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THE "HOMESTEAD" DUAL

Amateur Wireless
And Electrics

Vol. VIII. No. 204 SATURDAY, MAY 1, 1926 Price 3d

PRINCIPAL CONTENTS

WELL ILLUSTRATED

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U.S. RADIO HOUSE OPENED FROM LONDON BY WIRELESS.

Captain P. P. Eckersley, Chief Engineer of the B.B.C., by pressing a key in Radio House, London, opens the most up-to-date wireless-fitted house in America.

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

Vol. VIII. No. 204 — Technical Adviser: SYDNEY BRYDON, D.Sc., M.I.E.E. — MAY 1, 1926

Chief Contents

"Amateur Wireless and Electrics." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to the Proprietors, Cassell and Co., Ltd.

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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," La Belle Sauvage, London, E.C.4.

HANDS ACROSS THE SET

THE receiver of to-day is, of necessity, one capable of giving fine tuning and critical reaction adjustments. An almost inevitable corollary to these desirable features, however, is the undesirable feature of hand-capacity effects.

Especially in the case of receivers employing reaction or high-frequency amplification, a number of disturbing effects are found to occur whenever the operator's hand approaches various components of the set. It will often be noticed, for example, that after setting the tuning condenser to a value which gives a good readable signal in the phones, the removal of the hand causes a considerable variation in this strength, while upon the shorter waves, now so popular, the signals may be entirely lost.

Again, it not infrequently happens, in a receiver so affected, that the mere motion of the hand towards such parts of the set as valves, H.F. transformers, variable resistances, grid leaks and so on, causes an unexpected burst into oscillation, whilst the variation of the reaction coupling is often attended with unforeseen results in the way of howling or dead silence when the hand is withdrawn from the controls.

Capacity Effects

These, and a number of other phenomena, are generally termed "hand-capacity effects," and may prove so troublesome to the amateur that time and thought spent on the design of the receiver to minimise or eliminate them is well repaid by the greatly facilitated control of tuning obtained. The more experienced amateur, as a rule, has come up against this bogey frequently enough to be familiar with it and to know the best method of dealing with it. To the beginner, however, hand-capacity effects are apt to prove very puzzling.

They are due to the fact that placing a conductor, such as the hand of the operator, near to certain parts of the set which carry high-frequency currents alters the capacity of those parts and so upsets their equilibrium in various ways. The body of the operator, it must be remembered, is in contact with the earth and at earth potential. As long as this body is not brought into direct contact with portions of the receiver operating at a different potential, no harmful effects will ensue.

Curing the Trouble

If this explanation is kept clearly in mind during the more detailed consideration of the problems which arise in attempting to remove hand-capacity effects, little difficulty will be experienced in applying the principles to be laid down.

Three methods are available: Firstly, careful design of the set; secondly, shielding or screening of certain parts; thirdly, the employment of long control handles to the various tuning elements. The first is a definite preventive and should therefore receive the more earnest attention. The other two are merely palliatives to be adopted where the first is not feasible for any reason or other. The best method is a judicious combination of the three.

Good design, then, is the chief consideration. Considerable care should be exercised in arranging the high-frequency circuits so that their connecting wires may be short. Some thought should further be given to arranging the various controls in such a way that in operating them it is not necessary to stretch the hand across parts of the tuned circuits.

An excellent point consists in separating the wiring of the H.F. circuits from that of the L.F. and D.C. circuits when the first sub-panel connections are made. Such an arrangement is beneficial not only in reducing hand-capacity effects, but also the various objectionable inductive phenomena which may occur in valve circuits.

With regard to screening, this is now being extensively adopted in multi-valve sets and especially in those of the super-heterodyne type. In the latter case, the several portions of the receiver are separated by earthed metallic shields.

A simple and effective expedient is to

(*Concluded at foot of next page*)

A CRYSTAL SET FOR NINEPENCE!

THE crystal set about to be described can be constructed practically throughout from odd parts such as are usually to be found in the experimenter's store, the actual cost of construction being little more than 9d. One can hardly expect to make a receiver which not only works, but gives good results for a smaller sum than this. Further, if the necessary care is taken in the construction it is quite presentable in appearance. The principle involves a spade-tuning device for which an ordinary cocoa-tin is used. Spade-tuning gives equally good results to those obtained by the more orthodox methods usually employed by such means as sliders, tapped inductances, or variable condensers.

The materials which will be required are as follows:

One ebonite base-piece 4 in. by 4 in. by $\frac{3}{16}$ in., one ebonite detector mounting-piece 4 in. by 1 in. by $\frac{3}{16}$ in.; a 4-in. length of cylindrical cardboard former having an external diameter of 3 in. and an internal diameter of approximately 2½ in.; a socket for the loading coil or shorting plug; four small pillar terminals; one cocoa-tin; one ebonite knob; one detector of any pattern, or one built from odd parts.

Construction

The details of construction are shown in Fig. 1. The work should be carried out in the following manner: First prepare the ebonite base-piece by drilling four 4 B.A. clearance holes to receive the terminals indicated as E, A and Tel. Next prepare the cylindrical cardboard former by winding upon it 86 turns of No. 22 d.c.c. wire. Secure the beginning and end of the winding in any suitable manner, leaving sufficient lengths projecting for the purpose of making all the necessary connections. Secure the former thus wound to the ebonite base-piece by means of two screws and nuts. On one end of the former is attached a socket for the loading coil.

