YOU OUGHT TO BUILD OUR NEW PORTABLE!

Amateur Wireless

and Radiovision

Every Thursday 3d

Vol. XIV. No. 362 Saturday, May 18, 1929

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

SAFE!

1. *The double length Cossor filament famed for its colossal emission. Note the seonite bridge holding it rigidly in position.*

2. *Around the two stout grid supports is wound the first grid, electrically welded at twenty-five points.*

Cossor makes greatest advance in valve design since the introduction of the Dull Emitter - -

RIGID!

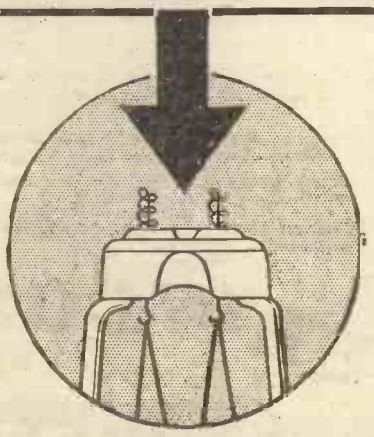
The wonderful new Inter-locked Construction employed in the Cossor Screened Grid Valve eliminates all the inherent weaknesses in valve design. Under this system (illustrated here) each element is firmly braced top and bottom. Every joint is scientifically welded. This girder-like construction ensures absolute rigidity. It positively prevents the slightest individual movement of the elements. Even the hardest blow cannot disturb their perfect alignment.

As a result the Cossor Screened Grid Valve retains life-long uniformity of its characteristics. Its Inter-locked Construction (exclusive to Cossor) makes it the strongest and most robust Screened Grid Valve ever produced. Use Cossor in your Screened Grid Receiver — there is no substitute for the Cossor patented system of Inter-locked Construction.

3. *Note the enormous strength and rigidity of the screen. Built on four stout supports, capped by a metal bridge-piece anchored to seonite insulator.*

4. *Finally, observe the construction of the anode. Actually two rectangular nickel plates are used and for greater rigidity each is diagonally ribbed.*

INTER-LOCKED!



Only Cossor Screened Grid Valves have inter-locked Electrodes

Cossor Screened Grid

Made in 3 types for use with 2, 4 and 6-volt Accumulator

Max Anode Volts 150, Impedance 200,000, Amplification Factor 200, Grid Bias 1-5 volts at max. anode Volts. Price (either type) **22/6**

A. C. Cossor Ltd., Highbury Grove, London, N.5.

BRITAIN'S STRONGEST AND MOST DEPENDABLE SCREENED GRID VALVE

8457 CA

MAY 18, 1929 No. 362. Vol. XIV

Amateur Wireless and Radiovision

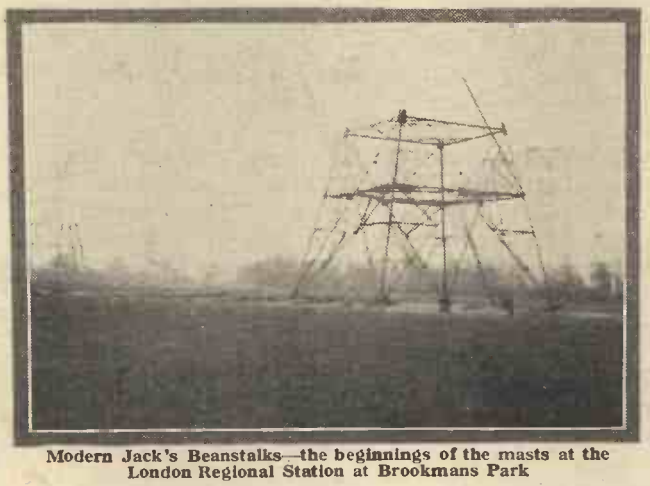
The Leading Radio Weekly for the Constructor, Listener and Experimenter

Editor: BERNARD E. JONES

Technical Editor: J. H. REYNER, B.Sc., A.M.I.E.E. :: Research Consultant: W. JAMES :: Assistant Editor: H. CORBISHLEY

A Surfeit of Politics—Those Morning Talks—How It Is Done—Talkers and Big Figures—Exit Rex—Popular Concerts

A Surfeit of Politics—A daily paper ran a competition in connection with readers' comments on broadcast political speeches. One of the received comments was very succinct. "I must congratulate—— on his clear level voice, which gave me the opportunity to make a few very gratifying adjustments to the loud-speaker." The B.B.C. has certainly "done us proud" this year so far as politics are concerned, and by the time the General Election is over, those who are unpatriotic enough not to care which party gets into power will be thankful that "Mike" has overcome his wave of controversial talk. Incidentally, the Secretariat of the Communist Party has sent a letter of protest to the B.B.C., demanding the same broadcast facilities as the other parties.



Modern Jack's Beanstalks—the beginnings of the masts at the London Regional Station at Brookmans Park

Those Morning Talks—It is welcome news that the morning talks are now broadcast from 2LO, as well as from 5XX. The innovation of morning talks from 5XX only was introduced in January last, and a B.B.C. official told an AMATEUR WIRELESS representative that this would be simply an experimental service for four months. At the start listeners were invited to express opinions on the talks. It has been found that these practical talks at 10.45 a.m. have now justified a permanent allocation in the programme. The post bag in consequence is very big, and applications for recipes and menus referred to in the Tuesday morning broadcasts now number 14,000!

How It Is Done—The B.B.C. Press Notices are gravity itself, as befits a Government Department, but things are done just a little differently in the States. For example, we have at hand a programme sheet from WJZ which says: "Kate Smith, that 'hot number,' whose pep is only equalled with her avoirdupois, will share the honors with Pil Spitalny . . ." "Also Miss Smith will croon 'Mean to Me' and 'Walking With My Sweetness,' a real 'low-down number.'" Incidentally this "low-down number" was S.B. through twenty-one stations of the N.B.C. group.

Talkers and Big Figures—Talker films are now "going big," to use another Americanism, and it is rumoured that John McCormack, the famous tenor, is to receive £100,000 for taking part in a "one-feature" picture. Incidentally film fans will be interested to know that after seventeen years' screen silence a Mary Pickford talker has just been released. A short time ago there was a miniature "scare" when a number of B.B.C. folk went over to the gramophone and talker spheres. It is to be hoped that all the talent will not be robbed from broadcasting, and that figures like the £100,000 offered to McCormack will not put the B.B.C. coffers to shame.

QSL Cards—Here's an item for DX fans and amateur transmitters. We apparently fell into error in stating that the R.S.G.B. will not handle QSL cards to or from non-members. It should be particularly noted that the R.S.G.B. will accept and deliver all QSL cards to persons sending stamped self-addressed envelopes to the headquarters of the society at 53, Victoria Street, S.W.1.

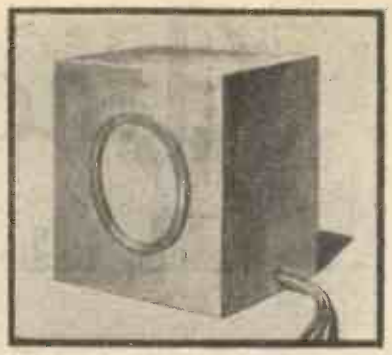
Exit Rex—So Rex Palmer has gone the way of so many B.B.C. notabilities recently, and has left radio for the gramophone world. "Uncle Rex," who was Director of the London Station for the first three years of its existence, is kindly remembered by thousands and thousands of listeners. Is the B.B.C. experiencing an influx of new talent, or must we admit that the gramophone and talker-film people are gaining what will be a big loss to British broadcasting? So many seem to have left the B.B.C. recently for one or other of these spheres.

Popular Concerts—Londoners who have not yet attended the popular concerts relayed from the People's Palace, Mile End Road, London, E., should book the date at once, for the last concert of this series is on Thursday next, May 23. There will be some good soloists and altogether this is a B.B.C. outside event which should not be missed by the musically-minded.

Listen for the Election—Next week there is to be a 1929 edition of that very popular receiver "Britain's Favourite Two." Simplicity is the great feature of this "two" and, together with the new version, will be given hints on hooking up the components so that they can be used to get the election results.

PRINCIPAL CONTENTS

THE B.B.C. CHANGES ITS "MIKE"



By BAYNHAM HONRI

UNLESS the London station transmission of the B.B.C has a large number of breakdowns ere these lines get into print, a devastating change of microphone policy will have taken a firm hold of Savoy Hill. The high-quality carbon microphone has had a long "run" at B.B.C.

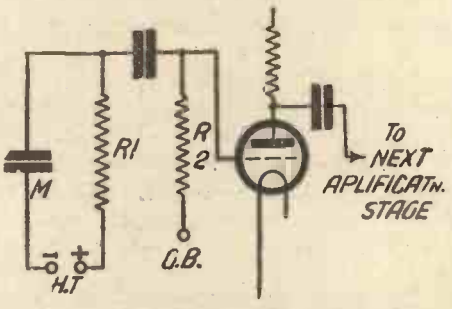


Fig. 1. Method of coupling Condenser Microphone

stations, and it is about to lose its job. The condenser microphone has at last passed its trials!

Hiss!

For some considerable time the B.B.C. has been dissatisfied with the performance of the studio and "O.B." microphones. These microphones, mostly of the Reisz type, have given high quality but have been subject to "blasting" on loud passages of music and a large amount of background hiss. From the maintenance point of view, however, they have given splendid service; in fact, I do not think there has been a single record of a breakdown being caused by a Reisz microphone suddenly going "dud." But that hiss . . . It had to be got rid of, somehow.

The Condenser Microphone

From time to time, the research and development departments have brought out new types of microphones, types which have varied from modified magnetophones using peculiar coils or iron filings to all kinds of electrostatic pick-ups. The electrostatic pick-up is another name for the condenser microphone, and in this type the sound waves impinge upon a tightly stretched disc, varying the capacity of a condenser formed by that disc and a solid piece of metal behind. This was the type of microphone in which the B.B.C. placed its hope for the future. Many times condenser microphones were "tried out" on transmission after passing laboratory tests, but the percentage of breakdowns and "crackle" they introduced was too high to make them of practical use.

Disadvantages

The condenser microphone must necessarily be close to the first stage of amplification; otherwise capacity effects in the microphone leads and other factors will decrease the sensitivity and stability of the microphone circuit. The circuit Fig. 1 shows clearly why this is so. The condenser M is really a microphone, and two or three hundred volts of H.T. are applied to one of the plates via a 15-megohm resistance. According to the variation in the capacity of M, so will there be a varying drop in the voltage across the large resistance R1. This variation in voltage, which is very small, is passed on to the grid of a valve, through a small coupling condenser. The value of the grid leak, R2, is the same as that of the microphone resistance.

Affected by Dampness

Until quite recently, dampness in the atmosphere has affected the functioning of condenser microphones in various ways, causing "frying" noises and other interference. The insulation between the plates of the condenser microphones must necessarily be high, or crackling noises will be caused by any leakage of current. Similarly, the insulation of the 15-megohm resistance rods and coupling condenser must be of a high order. I say "until quite recently" because the B.B.C. appears to have got over this trouble and condenser microphones have been used on most musical transmissions from 2LO during the past two months.

Gramophone Recording

The condenser microphone is not a new invention. It has been used for some time by the gramophone companies with great success, and more recently it has found its way into the talking-film studio. In gramophone recording, the slightly "metallic" brilliance of a highly-sensitive condenser microphone has been found to give more "clear cut" reproduction, particularly when the records were reproduced on ordinary mechanical type gramophones with sound boxes. Moreover, the actual process of recording is not continual, as happens in broadcasting, and a defective recording can easily be re-made should a fault develop.

Three Types

There are three types of condenser microphone. The "high-sensitivity," the "low-sensitivity" and the "H.F." type. The high-sensitivity type, already mentioned, has a slightly slackened diaphragm which introduces a resonance in the neighbourhood of 6,000 cycles. The low-sensitivity type has a fully tightened diaphragm and a very even response curve; it does however, necessitate additional stages of amplification. The third type, the "H.F.," uses an entirely different type of circuit, in which the variation of the condenser varies the output of a valve oscillating circuit.

The B.B.C. Type

The B.B.C. has adopted the high-sensitivity type of condenser microphone and has incorporated in it the side of a six-inch cube box holding the first stage of amplification. The characteristic of the microphone has been "cooked" somewhat, and closely resembles that of the Reisz, the Amplion and other high-grade carbon microphones—minus the hiss!

Whether or not this latest edition of the condenser microphone will become standard has not yet been decided. But the tests and maintenance trials have been "passed" triumphantly, and there is a great likelihood that the good old Reisz microphone will gradually be replaced in all stations by it.

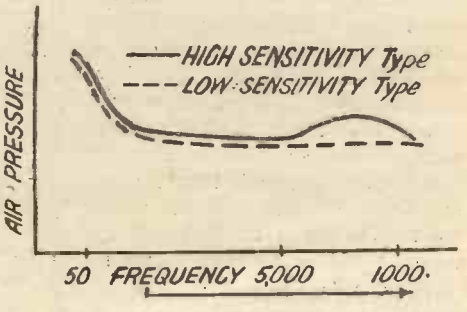


Fig. 2. Condenser Microphone Curves

The outside broadcasts will probably still be "taken" on carbon microphones, owing to the sensitivity of the condenser type to electrical interference caused by fans, electric-light switch sparks and the like.

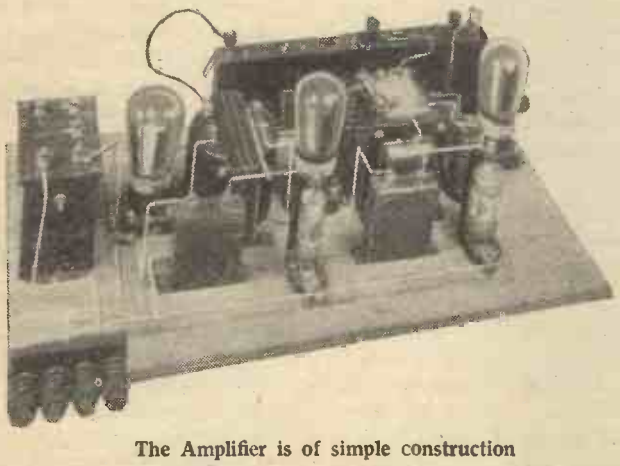
Alessandro Banfi, chief engineer of the Italian Broadcasting Company recently arrived in America to purchase a 50-kilowatt broadcasting transmitter.

MAKING AN ALL-ELECTRIC GRAMOPHONE

The turntable is driven by an electric motor and a three-valve combined dual-impedance and transformer-coupled amplifier is used to amplify the pick-up current

By J. H. REYNER, B.Sc., A.M.I.E.E.

AN amplifier for the reproduction of gramophone records which is known to have a good characteristic is a very useful piece of apparatus, and the instrument described herewith was constructed some time ago with the object of providing a simple amplifier capable of giving a high overall amplification with a satisfactory response curve.



The Amplifier is of simple construction

The uses of this amplifier are not limited, of course, to gramophone reproduction. It has been shown herewith coupled to an electric motor and B.T.H pick-up—a complete gramophone reproducing equipment. The amplifier, however, may be used for various other purposes. For example a simple microphone connected through a suitable step-up transformer to the grid of the first valve will enable the smallest sounds to be magnified up to very good loud-speaker strength. Finally, the amplifier can easily be used if desired, for broadcast purposes, either as it stands or with some slight modification. In either case the characteristics of the amplifier, ranging as they do from 50 to 8,000 cycles, are of considerable value.

The amplifier is unconventional in design. It has often been considered that for good-quality reproduction, resistance coupling is essential. I have on several occasions pointed out that this is not necessarily the case and the present amplifier is an instance of an arrangement giving the desired results without any resistance coupling at all. The advantage of the arrangement is that a much greater amplification can be obtained than would otherwise be the case, while it will be seen from the response curve (Fig. 1) that the amplification is uniform over a very wide range of frequencies, and does not fall off at high frequencies as a resistance amplifier is apt to do. The actual amplification is of the order of 800, whereas with a resistance amplifier the figure would be something under 200.

The circuit of the amplifier is as shown by Fig. 2. The first valve is followed by a dual-impedance coupler leading to the second valve. In the anode circuit here we have a 4:1 Marconiphone transformer, feeding the final super-power valve. A choke-output filter is used not only in the interests of the loud-speaker but also to ensure perfect quality. If any difficulty is experienced in obtaining a Marconiphone Ideal transformer, a Pye 4:1 transformer may be used.

