since they form a means of obtaining excellent reproduction from electrically recorded records. In them special attention must be given to eliminating any tendency for rattle, while records will very easily become harmed unless the weight of the pick-up and its actual position with regard to the record, are correct.

Special attention has been paid to these points in the pick-up made by Graham Amplion, Ltd., of 341 Goswell Road, E.C.1. The component is noticeably light, while owing to the provision of a long and robust connecting sleeve the chance of misalignment occurring due to faulty connection with the tone arm, is remote.



Amplion Vivavox Pick-up

The pick-up itself is of the electromagnetic type, which is of proved efficiency. A neat volume control is supplied with the instrument. The complete unit is supplied with an ample length of flex, whilst full instructions and diagrams are given for connecting up.

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**Wireless Loud-speakers** (second edition), by N. W. McLachlan (Iliffe & Sons, Ltd., London). Those who are interested in the principles and design of loud-speakers will find this handbook a very practical work. The early chapters deal with the essential theoretical considerations and later chapters show how these are practically applied, considerable prominence being given to cone and moving-coil instruments. Associated with the problem of quality reproduction is that of amplification, and this matter is also dealt with at length.

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1 Lissen L.F. Transformer	-	-	-	8/6
1 Lissen R.C.C. Unit	-	-	-	4/-
1 Lissen Resistor (7 ohms)	-	-	-	2/6
2 Lissen Valveholders at 1/- each	-	-	-	2/-
1 Lissen Fixed Condenser	-	-	-	1/-
1 Lissen Filament Switch	-	-	-	1/-
				<hr/>
1 Ebonite Panel, size about 8" x 6" x 1/4"	-	-	-	19/-
1 Ebonite Terminal Strip, about 5" x 2" x 1/4"	-	-	-	4/-
1 Baseboard (from your local joiner), 8" x 6" x 3/16"	-	-	-	1/6
Screws, Terminals and Wire	-	-	about	4/-
<b>Total cost (except valves and batteries)</b>				<b>28/6</b>

10,000 radio dealers will sell you all these parts at the prices stated. No matter what may be specified in any circuit or instructions you are building to, use LISSEN parts wherever you can. Your radio dealer will also willingly tell you how to connect every circuit you are interested in if you tell him you intend to use LISSEN parts and buy them from him.



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#### "Easter Portable."

**Q.**—Is it quite safe to leave the "Easter Portable" connected to the car battery when the engine is running and charging the battery?—H. G. (Birmingham).

**A.**—It is advisable not to attempt to charge the car battery while the receiver is connected up, as if the charging rate of the car dynamo is greater than the consumption of the receiver the valves will be ruined. The dynamo should always be switched to the "off charge" position when the receiver is connected to the battery.—L. A. C.

#### Atmospherics.

**Q.**—What exactly are atmospherics, and why is it that I cannot eliminate the noises, stated to be atmospherics, from my reception?—M. V. (Reading).

**A.**—Atmospherics are a source of interference experienced throughout the world and are the result of waves set up in the ether by different electric disturbances such as lightning discharges. Various methods of eliminating and reducing this form of interference have been tried, with little or no success, and you are advised not to waste your time and money attempting to eliminate the trouble, but to switch off your set when the disturbances reach a pitch which makes listening other than pleasurable.—L. C.

#### A Peculiar Case.

**Q.**—I have a Reinartz reaction set and I have satisfied myself that the wiring is quite in order. Also the batteries are registering full voltage, yet I can only get good results when I reverse the leads to my L.T. accumulator. Changing over the grid leak from positive to negative L.T. does not affect the result, so that this is not the cause of the trouble. Can you suggest the reason?—J. N. (Woking).

**A.**—You have a reverse reaction effect, due to your reaction coil opposing the rise and fall of current in your aerial tuning coil. If you will reverse the connections to your reaction coil-holder, you will obtain best results with the leads connected correctly to the accumulator.—C. L.

#### Wiring Up Receiving Sets.

**Q.**—When instructions for wiring up receivers are given, mention is invariably made of either No. 16 or No. 18 gauge wire. Why should not thicker or thinner wire than this be used, or stranded wire, such as flexible cable? At present I see no reason for the continued use of a gauge of wire which, although generally presentable in a set, may not necessarily make for greatest efficiency.—J. Mc. P. (Carlisle).

**A.**—When wiring up a set there are two important losses to guard against, namely, those caused by resistance and capacity. Fairly thick wire, "large-area" wire, is necessary to reduce resistance losses to a minimum, while if the wire be too thick, or exposes too much surface area to another wire in close proximity, then capacity losses will occur. No. 16 and No. 18 gauge wires form a compromise and will usually be found to give good results.—A. L.

#### Grating Noises in Receivers.

**Q.**—I am experiencing grating noises in my

loud-speaker, and this is also present when 'phones are used. I have ascertained that the trouble is in my set, as the noises still exist even

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and to the point

A Fee of One Shilling (postal order or postage stamps) must accompany each question and also a stamped, addressed envelope and the coupon which will be found on the last page.

Rough sketches and circuit diagrams can be provided, but it will be necessary to charge a special fee (which will be quoted upon request) for detail layouts and designs.

when the aerial and earth are disconnected. Can you tell me to what causes these noises are due?—F. B. (Balham).

**A.**—The noises you experience can be caused by defective or run-down grid, L.T., or H.T. batteries. If these are not the cause, then a fracture or burn-out in either your L.F. transformer windings or the anode resistance, if this is wire wound, will almost certainly be the cause. Grating noises can also be obtained by direct pick-up from a near-by crystal receiver in which the crystal detector contact is being readjusted.—C. L.



'ohmes Resistance

#### Aerial and Reaction Coil Relationship.

**Q.**—Is there a definite relationship as to size between the aerial and reaction coils in a receiver?—F. A. (Bath).

**A.**—There is no definite relation between the size of the aerial-tuning coil and the reaction coil used in a set. The best size for the reaction coil for any particular band of wavelengths must generally be found by experiment, but for smoothest reaction control and most sensitive reception, the smaller the reaction coil the better. If you find that a coil much larger than the aerial coil is needed for reaction purposes then the aerial-earth system you are using possesses a high resistance and your attention to this will be well worth while.—C. A.

#### "Add-on H.F. Unit."

**Q.**—I have built the "Add-on H.F. Unit" and find that I can only get the local station. Tuning the H.F. coil, which was originally the aerial coil of the receiver, is useless, and I would welcome suggestions from you in this matter.—J. C. (Epsom).

**A.**—When making use of the H.F. unit you mention, you should use a size larger coil for the H.F. tuning coil. This is necessary owing to the fact that when the set was originally coupled to the aerial the aerial inductance and capacity was added to that of the original aerial tuning circuit. Now that this circuit has been removed from the aerial, some compensation is required, a larger coil being the obvious remedy.—C. A.

#### "Simpler Wireless" Rectifiers.

**Q.**—I should like to make use of the special rectifier for the "Simpler Wireless" scheme to obtain the H.T. for an ordinary type of receiver. Is this possible, and if so, what are the necessary additions?—H. T. (Warwick).

**A.**—All that is necessary is to connect a potential divider across the output terminals of the smoothing circuit of the rectifier. The potential divider should have a resistance of between 5,000 and 10,000 ohms, depending upon the voltage of the mains and the current required for plate-filament supply for the valves. The wattage of the lamp in the rectifier will need to be reduced, and in this respect a 10-watt, or, at the most, a 20-watt lamp is suggested.—C. L.

#### Testing Filament Emission.

**Q.**—I have some valves which appear to be deteriorating with age, and should like to acquire a cheap and simple piece of apparatus with which I may test these valves. Can you suggest a suitable instrument and also a method of testing?—J. B. (Cornwall).

