THE FRAME AERIAL AND SELECTIVITY

Amateur Wireless
And Electrics

Every Thursday 3d

Vol. XII. No. 300 Saturday, March 10, 1928

The "Q" COIL THREE

THREE UNIQUE FEATURES

250-2000 METRES
NO COIL CHANGING
DIRECT PICK-UP ELIMINATED

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

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

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The "'Q'-Coil Three"—"The Night Fighters"—"Approved" Dealers, Please!—Wireless in Spain—Who is it?—The "School Five"

The "'Q'-Coil Three"

THE first "Q"-coil receiver which has been built is fully described and illustrated in this issue. Readers of Mr. Reyner's article on the "Q"-coil will turn to page 388 with interest. The receiver incorporates just an ordinary straightforward three-valve circuit, consisting of three stages—detector and two L.F.—these being R.C. and transformer coupled. The result is an efficient and selective loud-speaker receiver, which requires no coil changing whatever!

Wireless has played quite a prominent part in the winter sports at St. Moritz. Our photograph shows the Blatthaller giant loud-speaker "installed" on a structure on a snow-covered slope.

"The Night Fighters"

DID you like Cecil Lewis's *The Pursuit*, which we heard some time ago? It seemed to be well received, for the B.B.C. received over a thousand letters—mostly appreciative—after the broadcast. We are being given "more" in *The Night Fighters*, a second play in the new "technique" by Mr. Lewis. It will be broadcast from 5GB on March 24 and from 2LO and other stations two days later.

"Approved" Dealers, Please!

THE Radio Society of Great Britain and the Wireless League have jointly declared war on the "shady" wireless dealer and "shoddy" set repairer. They have instituted an "approval" board, which will approve or disapprove of dealers. Approved dealers will receive a sign to that effect. Those not approved and those who do not submit themselves for approval will be, presumably, boycotted. If they succeed the Society and the League will have done us all a service.

Wireless in Spain

IN Spain a company known as Transradio Espanola has been formed with a subscribed capital of 4 million pesetas. As it is really a collaboration of the three big concerns, Marconi, Telefunken, and the Spanish Radio-Electrica—which holds the patents of the French company Compagnie Generale de Telegraphie Sans Fil—Spanish broadcasting should soon brighten up.

Who Is It?

WITH reference to our last week's paragraph on the subject of who is it who decides who shall and who shall not broadcast, it was interesting to hear of a Parliamentary discussion on the point. It was raised by the case of an osteopeth who was not allowed to speak. The P.M.G. said he was not officially aware of the matter and did not propose to interfere with the discretion of the Corporation. Mr. Macquisten, who raised the point, said: "I wish you to interfere with their *in*discretion!"

A Continental Squabble

THERE is trouble brewing between the two Bordeaux stations, the cause being that the authorities of the official station want the old Radio Sud-Ouest closed down. While this station was undergoing repairs recently the Bordeaux Mayor ordered the electric current supply to be cut off. The director of the Radio Sud-Ouest is threatening to take the case into the courts.

Talking to China

GERMANY is now in regular communication with China by means of the Nauen AGW and AGJ stations. AGW works with a power of 400 kilowatts on 18,000 metres, and is used for the night traffic only. AGJ, the 15 kw. 40-metre transmitter, being used during daylight.

The "School Five"

DESIGNED to meet the needs of schools, the "School Five," to be described in our next issue, embodies all the latest developments, such as a screened-grid valve, astatic tuning coils, and a powerful resistance-capacity coupled L.F. amplifier. Apart from its special appeal to schools, we feel sure that many "old boys" will find the "School Five" of great interest. A push-pull L.F. amplifier, giving great volume without over-loading, using ordinary L.F. or small power valves, will interest those who have only a moderate H.T. supply available.

PRINCIPAL CONTENTS

Pages 385-392 are missing.

TELEVISION—The Problem of the Distant Image

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

A TELEVISION transmitter breaks up the image of the person or subject or screen into thousands of small parts. Each part is of a different brightness, according as it comes on the skin, or hair, or dark coat or pupil of the eye, and so on. The photo-electric cell, which "sees" these different amounts of brightness, converts them into electricity, in which form they can be transmitted over lines, or by wireless.

The first problem "at the other end" is to take up this rapid string of electric signals—amplitude variations or frequency changes, whatever they may be—and to turn them back into light. We might well imagine two cameras, one in Berlin focused upon a building (the image of which is thrown upon the focusing screen) and the other in London, set up, but with no lens—only an electric wire running from it to the camera in Berlin; the focusing screen of the camera in London has the image thrown upon it of the building standing before the first camera.

Except that the focusing screen is dispensed with, and that the eye sees the image without it, this wonderful feat of distance vision has, as we know, been accomplished by Baird across the Atlantic, and by Ives and Alexanderson over considerable distances on land in America.

Mr. McFarlan Moore the inventor of the Moore "high-speed" Lamp

Electricity to Light

The reconversion of the signals transmitted from the sending to the receiving instrument into light to form the replica image may be likened to the process so often seen in electric street signs. We, perhaps, watch one lamp after another, automatically switched on, following some prearranged pattern, until we see a complete image — possibly a face, a motor-car, a bottle pouring wine into a glass, and so on. Indeed, the day will come when actual television scenes are broadcast in the streets by these luminous signs controlled from distant television transmitters—just as cinematograph pictures are projected in busy thoroughfares to-day.

High Speed

Baird uses one lamp only, which is relighted, as it were, thousands of times a second. The eye watches it through a perforated disc, which is revolving in step with the disc of the transmitter. By means of the geometrical arrangement of the perforations one appears to see the lamp in a slightly different position each instant, so that many times a second it seems to be located at every single spot on a given viewing area.

As, also, its brightness is controlled at each instant by the incoming signals, the eye sees a living luminous image—it watches the image on the "focusing" screen of that other camera hundreds of miles away.

A lecture experiment I show occasionally to demonstrate the television cycle is seen in the diagram. A photo-electric cell (on the left) is coupled up in series with a suitable neon lamp and a battery of 230 to 270 volts. As soon as the light of an electric lamp (E) is shone on the cell (K) the neon lamp (N) glows. If the lamp is brought nearer to, or made to recede from, the cell, so the light emitted by the neon lamp increases or diminishes.

Dr. Alexanderson, of the General Electric Company in America, uses what amounts to a mosaic of tiny lamps, and Dr. Ives has employed one large rectangular lamp, 2 ft. by 2 ft. 6 in., which can be illuminated at any instant in any one of 2,500 different local patches or small areas. The latter can be viewed by a theatre full of people.

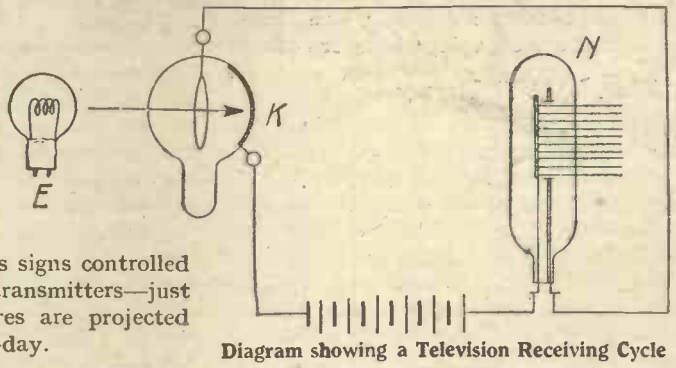
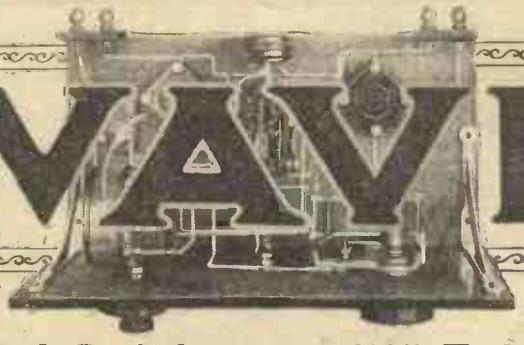


Diagram showing a Television Receiving Cycle

To describe how the complex type of viewing apparatus is operated, however, one must understand something of the most difficult part (mechanically) of the television problem, viz., synchronising the moving parts of the sending and receiving apparatus. The methods in present use will form the subject of the next article.

Readers who may have heard the weekly relays of operatic performances carried out by Radio Toulouse (France) from the local Theatre de la Capitole, may be interested to know that this station is the only European station which effects these transmissions by wireless link. As the French Posts and Telegraph Authorities have refused to place a landline at the disposal of the studio, Radio Toulouse has installed a short-wave equipment in the theatre; the signals are picked up by the 3-kilowatt transmitter at the Villa Schmidt and rebroadcast on 391 metres in the usual manner.

The 2-WAVE 2



Designed and Built by the "A.W." Technical Staff

"LONDON and Daventry calling," is a phrase which has an especial significance to the designer of wireless receivers. In that seemingly simple statement lies a difficulty peculiar to European listeners. For, whereas London, and for that matter, any other main B.B.C. station, transmits on a short wavelength, Daventry 5XX has, owing to the wide circle of listeners catered for, to transmit on the comparatively long wavelength of 1,600 metres.

A Rear View

The majority of experienced wireless amateurs will say that to overcome the difficulty of these widely separated wavelengths, it is only necessary to change the coils. But what of the non-technical members of the family who neither know, nor possibly care, anything about tuning coils and their relation to wavelengths? It is for these listeners that the "2-Wave 2" should have a special appeal.

In this up-to-date little two-valver, the change from the short wavelength band to the long waves, is simply a matter of pressing the small auxiliary knob attached to the reaction dial. There is no need to open the lid of the cabinet, delve into the interior and, at the risk of damaging the wiring of the set, perform the somewhat tedious operation of changing tuning coils.

In fact, we can truthfully say that the "2-Wave 2" is a set for the "ordinary listener," and as such, it has received very careful consideration in design to ensure the greatest possible simplicity of operation and maintenance.

The general lines on which the "2-Wave 2" has been assembled, can be gathered from an examination of the illustrations and reduced reproduction of the special full-size blueprint (which is available, price 1s., from this office). There are three panel controls, consisting of: (1) the tuning dial on the right; (2) the reaction coil dial and wave-changing knob on the left; and (3) the master rheostat in the centre controlling the filament supply to both valves.

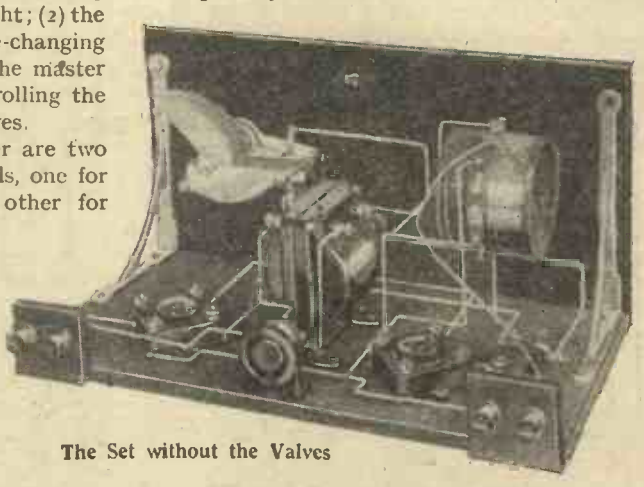
At the back of the receiver are two small ebonite terminal panels, one for the loud-speaker and the other for the aerial and earth wires. An ingenious battery plug is situated between the two terminal strips, and this considerably simplifies the connecting up of the various battery leads.

From a theoretical standpoint the "2-Wave 2" offers no startling novelty, although the simple circuit used has proved its worth in many Amateur Wireless receivers in the past. Briefly, the circuit is a detector with magnetic reaction, followed by one stage of transformer-coupled L.F. amplification. Upon analysis, we find the following points of interest. The tuning coil can be arranged to give a variable degree of selectivity, due to the provision of two aerial "taps" on the Wearite tuner. No difficulty should be encountered in separating the local station from, say, Daventry 5GB with one or other of these taps.

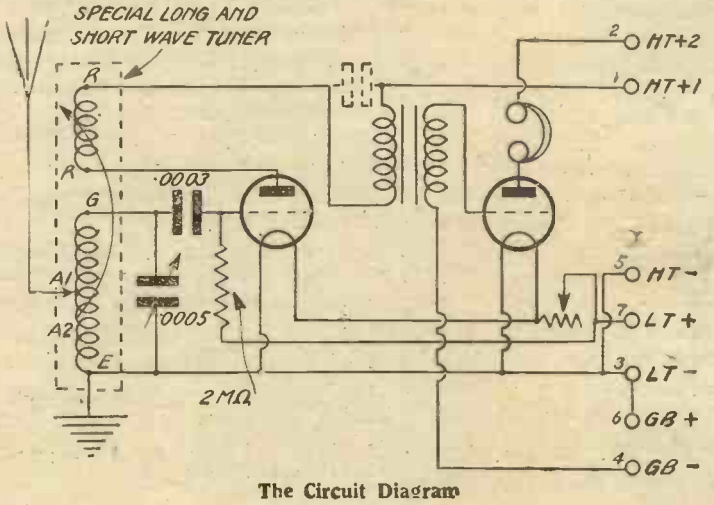
A .0005-microfarad variable condenser, in conjunction with this tuner, covers the complete broadcast band of 300 to 500 metres and allows a considerable wavelength range in the neighbourhood of 1,600 metres.