It will be noticed that the feed to each of the first two anode circuits is obtained through a resistance with a 2-microfarad by-pass condenser. This absolutely avoids all battery coupling and it means that this amplifier can be used on an ordinary dry battery provided it is capable of supplying the current which is of the order of 15 milliamps.

Points of particular interest are the inclusion of a high-frequency filter consisting of an H.F. choke and a .0003 by-pass condenser immediately following the first valve, and a ¼-megohm stopper in the grid circuit of the second valve. Since the amplifier is to be used, in many cases, without any high-frequency stages in front of it the inclusion of these components might appear to be unnecessary but practical experience shows that this is not the case. There is an extraordinary amount of high-frequency energy in the most unlikely circuits and this is likely to cause troublesome distortion which is very difficult to detect. In order to be on the safe side, adequate filtering arrangements have been inserted and this results in the amplifier being thoroughly satisfactory under all conditions.

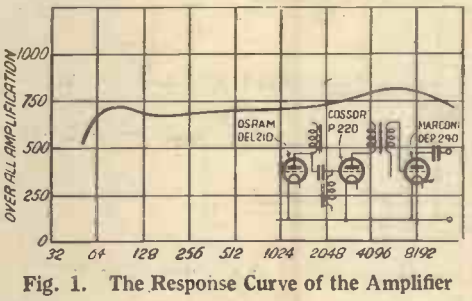


Fig. 1. The Response Curve of the Amplifier

Components Required for Amplifier

Three valve holders (Formo).
H.F. choke (Wearite).

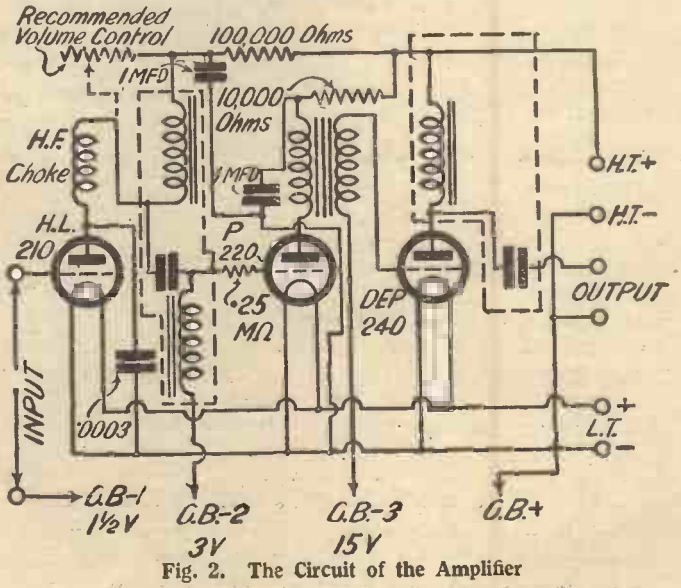


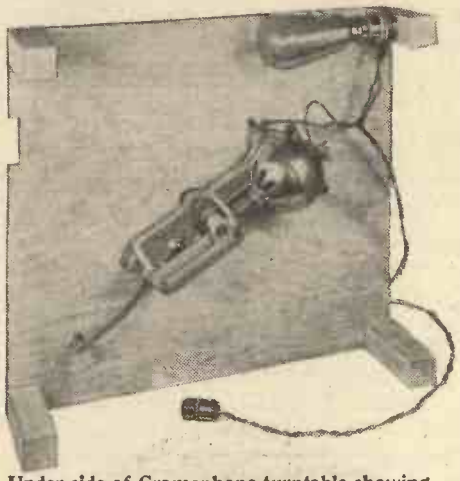
Fig. 2. The Circuit of the Amplifier

MAKING AN ALL-ELECTRIC GRAMOPHONE (Continued from preceding page)

Wire-wound anode resistance 100,000 ohms (R.I. and Varley).

Wire-wound anode resistance, 10,000 ohms (R.I. and Varley).

Two fixed condensers, 1-mfd. each (T.C.C.).



Under side of Gramophone turntable showing G.E.C. Electric Gramophone Motor

One dual-impedance coupling unit (Igranic).

One L.F. transformer (Marconiphone Ideal, 4 to 1 ratio).

One output filter unit (Wearite).

Six terminals, marked: L.S.+, L.S.−, L.T.+, L.T.−, H.T.+, H.T.−.

Terminal strips, 2 in. by 2 in. and 4 in. by 2 in.

.0003 mfd. fixed condenser (T.C.C.).

.25-megohm grid leak (Dubilier).

Grid bias battery clips (Bulgin).

Glazite wire for wiring. Baseboard.

Let us now consider the operation of the amplifier. How is it that we can obtain a substantially straight line characteristic with such apparatus? The answer is very simple. A dual-impedance coupler has a curious response characteristic. It amplifies the high-frequencies exceedingly well and usually with a slightly rising characteristic. Towards the low frequencies, there is a tendency to fall off, but this fall is arrested by a resonance effect which results in a hump in the characteristic as illustrated in Fig. 3a. The characteristic of a transformer on the other hand tends to fall off at the bottom and top ends of the scale. The cut-off at the top we do not mind, provided it is above a certain frequency. In fact, it is beneficial for it tends to eliminate higher frequency disturbances which we do not require. The cut-off in the bass, however, usually occurs somewhat early and here the resonance effect in the dual impedance coupler is of distinct assistance.

The net effect is that the two curves added together give a tolerably straight line characteristic as indicated in Fig. 3c. This is the type of characteristic actually obtained on the amplifier and the curve in Fig. 3 shows a response curve taken at the Furzehill Laboratories on the particular amplifier being described. It will be seen to be of the same general form and it maintains its amplification from 50 up to 8,000 cycles. The amplification is tolerably uniform with a rise towards the higher frequencies which is very valuable in off-setting the loss of high notes inherent in the average loud-speaker and the average pick-up.

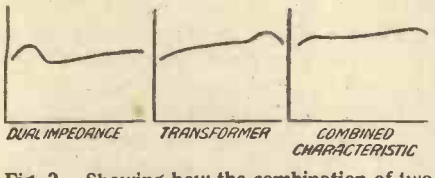
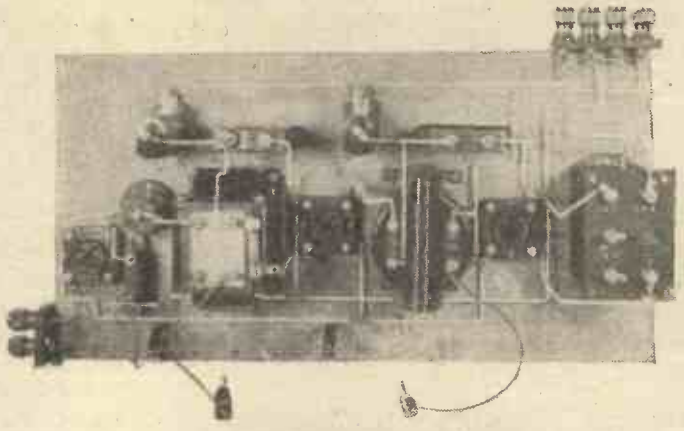


Fig. 3. Showing how the combination of two characteristics gives uniform responses

If, on the other hand, one is using this amplifier with either a pick-up or a loud-speaker which does reproduce the higher frequencies effectively, then a certain shrillness will be heard. This may easily be obviated by connecting a condenser across the pick-up itself and adjusting the value of this until the shrillness is cut off. Alternatively, the use of a scratch filter cutting off about 4,000 or 5,000 cycles per second may be resorted to as has already been described.

Incidentally the amplifier will give a really good test of various forms of pick-up. If the loud-speaker is a good one as regards the higher frequencies, then a good pick-up used with this amplifier will develop a distinct scratch. A poorer pick-up not having such a good high-frequency response will not show any scratch simply because the pick-up cannot reproduce frequencies above 2,000 or 3,000 cycles per second. As I have pointed out in a previous article, it is much more desirable to utilise a pick-up which will supply the scratch and the various higher harmonics of the music at the same time. The scratch may be then minimised by inserting a scratch filter which just cuts out sufficient of the noise to render the reproduction pleasant. The complete elimination of scratch is not desirable for it carries with it the elimination of naturalness. Before any experiments in this direction can be conducted, it is essential to have an amplifier capable of really reproducing the higher frequencies and the present instrument complies with these conditions.



A plan view of the Amplifier

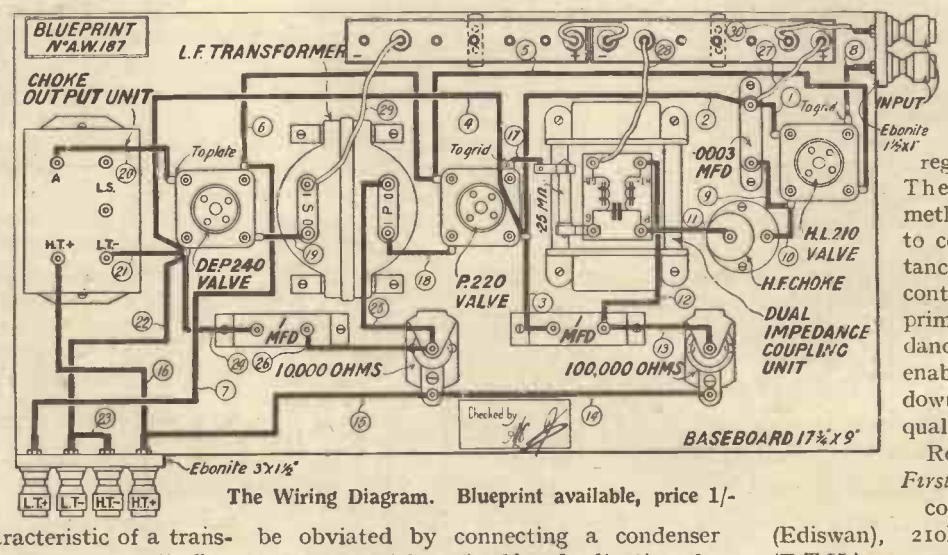
One final point may be mentioned regarding volume control. The most satisfactory method of volume control is to connect a variable resistance, such as a volume-control Clarostat, across the primary of the dual impedance coupler. This will enable the volume to be cut down without any loss of quality.

Recommended valves are:

First Stage.—DEL210 (Marconi or Osram), LF210 (Ediswan), 210LF (Cossor), G.P.210 (B.T.H.).

Second Stage.—220P (Cossor), DEP215 (Marconi or Osram), LF215 (B.T.H.), PM2 (Mullard).

Third Stage.—DEP240 (Marconi or Osram), P227 (B.T.H.), PM252 (Mullard).



The Wiring Diagram. Blueprint available, price 1/-

ARE THERE TWO HEAVISIDE LAYERS?

An account of some Recent Researches made by Prof. E. V. Appleton on the Location of the Heaviside Layer

By MORTON BARR

THE American Institute of Electrical Engineers has awarded the Liebmann Memorial Prize for the current year to Professor E. V. Appleton, F.R.S., in recognition of his recent work on the Heaviside layer. The prize is given each year in respect of the most important contribution made to radio science during the preceding twelve months.

Professor Appleton is Wheatstone Professor of Physics at King's College, London, and has been engaged for many years in the study of the electrical properties of the upper atmosphere. He was, in fact, amongst the first to produce acceptable evidence of the nature and location of that mysterious region known as the Heaviside layer.

A Double Layer

In the course of a series of experiments designed to measure the actual height of the layer above ground, Professor Appleton discovered the existence of a second layer located high above the first. Systematic measurements have placed the mean height of the first layer at 98 kilometres, and that of the second at 226 kilometres. These results have recently been verified by independent observations carried out in America.

It has been known for some time that the outermost parts of the earth's atmosphere are occupied by a zone of ionised air which acts as a barrier to all wireless waves longer than, say, 15 metres. If this were not so, long-distance reception would be practically impossible.

Wireless waves tend to travel in a straight line, in just the same way as a ray of light. Since the surface of the earth is curved, it would clearly be impossible, if the straight-line law held good, to transmit messages through the ether for any considerable distance. After a comparatively short travel the waves would leave the earth's surface at a tangent and be lost amidst the stars.

Space Waves and Ground Waves

The problem is not, however, quite so simple as appears at first sight. In practice it is found that the energy radiated from an ordinary transmitting aerial can be divided into two components. There is, first, an earth-bound wave which appears to be linked in some peculiar fashion to the ground, in much the same way as a high-frequency current is localised around a conducting wire.

Next there is the space-wave component, which travels upwards from the transmitting aerial at an angle to the ground. If it were not for the existence of the Heaviside layer this component would never reach a distant receiving station.

The relative proportion in which space-wave and earth-bound components are radiated in any given case depends in part upon the type of aerial used and in part upon the wavelength employed.

Generally speaking, the shorter the working wavelength, the greater is the proportion of space-wave energy present, and vice versa. Again, a very high proportion of space-wave energy can be radiated by using a flat-topped aerial. On the other hand the radiation from a vertical grounded wire is found to be largely earth bound.

Measuring the Angle of the Reflected Ray

In attempting to measure the elevation of the Heaviside layer above the surface of the earth two methods are available. The first depends upon the assumption that the angle made by the signal wave, as it meets the layer, is the same as that at which the reflected ray leaves the layer.

The second method is based upon the fact that the space-wave must travel over a greater distance to reach a given receiving station than the direct or earth-bound component. Actually it traverses two sides of a triangle, the base of the triangle being the track of the earth-bound wave.

In the first method a frame or loop aerial is used to measure the angle at which the down-coming ray from the Heaviside layer reaches the ground.

It is well known that maximum reception on a frame aerial occurs when the plane of the aerial points towards the source of the wave. Another way of stating this fact is that the frame aerial responds solely to the magnetic flux of the travelling wave.

This directional effect is generally applied to the earth-bound wave only. In practice, when the frame is pointing towards a transmitting station, the magnetic flux threading through the windings is a maximum, because the magnetic field vibrates at right angles to the actual direction of the wave-front as a whole.

This action holds good equally in the case where the received wave is travelling at an angle to the earth's surface. Accordingly, by using a frame aerial arranged to be swivelled about a horizontal plane, it is possible to ascertain the exact angle at which the space wave reaches the earth after reflection from the Heaviside layer.

Prof. E. V. Appleton, F.R.S.

Once this angle is known, it is merely a matter of triangulation to determine the required height of the point of reflection, since the distance between the transmitter and receiver has previously been measured.

An Interference Method

The second method is somewhat more complicated in practice, though it is capable of giving more accurate results. It is known as the "group-retardation" method, and as previously stated, depends upon the difference in effective length between the path taken by the direct and reflected space waves respectively.

As a matter of fact, this difference in the

(*Concluded in third column of next page*)

For the Newcomer to Wireless: GENERATING ELECTRICITY

SOMEBODY told me the other day that it was quite wrong to speak about a battery generating electricity. Surely that is not so since it obviously produces current.

It would be just as correct really to say that an electric fan generates air.

I don't see that. Of course, the fan does not create air. It makes a draught by setting air in motion.

Exactly. The fan gives rise to a current of air and the battery produces a current of electricity by setting electrons in motion.

An electric current is a stream of electrons isn't it?

Yes; electrons are present everywhere and in everything. It is only when we cause them to move in a definite way that we obtain what is termed a current flow.

Then what does the battery do?

We may say that it acts in very much the same way as a pump. You could do work by pumping water from a pond and letting it fall upon the vanes of a turbine.

I follow that. But how does the battery pump electricity?

By means of the chemical action that goes on inside it, a large assembly of electrons is produced at the negative terminal and an equally big company of positive ions at the positive.

What happens when a conducting path is provided?

The positive ions attract the electrons with a force billions of times greater than gravity; the latter rush through the conducting path—and there you have a stream of electrons which forms a current.

Can you tell me roughly what the chemical action inside the battery is?

We will take the Leclanché cell, which is one of the simplest. You know what the electrolyte consists of?

Sal ammoniac and water.

Sal ammoniac is another name for ammonium chloride. The chlorine in the solution proceeds to attack the zinc.

What happens then?

The zinc is readily dissolved but does not give up complete atoms.

How are they incomplete?

Each as it passes from the metal into the solution leaves behind some of its electrons. In other words it passes into the solution as a positive ion.

What is the result?