**A.**—An emission tester is described in the April number of the *Wireless Magazine*, now on sale, price 1s., or 1s. 3d. post free from this office. The method of testing is quite simple. Connect together the grid and the plate of the valve to be tested, place the milliammeter in circuit between the plate and grid of the valve and positive L.T. or filament and pass the required current through the filament. If the filament emission is satisfactory, a reading of anything up to about seven milliamps should be denoted on the milliammeter.—A. L.

**THE "Q" 4**

(Continued from page 650)

If the width of the baseboard is rather less than the width of the cabinet, short lengths of ebonite tubing can be used to "stand off" the terminal strip until it is flush with the back of the cabinet.

Glazite wire is used to connect the various components together. We do not think that, if the constructor is assembling the receiver from the blueprint, any snags will be encountered in the wiring process, but we would like to emphasise the necessity for care in making the "Q" coil connections. In this receiver a separate grid-leak holder combinator made by Lissen Ltd., is incorporated and this makes for simplicity of wiring.

Suitable valves are shown in the special

**Two-volt Valves for the "Q" 4**

Make	H.F.	Detector	L.F.	Power
B.T.H.	B 210L	B 210H	B 210L	B 215P
Cosmos	SP 16/G	SP 18/B	SP 16/R	SP 18/RR
Cossor	HF 210	RC 210	LF 210	Stentor 2
Ediswan	HF 210	RC 2	GP 2	PV 2
Marconi	HL 210	DEH 210	DEL 210	DEP { 215 240
Mullard	PM1 HF	PM1 A	PM1 LF	PM { 2 252
Osram	HL 210	DEH 210	DEL 210	DEP { 215 240
Six-Sixty	SS210 HF	SS210 RC	SS210 LF	SS215 P

valve table to which the reader is referred. The particular advantage of the "Q" coil will now be apparent in that no specifications are required for suitable coils for either the broadcast band or the long-wave band; for besides being extremely efficient the "Q" coils are, of course, all-wave coils and their use eliminates the necessity for at least six two-pin plug-in coils that would be required in the ordinary way.

Set the "Q" coil switch knob to the left and rotate the two tuning condenser dials in unison until the local station is received. The reaction condenser need not be moved from its zero position. Unless by chance the neutralising condenser is accurately set, it will be necessary to adjust this control until the usual feed-back hiss is eliminated on all combinations of the two tuning dials.

Distant stations can then be received in large numbers, the only limit being the prevailing conditions obtaining at any given time. Reaction should be used sparingly.

**OCEANIC S. W. 2 (A.W. 7/4/28)**

2 Ormond .0001 S.L.F. variable. Igranic 6 ohms. Lissen Potentiometer. 2 Benjamin Valve Holders. Colvern Short Wave Coils on Stand. Lissen H.F. Choke. Igranic L.F. Transformer. 2 Dubilier 2 mfd., Dubilier .0001, 3 meg. leak, series clip.

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16 by 8 by 9 in. Oak 8/11 (Radiano Three).  
18 by 7 by 10 in. Oak 10/6 (Mullard).  
21 by 7 by 9 in. Oak 10/6 (Cossor).

Complete with baseboard. These for callers ONLY.

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	100 " ( " 108) -	12/11
H.T.	60 " Super Power	13/6
	9 " Grid Bias -	1/6
BATTERIES	4 1/2 " Pocket Battery	5d.

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ATTACHMENT 15/-

With 4-in. Diaphragm

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COMPONENTS (2-valver) .0005 Variable, 5/-; 1 Neutrovernia, 5/6; 2 Lissen V.H., 2/-; Igranic H.F. Choke, 5/-; .0003 and 2 meg. Lissen 2/-; Lotus P.P.D., P.D.T., 4/-; Lotus S.F.C. Jack 1/6. Wire, Screws: THE ABOVE KIT, Post Free 23/11

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COMPONENTS

Three Coupling Units, Tubular Fixed Condensers, Multi-flex Cable and Plug. .0003 Variable with S.M. Dial, 2-way Geared Coil-holder, Connecting Wire, Red and Black Flex. The Lot, post free, 42/- net.

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5-Ply Baseboard, 2/6 with above kit only.

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H.F. 210, 10/6; R.C. 2, 10/6; P.V. 2, 12/6.

**BLUE SPOT CONE UNIT 25/-**

SIEMENS H.T., 60 v., 8/6; 100 v., 14/6. Power, 60 v., 15/- Power, 100 v., 25/- Grid, 9 v., 2/-.

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**NOTE!** If Valves not required on Mullard Master 3 please deduct 33/6, but add 2/6 towards cost of the otherwise free gifts.

**MULLARD MASTER THREE**

This wonderful set can be made in a short space of time. No solder, only 20 wires to connect (all ready for use).

SPECIFIED ACTUAL PARTS

2 Strips. .0095 J.B. Master 3/Coils.  
1 Base. .00035 J.B. 4 Named Terminals.  
2 Brackets. 3 Valve-holders. R.I.-Varley L.F.  
Climax Choke. Bulgin Switch. Do. Unit, "Type A."  
A.B.C. Links. Mullard .0003. 2-megohm Leak.  
Spade Terminals. Flex and Screws. 8 Plugs.  
and 3 MULLARD P.M. Valves. £6 : 17 : 6 (state voltage).

**FREE WITH ABOVE KIT** Extra quality aluminium panel, 18 x 7. (Drilled Surface specially Frosted), 100-volt H.T. Battery, good make, 9-volt Grid Bias, tapped every 1/2 together with 5-ply Baseboard. Carr. 2/-  
CABINETS with parts, from 5/-

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**Oak Cossor Melody Cabinet** (as shown above)

hinged lid, for the absurd price of

**5/-** Carr. 2/-

with components

**GENUINE COMPONENTS**

**£4 10 0 kit.**

2 Ormond .0005; 2 Do. S.M. Dials; 6 T.C.C. Condensers, .001, .002, two .0003, .0001, 2 mfd.; 2 Grid Leak Clips, B.B.; 1 Var. B.B. Rheostat; 3 Grid Leaks, 25, 3, 4 Meg.; 3 Lotus V.H.; 1 Ferranti A.F.3; 2 Panel Switches; 1 Cossor Melody Wound Coil; Terminals, Name Tabs. Glazite, 9-v. Grid Bias; screws