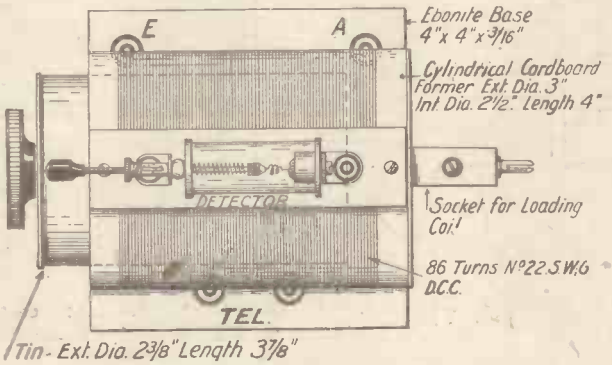


Fig. 1.—Details of Construction.

The method of doing this is as follows: Cut a cardboard disc 3 in. in diameter, securing the socket centrally to the disc

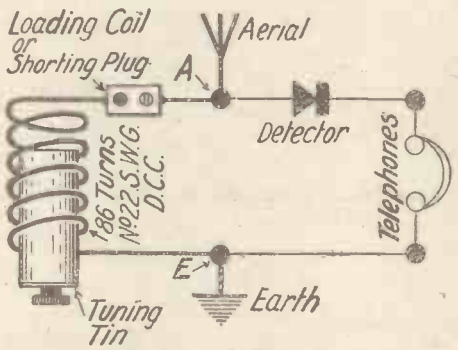


Fig. 2.—The Circuit.

by means of a screw. Having done this, secure the disc to the end of the former by firmly gluing and pin nailing or, alternatively, screwing. Next assemble the detector, which is mounted on the ebonite piece 3 in. by 1 in. in dimensions.

All that now remains is to prepare the cocoa-tin which acts as a spade tuner. Suitable dimensions for this tin is 2⅜ in. in diameter by 3⅞ in. long. Tins of this particular size will not be difficult to obtain, as they are mostly made to a standard. In the bottom of the tin punch a 4 B.A. clearance hole and secure a bushed ebonite knob in this position by means of a 2 B.A. screw. The construction of the receiver is now completed with the exception of the various connections.

For purposes of wiring up, reference should be made to the circuit diagram shown by Fig. 2.

Operation

The operation of this receiver is extremely simple. If local reception is required, insert a shorting plug in the socket provided. Connect the phones across the terminals provided and adjust the detector, leaving the tuning-tin fully out. Now slowly push the tuning-tin inwards until signals are heard at their loudest. For the reception of the high-power station a similar process is observed, but in this case a suitable coil is plugged into the socket provided in the place of the shorting plug. This coil should be in the region of 250 to 300 turns. The receiver described was wound with 44 turns of No. 16 d.c.c. wire, but this was not found to be sufficient for local reception owing to the fact that with spade tuning a larger amount of inductance is usually necessary. On the other hand, however, 86 turns of No. 22, as suggested, should suit most individual cases. It should be observed that no connection whatever is made from the tuning-tin to the circuit of the receiver.

RADIO.

"HANDS ACROSS THE SET" (*continued from preceding page*)

shellac a sheet of tinfoil to the back of the panel before drilling and to provide good earthing contact by means of a large washer on the shank of the earth terminal. If an anode-tuning condenser is used ample clearance should be left so that this component is not earthed; but in the case of the aerial-tuning condenser (the moving vanes of which should, of course, be connected to earth) additional contact is thus secured.

The use of long handles is so obviously a remedy that it is apt to become a nuisance. Many amateurs, finding themselves troubled with hand-capacity effects, seem to adopt this method so enthusiastically that a completely equipped receiver presents a confusion of long handles sprouting in every direction. A set of this description cannot by any stretch of imagination be pleasing to the eye, and, moreover, the various handles are apt to foul one another or the projections upon the panel.

Anti-capacity Handles

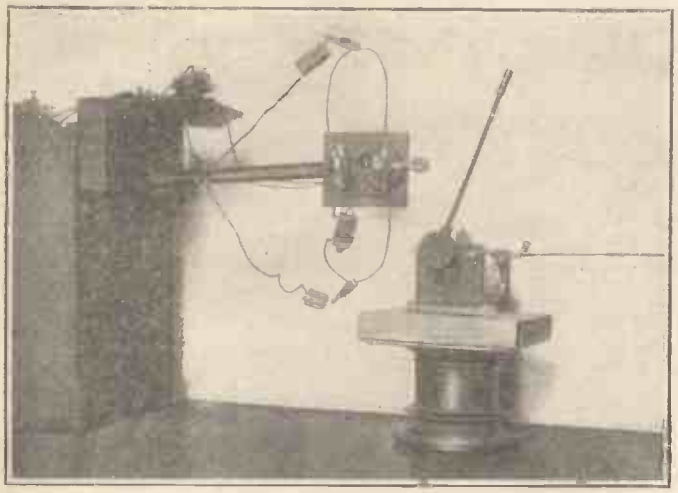
Anti-capacity handles, on the whole, are not altogether satisfactory. They have their legitimate uses, such, for example, as enabling one to obtain a very fine adjustment of tuning upon a variable condenser, though even for this purpose they are superseded by the slow-motion type of dial.