Sensitive valve rectification is provided for by the inclusion of a .0003-microfarad grid condenser and 2-megohm grid leak. This grid leak is connected between the grid of the detector valve and L.T. +.

Simplification of construction seemed to us to warrant the use of magnetic reaction, especially so, since this system is readily available with the Wearite reaction tuner. Because of this form of reaction, it is necessary to connect a small condenser across the primary of the L.F. transformer in order to by-pass the H.F. currents flowing through the reaction coil. If the L.F. transformer specified is used by the reader, there is no need for a separate condenser, because a suitable capacity has been incorporated inside the iron casing, by the makers. If an alternative make of transformer is incorporated, on no account omit



The Set without the Valves

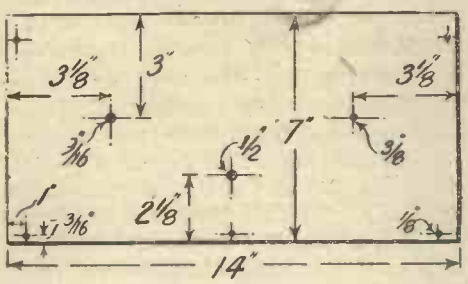


The Circuit Diagram

THE "2-WAVE 2" (Continued from preceding page)

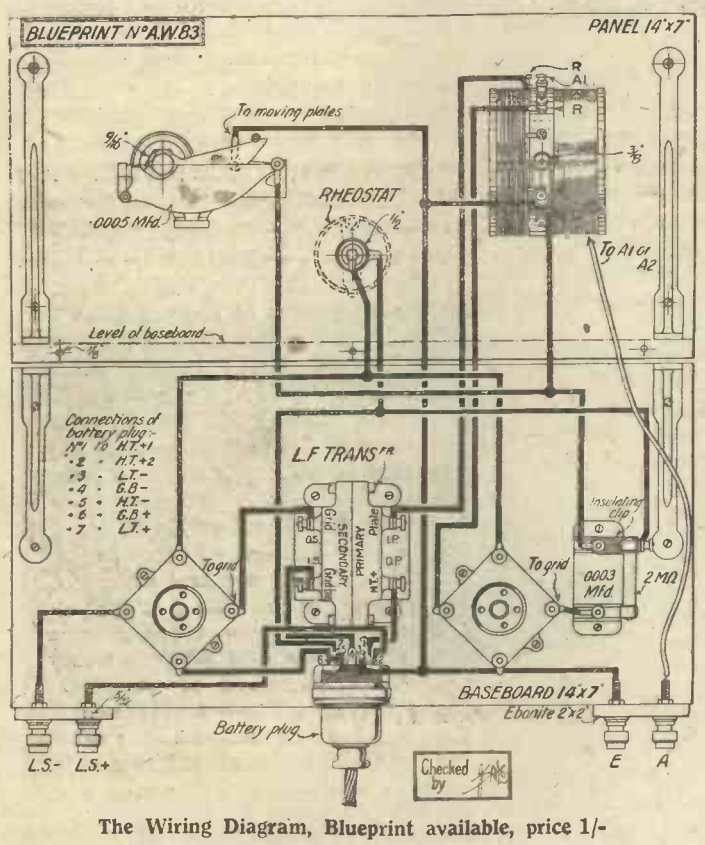
to shunt the primary winding with a .0005-microfarad condenser, otherwise erratic reaction effects will follow.

In a two-valve arrangement, where the maximum results possible are required, it is important that the second valve be given an adequate H.T. supply. Thus two H.T plus tappings are indicated in the circuit



Details of Panel

diagram, H.T.+1 giving a comparatively low H.T. to the detector valve, say 60 volts, and H.T.+2, at least 100 volts to the L.F. amplifying valve. The master rheostat in the L.T. + lead effectively controls the filament current of both valves. Grid



The Wiring Diagram, Blueprint available, price 1/-

bias for the L.F. valve is also provided for.

It should be noted that the seven battery terminals indicated in the circuit diagram and numbered, are actually soldering tags on the special battery plug. As the connections on this plug are numbered, as shown in the blueprint, there is no possibility of a wrong connection being made.

To build this receiver the following components should be obtained:—

Ebonite or bakelite panel, 14 in. by 7 in. by ¼ in. (Becol, Raymond, Ebonart, Pertinax).

.0005-microfarad variable condenser (Utility, Igranic, Burndept).

W.G. tuner (Wearite).

Panel - mounting rheostat (Benjamin, Igranic, Lissen).

.0003-microfarad fixed condenser with series clip (Dubilier, Igranic, T.C.C., Graham-Farish, Lissen).

2-megohm grid leak (Dubilier, Igranic, Graham-Farish, Lissen).

Two valve-holders (Benjamin, Wearite, Lissen).

Low - frequency transformer (Ferranti, type A.F.3, R.I. and Varley, Lissen).

Two pieces of ebonite or bakelite, 2 in. by 2 in. by ¼ in. (Becol, Ebonart, Pertinax).

Four terminals, marked: Aerial, Earth, L.S.—, L.S.+ (Belling-Lee, Eelex, Igranic).

Panel brackets (Camco).

7-way battery connector, (Harlie).

Connecting wire (Glazite, Junit).

Baseboard, 14 in. by 7 in.

Assembly

The three panel components, that is, the tuning condenser, Wearite tuner and Benjamin filament rheostat, are all "one-hole fixed" and, with the assistance of the blueprint already referred to, even the inexperienced constructor should be able to make very satisfactory progress. The panel brackets should be screwed to the panel before fixing the panel to the baseboard, and if this is accurately done the sometimes awkward process of panel - to - baseboard fitting is simplified.

The baseboard components, that is, the two valve-holders, combined grid-leak and condenser and L.F. transformer are then disposed as indicated. The assembly is completed by the fitting of the two terminal strips and baseboard section of the battery plug.

Wiring

In a simple receiver, such as the "2-wave 2," wiring is a very straight forward business, especially so if the point-to-point connections shown on the blueprint are carefully followed. Once again we feel it

The complete "2-Wave 2"

necessary to warn readers of the special insulated clip on the Dubilier grid condenser which, if ignored, has the effect of "shorting" the accumulator through the tuning coil. The L.T.+ connection of the grid leak is, of course, insulated from the tuning-coil side of the grid condenser by means of this clip which, incidentally, obviates the necessity of a separate grid leak holder. The grid side of the grid condenser is, of course, common to the grid side of the grid leak.

Three of the soldering tags on the battery plug are "shorted" by means of a single length of wire, namely the H.T.—, L.T.— and G.B.+ 3, 5 and 6. The other four soldering tags are soldered to wires leading to the various components. The battery ends of the seven-way battery cord terminate in small aluminium tags engraved with the battery abbreviation, say G.B.—, and underneath is the corresponding number, in this case number 4. Thus the grid-bias terminal of the L.F. transformer is wired to soldering tag No. 4 and, of course, the other end of the cable marked G.B.— is taken to the grid-bias battery. The numbers on the soldering tags are very clearly indicated, not only on the plug itself, but also in the draughtsman's representation shown by the blueprint.

The aerial terminal has soldered to it a suitable length of rubber-covered flex, terminating in a small spade tag, the latter being clamped under terminal A1 or A2, on the Wearite tuner.

Before inserting the valves and connecting up the batteries, loud-speaker and so on, it is a wise plan to compare the connections made in the receiver with those shown in the blueprint. Then suitable valves, such as are advised in our special

(Continued on page 404)

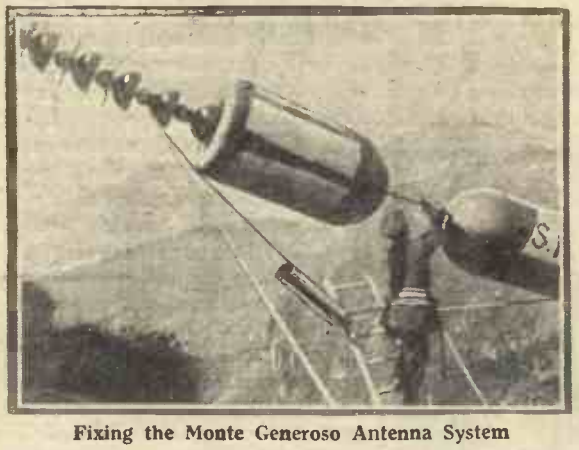
HARNESSING LIGHTNING TO BREAK UP ATOMS

By Dr. ALFRED GRADENWITZ

THOSE tourists who last summer happened to visit Lugano and thence to ascend to Monte Generoso, that beautiful mountain peak towering to a height of 1,800 metres (about 5,950 ft.) and dominating the whole of the Lombardian Plain, there witnessed a strange spectacle. Workmen were busy installing what to all intents and purposes was a huge antenna system, nearly 800 metres long, carried by a cable connecting the terminal points of the bow-shaped ridge. One of the familiar hotels had been temporarily closed down and was given over to a party of physicists whose instruments were aligned on the terrace; large posters indicated the danger connected with any contact with those wires, and an enormous placard announced that the whole was not as one might have been inclined to think, a gigantic broadcasting station, but an "experimental plant for investigating extreme atmospheric high tension."

The "Lead-In" on the Mountain Side

Who had been converting this celebrated belvedere into a temporary physical laboratory? The three young physicists living and working at this lofty height, when asked to solve the riddle, would give more or less indefinite replies.



Fixing the Monte Generoso Antenna System

The writer has had the good fortune of attending a recent sitting of the German Physical Society, where Dr. F. Lange, assistant at Prof. Nernst's Physical Institute of Berlin University, delivered a brief address on those most interesting experiments carried on by himself in co-operation with A. Brasch and C. Urban, and which in the course of the summer are to be resumed.

The actual aim of these experiments is nothing less than the *breaking up of atoms*—those fundamental particles which, until not very long ago, were considered indivisible and indestructible. That a further sub-division of atoms is possible, and that it points a way to the *transmutation of elements*, vainly attempted by the alchemists of old, has, of course, been shown by radio-active phenomena, and was first demonstrated by Rutherford, the celebrated British physicist.

Breaking up such a solid union as the atom, of course, entails the expenditure of extraordinary amounts of energy. Even those first results on a small scale were only possible by setting up a bombardment with alpha particles—those positively-charged helium atoms racing through space at enormous rates (up to 30,000 kilometres per second).

Now, as radium, so far resorted to to break up atoms, is only available in infinitesimal quantities, the effects possible were rather modest. Actual progress, it was felt, could only be hoped for, if there was a means of producing those bombarding particles in some other way, viz., by applying extreme high tensions to a tube where a high vacuum had been produced. In fact, as pointed out by these three physicists, past experience and theoretical considerations both went to show that forthcoming results would far exceed all that had hitherto been achieved.

How should, however, these extreme tensions be produced? One million volts has, of course, often been obtained, and nearly two millions has been obtained by American engineers. This, however, seems to be the upper limit, as difficulties in exceeding this figure are very great, leaving no prospect of further advance.

This is why the three physicists of Monte Generoso, following Franklin's example, made up their minds to draw upon atmospheric electricity—that perpetual source of energy which during a thunderstorm yields huge tensions.

It may be said that Franklin's classical kite experiment has been duplicated from time to time. However, accidents discouraged any further attempt along these lines. In fact, not before modern thunderstorm research called for quantitative measurement was this problem resumed, the damage due to storms in connection with long-distance transmission plants resulting in an accurate investigation of the nature and progressive variation of thunderstorm fields. Special thunderstorm stations were at some places erected in order to elucidate the influence of storms on high-tension lines.

A Spark from the Clouds—4·5 Metres Long

Messrs. Lange, Brasch, and Urban did not think it advisable to use kites or balloons for carrying the wire system destined to collect atmospheric electricity, as such a primitive arrangement would have been subject to squalls, jeopardising the experimenter's safety and making any

(*Continued on page* 398)

For the Newcomer to Wireless:

How Current Travels Through a Wire

I WONDER if you can explain how an electric current passes from one end of a wire to another? I can understand water flowing through a tube, but it is a little difficult to realise how an electric current makes its way through a solid wire.

First of all we had better try to see what this solid wire is made of.

Copper isn't it, as a rule?

Yes, but copper, like all other substances, is not exactly what it seems. To the eye it appears to be continuous and firmly knit, though actually it isn't.

How is that?

If we could see copper as it really is, we should find that it consists of a mass of tiny atoms, each of which is like a solar system in miniature.

Planets revolving round a central sun?

Just so. In each atom the "sun" is the nucleus which has a positive electrical charge. The planets are the far tinier electrons which *are* negative, electrical charges. Ordinarily the atom is perfectly balanced, the positive and negative electrical charges being exactly equal.

Can the balance be upset?