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**COSSOR VALVES**

210 D 410 HF 610 HF 10/6  
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ORIGINAL COMPONENTS

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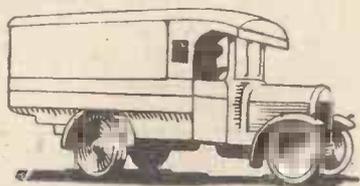
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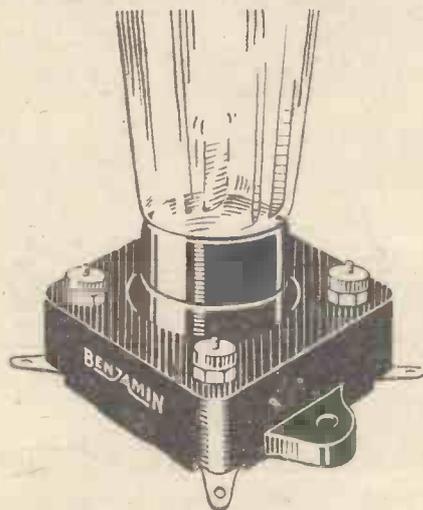
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361.4	830	London (2LO) 3.0	416	720				
384.6	780	Manchester (2ZY) 1.0	458	655				
400	750	*Plymouth (5PY) 1.2						
405.4	740	Glasgow (5SC) 0.2	477.7	628				
491.8	610	Daventry EX (5GB) 24.0	1,080	277				
500	600	Aberdeen (2BD) 1.5	1,750	171				
1,604	187	**Daventry (5XX) 25.0	1,850	160				
*Relay stations. **Relays 2LO.								
<b>AUSTRIA</b>								
254.2	1,190	Linz (under construction) 0.5	<b>GERMANY</b>					
272.7	1,100	Klagenfurt ... 1.5	37.65	7,966	Doerbitz ... 5.0	<b>ITALY</b>		
272.8	1,080	Salzburg (under const.) 0.5	204.1	1,470	Kaiserslautern ... 0.5	333.3	900	Naples (Napoli) 1.5
294.1	1,020	Innsbruck ... 0.5	236.2	1,270	Stettin ... 0.75	448.4	669	Rome (Roma) ... 3.0
357.1	840	Graz ... 0.5	241.9	1,240	Nurnberg ... 3	519.3	540	Milan ... 7.0
517.2	580	Vienna (Wien) 0.75	250	1,200	Muenster ... 1.5	<b>JUGO-SLAVIA</b>		
<b>BELGIUM</b>								
508.5	590	Brussels (Radio-Belgique) 1.5	252.1	1,190	Cassel ... 0.7	309.2	970	Zagreb (Agram) 1.25
230	1,304	Schaerbeek ... 0.5	256	1,172	Kiel ... 0.7	460	652	Belgrade ... 25
275	1,090	Ghent ... 0.25	272.7	1,100	Danzig ... 0.75	766	530	Laibach (under const.) 10.0
<b>CZECHO-SLOVAKIA</b>								
300	1,000	Bratislava ... 0.5	272.7	1,100	Bremen ... 0.75	<b>LITHUANIA</b>		
348.9	860	Prague (Praha) 5.0	275.2	1,190	Dresden ... 0.75	2,000	150	Kovno ... 15.0
441	680	Brno ... 3.0	283	1,060	Cologne ... 4.0	<b>LUXEMBURG</b>		
1,870	160	Kosice ... 5.0	297	1,010	Hanover ... 0.7	217.4	1,380	Radio (Luxemburg) ...
<b>DENMARK</b>								
337	890	Copenhagen (Kjbenhavn) 2.0	303	990	Koenigsberg ... 4.0	<b>NORWAY</b>		
1,153.8	260	Kalundborg ... 2.0	322.6	930	Breslau ... 4.0	30	9,994	Bergen ... 1.0
<b>ESTHONIA</b>								
408	735	Reval (Tallinn) 2.2	329.5	910	Gleitwitz ... 4.0	370.4	810	Bergen ... 1.0
<b>FINLAND</b>								
375.9	798	Helsingfors (Helsinki) 1.8	365.8	820	Leipzig ... 4.0	411	730	Notodden ... 0.7
1,525	196	Lahti ... 4.0	379.7	790	Stuttgart ... 4.0	434.8	690	Fredrikstad ... 1.1
<b>FRANCE</b>								
36	—	Lyon (PTT) ... 10.0	394.7	760	Hamburg ... 4.0	448	670	Rjukan ... 1.5
37	8,108	Vitus (Paris) ... 2.0	401	748	Aachen ... 0.75	461.5	650	Oslo ... 1.5
61	4,918	Radio LL (Paris) 1.0	428.6	700	Frankfurt-Main ... 4.0	504	594	Porsgrund ... 1.0
158	1,890	Beziere ... 0.6	470	638	Langenberg ... 25.0	555.8	540	Hamar ... 0.7
198	1,515	Biarritz ... 0.25	484.6	619	Berlin ... 4.0	<b>POLAND</b>		
230	1,304	Ste Etienne ... 0.25	535.7	560	Munich ... 4.0	270.3	1,110	Lemberg (under construction) 10.0
238.1	1,260	Bordeaux (Radio Sud-Ouest) 2.0	566	530	Augsburg ... 0.5	344	870	Posen (Poznan) 1.5
246	1,222	Juan-les-Pins ... 0.5	575.8	521	Freiburg ... 0.75	422	711	Kattowitz ... 10.0
252.1	1,190	Montpellier ... 0.5	1,250	240	Koenigswusterhausen-Zeesen 40.0	435	689	Wilno ... 1.5
259	1,160	Toulouse-Pyrenees (PTT) 0.5	1,800	167	Narddeich (KAV) 10.0	566	530	Cracow ... 1.5
267.8	1,066	Lille (Poste du Nord, PTT) 0.7	<b>HOLLAND</b>					
<b>ICELAND</b>								
			30.2	9,934	Hilversum (PCJJ) 25.0	1,111	270	Warsaw (Varschava) 10.0
			340.9	880	Huizen (until 5.0 p.m.) 1,870 m. on Sundays 4	<b>ROUMANIA</b>		
			1,069	280	Hilversum (ANRO) 5.0	1,800	187.4	Bucharest ... 2.0
			1,870	160	Huizen ... 4	2,800	107	Temesvar (testing) 2
			1,950	154	Scheveningen-haven 2.5	<b>RUSSIA</b>		
			<b>HUNGARY</b>					
			555.8	540	Budapesth ... 3.0	450	666	Moscow ... 4.0
			<b>ICELAND</b>					
			192	—	Akureyri ... 1.5	775	387	Kiev ... 2.0
			333.3	900	Reikjavik ... 1.0	995.5	301	Leningrad ... 10.0
			<b>IRISH FREE STATE</b>					
			319.1	940	Dublin (2RN) ... 1.5	1,450	209	Moscow (Moskva) 20.0
			400	750	Cork (5CK) ... 1.5	1,700	176	Khatkov ... 4.0
			<b>MANCHESTER</b>					
			May 1	1	"Manchester Man and Liverpool Gentleman," a debate between Sir Edwin Stockton (Manchester) and Sir Arnold Ruston (Liverpool).	310	967	Oviedo (EAJ19) 0.1
			" 5	5	Here, There, and Everywhere, a revue in fourteen outlooks.	323.9	926	Almeria (EAJ18) 1.0
			<b>NEWCASTLE</b>					
			May 1	1	Robbery, a play by John English.	335	895	San Sebastian (EAJ5) 1.0
			" 3	3	The Nellie Chaplin Trio and Dora Labbette	335	895	Cartagena (EAJ16) 0.5
			<b>GLASGOW</b>					
			May 3	3	Gilbert and Sullivan programme.	344.8	870	Barcelona (EAJ1) 1.5
			<b>BELFAST</b>					
			April 30	30	A Sullivan concert.	375	800	Madrid (EAJ7) 3.0
			May 2	2	Music by Alfred Reynolds.	400	750	Bilbao (EAJ9) 0.5
			" 3	3	An Oriental programme.	400	750	Cadiz (EAJ3) ... 0.5
						405	741	Salamanca (EAJ22) 0.55
						434.8	690	Seville (EAJ5) 2.0
						462	649	Barcelona (EAJ13) 2.0
						<b>SWEDEN</b>		
						260.9	1,150	Malmö ... 1.0
						416.7	720	Goteborg ... 1.0
						453.8	661	Stockholm ... 1.5
						545.6	550	Sundsvall ... 1.0
						720	416	Ostersund ... 2.0
						1,190	252	Boden ... 2.0
						1,380	217	Motala ... 30.0
						<b>SWITZERLAND</b>		
						411	730	Berne ... 1.5
						588	510	Zurich ... 0.6
						680	441	Lausanne ... 0.6
						760	395	Geneva ... 0.5
						1,000	300	Basle ... 0.25
						<b>TURKEY</b>		
						1,180	254	Stamboul ... 7.0
						1,800	167	Angora ... 7.0

## CHIEF EVENTS OF THE WEEK

Date	Event
April 30	<i>The Rheingold</i> , relayed from Covent Garden (Act 1).
May 1	<i>May Day</i> , or <i>The Little Gipsy</i> , a musical play by David Garrick and Arne, revised and adapted by Julian Herbage and Perceval Graves.
4	<i>Duffy</i> , a play by R. Morton Nance.
5	Eye-witness account of the British Hard Court Championship Finals (from Bournemouth).
<b>DAVENTRY (5GB)</b>	
May 1	The Royal Philharmonic Society's eighth concert, relayed from the Queen's Hall, conducted by Sir Hamilton Harty.
" 2	<i>Feed the Brute</i> , a play by George Paston.
" 3	Arts Theatre Club Concert.
" 5	Recital by Mark Raphael (baritone) and Edward Isaacs (pianoforte).
<b>CARDIFF</b>	
May 2	"My Programme," by Sir John Daniel.
" 3	Symphony concert relayed from the Assembly Room, City Hall.
" 5	Popular concert relayed from the National Museum of Wales.