Since each departing atom leaves electrons in the zinc, the metal soon becomes charged negatively. The electrolyte, receiving huge numbers of positive ions, becomes positively charged. There is thus an excess of positive ions in the carbon rod which serves to make contact with the electrolyte.

Suppose that we place a conductor across the battery terminals?

The electrons, as we have seen, rush across to the positive terminal, neutralizing the positive ions. The electrolyte can now get to work again on the zinc, which it promptly does and the eating away of the zinc goes on so long as there is an outside path between the battery terminals.

Then the battery produces current by consuming zinc?

Yes, in the same way as a boiler produces steam by consuming coal.

THE UBIQUITOUS EAVESDROPPER

Jottings from my Log. By JAY COOTE

WHAT in these Isles is badly termed a listener, in Germany merely a *hoerer*, in France, *un Amateur de T.S.F.* (an ennobling term!) is officially styled in Holland, a *luistervink* (an eavesdropper). I plead guilty to the last application, for at any moment of the day or evening I may be found connected up to my wireless receiver—eavesdropping! And these casual and informal calls on foreign studios invariably result in a goodly collection of interesting items.

A Relay from the Graf Zeppelin

Take, for instance, May 2, when I picked up through Koenigswusterhausen between 8.15 and 9.20 a.m. what was apparently a relay from Vienna of some cross-talk taking place between the Ravag studio and the German airship *Graf Zeppelin* whilst the dirigible was over the Austrian capital on its trip to the Mediterranean. I twirled the dials and found that the broadcast was being put out by several German transmitters. The roar of the airship's engines were clearly discernible as a background to the voice which gave a list of the notable guests on board, and time after time in order that there should be no doubt on the subject the announcer butted in with the call: "Radio Wien."

This is not the first time that the Austrian has been in touch with the famous airship on its experimental flights. Unfortunately, however, no notice is given of the studio's intention to carry out this two-way communication.

In the French Manner

Again, on May 4, towards 11 p.m. after listening to the relay by Milan of the last act of Puccini's opera *La Boheme*, as performed at the Scala Opera House, quite by chance I found that PTT Lyons had switched me over to some local sports arena in which heavy athletic competitions were taking place. The commentator, in the usual French manner, waxed enthusiast over the feats performed by some of the contestants.

A Memorable Occasion

The night of May 5 provided a "star" entry in my log for after most stations had signed off, I tuned in the Belgrade transmission which for some hours devoted itself to so wild a programme of music and speech that I was prompted to ascertain the cause of this unexpected exuberance. It appears that according to the Russian calendar, Easter Sunday fell on the same day as the Spring Festival or *Djurdzepski Uranak*, a fête dating back to heathen times when by song and dance throughout the night the natives greeted the rising of the sun. I held the broadcast well for some considerable time—there was no other station on the air—and was thus given a true picture of a Jugo-Slavian National Festival.

"ARE THERE TWO HEAVISIDE LAYERS?"

(*Continued from page* 707)

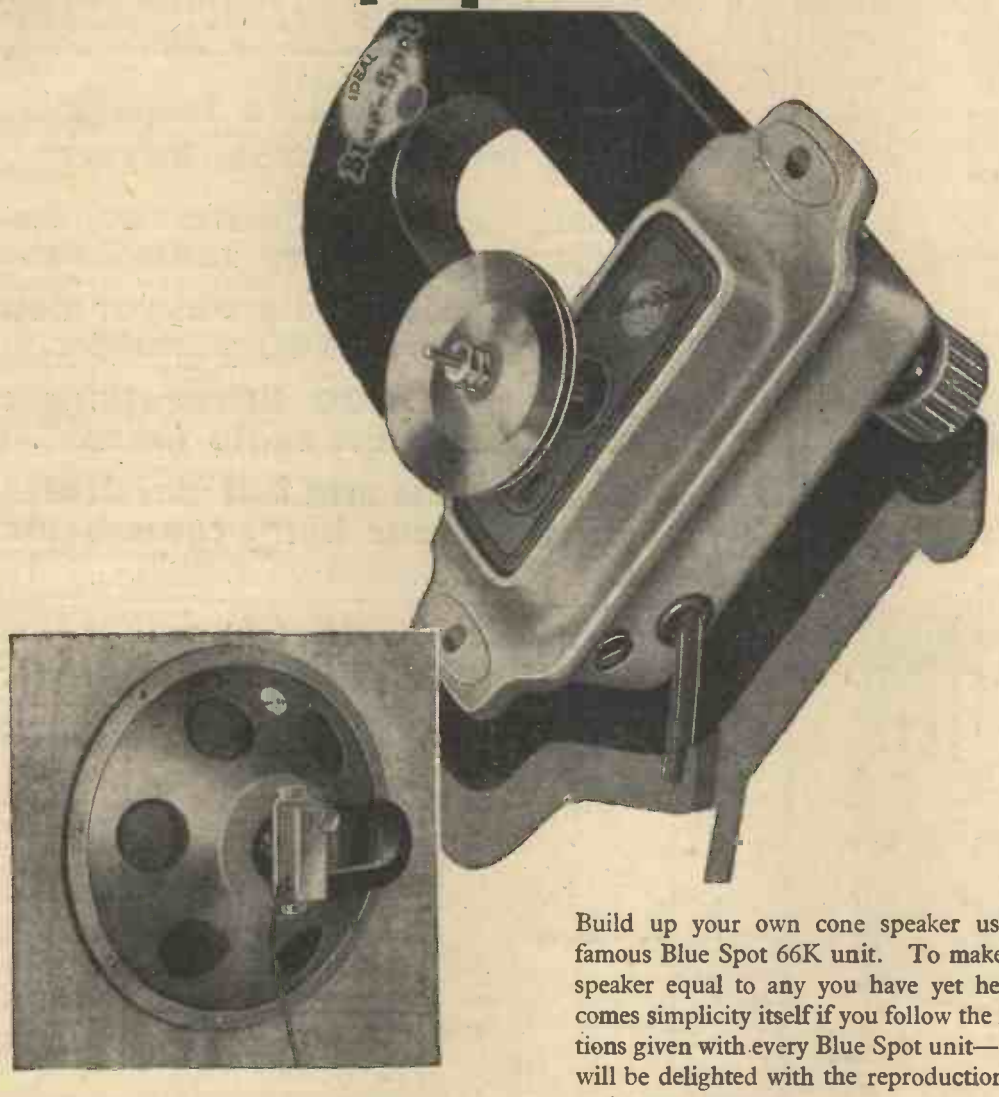
two paths is very largely responsible for the fading effects which are so noticeable in ordinary distance reception.

The space wave travels over a longer course to reach the receiving station, and is therefore out of phase with the direct wave when the two combine. Sometimes the phase difference is such as to neutralise the signal, whilst at other times it increases the signal strength.

By suitably choosing the distance between the transmitting and receiving stations, it is possible, first, to arrange that the average strength of signal due to the earth-bound component is equal to that due to the reflected space wave.

Next, by adjusting the transmitted wavelength the space wave is made to arrive in phase with the earth-bound wave. A slight further periodical variation in frequency is then superposed so as to give rise to a beat effect in the phones, from which the actual path of the space wave and, therefore, the height of the Heaviside layer can be calculated.

The ever popular 66K unit



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Blue Spot 66K 4-pole balanced armature unit : (adjustable), Price 25/-

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Build up your own cone speaker using the famous Blue Spot 66K unit. To make a cone speaker equal to any you have yet heard becomes simplicity itself if you follow the instructions given with every Blue Spot unit—and you will be delighted with the reproduction of any and every programme.

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On Your Wavelength!

Condenser Microphones

THE long reign of the Reisz microphone at B.B.C. stations may shortly end. The B.B.C. research department has been "playing about" for several years with various types of condenser microphone, but it was not until a couple of months ago that a type was evolved which fulfilled the requirements of broadcasting. A good condenser microphone has an ideal response to the musical frequencies, is practically blast-proof, and has no background noise. It does, however, suffer from the great disadvantage that it has to be very close to the first stage of valve amplification, gives crackling noises when it becomes damp, and picks up electrical interference, such as the spark made when an electric-light switch is turned off.

Gramophone Recording

From time to time experimental condenser microphones were tried out on the London transmission, but the percentage of breakdowns due to unwanted "crackles" was high, and arrangements had to be fixed up so that quick change-overs could be made to the Reisz microphones. Broadcasting goes on continuously and such breakdowns could not be tolerated. In gramophone recording, however, the condenser microphone has reigned supreme for some time. The slightly "metallic" brilliance of a high-sensitive condenser microphone gave very fine results on records, and if any crackles or other troubles developed a recording could be easily scrapped and another made. Condenser microphones are also used largely in the production of talking films, though it is a significant fact that for "topicals" the high-quality carbon type of microphone is frequently used. I noticed that the Pathe Gazette people used an Amplion microphone of the carbon type for making the sound film of the Cup Tie final at Wembley.

Killing the Crackles

Most of the troubles the B.B.C. has had with condenser microphones have been in the small amplifier which has had to be part and parcel of the microphone itself. One of the last developments of Captain A. G. D. West before leaving the B.B.C. was the design of a special condenser microphone amplifier to overcome all these troubles. A great many of the musical transmissions from 2LO during the last six weeks have been made with condenser microphones in the studios, and so far —touch wood—there have been no "troubles." Do you notice any difference in the quality? If you do, you're *wrong*! The characteristic of the B.B.C.'s latest condenser microphone is practically the same as that of the Reisz. The advantage is in the absence of background noise, such as that ordinarily made by any microphone of the carbon type, and the freedom from "blasting" effects on loud passages of music.

Moving Coils

There are still a few B.B.C. stations which use the old magnetophone microphones, in which a moving-coil is suspended in cotton wool in the field of a strong electro-magnet. Round-Sykes microphones, as they were called, gave very pleasing results on the horn loud-speakers of three or four years ago. Indeed, they give finer quality reproduction on horn loud-speakers than the latest types of carbon or condenser microphones, excepting when horns of the exponential type are used. Judged on the latest types of moving-coil or cone loud-speakers, the quality from the old magnetophone microphone lacked bass and "body."

Resistance Capacity

My remarks on the relative merits of resistance-capacity and transformer coupling a few weeks ago inspired a Manchester reader to send a most interesting letter of comment in which he strongly advocated the suppression of resistance capacity not only in our receivers, but in the B.B.C. amplifiers! The B.B.C., as you possibly know, makes great use of resistance coupling. This reader points out that there is a loss of higher frequencies when high magnification valves, resistances, and leaks are used, and that the B.B.C. must inevitably have a great deal of grid-current trouble with this type of coupling. I agree that high value resistances in a resistance-coupled amplifier are not good, owing to the fact that the capacity of the valve itself then becomes an appreciable factor and higher frequencies are lost. The B.B.C., however, uses low value resistances and low magnification valves, and when the amplifiers are fed from H.T. accumulators the response curve is dead straight from 50 to 10,000 cycles, even when five or six stages of amplification are employed! There are ten or twelve stages of amplification between microphone and transmitter, and the overall curve is practically straight. The deviation from the straight and narrow path, slight though it is, is due to the necessity of using input and output transformers on the long lines between studio and control-room and control-room and transmitter. This is a big score for resistance-capacity coupling!

Grid Current

In regard to the "blasting" on B.B.C. amplifiers, this is largely taken care of by careful design. The magnification and grid-swing of each stage is carefully considered, and the design of the amplifying chain is such that the first stage to run into grid current is that of the modulator valves on the transmitter. A "slide-back" meter gives the controlling engineer a "remote reading" of the grid-current meter in the modulator-valve grid circuits on the transmitter, and this can be adjusted to indicate the maximum modulation without transmitter "blast." The blasting effects that this correspondent has heard may have been caused on the transmitter, but I think the microphone, particularly if of the carbon type, is much more likely to have been the "guilty party."

Mains Troubles

However, when resistance-capacity amplifiers have to be supplied with H.T. from dry batteries or mains "eliminators," the problem takes on a different aspect. L.F. reaction, coupling, and even motor-boating may occur. And when the amplifier is connected with a detector and a few H.F. stages which are sharply tuned, it may be a disadvantage that the response curve is dead straight! Such a receiver will require an amplifier which has a rising characteristic above 5,000 cycles, in order that the cut-off introduced by sharply tuned H.F. circuits shall be neutralised, and this characteristic may be obtained by using good transformers.

Sir John Aird and Television

In an interview granted to a Canadian newspaper, Sir John Aird, Chairman of the Canadian Royal Commission on Radio Investigation, who returned to Canada recently with other members after an investigation of radio in Europe, stated that he was particularly impressed with wireless conditions in the mother country. He declared that, in his opinion, Great Britain is ahead in Europe so far as wireless is concerned, with Germany a good second. What impressed me most, though, was Sir John Aird's conviction that it was only a matter of a very short time before television would be quite common in this country. He, with other members of the Royal Commission, had witnessed a demonstration of the Baird Co.'s system, and they were all most emphatic in their remarks concerning the progress made. In the opinion of Sir John, we have advanced much farther than the Americans in television.

On Your Wavelength! (continued)

A Curious Trouble

I came across an interesting snag the other day which I myself, at any rate, had never encountered before. I was testing a portable receiver and, as one often does in hook-ups, I had arranged the panel with the various condensers and other controls thereon separately from the rest of the works, the two being connected by flexible leads. In order to mount the panel in a vertical position, I picked up an old 2-microfarad condenser and placed this under the variable condenser on the panel, this serving to support the whole arrangement practically vertical, so that I could operate it without difficulty and still obtain access to the various connections in case I wished to alter any of them.

The receiver worked fairly well, but I was troubled for a long time with an intermittent contact which I could not find. Sundry bangings of the set convinced me that there was some sort of loose contact effect, for any sudden jar would set up a horrible crackle which every wireless enthusiast knows; yet, try as I would, I could not locate the source of the trouble. I went over every connection carefully and re-made the greater portion of these, but still this annoying trouble remained. In exasperation I even changed the L.F. transformers, for, although I had never come across a breakdown in the windings of an L.F. transformer so severe as to give a crackle of this nature, yet I was by this time at my wits' end to trace the difficulty. Rather as I expected, however, the transformers were not at fault, and I was left with the curious position of having tested or changed everything in the set and still apparently having a loose contact.

Almost Hopeless

At this stage the bright and happy reader says: "Ah, of course, the poor mutt never troubled to change his loud-speaker!" As it happens, however, gentle reader, you are completely and utterly wrong, because this was about the first thing I did change, and I can assure you that this was no ordinary fault that was causing the trouble. I had practically decided to take the whole thing to pieces, and put it on one side for this purpose. Almost as a last resort I switched on again and found, to my amazement, that the crackle was no longer present, although the leads were now quite jumbled up. To cut a long story short, I found that in moving the apparatus I was no longer supporting the variable condenser on the 2-microfarad condenser, and this proved to be the solution to the whole problem.

An Unusual Cause

Whether the 2-microfarad condenser was faulty or not I do not know. It did not show any fault on test and was a perfectly well-behaved condenser, but it was in a thin moulded case, and apparently the varying pressure on this case produced some effect on the foil inside. At any rate, putting the 2-microfarad condenser under the panel condenser once again, and using it as a support, immediately caused the crackle to recur, and I can only put it down to some curious capacity to earth. The 2-microfarad condenser, I would say, was not in circuit at all and was being used merely as a support. The moral is: Do not use 2-microfarad condensers or other objects of this nature as supports for electrical apparatus unless you wish to have a harassing time.

Do You Find This?

For some little time past I have been wondering why it is that I do not have nearly the same success with distant stations whose wavelengths lie between about 425 and 460 metres as in other parts of the ordinary broadcast band. On good nights transmissions come roaring in on the lower wavelengths and on those above, but in this particular patch I always seem to need much more reaction to get decent strength out of it. I used to think that it was due to a dip in the characteristic of a choke or something of that kind, but experiments with different breeds of choke all produce much the same result. To my surprise I found, on discussing the matter with a friend the other day, that he has exactly the same difficulty with just the same small band of wavelengths. His circuit is quite different from mine and his locality is much better from a reception point of view than is mine. Do any readers find the same partial hole in their tuning that we do, and can anybody offer an explanation of it?

Good DX Conditions

Excellent conditions for wireless reception still continue. Atmospherics rarely cause any bother; fading is seldom noticeable except, maybe, for a short time at dusk; and signal strength is extraordinarily good. I have been quite surprised to find what a number of foreign stations there are nowadays on the medium band which can be quite well received in daylight. As a rule, the approach of summer means that the DX man's evening must begin later and later, but this year a trip abroad is often productive of good results at quite an early hour. The four outstanding foreign stations at the present time are Turin, Nuremburg, Hoerby, and Cologne.