Yes. Some of the electrons are not very closely bound to the system. They may easily travel from it to another. If an atom loses one electron its positive charge exceeds the negative and it is then known as a positive ion. Similarly, if it collects an extra electron it has a small negative charge.

Then what is an electric current?

An electric current is a flow of electrons. Let us see what happens when one electron is delivered at the negative terminal of a battery to a wire running to the positive. This electron charges into the nearest atom in the wire. Such is the force of its impact that an electron is knocked out of its orbit and goes crashing into a second atom, where the process is repeated. This happens all down the length of the wire, the net result being that whereas one electron went in from the negative terminal, one electron is shot out to the positive.

Then the one that comes out is not the one that goes in?

No, the original electron may take quite a long time to travel down the wire, but for every electron that goes in an electron is ejected and the process is so rapid that a current passes through a wire almost at the speed of light.

I suppose that a good many electrons are needed to heat the filament of a valve? several hundreds a second, I mean.

It is generally taken that the number of electrons passing a point in a wire through which an ampere of current is flowing is 8,700,000,000,000,000,000 in every second. Modern dull-emitter valves generally require only one-tenth of an ampere of current, so that to arrive at the number of electrons rushing through one of their filaments in each second of time you have only to knock off one nought from that figure. This is about 400,000,000 times as great as the entire human population of the world. You will understand now how it is that a thin wire gets hot when all these electrons are bustling through it.

THE "SCHOOL FIVE"

SOME NOTES ON NEXT WEEK'S BIG SET

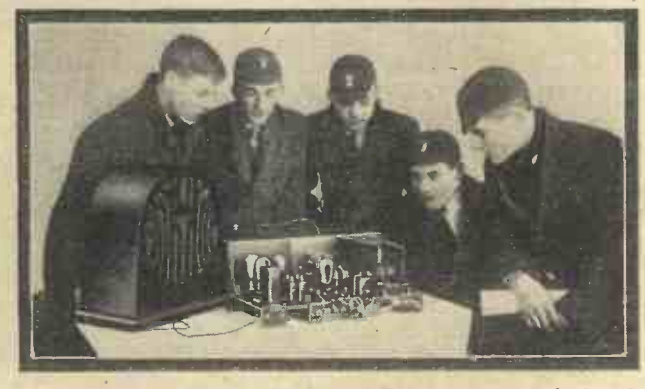
THE "School Five," which is to be illustrated and described next week in AMATEUR WIRELESS, is the result of a considerable amount of inquiry to ascertain the wireless needs of schools.

The "School Five" is no ordinary wireless receiver, and although its particular application to school use is emphasised it must not be overlooked that it is of general interest also.

First of all, we found that what was wanted by schools was a multi-valve receiver capable of bringing in a selection of foreign programmes at very loud loud-speaker strength with unimpeachable purity of reproduction. It was also evident that the operation of the receiver had to be fairly simple and that its initial cost and subsequent running costs, although not so important as in an individual listener's case, still had to be considered.

The three essentials of a good school receiver—sensitivity and purity with volume—cannot be obtained with less than four valves; and here it should be noted that two of the valves in the "School Five" are paralleled power valves. So that actually there are four valve stages in the "School Five," arranged in the following order: High-frequency amplifier, detector, and two low-frequency amplifiers.

Adequate sensitivity has been ensured by the incorporation of a screened-grid valve and astatically-wound plug-in coils. The two L.F. amplifying valves are resistance-capacity coupled, a system of coupling which is now coming into its own for pure reproduction.



The combined amplification of the screened-grid H.F. valve, the detector, and the two resistance-capacity coupled L.F. valves results in a very big signal voltage being applied to the last stage, and to prevent overloading, two "super-power" valves are therefore "paralleled." In this way greater volume, without any sense of "strain," is easily obtainable.

For such a sensitive receiver the "School Five" is unusually simple in its operation. The main control is a slow-motion dial in the centre of the panel, and on either side of this are the two subsidiary controls. One is a unique and, at the same time, extremely satisfactory reaction control, and the other what we can call a "resonator," which in plain language is simply a rough tuning control.

In its constructional aspect the "School Five" is again "something different." The completed wiring looks extraordinarily simple, because the straggling battery wires usually appearing on the baseboard are taken to a sub-panel wiring system. The screening of the screened-grid H.F. valve has also been simplified by the use of special astatic coils.

Our message to schools is a very practical one—just this: "Build the 'School Five,' specially designed for school use and have the satisfaction of knowing that *the school* has a set to be really proud of."

In order to avoid interference with Warsaw and Hilversum, the Basle station has reduced its wavelength to 1,000 metres.

Valves with the wonderful Mullard P.M. Filament

Powerful valves that fill any receiver with new life; lasting valves that maintain improved results long after a thousand hours' use; generous valves that give amazing volume and range due to the unequalled, tough, master filament they possess . . . the wonderful Mullard P.M. Filament; found ONLY in Mullard P.M. Valves.

Mullard

THE · MASTER · VALVE

On Your Wavelength!

A Revelation

WHAT Captain Eckersley would call the service area of 5GB—that is to say, the region in which dependable reception is possible with simple apparatus—is very queerly shaped. On the south coast, for example, in the neighbourhood of Brighton, signal strength is never very good, whilst fading is the rule rather than the exception. A friend of mine who lives down there found it hard to believe all the tales that I told him about the huge signal strength that I obtain from 5GB and the complete absence of fading.

A Difference

The other day, however, he helped to instal a little set—just a rectifier and two note-magnifiers—in a house situated in the Thames Valley. To his great surprise, he found 5GB what he describes as a "terrific" signal. Having seen the set working properly, he motored back to his own home and promptly tuned in 5GB with an efficient H.F. stage, a rectifier, and two note-mags., just to compare reception in the two localities. He found the transmission fading violently, whilst the quality, even during the loud periods, left a good deal to be desired. I am glad, however, of one thing. My friend now believes me when I tell him that it takes a good set in my locality to cut *out* 5GB and to cut *in* Berlin Witzleben. There are a good many problems in connection with high-power transmission on the medium waves that still leave us guessing, and no one really knows why a signal should be steady and powerful at forty-five miles, but weak and wavering at less than double that distance.

A Listeners' Strike!

I hear that in America there is a strong movement for listeners to down knobs as a protest against reception conditions over there. It appears that the U.S.A. Radio Act, despite all the care that has been expended upon it, is not being strictly enforced. Under its provisions both the power of stations and the times at which they may broadcast are very strictly limited, and it is laid down that any station which errs and strays even by a fraction of a metre from its allotted wavelength shall suffer all kinds of pains and penalties. One gathers that there is a tendency to evade the Act by boosting up the aerial watts, stretching the permitted broadcasting hours and wandering a metre or so up or down in order to avoid heterodynes—which always means producing others.

What Good?

The underlying idea of the listeners' strike is splendid; but, somehow, I don't quite see what good it could do. If only broadcasting stations could be provided with a meter which would indicate the number of receiving valves in use in their areas at any time, such a turning over of earthing switches would give their directors a nasty shock. But as things are they have no means of knowing whether what they send out is being taken in or not.

As You Were!

I gave recently a schedule of days and times for ANH, the Dutch colonial station at Bandoeng in Java. The very day after I had written the lines that contained it the post brought me a further letter from Bandoeng containing an entirely revised scheme. Here it is. Every Monday ANE broadcasts from 12.40 to 2.40 p.m. G.M.T., using a wavelength of 15.93 metres. Also, on Tuesday and Thursday ANE is at work, and his hours are from 4.40 to 6.40 p.m. and his wavelength 31.93 metres. ANH is now transmitting regularly only on Saturdays between 12.40 and 2.40 p.m., his wavelength being 17 metres, as before.

ANE's longer wave transmission comes in very well with the bigger short-wave coils, which usually tune from about 25 to 70 metres with a .00025-microfarad variable condenser. You can take his 31.93-metre transmission as a reference point near the lower end of the calibration curve, whilst KDKA, on 62.5 metres, comes in well up the curve. Other useful checking stations, since they are both crystal controlled, are 2XAD, on 21.96 metres, and 2XAF, on 32.77 metres.

A New Short-wave Giant

Probably before these lines appear in print many readers who use short-wave sets will have picked up a new short-wave transmission of great power. This is 3XL, who is shortly to get to work with 30 kilowatts behind him on a wavelength of 59.96 metres. Since 2XAD and 2XAF use only about 10 kilowatts we should expect fine signals from 3XL. One can never say what power KDKA is employing, since the station is always experimenting—that's what it is there for—and the output varies from time to time. It is always, however, pretty useful, for signal strength is generally good.

KDKA

If you gave up KDKA in disgust some time ago owing to the queer distortion which used to accompany his transmission, you will be well advised to give him another trial, for he is now using a different system, and on most nights his quality is extraordinarily good. KDKA is also one of the easiest of the short-wave stations to receive owing to his comparatively high wavelength. Even with a not very efficient set, capacity effects and their attendant evils do not, as a rule, manifest themselves very strongly until one drops down to about 40 metres or below. It is, in fact, quite possible to receive KDKA successfully with a 0-V-2 set designed for broadcast reception and not intended for work on the short waves.

A Dance Band Moves

Those who are fond of dance music will be grieved to read that Mr. Sidney Firman with his band is about to leave 2LO. It is understood that he intends to devote his attentions to the production of a novel theatrical revue, the setting of which is to be a broadcasting studio. He is sure to be very popular when he takes his revue on tour, for he has made many friends all over the country during his career as a broadcaster. But if we must say farewell to Mr. Firman, it is good news to hear that his place is to be taken by another star in the jazz firmament, Mr. Jack Payne. Just as Mr. Firman is about to strike a new note in revue, so Mr. Jack Payne promises us a new note in broadcast dance music. He intends to avoid the frequent repetition of popular tunes and to devote a good deal of time to the fresher and lesser known tunes.

The Young Idea

I spent an interesting, if somewhat strenuous, couple of hours the other night in giving a lecture on wireless at one of our public schools. There was no doubt about the keenness of the audience on wireless, for many of them had come armed with notebooks and pencils, which they plied assiduously, and heaps of them, when question time came round, were ready with sensible, though sometimes rather formidable questions to exercise what your THERMION is pleased to call his brain. I had rather a dreadful moment when I went in a quarter of an hour or so before the show started just to see that the demonstration sets were working properly. With one of them I tuned in 5GB and obtained splendid reception—for about ten seconds. Then came a horrid silence.

A Hectic Time

Trying to recall hastily all that I had ever read or written on the subject of rapid fault-finding, I started in with a sinking heart to locate the trouble. More by good luck than by good judgment, I was able to do this just in the nick of time. As a matter of fact, it was not in my apparatus at all. A six-volt accumulator had been provided for me, and I had hitched my L.T. leads on to it without examining it very carefully. One of the strap connections between its cells was loose, and as

On Your Wavelength! (continued)

the terminal was dirty, a slight movement had resulted in a complete cutting off of filament amps.

Huizen

The news that the Dutch Huizen transmitter, owing to interference from Scheveningen-Haven, has adopted the wavelength of 340.9 metres (that of the Petit Parisien) for all transmissions until 5.40 p.m., in a sense is somewhat disconcerting; as it is, that portion of the wave band is already fairly crowded, and the advent of a 5-kilowatt transmission in that region is rather inclined to wipe out our reception of more distant programmes, such as those we can receive from Barcelona, Posen, or even, for the matter of that, Prague.

A Pity

On top of this news from Holland, also comes the information that if the new medium wavelength is found satisfactory, Huizen will either entirely adopt it or seek one in the neighbourhood of 350 metres. If this does actually take place, I am afraid that the wipe-out effect will be even greater, at that time during the main evening hours when it is already difficult to pick up many stations in this portion of the wave band free of heterodyne or other interference. Personally, I cannot see that the congestion existing in the ether has been much reduced since the advent of the Geneva Bureau. Either this central authority of the Union of Broadcasters has executive powers or it has not; if it does possess any, why not exercise them? If it does not—well . . .

An Eye to the Future

I expect that many of my readers who have read these notes week after week are often wondering what the latest development is likely to be in receiver design. Quite rightly, many of them argue that we seem to have reached that stage when the various "dynes" have the field to themselves. The matter of most importance, however, in the near future will be selectivity of receivers, for with the advent of the regional scheme many receivers which are already obsolete will require a certain amount of attention in this respect. Already many readers have, no doubt, had a certain amount of forewarning in this respect, since the erection of the new masts at Daventry Experimental, 5GB, have resulted in a considerably increased signal strength to many listeners, which has in certain cases resulted in a certain amount of jamming when the receiver is not fitted with a wavetrap or otherwise rendered selective.

Australian Short-wave Transmissions

Short-wave enthusiasts have now another station to listen to, and one on which they can test their sets for real DX, in 3LO (Melbourne, Australia). The usual 3LO station is well known to most wireless enthusiasts as the sister station to London, as it were, on the Continent of Australia. Apparently a short-wave transmission has been inaugurated on a wavelength of 32 metres in addition to the normal service on the usual broadcasting band.