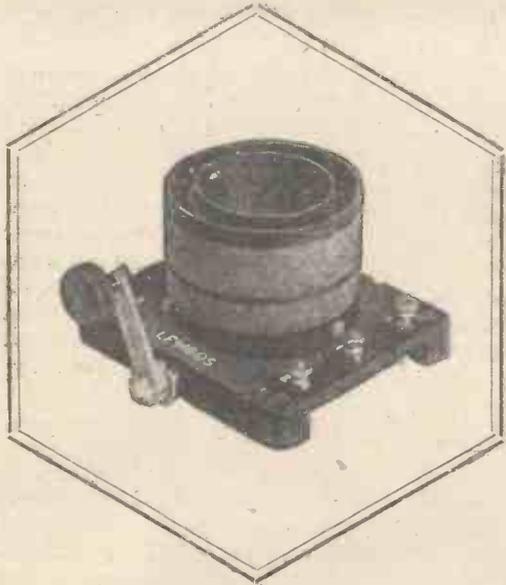
Date	Event
May 1	"Manchester Man and Liverpool Gentleman," a debate between Sir Edwin Stockton (Manchester) and Sir Arnold Ruston (Liverpool).
" 5	Here, There, and Everywhere, a revue in fourteen outlooks.
<b>NEWCASTLE</b>	
May 1	Robbery, a play by John English.
" 3	The Nellie Chaplin Trio and Dora Labbette
<b>GLASGOW</b>	
May 3	Gilbert and Sullivan programme.
<b>BELFAST</b>	
April 30	A Sullivan concert.
May 2	Music by Alfred Reynolds.
" 3	An Oriental programme.

According to Mr. Walter Dubilier, of the Dubilier Condenser Company, the radio set of the future will be "no larger than a cigar box."

# LEWCOS COILS

(Regd.)

## lead again!



# LEWCOS

(Regd.)

## 'Q' COILS

Specified in the

### "'Q' 4"

in "Amateur Wireless"

(April 28)

AERIAL COILS	- -	15/-
(Ref. Q.A.)		
H.F. TRANSFORMER		21/-
(Ref. Q.S.P.)		

As these coils cannot be supplied from stock, place your order at once and ensure early delivery. Obtainable from all good radio dealers.

The LONDON ELECTRIC WIRE CO. & SMITH'S LTD.  
Playhouse Yard, Golden Lane, London, E.C.1



## BUILD THE CABINET CONE LOUD-SPEAKER

described in "AMATEUR WIRELESS," APRIL 21st ISSUE

The design is thoroughly sound, and results are equal to those from commercial Speakers costing up to £8-8-0. A bold statement backed up by actual comparison.

To obtain these results the GOODMAN'S DOUBLE-ACTING REED UNIT and Cone Paper are essential. The Unit is actually two complete mechanisms in one, with two powerful Magnets, four-pole balanced and adjustable. The price is a little high (27/6, complete with Cone Bush and fitting screws), but vastly superior results are obtainable. Cone Paper 2/6, post free.

Send for Illustrated List (D.A.)

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## THE GAMBRELL NEUTROVERNIA CONDENSER



has again been chosen for inclusion in a special set by a famous designer. This time it is the Four Valve "Q" Coil receiver, described in this issue by J. H. Reyner, B.Sc. This condenser has no equal in Performance, Construction and Appearance and it occupies minimum baseboard space. It is for these reasons that it is chosen for inclusion in the many sets in which it is used.

It is perfectly constructed and has the greatest range of capacity, viz: 2/38 mmfds. The control is delightfully smooth, and uniform increase or decrease is obtained with each turn of the knob. It is dust- and damp-proof and cannot short. Suitable for either panel or baseboard mounting.

PRICE 5/6 FROM ALL DEALERS

### GAMBRELL CENTRE-TAPPED COILS

Because of their efficiency and the greatly improved results which their design ensures, they are used and recommended by experts for circuits designed for selectivity, and from which the utmost results are to be obtained. Their use is not limited to centre-tapped circuits. In any circuit requiring plug-in coils, "Gambrell" will ensure the finest possible results.



Size	a2	a	A	B1	B	O	D	E1	E	F	G
Price	4/10	4/10	5/-	5/3	5/6	5/9	6/3	6/9	7/9	8/6	10/-
Approx. No. of turns	18	25	30	40	50	75	100	150	200	300	600

Centre-Tapped, 6d. extra

Write or interesting leaflets dealing with the above and also full particulars of the range of Gambrell Mains Receivers for both A.C. and D.C. supply.

GAMBRELL BROS. LTD., 76 Victoria Street, London, S.W.1

# RADIOGRAMS



LISTENERS who recall the charming musical score written by Alfred Reynolds for *Lionel and Clarissa* and *Riverside Nights*, both of which were broadcast from 2LO, will be pleased to hear that a programme arranged for Belfast on May 2 will include the same composer's *The Policeman's Sevenade*, described as a "grand little opera," and his settings to A. P. Herbert's witty *She Shanties*.

An interesting debate on Association football will be broadcast from the Newcastle station on May 4. The captains of two leading teams—namely, Newcastle United and Sunderland—and two well-known local sportsmen will take part.

A concert given by the Folkestone Municipal Orchestra at Leas Cliff Hall, between 9 and 10 p.m. on April 27, will be relayed by 5GB.

The second talk in the series "Cities of the Industrial North" will be broadcast by the North Country stations on May 1; it will deal with York, and the speaker will be Dr. Lionel Ford, Dean of that City. On May 8, Mr. E. D. Simon will speak about Manchester, on May 15, Miss Margaret Law will deal with Bradford, and Professor C. H. Reilly will talk on Liverpool on May 22. During June, Sheffield, Hull, Leeds, and Chester will be "reviewed" in the same manner.

*Feed the Brute*, a one-act play by George Paston, first produced at the Royalty Theatre, London, twenty years ago, will be found in the 5GB entertainment on May 2.

Starting on May 3, Mr. F. Y. Broomhead will broadcast through 2LO a series of practical talks on "The Keeping of Poultry."

On the night of April 22-23 many French broadcasting stations will be on the air until 2 a.m. in order to give listeners the latest results in the General Elections. Readers will be given an opportunity of hearing Radio Beziers (on 158 metres), as the station may increase its power to some 500 watts for the occasion.

Arrangements have been made by the B.B.C. with the Covent Garden Royal Opera House to broadcast excerpts of the performances during the coming season, which opens on April 30. It is expected that Wagner's opera *Rheingold*, which has been chosen for the opening night, will provide the first relay.

It is reported from Hungary that work on the new high-power transmitter at Csepel is sufficiently advanced to permit preliminary tests being carried out towards the end of April.

According to semi-official statistics, it is computed that the number of wireless licences to population in European countries is now highest in Sweden, with 53.6 per 1,000 inhabitants. Great Britain comes next with 53, Denmark 44.8, Austria 43, Germany 28.1, Norway 22.1, Switzerland 15.9, Czecho-Slovakia 15.3, Hungary 9, Finland 8.8, and Belgium 4.6.

The South Polar Expedition which Commander Byrd has organised will be in constant wireless communication with New York from its base in the Ross Sea.