The queer thing is that long ranges do not always seem to depend upon the power behind the transmitter. Nuremburg, for instance, is only 4 kilowatts, though he comes in, as a rule, even more strongly than Hoerby with 10 kilowatts, the ranges of the two being very much the same. The 7-kilowatt Turin is sometimes as strong as either of them. But the wonder of the broadcast band is Kaiserslautern, who is rated at only *point* seven kilowatt, but comes in as strongly as if he had the full seven without the point. Paris P.T.T. is another smallish station with a big voice.

More and More

Berlin Witzleben is now sending pictures on most if not all evenings of the week as a regular part of his programmes, the transmission time being often between 7 and 8 p.m. Except on Sunday nights, many of us have rather a business to receive Witzleben, owing to the wipe-out of 5GB. But it is worth while noting that the Berlin station's programmes are often relayed by other big Germans. The other night, when Breslau was taking his programme, I found that both he and Gleiwitz were sending pictures, conditions being such that excellent reception was possible. Nuremburg has also been Fultographing, and many other of the German stations will be added to the lists very shortly now. I sincerely hope that the B.B.C. will soon make pictures a regular part of its programmes.

Earthing Switches

The recent instance of the destruction of a wireless set by lightning rather tends to emphasise what I have always said about the earthing switch. In this particular case the set was supposed to be earthed, but the switch seems to have been of very small size and to have been installed inside the house. Now, the proper place for the earthing switch is unquestionably out of doors, for when you come to think of it you don't want deliberately to conduct currents at a million volts or so into your abode. Further, it should be remembered that the single-pole double-throw switch so often used is practically useless. With this the earth is left connected to the receiving set and a shunt path is provided from the aerial to earth. A high voltage current may jump the gap to the aerial connection, playing havoc with the receiving gear. The earthing switch should certainly be of the double-pole change-over type, cutting the receiving set clean out and providing a straight-through path to earth. Better still, don't use a switch at all, but disconnect both aerial and earth leads from their terminals outside the window, hook them together and let them swing away from the house.

THERMION.

SECRETS OF THE TEST ROOM

The second of a new series of articles which will appear from time to time from the pen of our Technical Editor, indicating some of the methods employed in the testing of manufacturers' components and apparatus. The subject of this article is the testing of high-tension batteries.

DESPITE the increasing use of electric-light mains for supplying current to wireless receivers, the vast majority of sets still have to make use of batteries for their power. The low-tension, of course, can be obtained from an accumulator which is capable of being re-charged, but the high-tension supply is more conveniently obtained from dry batteries. In certain instances wet batteries or high-tension accumulators may be used, but there is (and will be for some considerable period) a large demand for dry batteries of the zinc-carbon type.

Length of Life

For some time past, AMATEUR WIRELESS test reports have quoted the approximate life of the batteries in milliampere hours. The actual life in practice depends upon the conditions under which the battery is used. One of the special features of the zinc-carbon battery having an electrolyte of sal-ammoniac or some similar salt is that it is capable of considerable recuperation. The effect of discharging the battery is that the chemicals are used up and in consequence the voltage on the battery falls. The battery, however, contains certain other chemicals which tend to arrest the fall of the voltage, and it is really only by virtue of these chemicals that we are able to obtain practicable results.

These chemicals are working to maximum effect when the battery is in use. When the battery is taken off discharge and allowed to rest, however, the "depolarising" chemicals continue their action and proceed to some extent to repair the damage which has been done by taking the discharge from the cells. They cannot completely recover the lost ground, but the cell certainly is in a fresher condition after a period of recuperation than it was when it was switched off load.

If the battery is kept on a continuous discharge, therefore, it will lose its effective voltage more rapidly than if it is discharged for short periods and allowed to recuperate. For this reason batteries are sometimes tested by being placed on discharge for a certain number of hours each day and allowed to recuperate for the remainder of the time. This certainly approximates to practical conditions, but it is impossible to say how long a battery will actually be used in practice, and after due consideration it appears better to discharge the battery continuously and to make allowance for the increased performance which will be obtained if the battery is only used intermittently.

Method of Testing

The method used in making tests, therefore, is to place the battery on discharge through a constant resistance. This resistance again is a somewhat arbitrary value, for a peculiarity of dry cells is that the milliampere-hours life from a battery decreases as the current increases. If we double the current which we take from a battery we might reasonably expect it to last half as long. Actually it will only last something between .3 and .4 times as long, this effect being due to the fact that the depolarising action has not had time to come into full operation. Conversely, if we discharge the battery at a very slow rate we can obtain a performance on continuous discharge which is very nearly equivalent to that obtained by discharging it at a normal rate for, say, five hours per day and leaving it to recuperate for the remaining nineteen.

In making a practical test, therefore, a compromise is adopted. Take, for example, the average single-capacity size of dry battery. This is rated to give about 7 milliamps economical discharge. We place this on test, therefore, connected across a resistance so adjusted as to draw 7 milliamps from the battery. As the voltage on the battery falls the current also falls, since the resistance has remained constant, and consequently the current, instead of being fixed at 7 milliamps, gradually falls away. This process is continued until the voltage on the battery has fallen to one-half of its initial value. The current, then, has also fallen by one-half, and at this point the battery is considered to be exhausted. This method of testing gives slightly better results than would be obtained if the discharge was maintained constant at the full 7 milliamps.

Milliampere Hours

The actual milliampere hours given out by the battery—that is to say, the product of the current and the time during which the current is taken—is obtained by a simple calculation. The current is obviously not 7 milliamps the whole of the discharge, nor is it 3½ milliamps, the former value being too high and the latter value too small. What we require is the average of these two values, and a little thought will show that this is three-quarters of the initial discharge rate. We obtain the milliampere-hour consumption, therefore, by multiplying the initial discharge rate by three-quarters and multiplying this by the number of hours continuous discharge obtained from the battery before its voltage fell to one-half.

Practical experiments show that this figure should be in the neighbourhood of 1,000 for an ordinary dry battery of the single-capacity type. Double-capacity and treble-capacity types should give approximately 2,000 and 3,000 milliampere hours. In the case of the larger sizes of battery, of course, the discharge rate is larger, since these batteries are intended to give

(*Concluded in third column of next page*)

HAVE YOU NOTICED

—what an untidy job, unless the constructor is experienced, is frequently made over soldering? And when this is the case, the futility of taking the trouble to solder, when the tag to which the wire is soldered is itself held under a nut? Thus, as far as good electrical contact goes, the wire held directly under the nut or terminal head is equally satisfactory. These remarks do not, of course, apply when the tag is an elongation of the part itself, when, naturally, the advantages of soldering are self-apparent.

IN a recent issue, Jay Coote, in his feature "Jottings from My Log," spoke about the new Belgrade station. This was officially opened on March 24 last and has been transmitting almost nightly.

Whilst the tests were on, Jay Coote searched on the wavelength of 260.5 metres allotted to it, under that well-worn scheme, the *Plan de Brussels*. The result was, as is not altogether uncommon with foreigners, that Belgrade was found to be working just between Aachen and Porsgrund—that is between 450 and 455 metres!

The call is *Radio Beograd*, the first syllable of the second word being pronounced as the English "bay." The power approaches that of 2LO and it is therefore interesting in that it provides new "meat" for the DX fan.

British Built

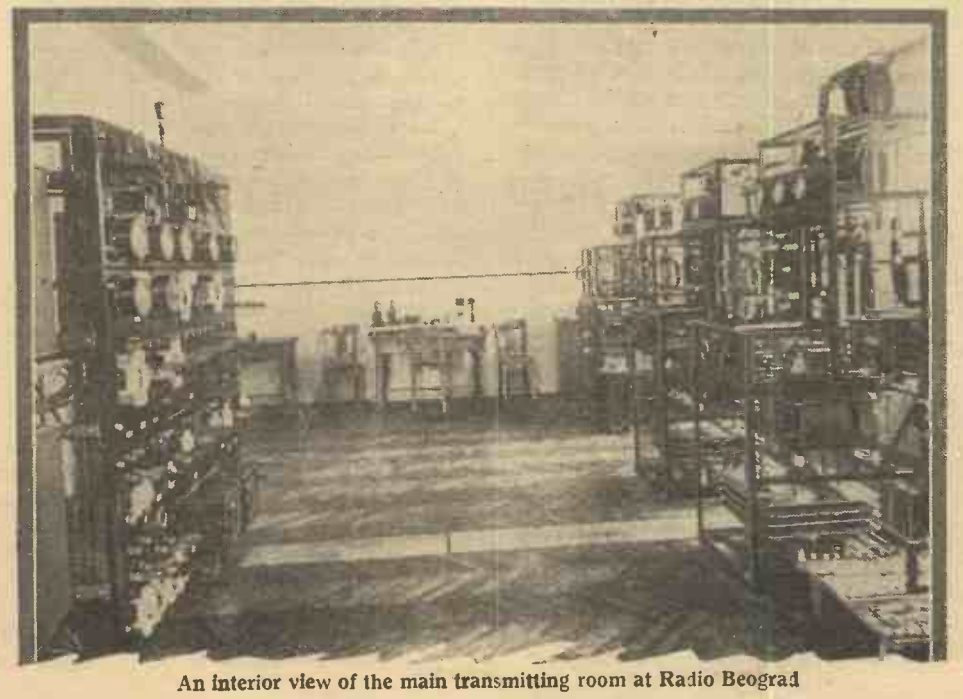
The whole station has been built by Marconi's Wireless Telegraph Co., and is, in appearance, similar to any typical main B.B.C. station. The fact that a British firm was called upon to organise broadcasting in Belgrade is surely a tribute of which we should be proud. The station itself is large and three studios are used to provide adequate programme service. At present there are about 7,000 listeners within range and it is estimated that most of them are valve-set users. The number should experience a big jump now that Beograd is in active operation.

The type "Q" transmitter, which is at Beograd, is very interesting because Marconi's have designed it as quite a standard job for use as a main broadcast set to serve a comparatively large area. The transmitter consists of the rectifier unit, the master oscillator, the power oscillator or magnifier unit and, finally, the speech amplifiers and modulator.

The Rectifier

The rectifier unit is a giant in its way, and its purpose is to convert 10,000 volts A.C. to comparatively smooth D.C. On the H.F. side the master oscillator circuit is one of the outstanding features of the Marconi transmission system. Large accumulators supply the L.T. and this is also the case with the main oscillator and the modulators.

It is worth while to see the way in which power is expended in the various circuits of a typical transmitter, such as is at Belgrade.



An interior view of the main transmitting room at Radio Beograd

The anode of the main oscillating valve has 1.5 kw., the drive oscillator 1 kw. and the modulator 1.5 kw. It is rather surprising that 1.2 kw. is expended in heating the filaments by means of D.C. The main oscillator valve takes 2.4 amps. filament current!

The "Q" type transmitter at Beograd necessitates fairly expensive gadgets, which many amateurs, and particularly amateur transmitters, would be proud to own. Super-capacity batteries for L.T., motor-alternator sets, battery charging plants and so on are all included in the list of extras.

Aerial Arrangements

At Beograd the aerial is suspended between masts approximately 80 ft. high, which have been erected at the top of the building. The layout is comparatively efficient and should result in an effective radiation without undue directional effects. Matters of this kind, however, are being experimented with in initial tests. In the opinion of many listeners in the south of England, Beograd is sometimes being received at very nearly the strength of Turin, and in any case quite loudly.

At present no interval signal has been decided upon—not even the ever-popular metronome tick-tick. This deficiency is made up for by the fact that all announcements are made in four languages, namely English, French, German, and Serbian, which latter may not be recognised by many listeners in this country.

When next making a round of the dials see if you can log the newcomer on its present wavelength.

SECRETS OF THE TEST ROOM

(*Continued from preceding page*)

a higher current, and should thus be tested under conditions approximating to their normal use.

Further tests show that the same battery tested on a continuous discharge and on a discharge of an intermittent nature gives results in the ratio of 1 to 1.75 approximately. That is to say, a battery discharged under practical conditions will give approximately 1¾ times the life quoted in the actual test report. The test report, therefore, serves firstly as a means of comparison between different classes of battery. Moreover, the particular test does not occupy an undue length of time, whereas the intermittent discharge takes something like a month in the ordinary course of events. Secondly, it serves as a guide to the life to be expected from the battery, since the reader can easily calculate for himself the approximate life by multiplying the milliampere-hour figures given in the test report by 1.75 and dividing this by the average number of hours use per day. This will give the length of life of the battery in days approximately.

WITHOUT FEAR OR FAVOUR

A Weekly Programme Criticism by Sydney A. Moseley

AMATEURS have often written to me asking how it is that when reaching out they hear talk, talk, talk from the German stations.

An understanding of the local conditions, however, is very enlightening. It is not all *ponderous* talk. The German loves to intersperse his entertainment with introductions of a gently chaffing nature. At the tea-dances, music-halls, everywhere where fun is to be had, you will hear an announcer entering the arena and seemingly give a talk before the next item comes on, but since every sentence is followed by an outburst of laughter from the audience you know very well that it is all part of the comedy. I daresay that if the German studios had audiences as we have (rather foolishly, I still think), British listeners would realise that all the talks are not as serious as they sound.

◆ ◆ ◆

"B.M.," of Wood Green, wants to know if I am interested in the views of "the very young generation" on the Children's Hour.

"You publish the views of the Big Children on this important question!" he writes, "so perhaps you will give a little space to a juvenile." Oh, certainly!

"My little daughter listens very regularly to that part of the day's programme devoted to children and takes a special interest in the birthday greetings. But she definitely dislikes the repeated basso exclamation of 'Hello, twins!'

"She thoroughly enjoyed a recent hour devoted to animals at the Zoo. Stories in which animals appear and make real animal noises intrigue her immensely. I have taken a census of opinion from other parents and found this partiality for animals quite general. She likes the musical part, but thinks the Uncles are sometimes rather 'silly.'"

My correspondent finishes up with the remark that, contrary to the general belief, "children are more interested in the real thing rather than make-believe."

◆ ◆ ◆

Don't you think the opera broadcasts have been really excellent? Surely nobody can grumble now about not getting their ten shillings' worth!

◆ ◆ ◆

A correspondent has gone to great pains in order to point out that I made a mistake in saying the second issue of *Gay Sparks* was by Charlot. Sorry, Mr. de Courville!

◆ ◆ ◆

"We have now heard both Stanley Baldwin and Lloyd George on the wireless," writes R. Sims, of Marylebone, "and it is interesting to compare the two personalities from a listener's point of view. Lloyd George is easily the speaker with the greatest wireless personality. He is entertaining and makes his presence felt. Mr. Baldwin, on the other hand, has more of the lecturer's style and talks *at* us. He was not half as interesting as L.G."

◆ ◆ ◆

Here is an interesting point of view which ought to promote discussion.

"I am not a sturdy he-man of the North," writes H.B.E., of Woking, "but I like to be given what is promised me. One of your correspondents recently said that a good orchestra attracts the crowd when in competition with a band. I believe that I am right in thinking that band music is just as well recognised a type as chamber music. The other day I read that one of our foremost composers was giving his attention to music for bands."

My correspondent maintains that we have very little of this type of music from the Wireless Band and that the music they do give us is played in the manner of an orchestra, and not as, say, the Coldstream Guards would play it. "If I am right," he concludes, "why have an orchestra called a military band?"

◆ ◆ ◆

Now and again one gets a cry of exasperation from a listener who finds that his protests to the B.B.C. direct are apparently unavailing. He then complains to AMATEUR WIRELESS in order that "something may be done"!

I am referring to a correspondent who deplores the amount of time devoted to talks other than those which have a direct appeal to him.

"It is no use writing to the B.B.C. about such things. I have done so frequently, but since they are a Corporation they are off-hand and disobliging, and their sole idea of development is by the introduction of further talk, talk, talk—either by way of debates, speeches, or robot plays.

"I begin to think the programmes are for their own amusement in the studios. They know the cry is for music, good music, and more music; but they show no development in this direction."

◆ ◆ ◆

Although my correspondent likes the language talks (because he happens to be a linguist!), he asks for an earlier timing for talks on gardening, household, farming, and marketing.