I was playing round last Sunday with a short-wave superhet arrangement, very similar to the admirable "Short-wave Super Six," described in AMATEUR WIRELESS a few weeks back, and I was surprised to hear, good and strong, a clock striking five, followed by the announcement: "This is 3LO, Melbourne, transmitting on 32 metres. It is just 5 o'clock. We are continuing our programme by transmitting . . ."

Excellent Reception

I thought at first that I could not have heard aright, but I sat on him for a little time to confirm the matter. He was subject to high-speed fading, and was rather broken up and, indeed, at times was almost unrecognisable. To my joy, he repeated his call at frequent intervals, and I was soon left with no doubt that he was really Melbourne, Australia. Gradually conditions improved, and the reception became excellent, although I was not able to get him as well as 2FC. Shortly afterwards, he amused us by giving results of the Ilford by-election; subsequently, he recounted some of Hinkler's adventures since landing in Australia. I do not know what the power of this station is, but it was certainly an interesting experience, and all the more pleasing since it was totally unexpected. I am asking the Editor to find out some more about this station, and no doubt, as information becomes available, he will publish it for the benefit of other readers. (Correspondence relating to this station appears on page 392.—ED.)

The X-ray Sleuth

An X-ray photographer to whom I was chatting the other day told me of a rather amusing application of his art to wireless. A friend of his, a great wireless enthusiast and one who knew a good deal about the subject, was the possessor of one of those wireless receivers that are guaranteed for a certain length of time so long as the panel seal is not broken. Now, this instrument developed a fault. At least, the cause of the poor reception was tracked down by a process of elimination to the "innards" of the receiver.

Although quite sure in his own mind that the receiver was at fault, the photographer's friend was loth to investigate further because of the seal. Then the bright idea occurred to him of having an X-ray photograph of the receiver taken. When, subsequently, he examined a photographic negative showing an X-ray interior of the box of tricks he was able to see that one wire was severed, being just "held" by the cotton covering of the wire.

NEXT WEEK:
FURTHER NOTES ON THE
"Q" COIL THREE

A Wizard

This is not the end of the story, for when he returned the receiver to the makers he informed them that if they broke the seal they would find a certain wire disconnected, but he omitted to mention how he knew this was so! He says that his reputation as a wireless expert went up very considerably in the estimation of the wireless firm concerned when, on opening the box, they found that his diagnosis was correct.

Where We Lead

One might have thought, from articles and correspondence appearing recently in some of the lay papers, that America had things more or less her own way as regards television. Such, however, is most emphatically not the case. The Americans themselves admit that our own countryman, Mr. J. L. Baird, is streets ahead of anybody else in this coming department of wireless, and that what he has already accomplished puts completely in the shade anything that has been done on the far side of the Atlantic. Mr. Baird does not do a great deal of talking about his work; in fact, we often hear very little about him for quite long periods on end. But he goes steadily forward. The time may not be very far distant when the televisor will do its work as well, at any rate, as did the wireless loud-speaker at the beginning of the broadcasting era. Once that stage is reached it will be but a short time before something like perfection is in sight.

More Radioese

You know my loathing of the jargon used by a certain section of wireless enthusiasts. So far, it seems to have been confined chiefly to wireless transmissions and to the cryptic letters or postcards that one occasionally receives from very young hands. The other day, though, I got rather a shock when a friend sent me on a letter that he had received in reply to an inquiry addressed to a wireless company.

"Dear Sir," it began, "We duly received your favour of the 17th ult. We feel sure that our —— transformer is exactly the component that you are looking for, O.M. . . ." Ye gods! Fancy calling a man "Dear Sir" at one moment and "Old Man" the next! I need hardly say that my friend did *not* purchase the transformer.

THERMION.

An Easily-Made Cone Loud-speaker

By J. H REYNER

PROBABLY the most popular type of loud-speaker in use at the present time is the cone. A glance at the window of any wireless dealer will reveal numerous examples of the type; some decorative and costly; others inexpensive, yet similar in design.

In this article constructional details are given of a simple, but effective, cone speaker, utilising a form of magnetic unit known as the balanced armature. The balanced armature is recognised as a very efficient type of unit and is employed in some of the best-known cone speakers.

The Balanced Armature

The majority of readers have, at some time or other, examined an electro-magnetic unit, in which a reed, attached to a cone, is caused to vibrate due to its proximity to the electro-magnet through which pulsating currents from an amplifier are flowing.

The system utilised in the balanced-armature unit is somewhat different; here a soft iron tongue is suspended between two sets of magnets at either end. The tongue takes up its position exactly between the magnets and unless a pulsating current is flowing in the magnetic windings, there will be no resulting force tending to move it. Consequently on the arrival of a pulsating force, the tongue, which is attached to a diaphragm, or other means of producing sound waves, is free to move in both directions and is consequently caused to rock from side to side of the mean position. Hence the motion transmitted to the cone approximates more closely to a true sine wave than is the case with the previously mentioned magnetic unit.

The unit utilised in this cone speaker is the Ideal unit marketed by Messrs. F. A. Hughes and has a number of interesting points in its design which merit attention. One of the most displeasing qualities of any loud-speaker is its tendency to resonate at certain audible frequencies. Precautions have been taken in this unit to avoid any appreciable resonance of the vibrating armature by damping the movement with Sorbo rubber.

The general effect of such damping is illustrated in the diagram. The full line curve illustrates an undamped resonance, whilst the dotted curve shows the effect of damping the vibrator movement. Although the overall strength of reproduction may be less, the reproduction is more pleasing, whilst there is less tendency for the tones to become jumbled.

The Design

No attempt has been made to design an elaborate speaker. It was thought that the reader would appreciate a simple, although efficient, construction.

The cone is essentially free-edged, in that it is supported at the periphery at one point only: in order to obtain the best possible reproduction, some form of baffle

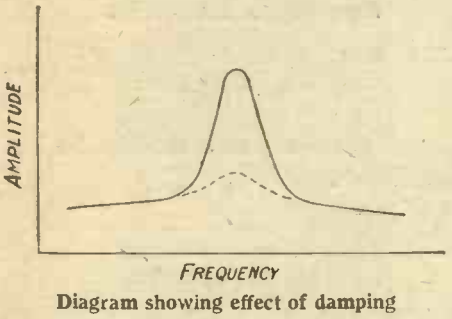


Diagram showing effect of damping

should be used consisting either of an enclosing cabinet or expanse of wood.

The Cone

Nineteen-inch diameter, Six-Sixty paper marketed by the Electron Valve Co., is utilised for making the cone. This part of the construction presents no difficulty whatsoever, as full instructions are given with each sheet of cone paper supplied. Seccotine or glue may be used in sticking the paper together.

The exceedingly simple construction is apparent in this picture showing how the unit is mounted

Since the cone is essentially free-edged some means of preventing distortion of the shape has to be provided. It was finally decided to cut out a thin piece of cardboard the same diameter as the cone and stick this round the edge. This is placed round the edge of the cone and, if necessary, a number of fairly light books are placed at various intervals on the top of the cardboard until the glue has had sufficient time to dry.

Mounting the Magnetic Unit

We must next consider a suitable method of mounting the balanced-armature unit in the correct position for attaching to the centre of the cone. The support may be a strip of wood mounted in the manner shown in the photographs. The magnetic unit is securely held by passing a screw through a small ebonite clamping piece.

A small piece of wood, with one side bevelled, is screwed on to the end of the baseboard behind the cone and serves to make the whole assembly rigid.

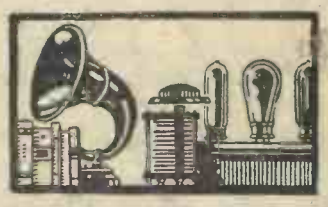
Assembly

The instrument may now be assembled. Unscrew the first nut on the operating spindle of the balanced armature, and remove the brass discs which are not required. With the Six-Sixty cone paper, will be found two metal centre pieces. Place one of these on the spindle, then the cone and finally fit the second disc and screw the whole up tight with the nut.

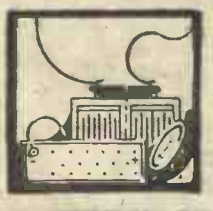
Now assemble the unit on its stand and adjust the height till the bottom of the cone just rests on the baseboard. Fit the bevelled block behind the cone and fix it in position. A screw through the cone into the block then completes the assembly.

The results obtained with this speaker are remarkably good; it will give surprising volume with quite a small input.

A new day and night wireless telegraphy service has been installed for the use of shipping by the Belgian Government at the Antwerp transmitting station OSA. Captains of ships desiring the services of a doctor address their telegrams *Radio-medical anvers Radio* and the letters SVH (*Sauvegarde de la vie Humaine*), to which priority is given. No charge is made for these messages, which can be transmitted in the French, Flemish, or the English languages. Official medical advice promptly follows all requests received from sea-going craft.



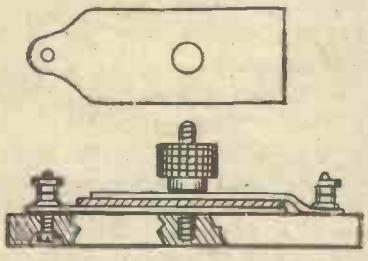
PRACTICAL ODDS & ENDS



Adjustable "Fixed" Condenser

THE condenser shown in the sketch is of the fixed type, with mica di-electric, but variable capacity is obtained by means of compression applied to the two plates. Two springy brass foils each about 2 in. long by 1 in. wide are cut out as shown, and a ⅜ in. hole is drilled through the centre of each, the centre being measured between the shoulder of the tag and the opposite end. The mica sheet is about 1¾ in. long by 1¼ in wide, this also being drilled ⅜ in. through the centre. It is then secured to the lower foil by means of shellac varnish, the usual hot flat-iron method being employed.

A suitable ebonite base is marked off from the foils and drilled through each end of a line with the centre to take two small terminals. In the exact centre a 2B.A. tapping hole is drilled and threaded (with a plug tap) to take one end of a 1½ in. length of 2B.A. screwed brass rod which is screwed hard down in the ebonite to form



An Adjustable "fixed" Condenser

a stud. A small ebonite knob is then drilled through and tapped 2B.A., so that it fits nicely over the end. The lower foil with the mica is slipped over the stud, and the tag secured firmly under one of the terminals. The other foil is slightly bent at the tag and secured in the same way. Care is taken to see that the edges of the central holes are well separated from the stud, and that the upper foil is just separated from the mica. The ebonite knob is now run down the stud, and by adjusting this the distance between the foils—and hence the capacity—can be carried between maximum when the foil is hard down on the mica, and minimum when the top foil is allowed to spring back to its normal position. O. J. R.

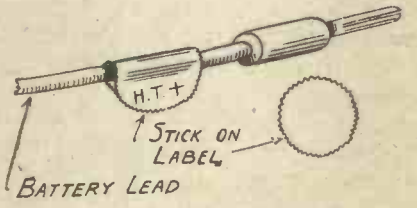
Keeping Files Clean

FILES used for work on ebonite are apt to become quickly clogged with ebonite dust, and the cutting surface thus rendered ineffective. This trouble is easily obviated if the file is frequently rubbed over with chalk during use. This enables the file to throw off the ebonite dust, which will not adhere to the chalked surface of the file.

H. B.

Battery Tags

OF all the methods of labelling battery tags, surely it is easiest to do so with the ordinary little paper stick or tab!



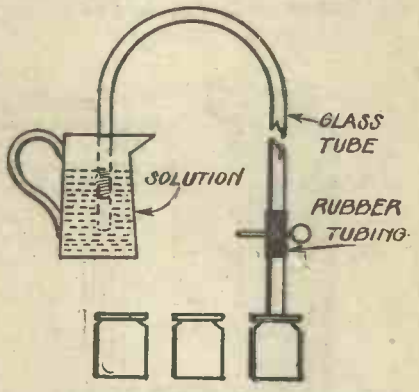
Paper Tags for Battery Leads

They take no time to put on, and they last for a surprisingly long time. H. B.

For Users of Leclanché H.T. Batteries

WHEN a leclanché battery of some 80 or 100 cells is in use, some clean and rapid method of refilling becomes a necessity.

A 2-ft. length of ¼-in. glass tubing is bent to shape in a gas flame, and a fountain-pen filler attached, as shown in the drawing, by an inch or so of rubber tubing. A pinch-cock or Mohr's clamp is then slipped over the rubber. The syphon is started by filling the glass tube with the solution. The Mohr's clamp allows the flow to start or cuts it off immediately.



For Rapid Wet Battery Charging

The syphon can also be easily adapted for drawing off the old solution. A. E. H.

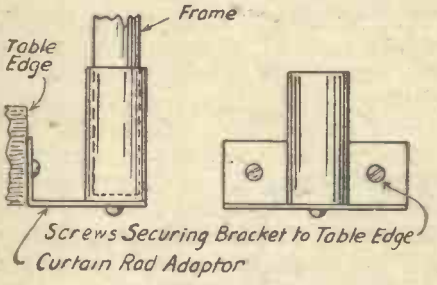
Scraping Flex Leads

DO not scrape the covering off the ends of flex leads over a receiver when wiring up. The reason for this caution is obvious, although it may not occur to many. There is always a danger of a fine strand of wire dropping off unseen during the process, and it is not a good policy to have fine pieces of copper wire near the components or wiring. There is a danger of even such minute factors causing trouble in the nature of short circuits. B. R.