Special broadcasts to the Far North districts of Canada are to be continued next winter. In order that the inhabitants of these desolate regions should be advised of the time schedules, the supply ships belonging to the Hudson Bay Company leaving early in June for the northern ports will carry full particulars of the transmissions as well as the year's mail. As has been the case for the last four years, the broadcasts will be carried out by KDKA (East Pittsburgh), KYW (Chicago), and WBZ (Springfield).

Although there have been rumours regarding the erection of a new high-power broadcasting station at Bucharest, for the

present no work is being carried out in this connection. The Rumanian capital possesses a 2-kilowatt telephony transmitter which has been adapted for the broadcast of musical programmes; it works on 1,800 metres, at irregular intervals.

The power of the Gleiwitz relay station has been increased to 4 kilowatts, and in order to avoid interference with the Polish transmissions the wavelength has been changed to 329.5 metres; the Koenigsberg transmitter is now working on 303 metres.

Work on two new broadcasting stations has already been started in Italy. At Genoa the old 1½-kilowatt Milan transmitter is being installed on the heights of Granarola in the vicinity of the city. Turin, however, is to be endowed with a new 7-kilowatt station, which is being built at Torre del Tremo, some 2,300 feet above sea-level. Although a small studio will be opened in the centre of the city, the transmitter is also to be connected to Milan by cable, in order that simultaneous broadcasts may be carried out by the two stations.

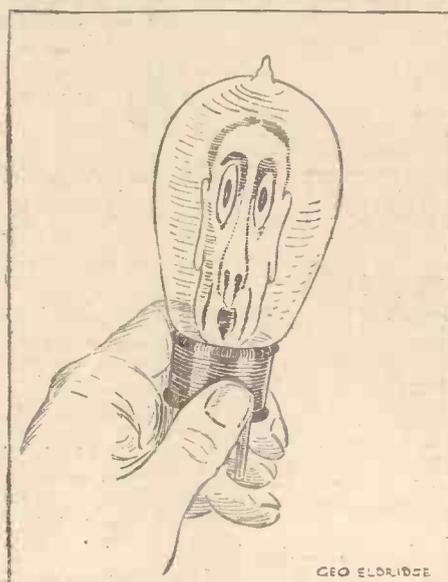
Music lovers should make a point of tuning in to the relays of the concerts of the National Orchestra of Wales, which are being given for six weeks in the National Museum at Cardiff every Monday, from 1 to 1.45 p.m., Tuesday, from 4 to 5 p.m.; Wednesday, 1 to 1.45 p.m., and Saturday, from 12 to 12.45 p.m., and in the City Hall, Cardiff, on Thursdays and Saturdays, from 7.45 to 10 p.m.

That the processes of radio telegraphy and mental telepathy are identical is the opinion of Professor Abbé Moreux, of France. "Scientists," he says, "think that the various waves in the atmosphere are of an electric nature, and that all atoms, including those forming our brains, emit waves similar to those sent out by radio stations. According to our capacity we receive an infinite number of radiations of all sorts that affect our brain-cells, and, by their intermediary, our intelligence and our nervous system."

The installation of 10-kilowatt broadcasting apparatus imported from the Marconi Company having been completed, the broadcasting stations in Osaka, Tokyo, Sendai and Sapporo after two weeks examination by the Communications Office are now starting trial broadcasting.

According to a report received from a reliable source in Peking, a representative of the Federal Wireless Company of America has purchased land in Fengching between Shanghai and Hangchow, which, it is believed, is to be used as a site for constructing a radio station for the company.

Maj.-General J. G. Harbord, president of the Radio Corporation of America, in a speech at Chicago recently, forecast that by the 1932 presidential campaign, voters will see candidates by radio, as well as hear them.



Distortion on One Valve!

**PICTURES BY 'PHONE**

THE recent announcement of a greatly improved system of transmitting pictures "by telephone" is somewhat misleading. Actually the telephone circuit is used simply because it is already pupinised or "loaded" to carry speech frequencies without distortion, and is therefore better adapted to transmit the various electric current impulses used in picture transmission than is the standard telegraph line.

The signals used in picture transmission are purely of a telegraphic nature and do

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Constructors of receivers described in this journal should make full use of our Blueprint Service and avoid all risk of failure.

not involve speech or other "phonic" sounds. In the new Siemens Karolus system a photo-electric cell is used at the transmitting end as in other well-known methods. At the receiving end, however, a special light "valve" is employed, in which the intensity of the light received is controlled by the action of a Kerr cell on a beam of plane-polarised light.

Over a high-grade telephone line, a picture measuring 5 in. by 3 in. can be transmitted by the new method in less than half a minute, which represents a speed considerably in advance of anything previously attained. B. A. R.

**Readers should note**

that the special transformer recommended for the "Q" 4 described in this issue is the POWQUIP Orchestral Transformer. The matchless ORCHESTRAL Model Transformer (as illustrated) stands foremost amongst other makes on the market. It reproduces without the slightest suspicion of distortion. Each instrument comprising the orchestra is most clearly defined. Weight 42 oz. Height 2 1/2 in. Width 3 1/2 in. Depth 2 1/4 in. Price 22/6



Write to the address below for full particulars

This Paper recommends the

**POWQUIP ORCHESTRAL TRANSFORMER**

for

**THE "Q" 4**

**THE POWER EQUIPMENT COMPANY LTD.**

**OTHER POWQUIP TRANSFORMERS**

It can be safely claimed that the STANDARD Model Transformer (illustrated here) has positively no equal at the price. Recently designed, its amplification and tone have benefited to the extent of 25 per cent. Weight 12 oz. Height 3 1/2 in. Width 2 1/2 in. Depth 1 1/4 in. Price 10/6

The Popular Manchester Model embodies all the features of the Standard type, but is larger and of heavier design. Its amplification is exceptionally good, whilst clearness of speech and tone is remarkable. Weight 14 oz. Height 3 1/2 in. Width 2 1/2 in. Depth 1 1/4 in. Price 12/6



Make certain it is POWQUIP

Kingsbury Works, The Hyde, Hendon, N.W.9

**Building the 1928 Solodyn's ?**

**5-VALVE MODEL**

We claim outstanding advantages for the special "Cylidon" 3 Condenser Assembly. Greater selectivity, easier tuning, better control, finer adjustment, and no extra drum to buy. Built as one unit on aluminium chassis. PRICE £3 12 6, or complete with screens, £4 10 0. Drilled Aluminium Base, 7/6. Drilled Copper Base, 12/6.

**3-VALVE MODEL**

This circuit specifies the "Cylidon" Twin Thumb Control Condenser. Price, complete with drums (0005) £2 7 0

Bébé Condenser for the 1928 Solodyn's. Price (0001) 7/6

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Grams: "Capacity Enfield"



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A sound variable condenser which fills a long-felt want. Specially designed to take the place of the hitherto generally used Fixed Condenser.

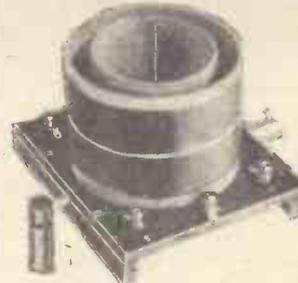
Write for Literature

**WEARITE COMPONENTS**

**WRIGHT & WEAIRE, Ltd.**

740, HIGH ROAD, TOTTENHAM, N.17.