The only case, perhaps, in which they are justifiable is that of the usual type of coil holder, in which the operator's hand otherwise approaches rather close to the coils and where screening is neither desirable from a theoretical nor convenient from a practical point of view. Otherwise, extended handles appear to be really a confession of failure in the more scientific methods.

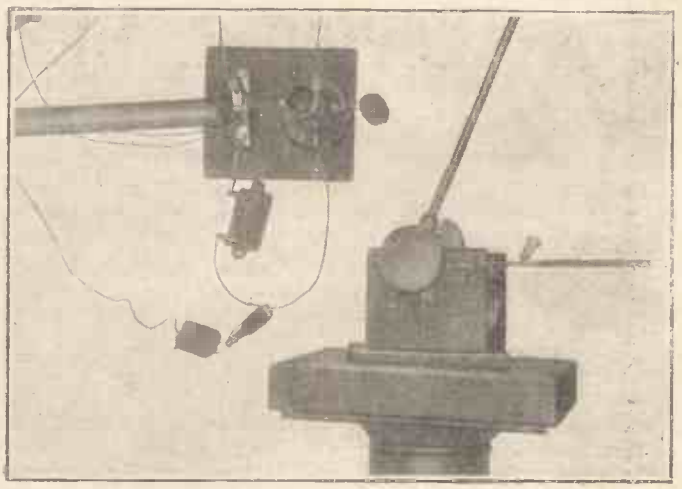
A. J. B.

Miss Blanche Tomlin and Mr. Tom Stuart, newcomers to the microphone, will broadcast from 2LO on May 7.

On July 24 the recital at the prize distribution of the Fellowship and Association Examination at the Royal College of Organists will be relayed to the high-power station, Daventry.



Three-metre Transmitter and Wavemeter.



Near View of Apparatus.

MEASURING THE ULTRA-SHORT WAVES

A simple method within the capabilities of any amateur

SOME time ago the writer described the construction and operation of a 2-3-metre transmitter and receiver ("A.W.," No. 194). The following is an account of some further experiments with the apparatus described in the previous article. The first essential was the determination of the wavelength. For this purpose the Lecher wavemeter was employed; its accuracy is unquestionable, whilst its operation and construction is simplicity itself. This may be news to many amateurs, for the writer has often seen the Lecher wavemeter described as "cumbersome," "beyond the capabilities of the amateur," and so on.

The Meter Circuit

The accompanying photographs show the actual oscillator and meter used by the writer in these experiments. The diagram shows the circuit of the wavemeter. C1 and C2 are two variable condensers, each consisting of one moving and one fixed plate. The "pick-up" coil is merely a short length of wire joining the two condensers. From the other terminals of the condensers two parallel wires, 6 in. apart, were led to insulators fixed to the walls, a distance of 8 ft. The resonance indicator A is an ordinary pocket flashlamp bulb of 2½ volts rating; it is mounted in the centre of a piece of stiff wire, laid across the wavemeter wires and shifted about at will. B is simply a short length of wire long enough to short-circuit the wavemeter at any point.

This is the usual arrangement, but it may be noted in passing that two condensers, although very convenient in practice, are not absolutely essential; one only may be employed, provided that it has a low minimum capacity.

The *modus operandi* is as follows: Bring the oscillating circuit of the transmitter to within 3 in. of the "pick-up" wire and place the lamp A across the meter at a point about 4 in. from the condensers. With the transmitter oscillating, the condensers C1 and C2 are *very* slowly rotated until the bulb glows. When transmitter and wavemeter are in resonance the lamp will indicate the fact by giving forth its maximum illumination. The tuning is best performed with one condenser only, the other being set at roughly half capacity.

Tuning is very critical, so much so that if the condenser is rotated too smartly the lamp may not glow at all, even though the resonance point is passed through. This, needless to remark, is due to the fact that it takes quite an appreciable time for any resistance, such as a lamp filament, to heat up. The easiest way to tune is to disregard the lamp at the beginning and concentrate attention on the milliammeter in the plate circuit of the oscillator; resonance will be denoted by a quick flickering of the pointer. If the lamp does not glow, bring the oscillator closer to the "pick-up" coil. If this is unsuccessful, try increasing the H.T. input to the valve and at the same time it may improve matters if the low-tension current is also increased. In the writer's case the lamp could not be illuminated until the H.T. was increased to 100 volts with a current of 12 milliamperes. With 120 volts and a current of 17 milliamperes the wavemeter bulb gave a brilliant light. A flashlamp bulb joined across the terminals of a two-plate condenser and tuned to resonance was illuminated at a distance of 8 in. when using the latter power.

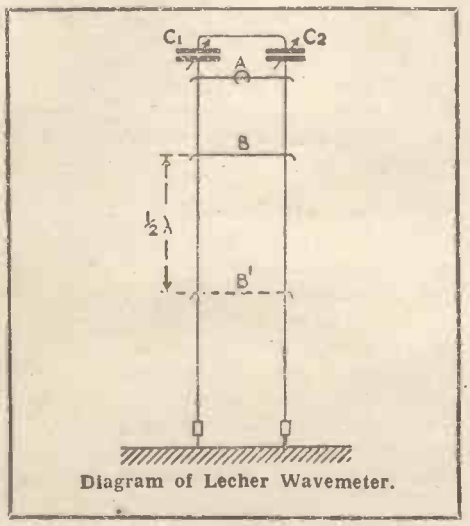


Diagram of Lecher Wavemeter.