A Simple Frame aerial Socket

A SIMPLE socket which may be attached to the cabinet of a receiver, or alternatively to the edge of a table or ledge, may be made from a curtain-rod adaptor, as shown in the drawing.

It is only necessary to secure the adaptor in any desired position where the frame is to be used. The frame itself is then



A Frame-aerial Support

dropped into the socket, as shown, and revolved round until the best position for reception from the required station is found. If the frame support should not fit the socket it is only necessary to turn the end down to a corresponding diameter.

C. B.

Self-contained Receivers

A POINT worthy of note is that there is a danger in the case of all enclosed receivers, of no ventilation being allowed to enable the sulphuric fumes arising from the batteries to escape. If this is the case, it will be found that these fumes are detrimental to the component parts of the actual receiver, especially the metal elements. It is best, if possible, to well separate the batteries from the receiver by means of a definite partition. Some means of ventilation also should be provided for in the battery compartment. R. D.

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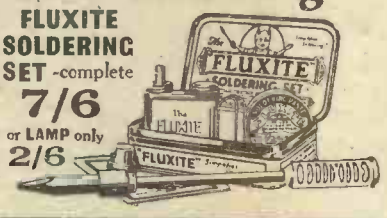

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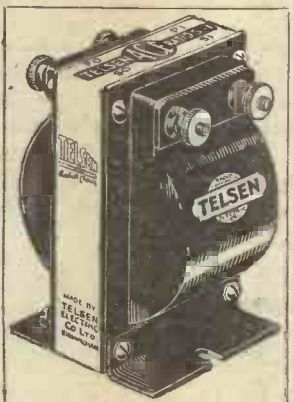

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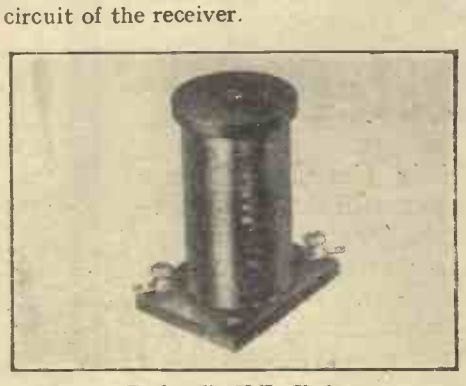
"A.W." TESTS OF APPARATUS

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

Tayloradio H.F. Choke

THE increased use of high-frequency chokes in not only the H.F., but also the L.F. circuits of wireless receivers, in order to avoid difficulties which arise from the presence of unwanted H.F. currents, has led to numerous samples of this component being placed on the market. It is often essential to the good working of the set that the H.F. choke function efficiently over the wave band covered by the tuning circuit of the receiver.



Tayloradio H.F. Choke

In view of this, we always give H.F. chokes a severe test, a special method of testing having been devised which shows up at once any defects in a choke, and it is only by the maintenance of a high standard of this nature that satisfactory performance reports can be given. The Tayloradio choke is clearly an attempt to minimise to the utmost that bugbear of designers—self-capacity. The winding is placed on a skeleton former consisting of five slotted ebonite rods. The winding is in eight sections, wound with fine-gauge enamelled wire, and the whole is enclosed in a glass tube to protect the windings from damage and dust.

On test, the choke functioned satisfactorily down to below 100 metres, and operated reasonably well on Daventry. There were indications, however, that the choking action was deteriorating in this region, and we should like to see a few more turns on the winding. The component, indeed, does not deserve to be handicapped by any such suspicion, for it is well constructed and reasonable in price.

It is produced by W. W. Taylor of 36 Furnival Street, E.C.4.

Ediswan Battery Lead

THE Edison Swan Electric Co., Ltd., of Ponders End, have recently put on the market the battery cord which they supply with their One-Der set. This has two L.T. tappings, plus and minus, and two H.T. + tappings, the H.T.— being common with the L.T.—. The L.T. leads finish in a plug, this being done to minimise the risk of wrong connections.

The resistances of the L.T. leads in series was found to be .1 ohm, which is quite satisfactory. The leads are provided with clear indicating tabs, and should prove useful.

Pertinax Panel Material

THE popularity of the modern "American" type of panel has given rise to the production of a large number of panel materials, some good and others not so good.

The Pertinax panel, which has been submitted for test by G. L. Scott & Co., Ltd., of 69 Fleet Street, E.C.4, is made of compressed bakelite paper. This is good not only as regards insulation (which is the most important factor, except in special circumstances), but also as regards losses at high frequency.

The material works well and has an attractive finish, and it should prove a useful substitute for the more usual ebonite.

L.S.A. Dry Batteries

ONE of the most important features of the original Leclanché battery was its marked recuperative powers. The L.S.A. batteries, marketed by Messrs. Thompson & Co., of 1 and 3 Old Swan

L.S.A. Dry Batteries

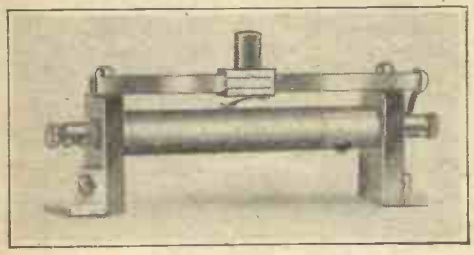
Lane, E.C.4, are made at the original Leclanché works in Switzerland, and are claimed to possess this recuperative power to a high degree.

A number of batteries of this type were recently tested in our laboratories. One, of the usual small size, placed on a discharge of 6 milliamps, gave a life of over 2,000 milliamp-hours. A similar battery placed on a 6-milliamp discharge for short periods and allowed to recover in the interim (the average use being five hours per day) is still working at the present time, having already lasted over 3,000 milliamp-hours.

These batteries thus appear to fulfil the claims of long life made for them, provided, of course, that they are discharged at a rate within the capacity of the particular size of cell.

Loriometer Potentiometer

LORIOSTAT resistances are well known to readers of AMATEUR WIRELESS, and it is with pleasure that we welcome the Loriometer, a potentiometer by the same manufacturer, A. W. Stapleton, of 19a



Loriometer Potentiometer

Lorrimore Buildings, Lorrimore Street, S.E.17.

This has a winding of fine-gauge resistance wire wound on a small barrel, contact being made by a slider running on a square metal rod running parallel with the barrel. The motion so obtained is very smooth and is electrically silent.

A particular point about potentiometers is that they should have a high resistance, for they are constantly across the battery, in some instances even when the set is switched off. There is thus a constant drain on the L.T. battery, and the higher the resistance of the potentiometer winding, the less will be this drain.

The sample tested had a resistance of 1,240 ohms, which is very good for so compact an instrument. We can recommend this to readers.

That birds have a short-wave transmitter and receiver located in their brains, to which is due that sense of direction and migratory instinct which has so long been a puzzle of naturalists and, in fact, all scientists, is the remarkable theory that has been put forward by M. Georges Lakhowsky, of Brussels. In conjunction with this cell is a conducting liquid which is both an oscillator and resonator of very short waves. So the carrier pigeon, for instance, makes use of wireless waves without knowing it.

RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, layouts, diagrams, etc., on separate sheets containing your name and address. See announcement below.

Cutting Out H.F. Valve.

Q.—*I wish to cut out the H.F. valve in my set, which consists of one stage of neutralised H.F., detector, and one L.F. Is there any simple and efficient means of accomplishing this without drastic alterations to the wiring of the set?—T. K. (London).*

A.—If you switch off the filament current from the H.F. valve and then throw the neutralising condenser out of adjustment, you will be able to use only two valves. In this way no switch or switches are introduced and no alteration to the wiring of the H.F. circuit is necessary.—L. C.

Loud-speaker Distortion.

Q.—*I experience distortion in reproduction from my loud-speaker, and although I have tested all the components, adjusted H.T., L.T., and G.B. to the best of my ability, distortion is still apparent on loud passages of music.—F. D. (Newcastle).*

A.—You are advised to connect a milliammeter in the plate circuit of your last valve and then adjust your H.T. and grid-bias voltages until the M/a needle remains stationary. If distortion persists, even when the needle is stationary, then it is possible that you are saturating the loud-speaker, and we suggest that you interpose a choke-filter circuit between the receiver and the loud-speaker. In this way the direct current from the H.T. battery will not pass through the loud-speaker windings and the latter will be able to deal more effectively with the signal current.—C. B.

When Asking Technical Queries

PLEASE write briefly 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.

Lead-in Insulators.

Q.—*I notice that most lead-in insulators consist of a tube of ebonite through which a brass rod is passed, the latter being the means of conducting the electrical energy through from the aerial to the receiver. Why is it that glass or other insulating materials are not used, as these appear to be insulators, i.e., have a greater resistance to the passage of electrical currents, than ebonite?—H. A. (Bury).*

A.—When considering the design of such accessories, it is essential to bear in mind the fact that one is dealing with oscillatory currents. An insulator that has a high resistance to direct currents may also have a high dielectric constant which will create a very large capacity to earth. This, in itself, will be the means of by-passing much of the signal energy to earth, and the aerial losses will be far greater than would be the case were ordinary ebonite used. Ebonite has a mean S.I.C. value of about 2.5, whilst glass has a value of approximately 8. Air has an S.I.C. value of 1, and if it were possible to pass a lead-in wire through an air space into a receiving or transmitting station and at the same time keep the lead-in from swaying, this would be an almost ideal arrangement. Ebonite is used because it is cheap, has a low S.I.C. value, and usually affords adequate insulation for the electrical impulses picked up by an aerial.—L. C.

CHIEF EVENTS OF THE WEEK

LONDON AND DAVENTRY (5XX)

Mar. 11 Military Band Concert. Belgian national programme.
„ 12 Programme S.B. from Cologne.
„ 13 *The Land of Heart's Desire*, by W. B. Yeats.
„ 14 *Joseph and his Brethren*, an opera in three acts by Mehul.
„ 15 *College Days*, a programme of students' songs from the Scottish Students' Song Book.
„ 16 National Symphony Concert, relayed from the People's Palace, Mile End.
„ 17 Running commentary on the Rugby International, England v. Scotland, relayed from Twickenham.

DAVENTRY (5GB)

Mar. 11 Albert Sandler
„ 12 *Joseph and his Brethren*, an opera in three acts by Mehul.
„ 13 Programme from Cologne.
„ 14 Two Comic Operas from Birmingham: *Breaking the Spell*, by Offenbach; *The Policeman's Serenade*, by Alfred Reynolds.

CARDIFF

Mar. 15 The Second Concert (thirtieth season) of the Newport Choral Society.

MANCHESTER

Mar. 13 "Down to the Sea in Ships," some glimpses of life on board an ocean-going merchantman.
„ 15 Hallé concert from the Free Trade Hall, Manchester.
„ 17 A Gilbert and Sullivan programme.

GLASGOW

Mar. 17 A concert by the Caledonian Strathspey and Reel Society.

ABERDEEN

Mar. 15 Concert relayed from the Music Hall

BELFAST

Mar. 15 Comedy and light opera programme.
„ 17 *Saint Patrick*, a narrative play.

BROADCAST TELEPHONY

(Broadcasting stations classified by country and in order of wavelengths).