**THE "Q" COIL**



The "Q" coil is the most efficient type of tuning inductance that has yet been designed, and the specimens marketed by us embody

all the results of our experience in making coils of all types during the past eight years. When building the "Q" Four" described in this issue be sure to incorporate the Wearite "Q" coil. Aerial Coil, price 15/- H.F. Transformer, price 21/-

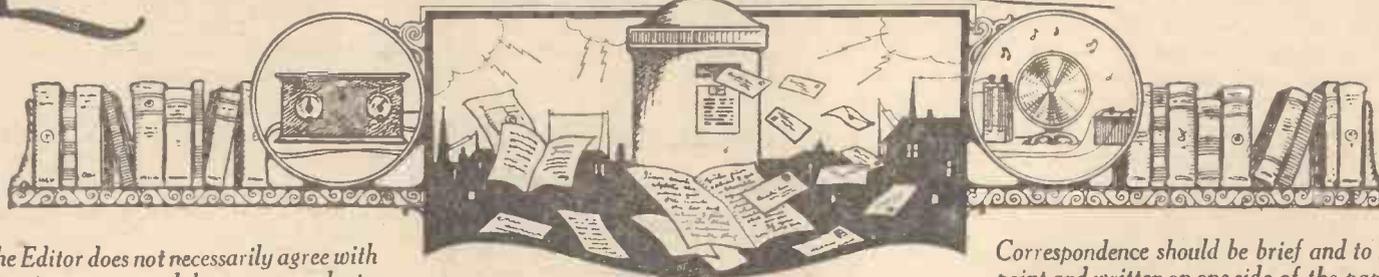
Special points of this valve holder are its exceedingly low inter-terminal capacity and the fact that it is impossible to insert a valve in the wrong way. For all types of receivers and particularly for short-wave receivers it is the ideal valve holder. Price 2/6 each.



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Advertisers Appreciate Mention of "A.W." with Your Order

# LETTERS TO THE EDITOR



*The Editor does not necessarily agree with the views expressed by correspondent.*

*Correspondence should be brief and to the point and written on one side of the paper.*

## A Unit Worth While

**S**IR,—I have "hooked-up" the high-frequency "Add-on H.F. Unit," and have tried it in front of two sets, each consisting of detector and two low-frequency stages. The first is a "straight" set, with R.I. tuner, and the second a "Hartley" modified from the "Hartley D.X. Three," described in *AMATEUR WIRELESS* some weeks ago. In each case the H.F. stage was a pronounced success; the straight set, while being very sensitive, is not selective, but the H.F. stage reduces interference from neighbouring stations to a negligible quantity. I also "bagged" Lyons on the "Hartley," and with a total of over sixty-five stations to log a new one is an experience. With the H.F. stage I get Glasgow at loud-speaker strength. E. (Woking).

## The "Favourite Two"

**S**IR,—I should like to express my thanks to *AMATEUR WIRELESS* for the splendid "Britain's Favourite Two." The results more than justify your claims for it. Here, within three miles of 2LO, I am able to get many stations, including 5GB, without interference from the former. I am also able to get Radio Paris at good strength while 5XX is in full blast. Also Barcelona, Stuttgart, and several unidentified French and German stations. I should like to add a final word of praise of the admirable performance of my two Cleartron valves, CT15 and CT15x (Selfridges), which at the price are a revelation.

D. (South Kensington).

## The "Favourite Three" on Short Waves

**S**IR,—Having made the very slight alterations necessary to the "Favourite Three" to convert it to the short waves, I must say if there is a better short-wave set I should very much like to hear it. I am only situated about five minutes' walk from our B.B.C. station, so you can imagine how Liverpool blots nearly everything out on the medium and long waves, but on the short wavelengths it is unsurpassable. I cannot speak enough about it. I do not know really how many stations it will bring in, but I have received 2XAF, KDKA, 7RL (Copenhagen), 2XAL, 2XAD, PCJJ, all on the loud-speaker. Besides

this, I have heard numerous amateurs and other stations not identified. I should like to say a word about Thursday evening, April 12. I was listening to 2XAF (Schenectady) as loud as the local on the speaker, when they announced that they were relaying the Savoy Orpheans, and at the end Big Ben chimed midnight. I can assure you it was thrilling.

C. (Liverpool).

## Improved Results

**S**IR,—Referring to the "Add-on H.F. Unit," I must congratulate you on such an excellent circuit. I connected it to a straight 3-valver (det. and two L.F.) with magnificent results. Stations that were only at moderate crystal volume come in splendidly on the loud-speaker at good volume. I have recommended it to several of my friends who are building it up. I might add that I have tried out several of the circuits published in *AMATEUR WIRELESS* with satisfactory results.

P. (Chesterfield).

## The "Super-power Push-pull Amplifier"

**S**IR,—I must congratulate you on the efficiency of the "Super-power Push-pull Amplifier," described in your issue of March 17.

I am using this amplifier in conjunction with a straight-circuit single-valve receiver, and have received 5GB every day from 6 p.m. onwards all the way from Liverpool to the above port, latterly at fair 'phone strength.

I had an aerial of 70 ft. over all, set between boat davits, used Mullard valves, and Lissen H.T., with 64 volts on the detector and 100 on the power valves.

Being very much a novice, this success may be overrated, still I think one can call the results good.

S. M. W. E., Lt.-Comm.

(Port Said, Egypt).

## An Opinion of the "Q" Coil

**S**IR,—I have obtained a "Q" coil from Messrs. Wright & Weaire, and it is such an excellent thing that I must write to say that I think it is about the most useful and convenient invention brought out in the current year, and Mr. Reyner

deserves the very best thanks of everyone interested in wireless. I am sure that it is destined to be the chief, if not the only coil used in the immediate future and it will be very difficult indeed to go one better. It is simple, convenient, and economical and occupies very little room. It will be particularly suitable for sets using one or two stages of high frequency, with or without screened-grid valves, as there is no tedious coil changing necessary. The one that I have obtained is very well made and I will get two more later.

W. J. F. (Redruth).

## The "Short-wave Super Six"

**S**IR,—Having just finished the "Short-wave Super Six," described in *AMATEUR WIRELESS* of January 7, I feel I should like to let you know how pleased I am with this set.

I have constructed it exactly according to the specification given, with the components recommended, and I must really thank you for the good results I am getting.

Five minutes after the set was finished I was listening in to KDKA on the loud-speaker, and on the following Sunday, between 6.30 and 8.30 p.m., I obtained 3LO (Melbourne, Australia), also on the loud-speaker, although not so strong, and several other stations which I could not identify. All on an indoor aerial.

My best station is 2XAD, every evening between 6 and 9. This station comes in quite clear on the loud-speaker as good as any other station on the Continent 300 miles away on another five-valver in my possession.

G. (London, N.1).

A series of broadcast vernacular talks is to be given from all Scottish stations to illustrate the different dialects of Scotland. A wide difference of word and phrase occurs in the speech of even closely neighbouring counties. The first talk is to deal with the dialect of the Border country.

The League of French Wireless Clubs wants French wireless to be put on a basis like that in England.

The annual French radio trade show will be held at the Grand Palais, Paris, this year from October 24 to November 4.

# The "Companion Portable" } A SEASONABLE RECEIVER

PUTTING the clock forward the other day reminded us that summer—or, at any rate, the English version of it—is not far off and that the portable season will soon be in full swing. Distinct advances have been made in the design and general arrangement of portable wireless receivers and readers can look forward to a varied selection of designs by the AMATEUR WIRELESS Technical Staff during the next few months.

One of the most satisfactory models yet designed, which is to be described and illustrated next week, is a receiver we have called the "Companion Portable"—an absolutely self-contained five-valver that can be carried about and that will bring in the local station, 5XX and 5GB at good loud-speaker strength anywhere in the British Isles. A small week-end suit-case forms a convenient and unobtrusive carrier for the various bits and pieces that go to make a five-valve installation.

Upon opening the case, there is revealed a neat control panel by the side of a loud-speaker and battery compartment. A novel feature of the arrangement is the

hinged cone loud-speaker which lifts right out of the case and stands erect during reception. Two frame aerials, both large

enough for efficient reception of quite distant stations, are built into the lid of the attaché-case.