Measurement

So far we have only tuned the wavemeter to resonance with the transmitter; we have yet to measure the wavelength. With the lamp glowing brightly, place the wire B across the wavemeter at a point about 6 in. away on the side farthest from the condenser. The light will disappear at once. Using a stick about 18 in. long, push the bridge B along the meter and carefully watch the lamp whilst doing so. The hand alone may be employed for this purpose with fair prospects of success, but the stick enables the operator to keep his body as far from the instruments as possible with a smaller risk of upsetting the tuning of the circuits. When the bridge arrives at the first nodal point of the stationary waves flowing in the wires, the lamp will shine as brightly as before. The lamp *may* light up faintly at some intermediate point owing to strong harmonics. Note the position of this model point. Now move the bridge farther along; the light will vanish once more,

only to return when the next nodal point is reached. The distance between these two positions, B and B1, as shown in the drawing, is a measure of the half wavelength of the transmitter. By doubling this measurement we obtain the actual wavelength. The photographs illustrating this article were taken when a wavelength of 3 metres was being measured. By cutting down the amount of wiring in the high-frequency circuit as much as possible a wavelength as low as 1½ metres was obtained.

An Alternative Method

It may be of interest to many readers if the writer describes an alternative method of measuring the wavelength in which no lamp of any kind is necessary. It has the further advantage in that it is applicable to low-power radiation. The procedure is somewhat similar, but instead of a lamp we use a piece of wire identical with B. Place the milliammeter in such a position that the pointer is clearly visible when moving the bridge along the meter. With the piece of wire in the position formerly occupied by the lamp, tune the wavemeter to resonance (a flickering of the milliammeter pointer will be evidence of this condition). If the tuning is carefully performed the milliammeter pointer will fall back 2 or 3 degrees and remain in this critical condition as long as the circuits are in resonance.

If the bridge B is now deposited on the wavemeter at any point but a nodal point, the milliammeter needle will return to its normal position; but if by chance B is placed at a nodal point, there will be no disturbance of the pointer. Hence it is merely a case of systematic trial and error until the nodal points are found.

Apart from the measurement of wavelengths, the Lecher meter is a most valuable aid to the study of short waves. As already stated, it is possible to trace the radiation of strong harmonics by watching the lamp as the bridge B is shifted along the meter. The futility of using fine wire for currents of very high frequency is strikingly illustrated by the incandescent condition of the lamp filament. Of course this is very fine wire indeed. The high-frequency wiring of the writer's transmitter is No. 16 S.W.G. This is a very thick gauge compared to the lamp filament, yet even it becomes perceptibly warm to the touch! Further, the valve pins sometimes become so hot that one cannot touch them! Naturally energy used in heating the wiring means less energy radiated into space. The reference to valve pins raises the question of the valve cap. Contrary to the accepted idea, the writer has found that there is really no necessity whatever to remove the cap—unless it is constructed of metal. This applies to both transmitters and receivers for use on the very short wavelengths. The writer would be very interested to have the opinions of any other readers who have had similar experience.

As described in the previous article, the writer employed a crystal receiver of special design for use with the transmitter. It might be asked, Why a crystal receiver? Why not a valve? The great advantage of the crystal receiver is its portability; it is easier to carry about in the hand and is less liable to body capacity influence than a valve receiver. In addition, the writer desired to obtain some idea of the efficiency of the crystal as a rectifier of ultra-high-frequency transmissions.

Modulated Carrier Wave

The carrier wave of the transmitter was modulated by means of a buzzer and transformer. Listening-in with the crystal receiver, a curious effect was observed; at first signals were very powerful, but they disappeared altogether after a second or two, and a fresh adjustment of the cat-whisker was necessary. This occurred continually. Anyone who cares to study the characteristic curve of a crystal will note that it is useless for rectification of strong signals; there is a limit to its efficiency. But in the particular case mentioned there *was* rectification for a very short period. Hence the failure of the crystal was not due to its inability to rectify strong signals but to some other cause. If we adopt the principle that thermo-electric action is the cause of rectification, then it is quite conceivable that the crystal is not efficient with waves of ultra high frequency. On the other hand, it may be merely a case of desensitisation of the crystal due to very powerful radiation.

Absorption effects are very marked on low waves. No signals whatever could be heard within a radius of 10 ft. of a fireplace; other metal objects absorbed energy to a less extent. But when a wavemeter or other apparatus in the vicinity of the transmitter was tuned to resonance, stronger signals were heard in the receiver headphones.

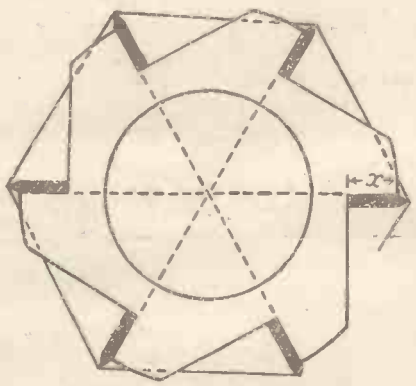
W. MACPHERSON.