"I think I only pay my fee for the language talks and the symphony concerts; practically all the rest of the programme is sheer rubbish, and I consider the fee too dear for the latter."

◆ ◆ ◆

And I know somebody with a garden who would be awfully upset if the gardening talks were given before he could get home from the City!

Miss Ann Penn—and her impersonations of Nellie Wallace, Dora Maughan, Gwen Farrar and Gracie Fields

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The Italian Broadcasting Company has authorised the Marconi Company to proceed with the manufacture of a short-wave broadcasting transmitter for Italy. The Italian station will to a large extent follow the design of 5SW, and will enable the Italian Broadcasting Company to carry on a broadcasting service for the Italian colonies.

A Highly Successful Portable by L. A. Chapman: Making the Frame Aerial: Assembling: Testing

The TALISMAN

Winding the Frame Aerial

DETAILS of the construction of the receiver portion of the Talisman Portable were given in last week's issue. There remains only the frame to be wound and the receiver to be assembled in the cabinet.

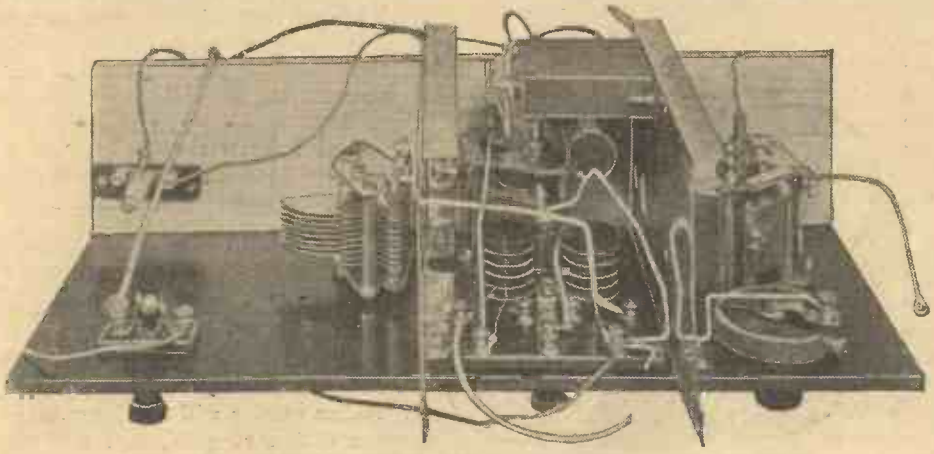
Assuming that the constructor has cut the fretwork grille, which forms a facia for the loud-speaker, and that the frame winding terminals and switch have been mounted, the stranded frame aerial wire can be prepared for the medium-wave-length winding.

Anchor the beginning of the winding by tying the wire in a knot around the support nearest to the switch. Now wind on eight turns and connect the wire to one of the terminals on the three-point switch. The wire that is left should then be connected to one of the other terminals on the three-point switch and the short-wave winding continued until another seven turns have been wound on. The wire should then be anchored off in the same way as when first started and sufficient length left for connecting both the start and the end of the short-wave winding to the outer two of the three terminals mounted on the fretted grille. The centre terminal is then connected to the remaining terminal on the three-point frame aerial switch.

The long-wave winding consists of fifty-four turns of No. 32 d.s.c. copper wire, each turn being arranged close to its neighbour. This winding calls for a little care as the wire is rather thin and if too much tension is applied it will be liable to break. On the other hand if insufficient tension is applied to the wire in winding then the whole of the long-wave winding will become straggly and look untidy.

Anchor the beginning of the winding to the support nearest to the switch in the same way as for the medium-wave winding, allowing sufficient spare wire for connection to the terminals on the grille. Now wind on the wire, leaving a space of ¾ in. between the end of the medium-wave winding and the beginning of the long-wave winding. Put on twenty-seven turns and then double the wire back over itself to form a "bight" and anchor off to the support nearest to the switch. The bight thus made should be long enough to permit making a direct connection to the centre terminal (B) (page 688, No. 361) of the three terminals on the grille. This being done, without breaking the wire, continue to wind on another twenty-seven turns in the same direction as the first section of the winding. Anchor off the wire around the support nearest to the switch as in the first case. Both the medium-wave winding and the long-wave winding should be wound on in the one direction.

In connecting up the ends of the frame windings use extreme care in baring the ends of the wire of insulation. Twist together the wire forming the beginning of the medium-wave winding and the beginning of the long-wave winding. Connect these two to the terminal marked C. The wire forming the end of the medium-wave winding and the wire forming the end of the long-wave winding should also be twisted together and these two taken to the terminal marked A. See the small perspective drawing of the frame and switch connection (page 688, No. 361).



The first stage in the assembly and wiring—the components on the panel

Adding the Loud-speaker

If the loud-speaker has not already been fitted in position this should now be done. Some of the portable types of Grawor speaker are supplied for fixing flush with the grille, whilst others require small distance pieces between the grille and the back edge of the speaker unit. The flush-mounting type has an extended screwed rod fitted to its reed movement.

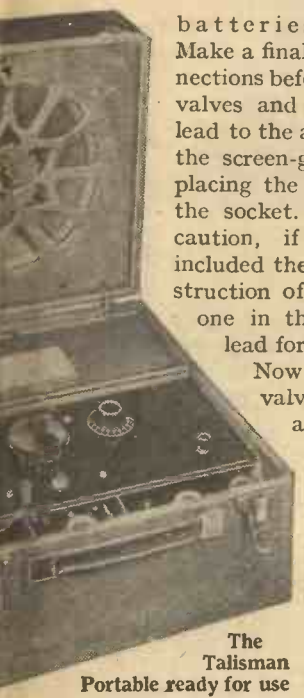
After having mounted the unit, place the diaphragm in position and carefully mark a pencil line around the edge of the diaphragm on the back of the grille. Now take the special "felt" as supplied with the speaker unit and gum this over the pencil line right round where the diaphragm will normally rest. The "felt" should be so arranged that its centre is right over the pencil line first made. Seccotine will be found to be a suitable adhesive.

Bench Test

Before attempting to put the receiver and the speaker into the cabinet the circuit should be checked over. The parts can be laid out on the table and the

PORTABLE

Hints on Tuning: Forty-one Stations at Loud-speaker Strength!



The Talisman Portable ready for use

batteries connected up. Make a final check of all connections before putting in the valves and connect the flex lead to the anode terminal of the screen-grid valve before placing the special plug into the socket. As a final precaution, if you have not included the fuse in the construction of the receiver put one in the H.T. negative lead for the first trial.

Now switch on the valve filament switch and turn on the rheostat about half-way round. If the loud-speaker howls then reduce the H.T. tapping for the anode of the screened-grid valve. Keep the reaction condenser set to a minimum. If no sound at all is heard then turn your attention to the frame and H.F. coil switches. See that the knobs are pulled up for the medium wavelengths and pushed down for the long wavelengths. Set the tuning condensers to the approximate adjustments for the local station or Daventry and bring up the reaction condenser. This should result first of all in a slight rustling noise and by a further movement a squeal. This will not cause interference with other listeners. In connecting up the receiver see that the centre terminal of the frame aerial is connected to a point giving 1½ volts negative bias on the grid-bias battery.

With the Pertrix battery used in the original set I find that applying the full voltage to the H.T. positive 4 terminal and about 90 volts to H.T. positive 3 terminal, 66 volts to H.T. positive 1 terminal and 60 volts to H.T. positive 2 terminal the receiver gives adequate volume with great stability. Some variations in H.T. voltage tappings may be necessary according to the valves in use.

Valves to Use

The valves I use are Six-Sixty 215SG, 210HF for the detector, 210LF for the first L.F. and 230SP for the last L.F. Other valves I have tried have been Osram S215 for the screen-grid stage, Six-Sixty 210RC for the detector stage also Ediswan LF210 for the detector stage, Ediswan LF210 for the first L.F. stage and Osram DEP240 for the last L.F. stage. The higher the impedance of the detector valve the greater the stability of the receiver and the smoother the reaction control, but amplification suffers a little. An H.F. valve gives good amplification and reasonable stability with ease of reaction control. An L.F. valve in the detector position gives more amplification than the H.F. type valve but it is inclined to be unstable.

If valves tend to sing or howl then the culprit can be found by flicking each bulb with the finger when a pronounced "pong" will be heard.

Hints on Tuning

Having satisfied yourself upon the handling of the receiver on the local station, now try to tune in a few of the more powerful distant stations. If the frame tuning condenser setting differs by many degrees from the anode tuning condenser settings then try spacing apart the medium-wave frame turns to bring the condenser settings more into step.

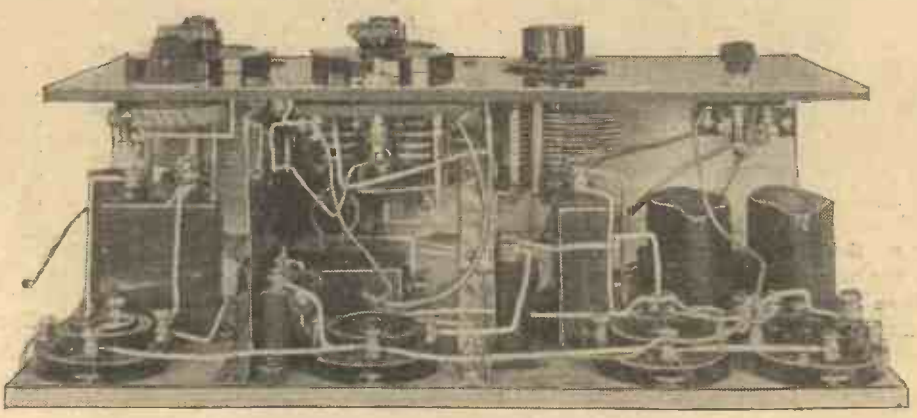
The dials should be in step with each other around the middle readings, thus allowing for a slight variation at the two ends of the scale.

In the original receiver the two dials were in step over almost the whole scale, on the medium waves, and out of step a fair amount on the long waves. This is not detrimental and cannot be avoided on the long waves, as the inductances for each circuit on the long waves differ so much.

Calibrating the Receiver

The set, when working properly can be placed in the cabinet. Slip all of the wander-plugs and wires through the lower part of the front of the cabinet and ease them through into the battery compartment. Before sliding the receiver down into its own compartment slip the loud-speaker leads through from the battery compartment into the receiver compartment and attach the leads to the proper points. Now take up all slack wires into the battery compartment and ease the set into the space provided for it.

The flexible battery leads should then be pulled up out of the way of the batteries and the latter put into place. The grid-bias batteries fit one by the side of the L.T. battery and one in front of it nearest to the receiver compartment. This means putting



This photograph shows a front view of the completed receiver portion

"THE TALISMAN PORTABLE" (Continued from preceding page)

in the accumulator before the grid batteries. Arrange a length of thin but strong tape around each of the batteries to facilitate their withdrawal when required. Now connect up all batteries as before and also wire up to the frame aerial. Place the cover over the battery compartment and calibrate the set according to the list of stations received on the original set.

Practically every station given in the list included in these pages was received at fair to good volume loud-speaker strength.

With the receiver in use within two miles of the London station I consider it possible to get about twelve alternative programmes any night. I have received Radio Paris, Hilversum, Eiffel Tower, 5XX, 5GB, Brussels, Turin, Toulouse, Zeesen and, of course, 2LO, during daylight hours at varying strengths on the loud-speaker.

41 Stations at Loud-speaker Strength

In giving this list of stations received, I would like to mention that the stations given have not been received regularly every night or on any particular night. It has taken nearly a month to get them all. Now that I have drawn up a rough calibration curve I find that I can pick on almost any individual station and tune it in during the dark hours.

Tuning is not simplicity itself, as some readers may anticipate, but by careful

This picture shows clearly the assembly of the combined frame aerial and loud-speaker

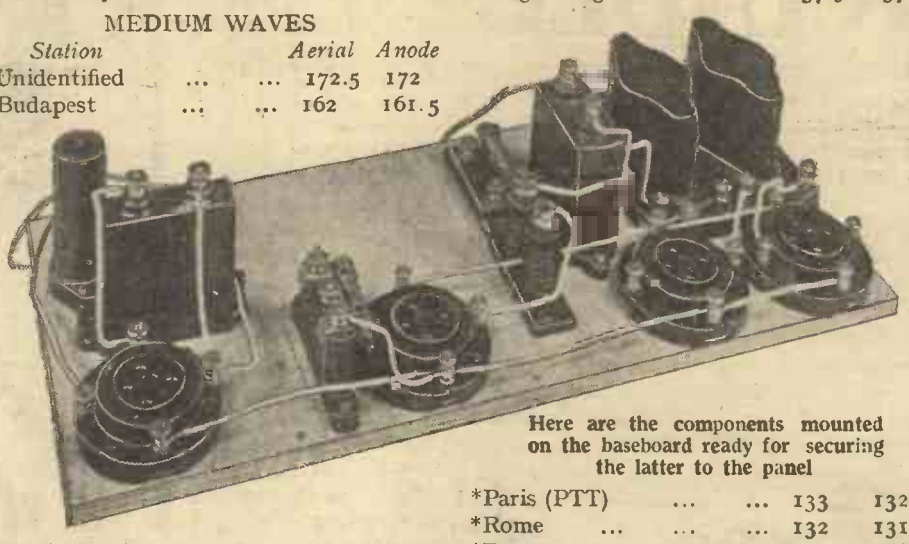
handling of the reaction condenser and judicious use of a pocket compass readers should have no difficulty in picking up about thirty-five stations for home reception.

Test Report

The following stations have all been tuned in on the loud-speaker, without the aid of phones. Fading has been experienced with a number of the more distant stations but this is only in keeping with normal types of receiver. Those stations marked with an asterisk have been definitely identified by their own announcement.

MEDIUM WAVES

Station	Aerial	Anode
Unidentified	172.5	172
*Budapest	162	161.5
*Munich	160	159
*Vienna	157	155
*Brussels	154	152
*Milan	150	150
*Daventry (5GB) ...	144	144
*Berlin	141	141.5
*Lyon (PTT)	140	140
Langenburg	137.5	137
*Paris (PTT)	133	132.5
*Rome	132	131
*Brunn	127	128
Madrid	125.5	126
*Frankfurt	123	124
Katowice	121	122
*Dublin	119	120
*Hamburg	114	114
*Toulouse	108	109
*Stuttgart	105	106
*London (2LO)	99	100
*Gleiwitz	83	85
*Cardiff	81	83
*Breslau	80	82
*Aberdeen	75	77
*Radio Vitus	73	76.5
*Belfast	70	73
*Bournemouth	63	65
*Turin	59.5	59.5
Kaiserslautern	57	57
*Cologne	47	50
Horby (Sweden) ...	44	48.5
*Newcastle	37	38
Nurnburg	35	35
Unidentified	21	26.5
*Cork	16	22
Flensburg	12	19.5



Here are the components mounted on the baseboard ready for securing the latter to the panel

For the convenience of constructors who have not yet completed the construction of the Talisman, we are again giving the list of components :—

Ebonite panel, 14 in. by 6 in. by $\frac{3}{16}$ in. or $\frac{1}{4}$ in. (Becol, Raymond, Ebonart, Paxolin).
Two variable condensers, .0005 microfarad (Ormond Midget, Utility, Formo).
Two slow-motion dials (Ormond, Utility, R.I. and Varley).
One rheostat, 15 ohms (Lissen, Igranic, G.E.C.).
One variable condenser, .0002 microfarad (Cyldon Bébé, Peto-Scott).
One L.T. switch (Wright & Weaire, Trix, Lissen).
Dual-range tuning coil (Wright & Weaire).
Copper screens (Parex, Wright & Weaire, Ready Radio).
Two H.F. stoppers (Marconiphone).
Safety fuse (Bulgin, Ready Radio).
Two fixed condensers, 1 microfarad (T.C.C., Dubilier, Ferranti, Lissen).
One fixed condenser, S.P. type with clips, .0003 microfarad (T.C.C.).
One fixed condenser, 2 microfarad (T.C.C., Dubilier, Ferranti, Lissen).
Four anti-microphonic valve holders (Lotus, Wearite, Formo, Trix).
One H.F. choke (McMichael, Burndept, Polar).
One grid-leak holder (Ediswan, Lissen, Dubilier).
One anode resistance, cartridge type, 30,000 ohms (Carborundum, Lissen, Ediswan).
One grid leak, 2 megohms (Dubilier, Lissen, Ediswan, Mullard).
Two L.F. transformers (Philips, Mullard, Igranic, type J).
Frame aerial switch, 3-point type (Wright nd Weaire, Bulgin, Ormond).
Frame aerial wire, 100 ft. (Lewcos).
Loud-speaker unit, portable type, and cone diaphragm (Grawor).
Unspillable accumulator, 2 volt (C.A.V. 2N.S. 21, Exide W P.C. 4, Pertrix, Oldham).
H.T. battery, 100 volts (Pertrix, Ever-Ready, Siemens).
Two grid-bias batteries, 9 volts each (Pertrix Ever-Ready, Siemens).
Eight wander plugs, five red, three black (Clix).
Spade terminals for accumulator, one red and one black (Clix).
Glazite wire for wiring and few yards of red and black flex (Lewcos).
Cabinet of dimensions given (Carrington).
Fourteen 4 B A. nuts and screws and three small terminals.
Two ounces of No. 32 d.s.c. copper wire for long-wave frame winding.
Plug and socket for S.G. valve anode connection (Clix).
Station tuning chart (Bulgin).