The operation of the Companion is the last word in simplicity—just one tuning knob, in spite of the fact that there are two H.F. stages, one reaction knob and one switch that, according to its position, gives long or short-wave tuning or cuts out the filament supply. The Polar H.F. unit incorporated provides a very compact and at the same time efficient circuit arrangement which in the "Companion Portable," comprises two H.F. stages, followed by a detector valve coupled to two stages of L.F. amplification, using one R.C. coupler and one L.F. transformer.

For sheer power and purity of reproduction the "Companion Portable" is unsurpassed in the portable line and readers can look forward to something quite out of the ordinary next week when the full constructional and theoretical aspects of this new receiver will be revealed. A special 1s. 6d. blueprint is now in course of preparation and will be available next week.



Outwardly the "Companion Portable" has the appearance of a suit-case

"A.W." Solves your Wireless Problems.

## The CRYSTO-BAR

50/-  
POST FREE



Wireless Receiver—an epoch-making New Wilson achievement—is an up-to-date Crystal Set combined with the Microphone Bar Amplifier.

It will make wireless cheaper and better for you. Only one or two inexpensive dry cells of 1½ volts required to give loud speaker results equal to a two-valve set.

**NO VALVES. NO ACCUMULATORS. NO HIGH-TENSION BATTERIES.**

Send postcard for illustrated literature; also ask for particulars of the MAGNETIC MICROPHONE BAR AMPLIFIER.  
Sole Manufacturers and Patentees:

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NON-VALVE CRYSTAL SET LOUD SPEAKER

Prov. Patent No. 7903,27

Microphone Amplifier and Loud Speaker combined in One Instrument.

Can be worked from any Crystal Set, or single Valve Set, by the aid of one or two Dry Cells of 1½ volts each, or one 2-volt Accumulator Cell.

Easy to adjust. Nothing to get out of order. **NO OTHER ACCESSORIES** of any kind required.



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POST FREE

## Amateur Wireless HANDBOOKS

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The Shielded Four-electrode Valve.  
Loud-speaker Crystal Sets.  
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The Wireless Man's Workshop.

The Practical "Super-het" Book.  
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**"1928" LOG CONDENSER**

**SMALLEST, LIGHTEST and most EFFICIENT**

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·0005 **5/-**

Also mounted **DUAL & TRIPLE**

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"Loud-speaker Facts and Fancies" (Continued from page 645)

each case and the actual expenditure of energy would, therefore, be the same. This is an important principle in mechanics and engineering generally.

We now have to introduce another factor into the discussion, namely that of time. To do a certain amount of work in a certain time demands a certain expenditure of power. James Watt, when he invented the steam engine, required some unit in which to rate the power developed. He made a number of experiments on dray horses and found that on an average a horse of this type could do 22,000 foot-pounds of work in a minute. To be on the safe side, he invented a mythical horse which could do 33,000 foot-pounds of work in a minute and this he adopted as the unit of "horse-power."

How the energy is expended during the given time does not matter. Suppose we wish to do 1,000 foot-pounds of work in a minute, we can do it in various ways. We can lift 100 pounds a total distance of 10 feet taking the whole minute to do it. Alternatively we could lift ten 100-pound weights one foot only taking one-tenth of a minute to do each job. The total expenditure of energy during the minute

would be 1,000 foot-pounds in each instance, but in one case, we have lifted the weight slowly through a large distance whereas in the other case we have lifted a number of equal weights more rapidly through a shorter distance.

A somewhat similar state of affairs applies to a loud-speaker diaphragm. We radiate sound energy by setting a certain column of air in motion. This column of air will have a certain effective weight or mass depending upon the construction of the actual loud-speaker. We can radiate energy by moving this column of air slowly or rapidly. If the motion is rapid the displacement need only be comparatively small, whereas if the motion is slow, we must displace the column of air through a relatively large distance if we are to do the same amount of work or, in other words, to radiate the same amount of energy.

**Diaphragm Displacement**

The actual relationship between the frequency and the displacement of the diaphragm is a simple one if the diaphragm itself is large in comparison with the longest wavelength to be radiated. This, unfortunately, is not a practical case as we shall

see in a moment, for it involves a very large diaphragm, but if such a reproducer were practicable, then the displacement of the diaphragm would be inversely proportional to the frequency. That is to say, to radiate the same energy at a frequency of 100 cycles, we should require ten times the displacement that would be necessary with 1,000 cycles and so on.

As was just pointed out, however, this is not a practical form of reproducer. The wavelength of a 50-cycle vibration is approximately 22 feet and the condition for the simple state of affairs just mentioned is that the diaphragm shall be large compared with the wavelength. Consequently, a diaphragm something like 50 feet in diameter would be necessary. On the other hand, where we are dealing with an oscillation of 5,000 cycles per second, the wavelength of the vibrations is only 2 1/2 inches and for such frequencies, the ordinary cone loud-speaker, one foot or eighteen inches in diameter, can be considered as large in comparison with the wavelength. Thus, with a cone loud-speaker, the law which the diaphragm has to obey is different at the top and bottom of the scale.

(Continued on next page)

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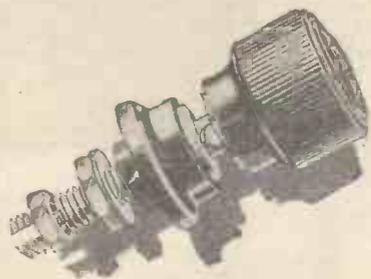
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## "LOUD-SPEAKER FACTS AND FANCIES"

(Continued from page 662)

In the case of the small diaphragm as used in horn types of speaker, the diaphragm is not large compared with the wavelength radiated even on the highest frequencies and this type of instrument approximates more closely to the point source.

A point source is a condition of affairs which is obtained when the diaphragm is small in comparison with the shortest wavelength to be radiated. As we have seen, the two are of the same order in the case of a horn speaker at the very highest frequencies, so that the law is not strictly applicable in the upper registers, but at the middle and bottom end of the scale the instrument behaves as a point source. For equal radiation of energy from all frequencies here, however, the amplitude of vibration of the diaphragm must be inversely proportional to the square of the frequency. Consequently, at the very low-frequencies the actual vibration of the diaphragm must be very large indeed, and it is this which is largely responsible for the failure to reproduce the lower tones in the ordinary type of loud-speaker. There is also an additional effect due to the loading imposed by the horn on the diaphragm, but I shall refer to this in a future article.

The free-edged cone is one outstanding type of loud-speaker, which permits of a very large vibration of the diaphragm, and with such an arrangement it is possible for the diaphragm to vibrate to such an extent that it complies with the law just quoted for point source. E. W. Kellogg, and the B.T.H. Company, in their specification No. 231420 give no little information on the point and they show a curve (see diagram) indicating the actual displacement of the diaphragm with a moving-coil type of loud-speaker at the different frequencies. The ideal curve conforming to the required law is a straight line as shown dotted and it will be seen that the moving coil curve corresponds with this down as far as 50 cycles per second. The other curve shows the amplitude of vibration of a typical loud-speaker of the ordinary type having a resonance at about 500 cycles per second. Above the resonance point, it follows the ideal curve tolerably well except near the peak itself, but below the resonance point the amplitude of vibration is much below what is actually required, and consequently, frequencies below about 300 cycles per second are reproduced in a very inferior manner. The displacement of the diaphragm at 50 cycles is only one-hundredth of what it should be.

This is merely a brief review of the reason for the adoption of the moving-coil type of instrument. In order to reproduce the low notes, a large amplitude of vibration is essential and the horn-type of speaker cannot produce the necessary movement.

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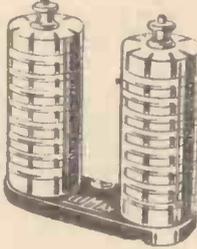
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Details of R. I. & Varley components, with circuits showing how they may best be used, are given in an interesting folder which R. I. & Varley, Ltd., of 103 Kingsway W.C.2. are sending out.