A NOVEL LOW-LOSS COIL FORMER

A COMMON fault with skeleton formers used for low-loss coils is that the ebonite rods or strips round which the wire is wound bend inwards, due to the pull of the wire. It is a trouble which is exaggerated by the thick wire generally used for such coils. As the winding proceeds the earlier turns loosen, and although they may keep in place they do not retain the even spacing which is so desirable if the H.F. resistance is to be kept low and the self-capacity evenly distributed.

A type of former which will be found absolutely rigid even when wound tightly with thick wire is described below. It does not differ in general principle from others which have been described, but the method of construction is such that the ebonite or hard-wood strips do not bend and the amount of solid material in the field of the coil is kept at a minimum.

The ends of the former consist of circular or hexagonal pieces of wood not less than ¼ in. thick. Six radial lines are drawn from the centre of each as shown dotted in the sketch, and the pieces of wood are then cut to the shape shown. The measurement *x* will depend on the width of the strips used, ¾ in. being a suitable figure.



Simple Low-loss Coil Former.

The six strips for supporting the winding can be of ⅛-in. or $\frac{3}{16}$-in. ebonite or hard, dry wood. The width should be about ¾ in. and the length according to the size of the coil it is desired to wind. The former should be longer than the winding, so that the wooden ends are not within the field of the coil.

A hole should be drilled at the end of each strip so that they can be screwed to the end pieces. Before doing so, however, it is well worth the extra trouble of cutting slots in the edges of the strips to ensure correct spacing of the wires. The six strips should be placed together in the vice so that the edges present a flat surface, and cuts made with a hack-saw; sixteen to the inch is a suitable number. The cuts need not be deep; a mere nick is sufficient to retain the wires in position.

If it is desired to reduce the area of contact with the wire the edges of the strips can be tapered off as shown in the sketch. Although such a former is some little trouble to make, when finished it will be appreciated by those who have had trouble with flimsy patterns.

R. H. B.

HOW TO CHARGE YOUR H.T. ACCUMULATOR AT HOME

The Nodon Rectifier.

THE only drawback of the high-tension accumulator (beyond the initial cost) is the inconvenience of having it recharged. The rate of charge must be kept so low that there is a risk of ill-treatment at the hands of the local garage, which is usually equipped only for charging low-tension batteries. It is therefore far better and much cheaper to charge at home, and this can be done with no inconvenience if the house is fitted with electric light on either alternating or direct current. If the current is direct, the operation is simplicity itself. It is merely necessary to pass the current through one lamp to the battery. A 60-volt accumulator, such as the Exide 1½ ampere-hour, requires a charging rate of not more than one-tenth of an ampere. On a 240-volt system the current passed by a 40-watt lamp is of suitable value.

A diagram of the circuit is shown in Fig. 1. AB can conveniently be pieces of flex terminating in a plug to put into any lamp-holder, and the lamp can be mounted in a socket screwed on to a piece of wood a few inches square. It is essential to connect the positive lead to the positive terminal of the battery. A simple pole-finder is described at the end of this article, and its use tells one instantly which is the positive lead and which is the negative.

If the house is supplied with alternating current it is necessary to rectify it. On account of the small current required this is quite a simple process, the Nodon valve or aluminium-lead rectifier being quite suitable and efficient enough for the purpose. Charging a 2- to 6-volt battery with such a rectifier is wasteful in electricity unless a transformer is used, and large outputs cause heating of the rectifier and loss of efficiency unless water cooling is employed, which, of course, may be very inconvenient. Neither of these objections applies in the case of the H.T. accumulator, as the voltage drop is smaller, the current required is very small, and the charging time is very short if fairly frequent charges are given. Thus, for a three-valve set using, say, 3 milliamperes of H.T. current working three hours nightly, or, say, twenty hours per week, the current used is 60 milliampere-hours, and charging at 0.1 ampere will put this back in theory in thirty-six minutes and in practice in about three-quarters of an hour. Thus a few hours charging per month will suffice.

Running Costs

In the case of the rectifier made by the writer, the following are the figures of cost of running: Current passed by 60-watt lamp (220-volt 50-cycle A.C.), rectifier and H.T. battery when charging (as measured at the house meter) is 1 unit in twenty-seven hours. At 6d. a unit this is four and a half hours per penny, so that the accumulator will cost less than one halfpenny per week to maintain fully charged. The above rate of charging gives about .07 ampere through the battery.

The Rectifier

The rectifier consists of four lead strips and four aluminium rods immersed in a saturated solution of ammonium phosphate contained in four glass jars. The jars may be tall jam jars, or, better, honey jars, as these have no constriction at the neck. The exact size is of no importance, but 1-lb. jars are big enough. Four lead strips are prepared about $\frac{1}{16}$ in. thick, and of width and length such that they can be fitted round the inside of the jars. A tongue should be left at the top of each for making the connections. A stand for the jars is convenient.

The stand can be made by taking a piece of 1-in. board large enough to hold the four jars and a lamp-holder. Four holes should be cut through the wood, the diameter of the jars. Another piece of board the same size, but preferably thinner, is screwed on to the bottom, thus producing a stand with four depressions to hold the jars (Fig. 2).

The diagram of the connections is given in Fig. 3.

A lid should be made for each jar by cutting with a centre-bit a hole half-way through a square piece of wood about ¾ in. thick. A 6-in. length of about ¼-in. pure aluminium rod is pushed through a well-fitting hole made in the centre of each lid for the purpose, leaving about 1 in. of rod above the lid for making the connections.