Metres	Kilocycles	Station and Call Sign	Power Kw.
GREAT BRITAIN			
24	12,500	Chelmsford (5SW)	20.0
252.1	1,190	*Bradford (2LS)	0.2
272.7	1,100	*Sheffield (6FL)	0.2
275.2	1,090	*Nottingham (5NG)	0.2
277.8	1,080	*Leeds (2LS) ...	0.2
288.5	1,040	*Edinburgh (2EH)	0.2
294.1	1,020	*Stoke-on-Trent (5ST)	0.2
294.1	1,020	*Swansea (5SX)	0.2
294.1	1,020	*Dundee (2DE)	0.2
294.1	1,020	*Hull (6KH).....	0.2
297	1,010	*Liverpool (6LV)	0.2
306.1	980	Belfast (2BE)...	1.5
312.5	960	Newcastle (5NO)	1.5
326.1	920	*Bournemouth (6BM)	1.5
353	850	Cardiff (5WA)...	1.5
361.4	830	London (2LO)	3.0
384.6	780	Manchester (2ZY)	1.0
400	750	*Plymouth (5PY)	0.2
405.4	740	Glasgow (5SC)	1.2
491.8	610	Daventry EX (5GB)	24.0
500	600	Aberdeen (2BD)	1.5
1,604	187	**Daventry (5XX)	25.0
AUSTRIA			
254.2	1,190	Linz (under construction)	0.5
272.7	1,100	Klagenfurt	1.5
277.8	1,080	Salzburg (under const.)	0.5
294.1	1,020	Innsbruck	0.5
357.1	840	Graz.....	0.5
517.2	580	Vienna (Rosenhuegel)	10.0
577	520	Vienna (Wien)	0.75
BELGIUM			
508.5	590	Brussels (Radio-Belgique)	1.5
CZECHO-SLOVAKIA			
300	1,000	Bratislava	0.5
348.9	860	Prague (Praha)	5.0
443	676	Brunn (Brno)...	3.0
1,870	166	Kosice (testing)	5
DENMARK			
337	890	Copenhagen (Kjobenhavn)	2.0
1,153.8	260	Kalundborg ...	7.0
ESTHONIA			
408	735	Reval (Tallinn)	2.2
FINLAND			
375.9	798	Helsingfors (Helsiuki)	1.8
1,530	—	Lahtis (testing shortly)...	20
FRANCE			
37	8,108	Vitus (Paris) ...	2.0
39.5	—	Lyon (PTT) ...	10.0
61	4,918	Radio LL (Paris)	1.0
158	1,899	Beziers	0.6
200	1,500	Biarritz.....	0.25
230	1,304	Ste Etienne	0.25
240	1,240	Nice.....	0.5
237	1,205	Bordeaux (Radio Sud-Ouest)	2.0
252.1	1,190	Montpellier.....	0.5
257	1,170	Juan-les-Pins ...	0.5
259	1,160	Toulouse-Pyrenées (PTT)	0.5
268	1,119	Strasbourg (8GF)	0.3
273	1,098	Limoges (PTT)	0.5
275	1,090	Bordeaux (PTT)	1.0
276	1,085	Rennes	0.5
278	1,079	Grenoble (Poste des Alpes, PTT)	1.5
287.9	1,042	Lille (Poste du Nord, PTT)	0.7
289.3	1,038	Radio Lyon ...	1.5
297	1,010	Radio Agen.....	0.5
300	1,000	Algiers (PTT)...	2
302	993	Radio Vitus (Paris)	1.0
305.1	980	Casablanca (Morocco)	1.5
309	970	Marseilles (PTT)	0.5
340.9	880	Le Petit Parisien, Paris	0.5
345	867	Rabat (PTT) ...	1.0
370	811	Radio LL, Paris	1.0
391	767	Toulouse (Radio)	5.0
400	250	Mont de Marsan	0.3
458	655	Paris (Ecole Sup., PTT)	3.0
477.7	628	Lyons (PTT) ...	1.0
1,080	277	Strasbourg (testing)	
1,750	171	Radio Paris ...	3.0
1,850	154	Radio Carthage (Tunis)	2
2,650	113	Eiffel Tower (FL)	8.0
GERMANY			
37.65	7,966	Doeberitz.....	5.0
204.1	1,470	Kaiserslautern	0.5
236.2	1,270	Stettin.....	0.75
241.9	1,240	Muenster.....	1.5
250	1,200	Gleiwitz	0.7
252.1	1,190	Dresden.....	0.75
252.1	1,190	Cassel	0.7
254.2	1,180	Kiel	0.7
272.7	1,100	Danzig.....	0.75
272.7	1,100	Bremen	0.75
283	1,060	Cologne	4.0
297	1,010	Hanover	0.7
303	990	Nurnberg	4.0
322.6	930	Breslau	4.0
330	908	Koenigsberg ...	4.0
365.8	820	Leipzig	4.0
379.7	790	Stuttgart.....	4.0
396	757	Hamburg	4.0
400	750	Aachen	0.75
428.6	700	Frankfurt-Main	4.0
470	638	Langenberg ...	25.0
483.9	620	Berlin	4.0
535.7	560	Munich	4.0
566	530	Augsburg	0.5
577	520	Freiburg	0.75
1,250	240	Koenigswusterhausen-Zeesen	40.0
1,800	167	Norddeich (KAV)	10.0
HOLLAND			
30.2	9,934	Hilversum (PCJJ)	25.0
340.9	880	Huizen (until 5.40 p.m.)	4
1,069	280	Hilversum (ANRO)	5.0
1,950	153	Huizen	4
1,950	154	Scheveningen-haven	2.5
HUNGARY			
555.6	540	Budapesth	3.0
ICELAND			
192	—	Akureyri.....	1.5
333.3	900	Reikjavik	1.0
IRISH FREE STATE			
319.1	940	Dublin (2RN)...	1.5
400	750	Cork (5CK).....	1.5
ITALY			
407	737	Naples (Napoli)	1.5
452	663	Rome (Roma)...	3.0
550	545	Milan (Vigentino)	7.0
JUGO-SLAVIA			
309.2	970	Zagreb (Agram)	1.25
460	652	Belgrade (testing)	.25
LITHUANIA			
2,000	150	Kovno (Kaunas)	15.0
LUXEMBURG			
217.4	1,380	Radio (Luxemburg)	
NORWAY			
30	9,994	Bergen (testing)	
370.4	810	Bergen.....	1.0
423	709	Notodden	0.7
434.8	690	Fredriksstad ...	1.1
448	670	Rjukan	1.5
461.5	650	Oslo.....	1.5
524	572	Porsgrund	1.0
566	530	Hamar.....	0.7
POLAND			
270.3	1,110	Lemberg (under construction)	10.0
344	870	Posen (Poznan)	1.5
422	711	Cattowitz	10.0
435	689	Wilno	1.5
566	530	Cracow	1.5
1,111	270	Warsaw (Varschava)	10.0
ROUMANIA			
1,800	187.4	Bucharest	2.0
RUSSIA			
675	444	Moscow (Popoff)	10.0
1,000	300	Leningrad	10.0
1,450	209	Moscow (Moskva)	20.0
1,700	176	Kharkov.....	4.0
SPAIN			
310	967	Oviedo (EAJ19)	0.1
323.9	926	Almeria (EAJ18)	1.0
335	895	San Sebastian (EAJ8)	1.0
335	895	Cartagena (EAJ16)	0.5
344.8	870	Barcelona (EAJ1)	1.5
375	800	Madrid (EAJ7)	3.0
400	750	Madrid (Radio Espana, EAJ2)	1.0
400	750	Bilbao (EAJ9)	0.5
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
SWEDEN			
260.9	1,150	Malmo.....	1.0
416.7	720	Goteborg.....	8.0
454.5	660	Stockholm	1.5
545.6	550	Sundsvall	1.0
720	416	Ostersund	2.0
1,200	250	Boden	2.0
1,320	227	Motala.....	30.0
SWITZERLAND			
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
TURKEY			
1,230	244	Stamboul	7.0
1,800	167	Angora (testing)	7.0

MYSTERY WIRELESS SOS

WHEN the Italian steamship *Alcantara* was sunk with her crew of twenty-two, as the result of the collision with the Russian sailing ship *Tovarisch*, the Russian Captain sent out SOS signals. Soon afterwards the *Baron Douglas* came alongside and was informed of the disaster. As the Russian ship was in no danger the *Baron Douglas* went away, presumably in order to render assistance to the *Alcantara*. Of course, the *Tovarisch* received a number of other wireless messages asking the reason for the signals of distress. It was at this point that a disastrous confusion arose, for the Russian Captain gave the "SOS Clear" signal, although, as he afterwards explained, this was only meant for his ship, but apparently other ships in his vicinity understood him to mean that there was no need for any assistance at all. Later the Russian Captain says he sent a message giving the place of the collision and stating that men of the *Alcantara* might be in the water.

Fortunately such occurrences as the above are very infrequent. Those who go down to the sea in ships have in wireless communication an ally that rarely lets them down.

"A.W." Solves Your Wireless Problems

"HARNESSING LIGHTNING TO BREAK UP ATOMS"

(*Continued from page* 375)

continuous work well-nigh impossible.

The most suitable place for thunderstorm investigation would have been the tropics. However, for obvious reasons, the three experimenters had to be content with a less distant place, viz., Monte Generoso, near Lugano, in Southern Switzerland, which of all those in Central Europe, by the particular frequency and intensity of its thunderstorms, is the most suitable. Moreover, the precipitous slopes of that mountain made it particularly suitable for the installation of antennae spanning a valley.

Voltage and Current

Preliminary tests—current and tension readings during several thunderstorms (made with a small experimental plant)—showed that only storms located immediately above the peak could supply the required energy. Whereas in normal weather the antenna tension was 3,000 volts, with a current intensity of 10.7 milliamperes, it would, during thunderstorms, rise to 600,000 volts, the current intensity, as gauged from the number of sparks per second and the capacity of the antenna, being of the order of several milliamperes. However, insulation losses in connection with these tests were considerable.

The comprehensive antenna system above referred to was therefore designed, comprising a network of large-meshed, pointed wire, 100 metres long by 4 metres wide, which at 80 metres high was suspended by a carrying cable traversing in a span of 760 metres the space between the extreme points of the ridge. Inasmuch as insulation against very high tensions, of course, raised difficulties of no common nature, and a magnitude never before faced in connection with any power plant previously installed, the co-operation of Messrs. Brown, Boveri & Co., of Mannheim, was gladly accepted. This firm supplied free of charge their steatite foot motor insulations, of which chains of 30 were provided at each end, thus affording sufficient insulation against 2.5 to 3 million volts continuous current. One-half of the carrying cable served as a discharging cable, carrying the electric charges on the antenna network to the measuring instruments installed below the place where the cable was least distant from the ground.

Corona Losses

Another problem to be solved was guarding against corona losses in the cable leading from the network to the measuring instruments. Hollow metal cylinders with very thin walls and decreasing diameters were therefore provided, surrounding the cable and touching each other like the components of a string of pearls. In fact, these cylinders proved extremely mobile and behaved like a continuous tube surrounding the cable. A cable section 150 metres long was thus protected, beginning with a diameter of 5 cms. and progressively increasing to a terminal diameter of 75 cms. A static instrument was used to read the tension, while the distance of a spark gap at the same time allowed the actual minimum tension to be gauged.

All observations were made in a lightning-proof metal-coated cabin, whence the spark gap was controlled by means of a lever, the upper end of which could be approached towards the last corona protector. The maximum spark-gap distance was 4.5 metres, which was readily traversed, the sequence of sparks during thunderstorms being about one per second and remarkably constant. The minimum tension corresponding to 4.5 metres was found to be 1.7 million volts.

The installation not being completed before the end of August, there was only one chance of taking readings during an actual thunderstorm, when the tension of nearly 2 million volts being measured, the plant was shown to work well.

Further Experiments

There will be no difficulty in increasing the dimensions of the present installation and greater effects will be obtained. In fact, a thunderstorm field in such an arrangement is bound to yield the highest tensions obtainable.

Experiments will therefore be resumed this spring, it being believed that tensions actually sufficing for the breaking up of atoms may be then obtained.

At the same time, the experimenters have availed themselves of the past winter to design discharge tubes suitable for extreme tensions and which are to be used in connection with the forthcoming definite tests.

The Emergency Committee for Assisting Scientific Research (known as the *Notgemeinschaft der deutschen Wissenschaft*), an institution specially founded with the intention of promoting scientific work under present difficult economic conditions in Germany, supplied the means of undertaking these remarkable tests. The steel cable was supplied free of charge by the Cable Industry Co., Ltd., of Mannheini.

The United States National Air Transport Company have inaugurated a radio beacon service to guide planes flying over the air-mail route between New York and Chicago.

The Funktechnische Verein, Blumenthalstr., of 19 Berlin W.57, is asking German radio enthusiasts to send in any old apparatus they can spare for the club members to hook up into sets for blind people too poor to buy sets for themselves.

RADIOGRAMS

ON March 11, the B.B.C. stations and the most important Continental studios will broadcast a programme of compositions by Belgian musicians.

On the occasion of the second annual banquet of the Company of Master Mariners, which takes place at the Mansion House on March 21, the B.B.C. proposes to relay to 2LO and 5XX the speeches made by the Prince of Wales and the Prime Minister, Mr. Stanley Baldwin.

On March 27, Sir Henry Wood will go to Bristol to conduct a symphony concert which will be relayed to the Cardiff station. The orchestra will consist of the station orchestra and the Bristol Symphony Orchestra, the soloists being Miss Flora Woodman and Mr. Maurice Cole.

For the evening of March 21, the London studio promises a Sullivan concert, to which will contribute the Wireless Chorus, supported by the 2LO Wireless Orchestra. John Ansell will be the conductor. Selections from *Patience*, *The Yeoman of the Guard*, and *The Mikado* will be included in the programme.

A new series of light programmes, entitled "Noises Off," comprising an entirely novel method of presenting vaudeville, will be given by Cardiff on March 24. The entertainment includes a sketch, *The Painters*, songs at the piano, a new vocal act, and Jacque Thomas in "Cymric Comedy Cameos."

Cecil Lewis, who thrilled many listeners with his cinematographic radio-view *Pursuit* some weeks ago, has written a new play, entitled *The Night Fighters*. It is to be broadcast for the first time from 5GB on March 24.

Sir Oliver Lodge will give his second half-hour talk on "Scientists I Have Known" from 5GB on March 22.

For the production of the musical comedy *The Gipsy Princess*, to be broadcast from 2LO, 5GB, and other stations on March 8, a particularly strong cast has been engaged. It will include Murri Moncrieff (as Niblo, the cabaret manager), Maggie Teyte, Robert Chingell, Miriam Ferris, Dorothy Monkman, Leslie Sarony, Ewart Scott, Paul England, Eric Derwent, and Frank Denton.