The Wet H.T. Battery Co., of 12-13 Brownlow Street, High Holborn, W.C.1, have sent in some leaflets dealing with the "Standard" Wet H.T. Batteries.

The catalogue of the Grafton Electric Co., of 54 Grafton Street, Tottenham Court Road, W.1, should be in every constructor's hands.

Particulars of Hirmax, Godurnix, and Microtune radio components are given in a folder sent in by J. Dyson & Co., Ltd., of 2 Coleman Street, E.C.2.

Readers who like sets to be handsome will be interested in a folder produced by the American Hard Rubber Co. (Britain), Ltd., of 13a Fore Street, E.C.2, which gives details of Resiston and Radion panels. These panels can now be supplied with gold decorative designs.

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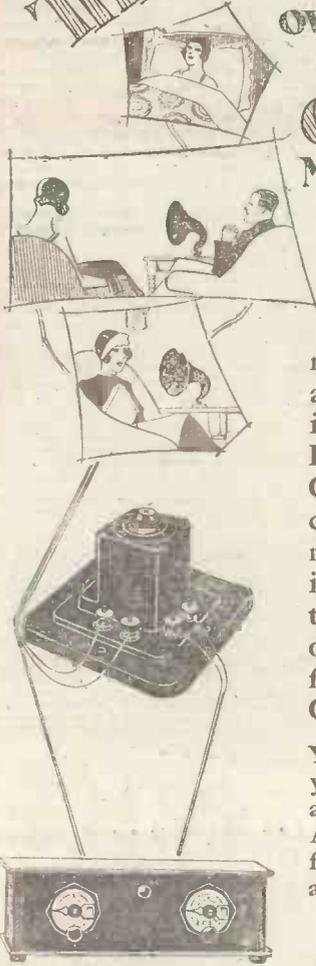
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 Lotus Works  
 Broadgreen Road, Liverpool

# Something new in Condensers



## The BOWYER-LOWE "ELFIN"

Illustration shows the "Elfin" compared with the Bowyer-Lowe Popular, itself a compact instrument.

### PRICES

Supplied with pointer knob and drilling template.

00015 mfd.

6/-

List No. 312.

Also supplied in three other sizes.

List No.

0001 mfd. ... 311 ... 5 9

0002 mfd. ... 313 ... 6 3

00025 mfd. ... 314 ... 6 6

Bowyer-Lowe introduces the smallest and lightest condenser model yet made—the 00015 mfd. weighs only 2½ ozs., and with fully extended vanes occupies only 2½" x 1½" x 2" behind panel.

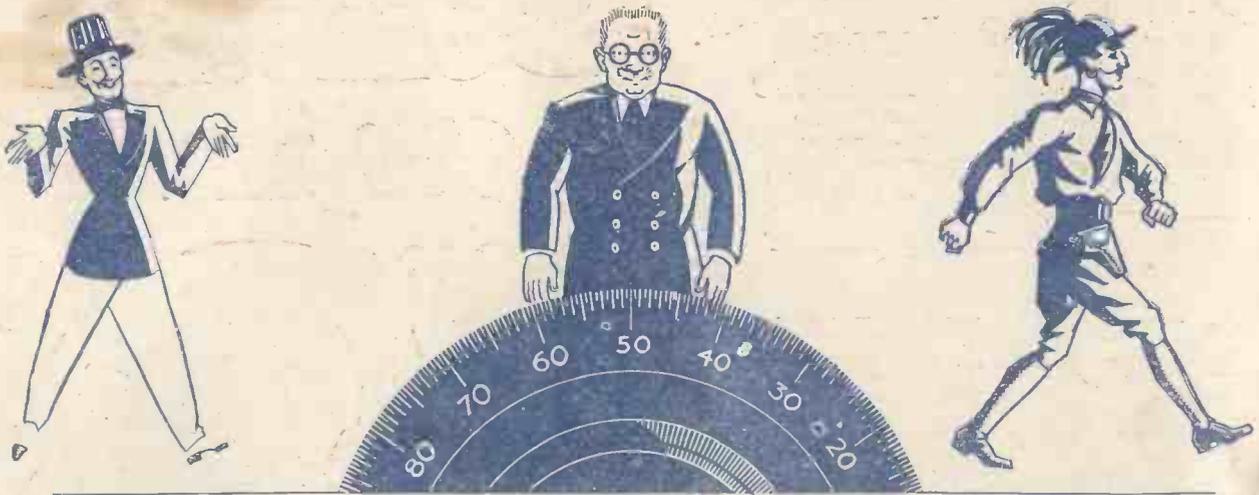
The "Elfin" is not just a mere novelty, but a precision instrument of quality, a miniature logarithmic condenser. It is specially designed for reaction control or in sets where space is at a premium.

Write for the Bowyer-Lowe catalogues of Components and receivers.



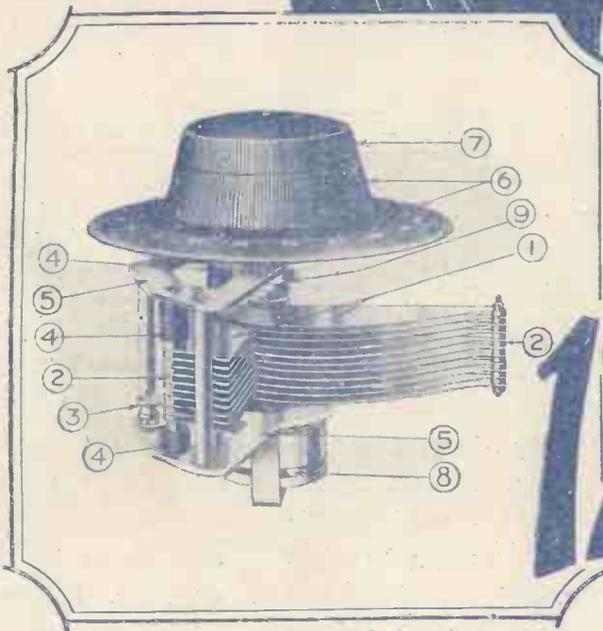
BOWYER-LOWE CO., LTD., RADIO WORKS, STATION WAY, LETCHWORTH

Advertisers Appreciate Mention of "A.W." with Your Order



**THEY COME IN AND GO OUT—**

*Without Colliding*



**12!**

Complete with knob & dial & Vernier

Paris . . . Berlin . . . Milan . . . any stations you desire . . . as you turn the knob they come in and go out without colliding.

Fit your set with a Dubilier K.C. Condenser which is specially designed to give adequate distribution of the stations round the dial and uniform Kilocycle tuning when used with the Dubilier Toroids.

Unsurpassed in performance like all Dubilier products, the Dubilier K.C. Condenser is a further example of the Dubilier standard of efficiency.

**WHAT YOU GET FOR YOUR MONEY—**

- 1. VANES of stout brass sheet.
  - 2. SPACERS of consistent size.
  - 3. TERMINALS—one giving direct connection with frame and rotary vanes, the other with fixed vanes.
  - 4. INSULATORS of high quality moulding material under compression.
  - 5. END PLATES of skeleton type, rigid and light.
  - 6. KNOB AND DIAL of finest finish, engraved in 0 to 100 with half divisions. Diam. 4 ins.
  - 7. SMALL KNOB working slow-motion drive.
  - 8. SLOW-MOTION BALL DRIVE—Approx. reduction ratio 200-1.
  - 9. BALL RACE ensuring velvet-smooth movement—entirely without backlash.
- One Hole fixing— $\frac{1}{2}$  in. clearance. Large nut provided for panel mounting. Maximum Capacity .0005



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Adv. of the Dubilier Condenser Co. (1925), Ltd. Ducon Works, Victoria Road, North Acton, W.3