Portions of the under side of each lid will also have to be cut away to allow the tongues from the lead plates to pass out. It will be noticed from Fig. 3 that a pair of lead plates are connected together and a pair of aluminium rods are similarly treated, while one wire from the A.C. mains is connected to an aluminium rod and to a lead plate and the other A.C. wire goes through a lamp to the remaining aluminium rod and lead plate. The negative rectified current is drawn from the lead plates which are joined together, while the positive comes from the aluminium rods which are similarly joined.

The ammonium phosphate solution is made by dissolving ½ lb. of the pure salt

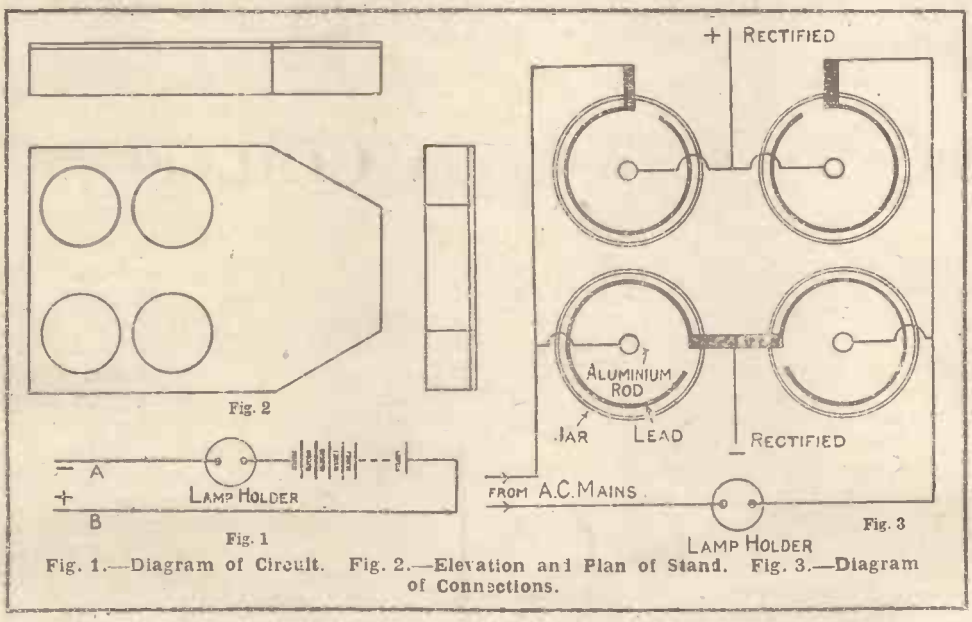


Fig. 1.—Diagram of Circuit. Fig. 2.—Elevation and Plan of Stand. Fig. 3.—Diagram of Connections.

in rather less than 2 lb. of hot water and allowing to cool. Each jar is filled about three-quarters full with this solution, and then about ½ in. of liquid paraffin is poured on to the surface of the liquid to prevent spraying and evaporation. The complete instrument is shown in the photograph.

Testing

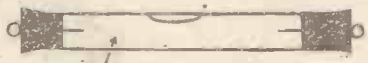
When the lids holding the aluminium rods have been put on the jars and connections made, the rectifier is ready for trial. When first it is put into action, a 60-watt lamp, or a smaller one, should be put into the lamp socket and the wires for the rectified current should be left unconnected. When the A.C. current is switched on, the lamp will probably glow with full brightness at first, but should then slowly go dimmer until it is nearly or quite extinguished. This may take some minutes to happen. The aluminium rods will then be noticed to present a beautiful appearance where they are immersed in the phosphate solution, as they scintillate with innumerable tiny twinkling sparks.

If this effect is not obtained when first starting up, try temporarily raising the aluminium rods until they only just enter the phosphate solution; this will start it off and the rods may then be slowly lowered into their proper positions. They are now "conditioned" and ready for use.

To charge the accumulator, connect the wire from the two lead plates of the rectifier which are joined together to the negative terminal of the accumulator and the wire from the joined aluminium rods to the positive terminal.

Finding the Correct Polarity

The lamp in the rectifier will now light up again and the scintillations on the aluminium rods will cease. This is as it should be. It is desirable to include an



PHENOLPHTHALEIN AND SODIUM SULPHATE SOLUTION

Fig. 4.—Details of Pole Finder.

ammeter or milliammeter in the rectified circuit. The size of the lamp used controls the current produced. The pole-finder mentioned earlier in the article is simply made by taking about 3 in. of glass tube about ½ in. in diameter and fitting it with corks or sealing-wax ends to hold two wires of platinum, silver, or resistance wire (Fig. 4).

The tube is nearly (but not quite) filled with a solution made by dissolving one or two small crystals of sodium or potassium sulphate in a spoonful of water, to which has been added a few particles of phenolphthalein previously dissolved in a few drops of methylated spirit.

When the two wires are connected to a battery or to D.C. mains (through a lamp), the negative end is indicated by a deep pink coloration. The positive end remains colourless. What happens is that the potassium sulphate (or sodium sulphate) is electrolised, forming potash (or soda) at the negative terminal, this reacts with the phenolphthalein and gives the pink colour; sulphuric acid is formed at the positive end, but produces no colour.