On March 17 (St. Patrick's Day) Belfast will give the first performance of a new play, entitled *St. Patrick*, a narrative of the life of Ireland's saint, written by F. K. Fahy. The second part of the programme consists of Irish variety and will be shared by Glasgow. The evening will conclude with a relay of a carillon from St. Patrick's Cathedral, at Armagh.

The centenary of the birth of the famous Norwegian dramatist, Henrik Ibsen, is to be commemorated by the Belfast station by a broadcast of his *Peer Gynt*, with Irene Rooke and Robert Speaight in the leading rôles.

According to the latest statistics, Japan now possesses 500,000 registered broadcast listeners, of which 340,000 listen to the Tokio station, 99,000 to Osaka, and 41,000 to Nagoya.

Under the call letters EATH, the Radio Laboratory of the Electro-Technical Institute of Vienna regularly broadcasts gramophone records every Monday and Thursday at 9.30 p.m. G.M.T. simultaneously on 37 and 620 metres. In the near future experiments will be carried out in the transmission of pictures.

Within a few months Rumania will possess another broadcasting station, for the wireless telegraphy transmitter at Temesvar is being converted to radio telephony. Experiments have been carried out recently between 3 and 7 p.m. G.M.T. on a wavelength of 2,800 metres with a power of some two kilowatts. For the purposes of tests, gramophone records are broadcast, all announcements being made in the Rumanian, Hungarian, German, French, and English languages.

The Italian State Railways have equipped fourteen of their main stations throughout the country with wireless receivers so that they may receive broadcast time signals. Since the adoption of this scheme considerable improvement has been made in the running of the trains to advertised schedules.

Some original prizes are offered for a competition organised by the Eiffel Tower broadcasting station; they include three flats, small bachelor apartments of three rooms, rent free, for a period of three years. The idea is a novel one, and it is expected that the number of entries will constitute a record.

In planning their afternoon talks for the next few weeks, the Scottish stations have considered their rural women listeners in particular. A number of talks on "Women's Part in Village Life" have been arranged for Wednesday afternoons.

A WONDERFUL 3-VALVE LOUD-SPEAKER SET

The Saxon 3-Valve Loud-speaker Set is the finest 3-valve set that money can buy. Very few 4-valve sets can equal the performance of the SAXON 3, either for purity, volume, range or selectivity. 48 stations at our Works (more than half at good loud-speaker strength), Daventry on loud-speaker 1,200 miles away, 20 stations in Devonshire, 35 in Torquay, and over 20 stations on loud-speaker in the Orkney Islands have actually been received.

All latest improvements are incorporated—no coils are required, as the new SAXON all-wave tuner covers all wave-lengths from 200 to 2,000 metres by merely turning a knob.

Easily built by any beginner in two hours. All panels are drilled, and most of the components assembled ready for wiring. No soldering required. 24-page instruction book and wiring diagram 3d. post free.

SAXON RADIO Co. (Dept. A.W.), South Shore, BLACKPOOL

OAK OR MAHOGANY CABINET SPEAKER

The Whiteley Boneham oak or mahogany cabinet speakers are designed to give true utterance to the broadcast instrument or voice. The cone unit embodied in these speakers entirely eliminates rattle and distortion. Price £3

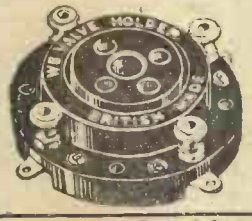
The range of Whiteley Boneham Speakers include :

Patent All Bakelite Cabinet model £4 4s.

Junior Model 20 in. x 10 in. x 4 in. £2 10s.

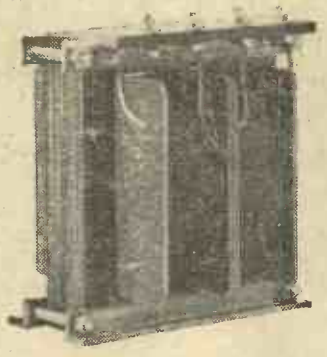
The W.B. ANTI-PHONIC VALVE HOLDER

A valve holder that ensures perfect freedom from vibratory noises and valve shocks and losses. The valve holder that Cossor specified for the "Melody Maker." At the popular price of 1/9



WHITELEY BONEHAM & CO., LTD., Nottingham Rd., Mansfield, Notts.

"PARMEKO" High output smoothing chokes



These chokes are designed for working in conjunction with our large Eliminator Transformers.

Wound in two halves so that half may be used in each leg of the smoothing circuit if desired. The windings are of heavy gauge wire and the choke will safely carry 100 milliamps without saturation. Price £2

Large power transformers

specially designed for driving Moving Coil Speakers, large output Eliminators and Amplifiers.

These large Parmeko Transformers are very strong and robust, extremely efficient, and have a low no-load current. A Terminal panel is provided so that all connections can be conveniently taken. Suitable for directly screwing down to a board. Price £3 : 10s.

We manufacture Transformers to give any voltage and output and for all purposes. We shall be pleased to quote you for any type of Transformer, Choke or Rectifying Apparatus.

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MAGNAVOX

NOTICE

MAGNAVOX Dynamic Speaker Units (moving-coil) are manufactured under the following patents :

BRITISH PATENTS	AMERICAN PATENTS
No. 197,836, May 24, 1923	No. 1,051,113, Jan. 21, 1913
	„ 1,088,283, Feb. 24, 1914
	„ 1,266,988, May 21, 1918
	„ 1,444,524, Feb. 6, 1923
Others pending.	„ 1,448,279, Mar. 13, 1923
	„ 1,524,349, Jan. 13, 1925
Foreign Patents issued and pending.	„ 1,579,392, April 6, 1926
	„ 1,582,417, April 27, 1926
	Others applied for and pending.

Purchasers of these Units through our exclusive Sales Representatives : **The ROTHERMEL CORPORATION, LIMITED, 24-26 Maddox Street, London, W.1,** are advised that they will be fully protected against any infringement actions.

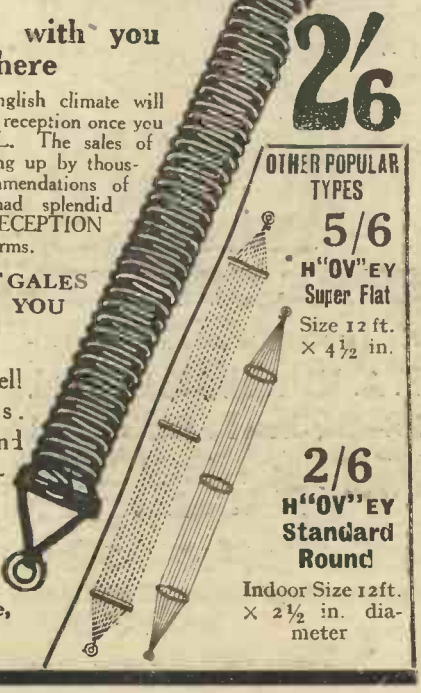
WARNING

The Magnavox Company serves notice that infringers of the above British patent—manufacturers of moving-coil speakers assembled or unassembled embodying any exclusive **Magnavox** features—will be vigorously prosecuted.

THE MAGNAVOX COMPANY
OAKLAND, CALIFORNIA, U.S.A.

Better reception with less trouble

The NEW "HOVEY" Patent COLLAPSIBLE Spiral Aerial



Take Wireless with you Everywhere

The vagaries of the English climate will never interfere with your reception once you fit a H"OV"EY AERIAL. The sales of H"OV"EY Aerials are going up by thousands through the recommendations of delighted users who had splendid TROUBLE-FREE RECEPTION throughout the recent storms.

YOU CAN FORGET GALES AND STORMS IF YOU FIT A H"OV"EY

All good dealers sell H"OV"EY Aerials. Order locally or send direct to the manufacturers.

THE HOVEY AERIAL CO.
10, Red Lion Passage, LONDON, W.C.1

2/6

OTHER POPULAR TYPES

5/6
H"OV"EY Super Flat
Size 12 ft. × 4½ in.

2/6
H"OV"EY Standard Round
Indoor Size 12ft. × 2½ in. diameter

THE FRAME AERIAL AND SELECTIVITY

(*Continued from page* 385)

When the frame is placed "broadside on" to the transmitter in this way, it is said to be in the position of minimum or zero response.

On the other hand, if the frame is swung about the side AB as pivot, so that it occupies the dotted-line position, the direction of the wave-front being as before, then the largest possible number of lines of magnetic force thread through the windings, consequently the induced voltage across the windings reaches a "peak" value and signal strength will be loudest.

In this case when the windings are arranged end on towards the transmitter, the frame is said to be in the position of maximum pick up.

The variation of signal strength at intermediate positions, i.e., as the frame is gradully swung from the position AC shown in plan in Fig. 2 to the position A1C1, and so on round the circle, is shown shaded in the so-called polar diagram of Fig. 3.

Maximum Pick-up

It will be seen that there are two positions of maximum pick-up, one when the frame lies along the line $A^1 C^1$, and another when it has turned through an angle of 180 degrees. Similarly there are two "minimum" positions, one along the line AC and the other 180 degrees later. The two minimum points coincide in the centre of the polar diagram.

So far we have considered the action of the magnetic flux only, and we have seen that it affords a sufficient clue as to why signal strength should be loudest in one position of the frame and zero in another.

If we also take into account the action of the electric field it will be found to be quite consistent with the results given by the magnetic field. In the minimum or full-line position shown in Fig. 1, both the uprights AB and CD act as miniature elevated aerials so far as pick-up is concerned.

They are both situated at the same distance from the transmitter and they will, therefore, both pick up the same amount of energy, the induced voltages being in phase. All the vertical windings are, however, in series with each other, so that upwardly directed voltages induced in AB occur simultaneously with upwardly directed voltages in CD. These mutually counter-balance each other and so have a zero or minimum resultant effect in the receiver.

It must, however, be borne in mind that these voltages exist, and if they are given a chance to manifest their presence they will do so. Meanwhile theoretically we must consider them as in a state of balance.

Maximum Position

In the maximum or dotted-line position of Fig. 1, the vertical sides AB and $C^1 D^1$ are no longer equidistant from the transmitter. Accordingly the induced voltages, due to the electric component of the received waves being slightly out of phase, have a net resultant value. This produces a voltage across the windings, which co-operates with that due to the magnetic field to create maximum signal strength in the receiver.

Consider, however, what happens when the two sides of the frame are connected to the grid and filament of a receiving valve as shown in Fig. 4. In the first place any signal response in the receiver must be due to the voltage existing across the condenser C, i.e., across the two ends of the frame aerial.

As we have seen, in the minimum or zero position, the induced voltages due to the electric field are mutually in opposition and should, therefore, balance out. Accordingly there should be no signals in the receiver.

Leakage Paths

The introduction of the valve, however, opens out several possible leakage paths from the frame to earth for the "balanced" voltages existing in the frame. In the first place there is the capacity between the accumulator and earth, then there is the capacity between grid and filament, and finally that between the grid and plate, all shown in dotted lines.

In all probability the capacity between the accumulator and earth will be a path of less impedance than the others. Accordingly some of the charge due to the electric pick-up on the lower plates of the condenser C leaks away to earth at a greater rate than the charge on the upper plates. This sets up a voltage difference across the condenser which destroys the theoretical balance of the minimum position. As a result signals appear where none should be heard.

In direction-finding equipment it is essential to secure a high degree of accuracy; a small auxiliary condenser may be inserted across the grid of the amplifier to earth, and be adjusted to balance the capacity between the accumulator and earth.

In this way the leakage paths from each side of the tuning condenser C are made equal, so that the residual or signal voltage reflects the clear-cut directional response of the frame.

As a further precaution a secondary coupling may be inserted between the frame and the amplifier input. The centre point on the frame windings can then be directly earthed, so that currents due to the so-called "vertical" effect of the aerial are not transferred through the valve to the telephones.

In the arrangement shown in Fig. 5,

the centre point of the frame winding is earthed at C to eliminate the vertical or direct pick-up effect, whilst the input between the grid and filament is across only half the frame windings, i.e., between the point C and terminal D.

A balancing condenser N is inserted between the plate and the upper terminal A of the frame as shown. This stabilises the valve by neutralising the effect of the interelectrode capacities indicated in Fig. 4. With such an arrangement the directional effect of a frame aerial can be made clear-cut and its selective action is increased accordingly.

M. A. L.

ELLEN TERRY'S WIRELESS BIRTHDAY

ON the eightieth anniversary of her birthday, Dame Ellen Terry was able to listen-in on a portable wireless receiver—sent down to her by the B.B.C.—to an hour's broadcast tribute to her greatness as an actress. In this way she shared a birthday hour with all the millions of her admirers who are also wireless listeners.

The "world's greetings" were spoken through the microphone at 2LO by Sir Johnston Forbes-Robertson. As it was considered inadvisable for Dame Ellen Terry to use her voice to reply to these greetings, Miss Edith Craig read the message for her mother. "I am very grateful for this lovely posy of words you have sent me for my birthday. I am very grateful to everyone who has thought of me to-day."