LONG WAVES

Station	Aerial	Anode
Kovno (?)	152	131.5
*Huizen	141	122
*Radio Paris	132	113
*Zeesen	122	104
*Daventry (5XX)	112	97
*Eiffel Tower	101	87
Motala (?)	82	72
Kalundborg (?)	48	47
Hilversum	29	35

Tuning Coils

As the coils for this portable are of particularly simple design, many constructors will doubtless prefer to make their own; full instructions for doing this with complete winding data will be given in our next issue.

"A.W." TESTS OF APPARATUS

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

Graham-Farish Condenser

THE physical dimensions of differing types of .0005 variable condensers do not alter appreciably; they are always of a bulky nature and ample space must be provided for when mounting them in a set. This question of condenser bulk is often a problem to the designer, particularly in portable receivers, since it is apt to limit the possibilities of a compact layout.

Graham-Farish variable condenser, with a bakelised paper dielectric

It was therefore with some interest that we tested a new design Graham-Farish .0005 capacity variable condenser having a bakelised paper dielectric. This condenser is housed in a cylindrical insulated case measuring 2⅞ in. in diameter and ⅝ in. thickness, whilst the overall thickness, including the terminals, is approximately 1 in. It will therefore be seen that the space occupied by this component is considerably less than is usual for a variable condenser. This, taken in conjunction with the low cost, is a desirable feature.

It must be remembered, of course, that the substitution of a paper dielectric for the normal air dielectric materially increases the H.F. resistance of the article and in consequence the efficiency and selectivity of a set may be affected. Used in a normal detector circuit with reaction, the condenser resistance may be counteracted to a great extent by increasing the reaction, although this tends to make searching for distant stations a more difficult procedure.

In other cases, particularly when utilising screen-grid circuits, the H.F. resistance of the tuning circuit must not be too low, otherwise chronic self-oscillation will occur. Thus it might be possible to wind efficient coils and use these with the paper dielectric condensers and so balance matters.

For a solid dielectric condenser, the motion is commendably smooth and had the feel of a normal air dielectric article The capacity range was found to extend from .00001 to .00057. At 400 metres the increase of H.F. resistance in a circuit due to the use of this condenser was of the order of 10 ohms.

Junit Valve Holder

THE popularity of four- and five-electrode valves has increased to a large extent during the past year and it has therefore been necessary to adapt them for use with the normal valve holder, although this latter component is not always most convenient for these types of valve.

A valve holder made by the Junit Manufacturing Co., Ltd., of 2 Ravenscourt Square, W.6, has been designed specially for use with the new four- and five-electrode valves. It may be mounted either in a horizontal or vertical position and will therefore hold a screen-grid valve in the correct plane for screening.

An additional terminal is fitted to the holder and serves as a junction for a flexible lead to the extra terminal on the pentode and a rigid connection to H.T. positive.

The four sockets of the holder are mounted on a small square moulding and the connections are taken out to four terminals at the corners. Holes are drilled in the

Junit valve holder

moulding for mounting the holder in two separate planes. The component, which is well-finished, should prove useful to set builders.

Loewe Loud-speaker Unit

LOEWE components have from time to time been reviewed in these columns and generally show a degree of workmanship and finish which is entirely commendable. The new loud-speaker unit is no exception to this rule, and is an exceedingly neat and serviceable component.

The simple electro-magnetic unit, which consists of a reed mounted in proximity to an electro-magnet, is housed in an attractively finished moulded insulated former. An adjustment for the unit is controlled by an external knob and comprises a piston movement attached to the reed via a spring. One of the Loewe vacuum variable condensers is placed across the loud-speaker terminals in order to correct the tone.

We placed this instrument on test by clamping it in a floating cone assembly of a known efficiency. Mounting was quite a simple matter since two lugs on the moulded casing are provided for this purpose. The results we obtained from our tests on reproduction of speech and music were good and compared favourably with out standard cone speaker. There is no drumming and speech is quite clear; at the same time the reproduction is sufficiently mellow to give pleasing results on musical items. The extent of reproduction was quite satisfactory for a unit of its type, being very nearly as good in this respect as our standard unit.

Loewe reed-type loud-speaker unit, incorporating a shunt condenser

This is quite a high-class unit and can be recommended to readers.

HEAVISIDE-LAYER "WOBBLES"

RECENT investigations have shown that the surface limits of the Heaviside layer fluctuate rapidly from minute to minute, particularly during the daylight hours. On one occasion the layer was found to rise at the rate of six miles per minute, and to fall at the rate of twenty miles per minute, over a period of approximately a quarter of an hour. One possible explanation for this behaviour is the existence of mysterious electric fields which impact on the outer atmosphere from interstellar space and swing the free electrons up and down in bulk. B. A. R.

The National Broadcasting Company in America has contracted with 643 radio artistes to broadcast for it exclusively.

WIRELESS IN PARLIAMENT

From Our Own Correspondent

VISCOUNT WOLMER informed Colonel Woodcock that the following revised arrangements for wireless licences had recently been introduced :—

(1) A wireless licence covers the use in the premises occupied by the licensee of any number of sets of receiving apparatus of any character by the householder, his family and his domestic staff. (A separate licence is necessary for a separate building, such as a lodge or gardener's house, or for a portion of the same address under a separate tenancy.)

(2) A wireless licence covers the temporary use (for example, during holidays) of receiving apparatus of any character at another residence, provided that no receiving apparatus is being worked at the home address.

(3) A wireless licence covers not only the use of wireless sets at one fixed address, but also the use (whether simultaneously or not) of one portable set at any place in Great Britain or Northern Ireland by the licensee or any member of his household. When a portable set is used away from the home address (for example, on a motor-car) the person using it must carry the licence with him and produce it if asked to do so by an authorised officer of the Post Office.

The concession in regard to portable sets takes effect immediately, but no rebate will be allowed in respect of a separate licence already taken out for a portable set. The conditions printed on the licence form will be amended in due course.

A French author and playwright brought a libel action against P.T.T. Paris, as on a recent evening, in the course of its news bulletin, the announcer stated that the dramatist had committed suicide.

A further super-power transmitter is to be erected in Sweden; the Stockholm station will be replaced by Marconi plant capable of supplying 60 kilowatts to the aerial.

A new law has been passed by the Belgian Chamber of Deputies dealing with the organisation of a National Broadcasting Institute to be controlled by an official council with the Minister of Posts and Telegraphs as president. The institute will take over Radio Belgique and the proposed Louvain station.

With the selecting of a tentative site at Grand Island, Nebraska, for the master radio monitoring station, the Radio Division of the U.S. Commerce Department believes it has determined the radio centre of the United States. This is the result of many months surveys and observations.

MY WIRELESS DEN

By W. JAMES

Weekly Tips, Constructional and Theoretical—

For the Wireless Amateur

Earth Connections

I WONDER what proportion of complaints of poor results are to be traced to a hurriedly constructed earth? I find the earth connection is often neglected, a piece of wire being wrapped around a convenient metal pipe. Even when a water pipe is chosen and the earth wire is carefully wrapped over a clean portion, the earth may not be a good one.

Sometimes it is, of course, possible to employ a short earth wire and to connect it to a clip fastened to a water pipe where it is about to enter the ground, but in many instances it is better to provide an earth plate. This may consist of a sheet of zinc or copper, two or three feet square. The earth wire should be soldered to it and the plate buried in the ground.

If the earth wire happens to be short and the plate is of reasonable size, the earth will be most effective and it is surprising how signal strength and selectivity will be improved. A good earth is always worth while and will repay any little trouble taken over its construction.

Curing Transformer Defects

Do you know the two principal defects of poorly constructed transformers? The first is an uneven frequency response. This means that the lower, middle, and higher notes are not magnified uniformly, with the result that distortion is produced.

This is obviously to be avoided when possible, or at all events to be minimised, and in this connection it will be found that the addition of a grid leak will often improve matters. The grid leak should have a fairly low value of resistance and be connected across the terminals of the secondary winding of the transformer.

A suitable grid-leak to try would be one having a resistance of half a megohm, but the most marked improvement in the quality of the reproduction may be obtained when a grid leak of one quarter megohm is used. The volume may be reduced a little when the grid leak is connected but the effect will be to improve the performance as a whole.

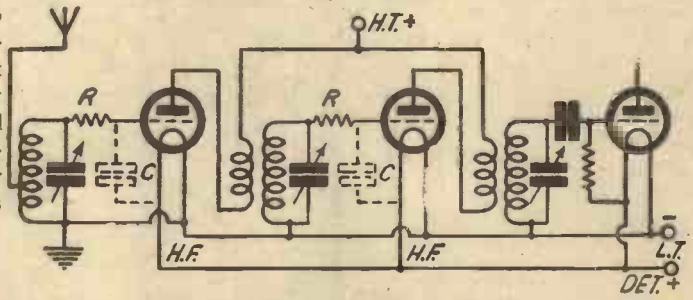
The second defect referred to is due to the use of poor iron for the core and results in the creation of harmonics. In other words, the output from the transformer is very different from the input.

This form of distortion is unfortunately not to be minimised by the employment of grid leaks or other accessories—which is a point to be remembered by those considering the purchase of a very cheap transformer.

A Stabilising Resistance

High frequency amplifiers employing ordinary three-electrode valves are usually stabilised by suitably arranging the circuits in order that the capacity of the valves may be neutralised. For this purpose a neutralising or balancing condenser is generally used.

Another method of stabilising is, however, often used in foreign receivers and takes the form of a resistance included in the grid circuits of the high frequency valves. This resistance acts to prevent instability when it has sufficiently high value, because it is in a circuit which includes the capacity of the valve as indicated in the diagram.



A grid resistance used for stabilising

For a given value of resistance, the stabilising effect would be increased by raising the grid-to-filament capacity, marked C in the diagram. A similar effect results when the resistance is increased. It is, therefore, possible to find by experiment a value of resistance which will ensure stability for any type of valve and the value of the resistance actually found suitable will depend, amongst other factors upon the capacity.

Making Connections

Attempts to introduce cable connectors to replace the existing terminals and single wires have, up to the present, not met with very much success.

I myself have used in a published set, a cable or battery cord fitted with the necessary plug or socket but few followed my example. Whether this was due to the relatively high cost of a six- or seven-wire cable fitted with connectors or to the idea that the connectors themselves were not always satisfactory I do not know, but one must admit that some contact pins are not very reliable. They are not of a sufficiently robust construction, neither are they designed to be fool-proof. But these defects will in time be removed and then I expect the advantages of joining mains units or batteries to a set by this method will be recognised.

Mass-production Wiring

Those who construct and wire their own receivers take pride in so arranging the various wires that when completed, the set is not only efficient but good to look at.

It is all very well carefully to shape and put in each wire in a set when time is of no great importance, but manufacturers have to consider cost and it is therefore necessary for them to so simplify the wiring that relatively unskilled persons may be employed with the minimum chances of mistakes occurring.

The usual practice in quantity production is to employ a cable composed of the necessary number of different coloured connecting wires. These may be shaped in a dummy set and where the wires run together they may be bunched and laced with string. Operators build up sets of wires and others drop them in assembled sets and commence the wiring. The wiring is usually carried out by a number of operators, each one being responsible for a small number of connections. This scheme is thoroughly satisfactory and results in the wiring being completed in a very short time with the minimum of faults.

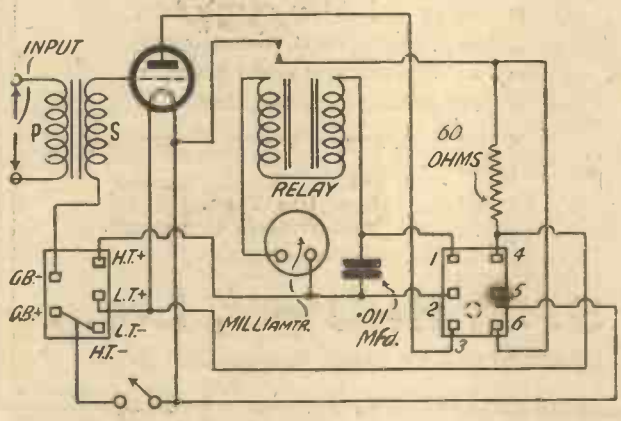
On a recent occasion a Dutch programme broadcast by the Huizen (Holland) high-power short-wave transmitter (PHI) was relayed to WGY (Schenectady, New York) and re-broadcast through thirty-five U.S.A. stations.

Building Your Own FULTOGRAPH

Concluded from No. 360

IN AMATEUR WIRELESS No. 360 were given constructional details for building up the reproducing and relay units of the Fultograph, from the kit of parts supplied by Wireless Pictures (1928) Ltd.

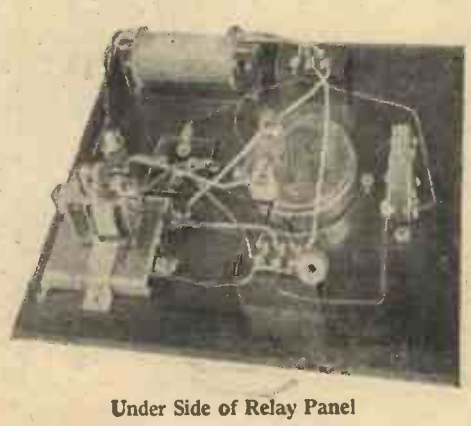
When all the parts are assembled as was described in this article, there remains a certain amount of wiring to be done before the picture receiver can be operated. The flex wires attached to the six-socket holder at one corner of the metal panel are supported by clips on the underside of the panel and pass up again through a bushed hole at the other end of the panel and are connected to the switch blade contacts and so on.



The Circuit Diagram of the Fultograph Relay Panel

Connecting Points

The following will serve as a guide to show how the connections are placed. (*a*) Long blade of the top switch to socket No. 1; (*b*) stylus arm (black cable) also to No. 1 on socket; (*c*) short blade of the top switch on the magnet bracket to No. 2 on the socket; (*d*) screw on anchor plate of ball bearing pedestal to No. 3 on the socket; (*e*) inner clutch ring contact to socket No. 4; (*f*) one end of the electro-magnet coil also to socket No. 4; (*g*) long blades of the two middle switches to be connected together and to socket No. 5 and (*h*) the other end of the electro-magnet coil to No. 6 on the socket. Finally the short blades of the two bottom switches on the magnet bracket should be connected together and to the outer clutch ring contact. The black wire connected to the stylus arm, which goes to No. 1 socket, passes through a hole of its own in the metal panel.



Under Side of Relay Panel

Relay Connections

On the relay panel are mounted the milliammeter magnetic relay with a .01 microfarad condenser underneath, transformer, switch, and socket bases with a resistance bobbin attached to the socket base designated c/24. An accompanying diagram shows how all these parts are to be wired up. Tinned wire, cut to length, is used and should be covered with insulating tubing. All joints should be soldered except at the milliammeter, switch and input terminals where the connections are made by nuts.

The wander plugs on the ends of the cable attached to the relay unit carry indications showing to which batteries they should be connected.