After the test, the tube is shaken for a second, when the potash and acid mix and re-unite, and the solution becomes colourless again, ready if required for the next test.

Another Method

Another method is to use potassium-iodide paper. Some blotting-paper is wetted with a solution of potassium iodide in water. The two wires to be tested are placed about 1 in. apart on this. Iodine is produced at the positive pole and makes a deep brown stain there.

It may be convenient to some readers to know where to obtain the materials mentioned, so it may be said that the ammonium phosphate and other chemicals can be got from Baird and Tatlock, Cross Street, Hatton Garden, London, or other chemical dealers, while the aluminium rod can be obtained from the Economic Electric Company, Ltd., Euston Road, London, N.W.1.

A. F. G.

RELAYED PROGRAMMES—ARE THEY A SUCCESS?

THE Londoner is apt to imagine that the transmission side of broadcasting borders on the perfect, but surely that impression is due to living in London. The north-country listener is familiar with the full portent of an expression as "Relayed from Little Poppington." Such an announcement usually means an evening of "mush." The listener who receives from a local station or from Daventry may get an evening's amusement free of exasperating noises, but when one comes to consider that on an average the English main provincial stations receive approximately sixty-five per cent. of the material by land-line from London, one may begin to realise that to many listeners broadcasting is a very crude form of amusement.

The local broadcasts are undoubtedly of the same tonal quality as London. Before expenditure is undertaken on new stations dependent on London, it behoves the engineering department to devise means for eradicating the majority of land-line noises. One sees in official announcements that active steps are being taken to improve matters, yet the quality to the ordinary individual is very little improved. At a period when, owing to financial charges and paucity of broadcast material, it is essential to increase the proportion of simultaneous broadcasts, it has become obvious that in their present state the available land-lines are absolutely inadequate for the purposes to which they are being put.

S.B. Programmes

There seems to be a disinclination to allow transmissions to be relayed by wireless from London. In recent months one or two interesting topical features have been radiated by this method with undoubted success. Further, it can be stated that during a recent storm several stations by relaying the Daventry programme by wireless were radiating such clear transmissions that the local listeners were enthusiastic. Later in the evening lines became available and, perforce, the London transmission arrived by this means. Immediately the luckless Northerner was switched off his perfect quality on to a chaotic hubbub.

Alternative Methods

It is not the object of these comments to advocate the sole use of the wireless link, but it would seem to be essential that all stations should be equipped with an alternative method to the present inadequate land-line. It is not unreasonable to expect that each provincial station, by experiment, could find a spot in its locality from which London or Daventry could be received to the best advantage. This small receiving point could be connected to the local station by a permanent telephone line.

Technical Development

Experimental work on the "beam" principle for use in S.B. transmission would not be amiss, for if lines of receiving stations could be erected two beam transmitting sets could serve all these on a low wavelength free of interference. To these points the area stations as projected could be linked by short private lines and the transmissions radiated on a high wavelength. To obviate interruption, parallel systems could be employed.

The result would be freedom from destructive noises and the saving of an enormous annual line charge, which in a few years would wipe out many times the cost of the experimental work. Whatever the method adopted, it is essential to the progress of British broadcasting that the present absolute dependence on land-line transmissions, technically economical as they are, should cease.

ADVERTISEMENT INSTRUCTIONS for "Amateur Wireless" are accepted up to first post on Thursday morning for following week's issue, providing space is available.

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The Wireless Magazine

The World's Greatest Magazine of Wireless

CONTENTS

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Free Structograph Plate and Blue-print with this issue

Get Your H.T. *and* L.T. from the Mains!
How to make a rectifier unit for A.C. supplies

A Cabinet Three-valver
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A Two-station Crystal Set
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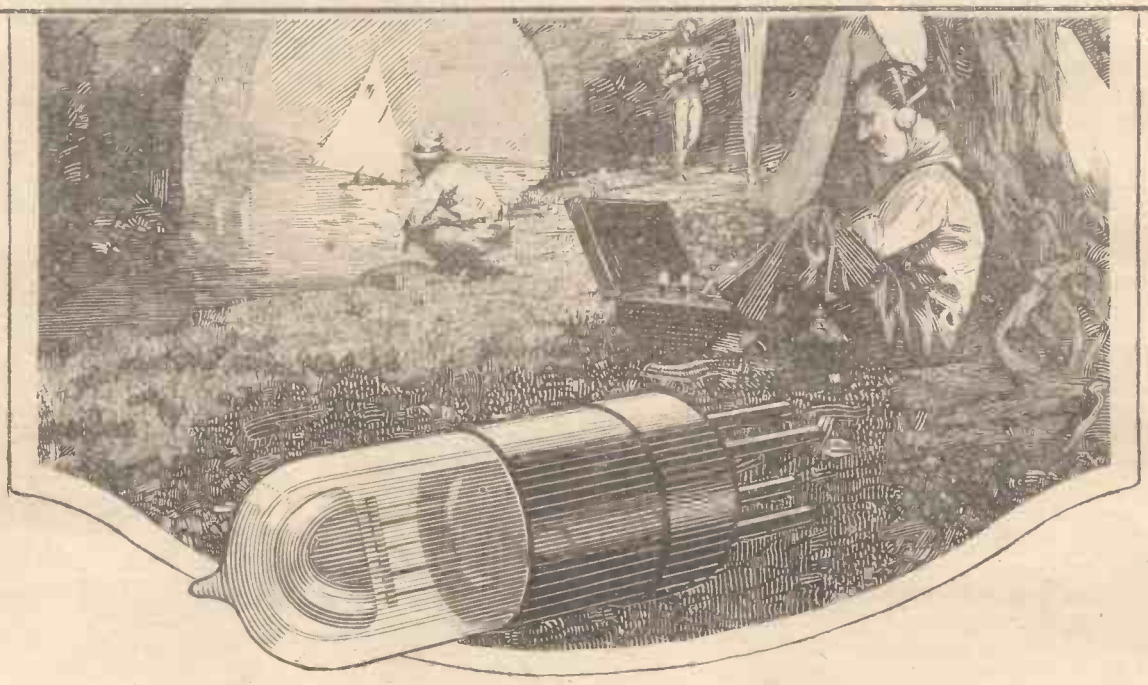
The Dull Emitter which popularised Summer Radio