In her peaceful surroundings at Wateringbury, Kent, this frail old lady was thus able to conjure up voices of the past through the medium of broadcasting.

Under the call-sign OHK2, the Radio Austria Company of Vienna has installed a short-wave transmitter in that city. Tests are now being carried out on a wavelength of 70 metres.

THE "2-WAVE 2"

(*Continued from page 374*)

valve table, can be inserted and the various batteries connected up.

Tuning is a very simple process, and in the initial tests this should be done with the reaction dial set at zero, and the small auxiliary wave-changing knob pushed in. Then with the rheostat turned on, it should be possible to tune in the local station without difficulty, and when this has been done, the reaction dial can be "advanced" until the volume is sufficient. Minor adjustments of H.T. and grid bias complete the preliminary tests. If the receiver is to be used by non-technical listeners the dial reading for the local station and Daventry 5XX should be calibrated and then all that will have to be done on subsequent occasions, is to set the dials at the pre-determined positions and push in the knob on the reaction for high waves dial, or pull it out for low waves.

2-volt Valves for the "2-wave 2"

Make	*Detector*	*L.F.*
B.T.H.	B210L	B215P
Cosmos	SP16/G	SP18/RR
Cossor	210HF	Stentor 2
Ediswan	HF210	PV2
Marconi	DEL210	DEP { 215 / 240
Mullard	PM1HF	PM { 2 / 252
Osram	DEL210	DEP { 215 / 240
Six-Sixty. ...	SS210HF	SS215P

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General Correspondence is to be brief and written on one side of the paper only. All sketches and drawings to be on separate sheets.

Contributions are always welcome, will be promptly considered, and if used will be paid for.

Queries should be addressed to the Editor, and the conditions printed at the head of "Our Information Bureau" should be closely observed.

Communications should be addressed, according to their nature, to The Editor, The Advertisement Manager, or the Publisher, "Amateur Wireless." 58-61 Fetter Lane, London, E.C.4.

WIRELESS IN PARLIAMENT

From Our Own Correspondent

MR. MACQUISTEN asked the Postmaster-General whether the British Broadcasting Corporation was authorised to exercise discrimination between representatives of the medical profession and other practitioners who did not belong to that profession.

Sir W. Mitchell-Thomson said that the British Broadcasting Corporation was entirely responsible for the selection of the persons engaged to broadcast talks or lectures, and he did not propose to interfere with the Corporation's discretion in this matter.

Television

Mr. Malone inquired whether the Postmaster-General was taking any steps to keep in touch with recent developments in television, and whether he had considered the application of existing radio legislation to this invention.

Sir W. Mitchell-Thomson said that the answer to both parts of the question was in the affirmative. His technical advisers considered that television was still only in the experimental stage.

P.O. Certificates

Mr. Briant asked the Postmaster-General if he would state under what regulation, if any, a natural-born British subject was not eligible for the Post Office certificate of proficiency in radio telegraphy, and why the fact of being the son of an allied alien debarred him from the occupation of wireless operator in British ships.

Sir W. Mitchell-Thomson replied that the International Radio-telegraph Regulations prescribed that a person employed as a wireless operator in a ship must hold a certificate issued by the Government to which the ship was subject. It had been the general rule in this country since 1919 that such a certificate should be issued only to a natural-born British subject whose father was also a natural-born British subject. This rule was made after consultation with all the Government Departments concerned, and was considered necessary in view of the special character of the duties of an operator.

Ripault's Self-regenerative H.T. Battery.—In our test report in No. 298 on this battery we gave the name of the makers as the Ripault's Engineering Co. We have been advised, however, that Ripaults, Ltd., is the correct name. In the title we also omitted the words "self-regenerative." The recuperative qualities of the battery are, as we pointed out, a prominent feature.

WORTH WRITING FOR

THE Fuller Accumulator Co. (1926), Ltd., of Woodland Works, Chadwell Heath, Essex, have sent us a selection of leaflets and booklets dealing with their accumulators. The company makes various types for house, train, and automobile lighting, or general purposes, and also for wireless. Various types of cells—Leclanché, etc., are also made.

The Edison Swan Electric Co., of 123-125 Queen Victoria Street, E.C.4, have issued a new price list of motor-car lamp bulbs. We have also received from this firm an interesting accumulator catalogue.

TRADE NOTES

THE London Electric Wire Co. and Smiths, Ltd., held their third annual dance at the Whitehall Rooms, Hotel Metropole, on February 17. Over 200 employees and friends attended the function.

Philips Lamps, Ltd., announce that as from March 1 the price of their H.T. supply unit for D.C. mains (type 508) will be reduced from £5 to £3 17s. 6d.

Wembley Wireless Society Meeting

ON February 17, Mr. J. H. Reyner gave a talk on the new tuning coil which he has evolved.

Many members asked questions; this led on to various topics of an extremely interesting nature, and all were able to follow Mr. Reyner's very lucid explanations. Mr. Reyner then went on to describe a simple set which can be attached to the ordinary broadcast receiver in order to bring in the various American and Continental short-wave stations. Judging by the number of members who were seen busy with pencil and paper, this proved to be a very fascinating topic.

The meeting closed with a hearty vote of thanks to Mr. Reyner.

The "Ridley Short-wave Three"

IN their advertisement, which appeared in the issue in which this receiver was described (No. 298), Burndept Wireless, Ltd., stated that a 250,000-ohm resistance was required. A 30,000-ohm resistance was, of course, actually used. Burndept's price for this is 8s. 6d. In the bottom line of the coil chart for the receiver a typographical error occurred. Coils 25 and 15 are stated to cover the 25- to 150-metres wave band. This should read 75 to 150 metres.

In the news bulletin the other night it was announced that Metropolitan Vickers, Ltd., and Ferranti, Ltd., are sharing the contract, amounting to over a quarter million pounds, for the new Scottish electrification scheme. The Ferranti Co.'s share is thirteen transformers each weighing over 95 tons! Congratulations to the firms that have secured this big contract.

"SWITCH ON AND OFF FROM ANYWHERE"

(*Continued from page* 386)

by the relay is in the neighbourhood of .2 ampere.

The relay having been constructed and wired up as shown in Fig. 1, the counterweight is adjusted so that the copper contacts are just lifted clear of the cups when the armature is not attracted to the magnet. The armature is gently raised with one finger, and the copper contacts adjusted until they just reach the bottom of the cups and a bolt is inserted through the baseboard to act as a stop for the rocker. A similar stop is fixed to prevent the undue movement of the rocker in an upward direction.

These adjustments having been made, the effect of switching on the current from the local battery may be tried. The rocker should tilt smartly. If it fails to tilt, the armature is too far away from the magnets, and the screw on the contact post must be tightened up to push the armature towards the magnets. This adjustment may necessitate the readjustment of the rocker contacts, but this is easily accomplished. This operating satisfactorily, the cups in the ebonite may be filled with clean dry mercury. Closing the switch, the lamp beneath the switch will light up, the armature will be attracted to the electro-magnets of the bell movement, and the rocker will tilt, plunging the copper contacts into the mercury cups and completing the H.T. and L.T. circuits, thus putting the set into operation.

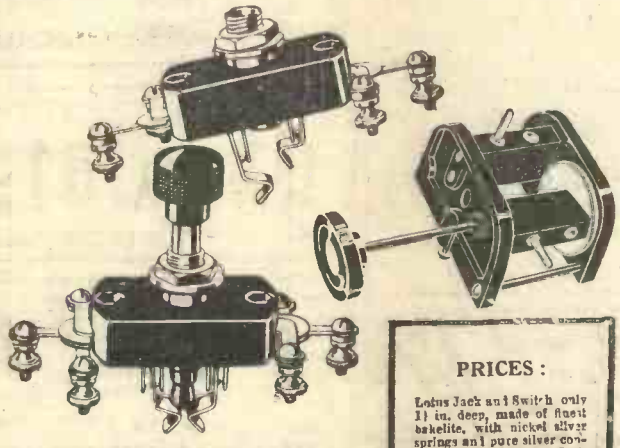
It will be noticed from Fig. 5 that both the H.T. and the L.T. circuits are broken where they are connected together. This obviates the danger of burning out the valves through a wrong connection, such as might occur if both poles of the H.T. battery were connected to the relay. In conclusion, it might be mentioned that the relay constructed by the writer has given entire satisfaction.

NO MORE JACK TROUBLES

Now you can eliminate the old, messy soldering troubles when fixing jacks and switches. The famous Lotus Jacks and Switches are being made with terminals instead of soldering tags. The terminal makes as good a permanent connection as the most expert soldering job.

Lotus Jacks and Switches are made of finest bakelite, with nickel silver springs and pure silver contacts. To establish reliable connections in any set you make, choose Lotus Jacks and Switches. They occupy the minimum space—only 1¼ in. behind the panel.

The Lotus Coil-holder holds the heaviest coil in position. The moving block cannot fall. Prevents fading away of volume. Vernier movement reduces speed of moving-coil block by eight times. For left or right hand.



PRICES:

Lotus Jack and Switch only 1¼ in. deep, made of finest bakelite, with nickel silver springs and pure silver contacts. With terminals. Jack No. 3, 2/6; others from 2/- to 3/-. Jack Switch No. 9, 4/-; others from 2/3.

Lotus Jack Plug. Spring sleeve fitment supplied. Can be used with any jack. Bakelite moulding, nickel-plated brass parts. Price 8d.

Lotus Coil-holder, 2-way, for outside panel mounting, 7/-; 3-way, 10/3. For inside baseboard mounting, with 6-in. handle, 8/-; 3-way, 12/3.

LOTUS

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Split Secondary Transformers.
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Binocular Coils are the latest Lewcos development in six-pin Coils. They are interchangeable with the popular types and can be used in a standard Lewcos Screen, although for use in multi-stage receivers they are sufficiently fieldless without screening. All dealers can obtain them for you. Full particulars and prices gladly sent on request.

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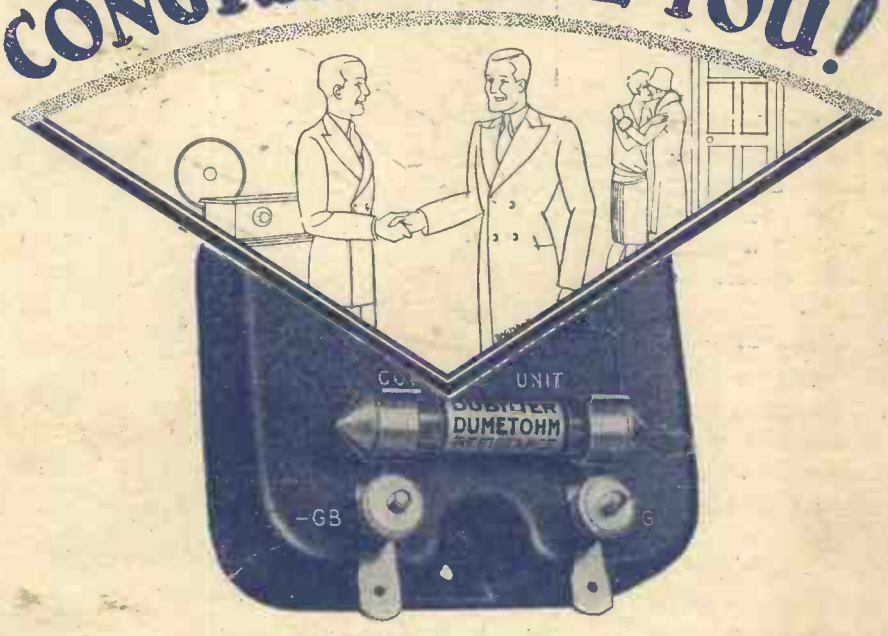
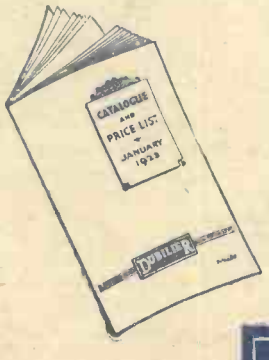


—on the improved performance of your set; on its remarkably increased clarity of reception with yet sufficient volume: meanwhile they might wonder at the cause. They would be astonished if you told them—that it was due to your having fitted a Dubilier R.C. Coupling Unit to your set.

Some may tell you they have tried Resistance Capacity Coupling as the recommended means of obtaining purer amplification, but with a disappointing decrease in volume. Yet the fault lies not in the method—mostly it emanates from the various components in the set having been carelessly selected.



Thousands are now being delighted by the purer reproduction, combined with adequate volume, which their sets have given since they installed the Dubilier R.C. Coupling Unit—proof enough of the supremacy of the Dumetohm for R.C. Coupling.

The Dubilier R.C. Unit will take Dumetohms of various values to suit your particular requirements, an advantage second only to that of price; for this efficient component costs no more than 7/-.

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Dubilier R.C. Coupling Unit. Complete with 2 "Dumetohms." Price 7/-

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·0002 mfd., each 2/6
·0003 mfd., each 2/6

"Dumetohm" 2-megohm. Each 2/6

Whatever circuit you follow and whether the set you build is for the purpose of pleasure or experiment, remember

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