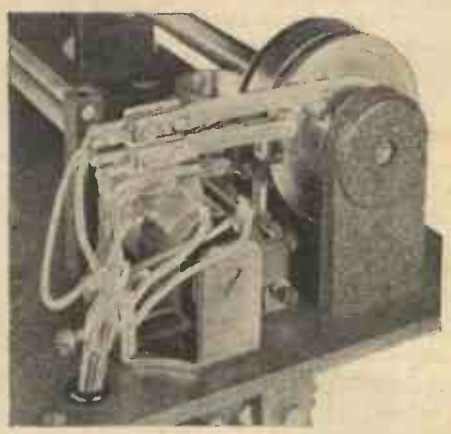
Operating Hints

The correct method of operating the Fultograph has been fully dealt with in previous issues of AMATEUR WIRELESS, but there are one or two points which are of particular importance to home constructors. The following points should be given attention. The platinum point of the stylus should be bent so that it touches the paper at an angle of about 70 degrees. A piece of the finest emery paper should be fixed round the drum so that by rotating it slowly the end of the stylus can be slightly ground until it presents a smooth face to the paper.

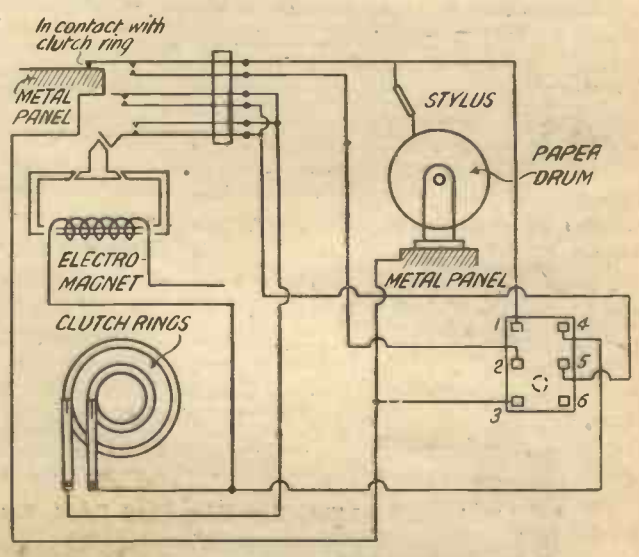
Adjustment should be made so that there is about 1/32 inch gap between the armature and the magnet pole pieces when the catch is resting in the notch. Allow the catch to drop into the notch only just sufficiently to prevent the wheel from turning. Its movement should be arrested by the adjusting screw.

Relay Adjustments

To test the magnetic relay make all normal connections from the batteries to the picture receiver but do not connect up the loud-speaker. Put the G.B. negative terminal into the 15-volt tapping and the G.B. positive terminal into the 18-volt tapping. Switch on the relay and then make a few experiments with the H.T. plug. Put the plugs first into, say, the 75-volt tapping and notice if a click is heard from the relay. The click must also be heard if the plug is withdrawn. When the right tapping is found try rapid successive contacts and these should work the relay every time.



This Photograph shows the connections to Magnet Bracket



The Circuit Diagram of the Reproducer Unit

RADIOGRAMS

IN the 2LO vaudeville programme to be broadcast on Whit-Monday will be found the names of Heather Thatcher and Lawrence Anderson. These artistes will share the microphone with Leslie Sarony, Geoffrey Gibson, and Bert Copley.

Cupid and the Cutlets, by Percy Greenbank, co-author of *San Toy*, *The Country Girl*, *To-night's the Night*, etc., is a new burlesque operetta, of which the first performance is to be given by 5GB (Daventry) on May 30.

On May 25 the Moursgorsky quartet of Russian singers will broadcast for the first time in the course of a variety programme arranged for that day. Fred Duprez, Yvette Darnac, Billy Thorburn, Dorrie Dean, Florence Bayfield, and Harold Kimberley are included in the bill.

Sir Henry Newbolt, the composer of *Drake's Drum*, will be responsible for the 2LO Empire Day programme down for transmission on May 24.

Polling Day (May 30) is to be celebrated by 5GB by the production of *Vote-ville*, an original revue specially written for the occasion by Alfred Butler, with additional numbers by Graham Squiers.

A short play in one act entitled *The Turn of the Tramp*, from the pen of Constance Smedley, will be produced at the Cardiff studio on May 30.

All stations of the northern region during the summer season will take programmes from famous holiday resorts. The series opens on May 21 with a concert from Blackpool, to be followed on ensuing days by entertainments from Southport and Buxton. Concerts are also to be relayed from Scarborough, Harrogate, and Llandudno.

A studio performance of Massenet's well-known opera *Le Jongleur de Notre Dame* is to be broadcast from 5GB on May 27, and from 2LO, 5XX, and other stations on May 29. It is described as a miracle in three acts.

Listeners interested in thrilling adventures of the sea should listen to a talk on mystery ships to be given by Captain C. E. Harris from the Cardiff station on June 1. He was navigating officer of the smallest "Q" boat in the service, a ketch christened *The Record Reign* in honour of Queen Victoria.

The Radio Paris luncheon-hour transmission now consists entirely of a broadcast of gramophone records.

The application list for membership of the National Orchestra formed by the B.B.C. in co-operation with Sir Thomas Beecham closed on Saturday, May 11. During the autumn it is proposed to inaugurate a trial season with a view to the establishment of a permanent symphony orchestra of about ninety musicians who will be engaged on a full-time non-deputising basis.

The Swansea relay station has adopted the national common wavelength of 288.5 metres; the change, however, is so slight that very little readjustment in the tuning of listeners' receivers will be found necessary.

If it were practically possible to use wavelengths of from one to ten metres for broadcasting purposes there would be no difficulty in accommodating some 25,000 stations within those limits without any risk of mutual interference.

In addition to several short-wave transmitters already operating in the Belgian Congo, nine of the existing long-wave stations in that territory are being re-equipped for short-wave working in both C.W. morse and telephony.

The Koenigswusterhausen and Nauen groups of short-wave telegraphy stations (situated near Berlin) will, it is understood, be augmented shortly by a number of new transmitters designed to work on wavelengths between 7 and 50 metres, which are now under construction.

Dancing, firework displays and throwing of rice cakes were part of the inaugural ceremony of the new wireless station recently constructed at Nagoya Prefecture, Japan, at a cost of 4,800,000 yen.

Twenty aeroplane licences and permits for ground wireless stations have been granted by the Federal Radio Commission for a new aeroplane service between New York and Los Angeles to commence on July 1. Eleven radio stations are to be erected at points along the route to furnish pilots with weather reports and other vital information.

The proposed station in America to be used for checking the wavelengths of broadcasting stations will be erected at Nebraska.

The Prince of Kambaeng Bejra, minister of communications for Siam, has issued a statement that all radio apparatus in that country is banned at present.

(*More Radiograms on page 727*)

BROADCAST TELEPHONY

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

Metres	Kilocycles	Station and Call Sign	Power (Kw.)
GREAT BRITAIN			
25.53	11,751	Chelmsford (5SW)	15.0
243.9	1,230	Newcastle (5NO)	1.0
258.6	1,160.1	*Leeds (2LS)	0.13
288.5	1,040	*Sheffield (6LF)	0.13
288.5	1,040	*Bournemouth (6BM)	1.0
288.5	1,040	*Edinburgh (2EH)	0.35
288.5	1,040	*Hull (6KH)	0.2
288.5	1,040	*Dundee (2DE)	0.13
288.5	1,040	*Liverpool (6LV)	0.13
288.5	1,040	*Stoke-on-Trent (6ST)	0.13
294.1	1,020	*Bradford (2LS)	0.13
294.1	1,020	*Swansea (5SX)	0.13
302.6	991.1	Belfast (2BE)	1.0
311	964	Aberdeen (2BD)	1.0
323	928	Cardiff (5WA)	1.0
358	838	London (2LO)	2.0
378	793	Manchester (2ZY)	1.0
396	757	*Plymouth (5PY)	0.13
401	748.3	Glasgow (5SC)	1.0
482	622	Daventry Ex. (5GB)	17.0
1,566.5	191.5	†Daventry (5XX)	25.0

* Relay stations. †Relays 2LO.

AUSTRIA			
250	1,200	Linz	0.5
277.8	1,080	Salzburg (under construction)	0.5
283	1,060	Innsbruck	0.5
354.2	847	Graz	0.5
456	694	Klagenfurt	0.5
520	577	Vienna	20.0
BELGIUM			
220	1,360	Chatelineau	0.25
249	1,203	Schaerbeek-Brussels	0.5
275	1,090	Ghent	0.5
280	1,070	Liége	0.5
312	960	Arlon	0.25
512	586	Brussels	10.0
CZECHO-SLOVAKIA			
265	1,128	Kosice	2.0
278	1,080	Feriby (testing)	12.0
305	982	Bratislava	4.0
343	873	Prague (Praha)	5.0
432.3	694	Brunn (Brno)	2.4
DENMARK			
339	883	Copenhagen (Kjobenhavn)	1.0
1,156	259	Kalundborg	7.5
ESTHONIA			
408	735	Reval (Tallinn)	1.3
FINLAND			
374	800	Helsingfors (Helsinki)	0.8
1,502	199	Lahti	20.0
FRANCE			
175	1,714	St. Quentin	0.25
200	1,500	Fécamp	0.3
211.3	1,420	Beziers	0.1
238	1,260	Bordeaux (Radio Sud-Ouest)	2.0
240	1,250	Radio Nimes	1.0
245	1,224	Lille (PTT)	0.8
252.1	1,190	Juan-les-Pins	0.4
254	1,180	Rennes (PTT)	1.0
255	1,175	Toulouse (PTT)	1.0
268	1,118	Strasbourg	0.3
274	1,092	Limoges (PTT)	0.5
285	1,050	Montpellier	1.5
292	1,028	Radio Lyons	1.5
300	996	Bordeaux (PTT)	0.5
304	982	Marseilles (PTT)	0.5
305	982	Agen	0.3
322	930	Vitus (Paris)	2.0
336	892	Petit Parisien	0.5
353	849	Algiers (PTT)	2.0
368	815	Radio LL, Paris	1.0
382.2	785	Toulouse (Radio)	9.0
400	749	Mont de Marsan	0.4
413	725	Radio Maroc (Rabat)	2.0
423.7	708	Radio Flandre Lille	0.25
429	699	Grenoble (PTT)	1.5
450	666	Paris (Ecole Sup., PTT)	0.7
468.8	640	Lyons (PTT)	5.0
1,478	203	Eiffel Tower	8.0
1,749	171	Radio Paris	8.0
1,825	164	Radio Carthage (Tunis)	
GERMANY			
219	1,370	Flensburg	1.5
240	1,250	Nurnberg	4.0
250	1,200	Kiel	0.7
250	1,200	Cassel	0.7
263.2	1,140	Cologne	4.0
267.8	1,120	Muenster	1.5
273	1,099	Kaiserslautern	1.5
280.4	1,070	Königsberg	4.0
283.1	1,058	Berlin (E)	0.7
283.1	1,058	Stettin	0.7
283.1	1,058	Magdeburg	0.7
317.5	945	Dresden	0.75
320	937	Breslau	4.0
326.4	919	Gleiwitz	6.0
329	910	Bremen	0.75
361.9	829	Leipzig	4.0
374.1	802	Stuttgart	4.0
391.6	766	Hamburg	4.0
427	711	Frankfurt	4.0
455.9	654	Danzig	0.75
456	651	Aachen	0.75
462.2	649	Langenberg	25.0
476	630	Berlin	4.0
538	558	Munich	4.0
566	530	Augsburg	0.5
566	530	Hanover	0.7
577	520	Freiburg	0.7
1,653	181.4	Zeesen	20.0
1,648.3	182	Norddeich	10.0
GRAND DUCHY OF LUXEMBOURG			
1,275	235	Radio Luxembourg	0.25
HOLLAND			
31.4	9,554	Eindhoven (PCJ)	25.0
38.8	—	Kootwijk (PCL) (Wed. 1.40 p.m. B.S.T.)	32.0
336.3	891.5	Huizen (until 6.40 p.m. B.S.T.)	5.0
1,076	278	Hilversum (ANRO)	5.0
1,846	162.5	Huizen (after 6.40 p.m. and on Sundays	5.0
1,846	162.5	Scheveningen-haven	5.0
HUNGARY			
548	548	Budapest	15.0
ICELAND			
333.3	900	Reykjavik	1.0
IRISH FREE STATE			
222.2	1,350	Cork (5CK)	1.5
411	730	Dublin (2RN)	1.5
ITALY			
276	1,080	Turin	7.0
333	900	Naples (Napoli)	1.5
387	775	Genoa (IGE)	3.0
442	677	Rome (Roma)	3.0
450	666	Bolzano	0.3
503.5	596	Milan	7.0
JUGO-SLAVIA			
308.3	973	Zagreb (Agram)	1.25
458	655	Belgrade	4.0
582	515	Ljubljana	5.0
LATVIA			
529	567	Riga	2.0
LITHUANIA			
2,000	150	Kovno	15.0
NORWAY			
242	1,240	Rjukan	1.0
297	1,010	Notodden	0.7
365	820	Bergen	1.0
387	774	Fredriksstad	1.0
456	657	Tromso	1.0
456	657	Aalesund	1.0
456	657	Porsgrund	1.0
496	604	Oslo	1.5
577	519.9	Hamar	0.7
POLAND			
314	955	Cracow	1.5
337	890	Posen	1.5
415.5	722	Kattowitz	10.0
456	658	Wilno	1.5
1,397	214	Warsaw	10.0
PORTUGAL			
317.5	945	Lisbon CTIAA (Wed and Sat.: 10—midnight)	
ROUMANIA			
395	757	Bucharest	4.0
RUSSIA			
492	609	Kharkov (NKO)	5.0
825	363.6	Moscow (PTT)	25.0
925	323	Homel	2.5
1,004	299	Leningrad	20.0
1,450	206.9	Moscow	30.0
1,698	178	Kharkov	15.0
SPAIN			
314	956	Oviedo (EAJ10)	0.5
346.8	865	Barcelona (EAJ1)	10.5
369	811	Seville (EAJ5)	0.5
400	750	Radio España	1.0
405	740	San Sebastian (EAJ8)	0.5
428	700	Madrid (EAJ7)	3.0
456	658	Salamanca (EAJ22)	0.55
SWEDEN			
261	1,150	Horby	10.0
265	1,130	Trollhattan	0.4
333	900	Falun	0.5
350	858	Goteborg	6.0
437	686	Stockholm	1.5
550	546	Sundsvall	1.0
770	390	Ostersund	2.0
1,200	250	Boden	2.0
1,350	222	Motala	30.0
SWITZERLAND			
406	739	Berne	1.0
496	604	Zurich	0.6
680	441	Lausanne	0.6
760	395	Geneva	0.5
1,010	297	Basle	0.25
TURKEY			
1,200	250	Stamboul	5.0
1,809	164	Angora	5.0

CHIEF EVENTS OF THE WEEK

LONDON AND DAVENTRY (5XX)

May 19. British Legion Service from the Cenotaph.
„ 23. People's Palace Concert.
„ 24. Empire Day Programme.

DAVENTRY EXPERIMENTAL (5GB)

May 22. "Cabaradio," by Charles Brewer.
„ 23. Two Plays—"The Pierrot of the Minute," a dramatic fantasy by Ernest Dowson, and "The Man with the Flower in his Mouth," a dialogue by Luigi Pirandello.
„ 24. Covent Garden Opera.

CARDIFF

May 22. A Variety Programme.

MANCHESTER

May 20. Running Commentary on Lancashire v. Yorkshire County Cricket Championship, by Mr. A. E. Lawton.

GLASGOW

May 22. A Mixed Menu served by the Radioptimists.

ABERDEEN

May 20. A Scottish Concert.

Interviewed at the Ritz Hotel, London, recently, Mr. Merlin Aylesworth, president of the National Broadcasting Company in America, stated that, as a result of a series of conferences with British broadcasting interests, arrangements have been completed for a regular exchange of broadcast programmes between England and America to start in a very short time.

MORE RADIOGRAMS

THE province of Victoria, Australia, has more than eight wireless sets for every 100 persons.

About 90 per cent. of all the radio equipment in the world is of English, American, and German origin, according to figures compiled by the United States Department of Commerce.

More than 95 per cent. of the sets now in use in America are valve receivers.

Whatever the song request addressed to WNER, Chicago, there is a good chance of it being found in the musical library of that station. In this library there are more than 78,000 sheets of music.

The Czechoslovakian telegraph authorities have recently placed a contract for the establishment and equipment of a short-wave wireless telegraphy station at Podeprady, near Prague.

The directors of the Greek Postal and Telegraph Administration have completed the programme for the extension of the postal network for wireless telegraphy. For coastal services, particularly with ships, four wireless stations will be established at Attika, Sitia, Salonica and on the island of Zante. The internal radio network is to be extended by the establishment of three stations.

A large radio exposition will be held in the Kursaal at Scheveningen from May 17 to 25.

According to the Washington Conference the following wavelengths have been allotted to television and still picture transmissions: 64,000 to 56,000 khz., i.e., 4.69 to 5.35 metres; 2,000 to 1,750 khz., i.e., 150 to 175 metres.

To coincide with the official opening of the Barcelona International 1929 Exhibition this month, the EAJI broadcasting station has been increased in power to 10 kilowatts. Tests are now being carried out in the late evening hours on a wavelength of 350.5 metres. An interesting programme of relays to the transmitter has been arranged during the period of the Exhibition and foreign listeners will hear broadcasts made from the Greek Theatre, the Stadium and the specially constructed Spanish village enclosing an arena in which gala bull-fights are to take place. Radio Catalana, (EAJ 13) which has also been reconstructed will also transmit on higher power.

The French military authorities have equipped an army motor lorry with short-wave wireless transmitting and receiving apparatus for experiments to be carried out in the Sahara Desert. A small radio station is to be installed at Timbuctoo, the base headquarters of the expedition.

On May 15, Holland introduced summer time by advancing her clocks by sixty minutes; this alteration will bring her time forward by 20 minutes in advance of B.S.T.

Some interesting outside broadcasts are to be carried out by the Paris P.T.T. station, Ecole Supérieure and its provincial relays in the near future, one of which, on May 19—20, will consist of a running commentary on the aviation fête to be given at the Polygone de Vincennes by Jean der Horter, the famous *parleur inconnu*, who was responsible for the eye-witness account of the international football match (France *v.* England) which took place at Colombes, near Paris, on May 9.

A further meeting of the U.I.R. (Union Internationale de Radiophonie) will take place at Lausanne (Switzerland) on May 27—31. Another wave plan?

On the occasion of the total solar eclipse, which took place on May 9, but of which observations could only be made in Siam, the Dutch East Indies, Cochin China, and the Philippine Islands, a commission of French physicists and astronomers at Poulo Condor carried out elaborate preparations in order to note the influence of the eclipse on short-wave transmissions. For this purpose, amongst others, a small transmitter was installed on a sailing boat, and at regular intervals a series of short dashes were broadcast on wavelengths of 30 and 40 metres. PCJ (Eindhoven) was also brought into action and put out at periods of 15 minutes a calibration signal, frequently interrupted by the station's call.

At Saarbrucken (Saar), on the site of the old Petersberg telegraphy transmitter, the French authorities have decided to erect a broadcasting station. Although it is mainly to be used for aeronautical services, it is expected that during a portion of the day and evening it may be devoted to a programme of wireless entertainments, as for the present the inhabitants can only receive the German broadcasts.

In view of mutual interference caused to stations working on the common wavelength of 455.9 metres, the Ravag (Vienna) authorities ordered Innsbruck to operate on 283 metres. As, however, no improvement to the broadcast has been noted, it is expected that this relay station will seek another position in the waveband.

WINDING YOUR GRAMOPHONE ELECTRICALLY

IT is now possible to wind your gramophone electrically, and automatically, without any attention whatever. The device by means of which this can be accomplished is the A.E.D. self-winding motor, which combines the convenience of electric drive with the dependable accuracy of the spring motor.

Briefly, it consists of an electric motor connected to a spring motor of the ordinary standard type through the intermediary of reduction gear. The arrangement is shown in the photograph. The gearbox is connected to the winding shaft of the spring motor by means of a coupling consisting of one member fixed to the winding shaft and one sliding member which is held in engagement by an adjustable coil spring.

When the spring motor is wound to such pre-determined point that the tension of the

The A.E.D. self-winding Gramophone Motor

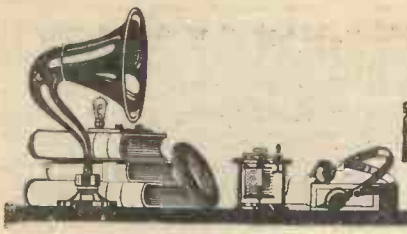
spring which keeps the coupling in engagement, the loose member of the coupling is forced back out of engagement with the fixed member, thus freeing the winding shaft of the spring motor from the electric motor. Upon the disconnection between the electric motor and the spring motor taking place, the electrical circuit is broken.

If it is desired to use the gramophone without making use of electric current, it can be wound up by hand in exactly the same way as any ordinary spring drive. The winding motor is universal and can be used on both A.C. and D.C. circuits (all voltages).

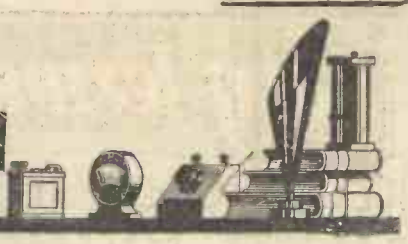
It will be understood that for use with electrically amplified gramophones, this motor is of particular interest, as all risk of interference from the electric motor is eliminated. The current consumption is exceedingly low as the electric motor is only actually in service for about 30 seconds at intervals of 3½ minutes.

Since January 1, 1929, Germany has increased the number of her licensed broadcast listeners by 202,327, thus attaining on April 1, the grand total of 2,887,894.

Change of Address.—Messrs. Climax Radio Electric Ltd. notify us that owing to increase of business they have removed to Haverstock Works, Parkhill Road, Hampstead, London, N.W.3.



OUR INFORMATION BUREAU



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. Address Queries—AMATEUR WIRELESS Information Bureau, 58/61 Fetter Lane, London, E.C.4

Improving Reproduction.

Q.—*I have an L.F. transformer which is about a year old, and find that even though this is used in the second stage of L.F. coupling, with R.C. coupling in the first stage, there seems to be a considerable improvement in the quality of reproduction by putting a small capacity fixed condenser across the primary winding. Is this as it should be, and is the use of this condenser likely to give rise to any detrimental effects in the receiver?*—*S. A.* (*Bath*).

A.—The use of the condenser in question will not in any way be detrimental to the receiver. Even with transformers not designed to have a fixed condenser in their construction it is often an advantage to fit one, as such a condenser often alters the band of frequencies to which the transformer will respond to the benefit of the amplifier and loud-speaker in general. As you have found this condenser to be an improvement, we would advise you to retain it in circuit.—L. C.

Grid-leak Connections.

Q.—*In some circuits the grid leak is joined across the grid condenser, while in others it is between the grid of the detector valve and one side of the filament. What determines which way the grid leak should be connected?*—*R. A. C.* (*Brighton*).

A.—In both cases the grid leak is really between the grid and filament. When the side of the grid condenser farther from the grid of the valve is connected to the filament circuit through either a tuning coil or the secondary of an H.F. transformer, placing the grid leak across the condenser virtually connects it between grid and filament. When, however, the detector valve follows a stage of tuned-anode coupling, the grid leak must not be connected across the grid condenser as this would result in it being connected, through the tuned-anode coil, between the detector grid and H.T. positive.—R. E.

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 for the usual query fee. Any drawings submitted should be sent on a separate sheet of paper. Wiring plans and layouts cannot be supplied.

Gramo Radio.

Q.—*I am using a pick-up with my receiver, the amplifier portion of which consists of one R.C. stage and one push-pull stage. Ordinarily my wireless reception on a moving-coil loud-speaker is all that one could desire, but as soon as I put on the pick-up, especially with some records, reproduction seems distorted. The pick-up is of good make. Can you suggest anything?*—*I. F.* (*Dublin*).

A.—You are overloading the valves in your amplifier. The pick-up may be rather too efficient for your particular amplifier and the first valve is being badly overloaded. We suggest that you fit a volume-control across your pick-up and in this way regulate the amount of energy applied to the grid of the first amplifying valve. The use of a controlling device will be quite satisfactory.—N. O.

LETTERS TO THE EDITOR

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

The "Clarion Three"

SIR,—Having built the "Clarion Three" as described in AMATEUR WIRELESS, I feel that I must write and offer my thanks for publishing the details. I am very pleased with the results.

To mention a few stations I have received at full loud-speaker strength, there are Radio Paris, Cologne, Budapest, Hilversum, Frankfurt, Brussels, and other stations I have not been able to identify. London and the two Daventrys come in at terrific volume.

The valves I am using in the set are a Mullard combination, being a PM12, PM2DX, PM2, with 120 volts on the plates of all three, with 78 volts on the screened grid, and this works very well.

P. (London).

Condenser Defects

SIR,—I have a grouse about the majority of tuning condensers—the round section of the main spindle. Most of the moderate-priced S.M. dials can only be fixed by a small set screw, with a smooth bevel point, which, in the case of the lock-vane type of condenser does not stand much usage. There is an almost unavoidable "jar" when the condenser stops at either end, and in time this causes the point of the screw to wear a groove in the spindle and makes accurate "logging" impossible, as once the groove is there the dial "slops" about. Even filing a flat does not cure the trouble for long.

Why the makers do not fit a square section spindle is a mystery to me; its action would then be absolutely reliable, even should the screw loosen. On an old Army Mark III condenser I have, the spindle is square section, with knob and dial fixed by a screw running lengthwise into the end of it, and nothing could be more immovably correct.

No doubt professional assemblers would scoff at my complaints, but amateurs have to *use* the components as supplied, and the round-section spindle is thoroughly bad, unless a threaded hole is used for the grub screw, which is not possible in this case, as the dial has to be adjusted after the condenser is fixed.—B. F. (Rayleigh).

Moving-coil v. Linen-diaphragm

SIR,—Your correspondent F S. (London, S.) is, no doubt, quite right when he says the linen-diaphragm loud-speaker is not equal to the M.C. operated under ideal conditions; but he does not say what is the ideal condition. There are not many fortunate enough to possess the conditions he, no doubt, has in mind. Now, as it happens, I have, and have operated M.C.'s and have listened to them at the exhibitions, and yet I would not run one as a regular thing at any price. The result produced does not, to my mind, suit ordinary household needs.

The M.C. has its drawbacks, the same as any other reproducer, this being according to the taste of the listener. One fault is that the higher frequencies are smothered by the lower, and this condemns it from my point of view. I don't say that the "linen" is faultless, its fault being that it does not produce the higher so well as the lower notes, but it does not smother.

Personally, I use a combination of a "linen" speaker in conjunction with a first-class horn speaker, the last named being modulated just to bring out the deficiencies of the former, and I must say that I am convinced that even F.S. would agree that the result is all that one could desire. I may say here that I have as fine a set to produce results as one could wish for.

My "linen" speaker is not the square-frame type but has circular cones, which I think are a great deal easier to make and far more substantial.—A. G. (Bolton).

Undistorted Rectification

SIR,—Regarding "Thermion's" remarks that it is an exceedingly difficult feat to obtain anything like perfect and undistorted rectification of strong signals, I would draw your attention to the characteristic curve of the P.M. DX valves or Marconi DEL class. Valves of this type make very efficient anode-bend detectors if used to handle *large* inputs; if, however, the input is small distortion will result. I trust you will see the meaning of my remarks.

The greater part of the curve of these valves is straight, with a well-defined bend at the bottom, if weak signals are applied the valve will be working on or near the curved part of the characteristic, also the impedance under these conditions will be comparatively high, making it necessary to use a high value of anode resistance for the following stage, with the resultant loss of the higher frequencies.

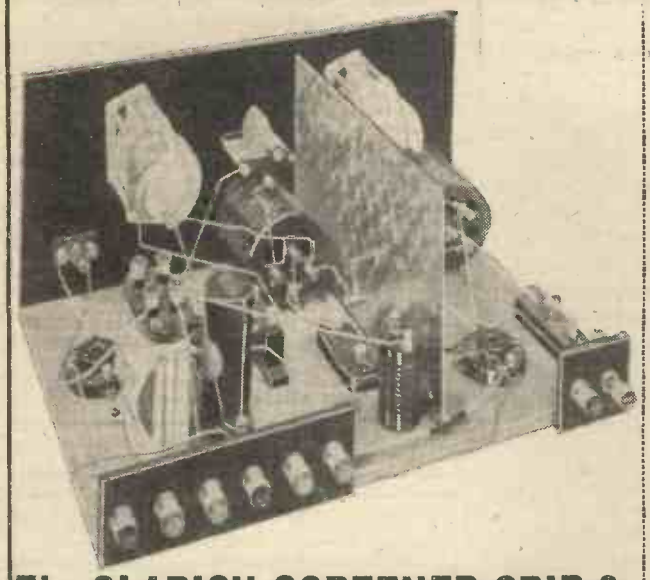
However, if the input is large, about 10 volts swing fully to load the detector there will be very little distortion, for the signal will be applied to a much greater part of the straight portion of the curve and the output for all ordinary purposes will correspond to the input. Again, the impedance of the detector working under these conditions will not be much more than about twice the maker's rating; thus a coupling resistance of some 50,000 ohms may be used with the resultant amplification of the higher frequencies.

It is quite difficult to overload a detector of this type, for what single screen-grid valve can deliver an output to overload a valve capable of handling 10 volts grid swing at any reasonable distance?

E. A. S (Chigwell).

(*Continued on page 732*)

MAKE THIS WONDERFUL RECEIVER



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Brown L.F. Transformer, 30/-. Reed type Headphones, 4,000 ohm, 20/-. Horn type £6 6s. Speaker now 63/-. Electrical Pick-up, with adaptor plug, 28/-.

Exide L.T. Batteries. Standard CZ4, 40 amp actual, 2 volt, 13/6; in crate, 19/-. 4 volt (2 cells), 33/3 (in crate). 6 volt, in crate, 3 cells, 47/9. Can only be sent by train if ample amount for carriage and packing sent. Surplus returned.

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Magnum Centre-tapped L.F. Choke, 20/40 henries, 15/-. Wavetrap, 15/-. Titan (approved) Coil Unit, 15/-. Standard Screens, Auto Fuses, etc., stocked. Post ex.

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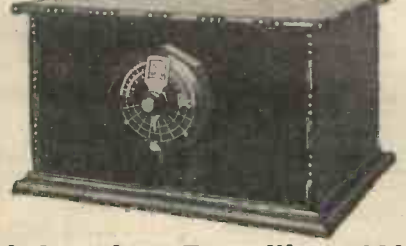
Utility "Mite" Vernier Condensers, .0005, for portables, 10/-. New Type Switches, 2 pole, 5/-; 3 pole, 6/-, etc. Post 3d. each.

Dubilier K.C. Geared Condensers, Max. .0005, 12/-. With Drum Dial, 15/-.

Cossor New Model L.F. Transformer, 21/-.



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A.W. 6/4/29

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AMATEUR WIRELESS 58-61 FETTER LANE LONDON, E.C.4

"LETTERS TO THE EDITOR"

(*Continued from page 730*)

Rattle in Linen Speakers

SIR,—I built one of the above, according to your instructions as published. But, do whatever I could, I could not stop a certain amount of rattle. So, concluding it was impossible to get an even centre tension from a square frame, I decided to experiment as follows. I took two 5-ply boards, 24 in. square, and cut a circle in one 20 in. and in the other 15 in. I then glued the linen dead tight across the whole of the boards, and then doped it and mounted them up as per your instructions, with just the 6-in. bolts connecting the two boards. The result is simply perfection. Several of the wireless fans about this neighbourhood have seen it, and before long there will be plenty of them about here. I got the first benefit of that type of speaker from you, so am glad to pass on to you my idea for the benefit of your readers.—J. L. (Poplar, E.).

TRADE NOTES

MESSRS. FERRANTI, LTD., advise us that in future all audio-frequency and output transformers manufactured by them will have their primary and secondary terminals reversed from what has hitherto been their standard positions.

Mr. J. H. Thomas, M.C., M.I.E.E., has relinquished his position as Assistant Manager of the Manchester branch of the General Electric Co., Ltd., and has taken up the position as General Sales Manager of A.C. Cossor, Ltd., of Cossor House, Highbury, London, N.5.

Peto Scott Rover Portable Receivers have evidently proved so popular that certain individuals visited the showroom at 77, City Road, at 6 a.m. on a recent Sunday morning, with burglarious intent. The attraction was so powerful that the fear of the law proved to be as unavailing as the plate-glass window, through which the enthusiasts were irresistibly drawn.

Messrs Peto Scott Co., Ltd. wish to point out that the easy way is still through their doors!

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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.

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