SO long as bright-emitter valves were the only ones available the really portable Receiver was impracticable. No one wanted to carry big 6-volt accumulators out into the country for the pleasure of enjoying a Radio concert in the meadows—it wasn't worth the trouble. And even when the first dull emitters became more popular their extreme fragility rendered them unsuitable for the inevitable rough handling which every Set must get when carried from place to place.

And so the portable Receiver lagged in development. But, with the introduction of the Wuncell, summer Radio becomes a new delight. It is now quite easy to design a three-valve Receiver which can be fitted into an attache case complete with a 2-volt unspillable accumulator. Such a Receiver will give at least 10 to 12 hours' reception on one charge. And, what is more important still, the Wuncell valves will not be harmed by the vibration and rough usage to which such a Receiver must inevitably be subjected.

The reason for this lies in the design of the filament and its method of manufacture. Instead of being a long, straight filament, it is arched and further stayed at its centre with a third support. Instead of obtaining low current consumption by thinning down the filament at the risk of fragility, the Wuncell filament is manufactured under an entirely new process. This permits an exceptionally high electron emission at a temperature of only 800 degrees—when the Wuncell valve is working, its glow is practically invisible in daytime. Even in the dark it is no more apparent than the luminous figures on a watch dial. As a result, therefore, we have every confidence in saying that the Wuncell Valve is quite as robust as even the well-known Cossor Bright Emitter.

Types and Prices:

*W.1. For Detector and L.F. use - 14/-
1·8 Volts. Consumption ·3 amps.
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Cossor Valves

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Gilbert Ad. 5067

On Your Wavelength!

A Black Spot

WHENEVER a well-founded complaint about interference caused by radiation from oscillating receiving sets is received by the B.B.C., a flag is stuck into the point upon a large-scale map which represents the district from which it emanates. Should there be many "grouses" an appeal is issued from 5 X X for peace in the ether in that part of the world. This failing, a circular is posted to all owners of receiving sets in the neighbourhood begging them to play the game. If the nuisance still goes on, the matter is placed in the hands of the Post Office—which usually does nothing, though dire threats are issued from time to time. At the present moment Beccles holds the record for the number of complaints received in proportion to the population. I could mention another small town some thirty miles from London, also beginning with a B, where half a dozen selfish and incompetent users of reaction regularly spoil the programmes on most nights of the week. The appeals from Daventry are good, but I do wish that they could be made also from the medium-wave stations, for it is upon the 300/500-metre band that oscillation is at its worst.

The B.B.C.'s Part

It was announced some weeks ago that the G.P.O. was to send out what *looked* like innocent mail-vans, but were really howler-detectors, that is, vans staffed by wireless experts and fitted with direction-finding apparatus, whose mission was to track down persistent oscillators. Now I learn that the B.B.C. is working on the same lines. A special van is patrolling the London district, paying particular attention to those areas from which the largest number of complaints are received. The crew of this mobile interference-hunting station are concerned also with tracking down heterodyne whistles. At the present time they are trying to discover the identity of what is apparently a new Continental station—probably it is still in the experimental stage—which has been causing a certain amount of trouble. No one can possibly say that the B.B.C. has not done everything in its power to put an end to the oscillation nuisance; the trouble is that its powers in this direction are so limited.

Unconscious Offenders?

I have heard and seen it suggested on more than one occasion that listeners who are deaf are offenders, quite unwittingly, in the matter of howling. It is maintained that deaf people who take to wireless do not hear the squeals and the howls that their sets produce when they press reaction too much. Now this I simply do not believe. If a receiving set howls, the noise produced is always at least as loud as that of an incoming signal; further, it is a piercing sound that anyone who is able to hear a programme of music with the aid of the wireless set must most certainly hear. I am quite sure that the deaf are much less to blame than those whose hearing is perfect, and that his accusation is without foundation. Many people, by the way, whose hearing is so bad that they cannot follow an ordinary conversation or hear properly the sounds of music, find an immense solace in wireless, for with the help of headphones they can enjoy the whole evening's programme. It has been claimed that listening in this way may help to cure deafness. In some cases it may; but the use of big L.F. amplification in conjunction with head telephones should never be resorted to by deaf people unless it is recommended by a doctor, for in certain sorts of deafness this kind of thing may tend only to make matters worse.

A Mystery Evening

I am sure that every wireless enthusiast is looking forward to the Mystery Concert to be given on the last evening of the month by the *Daily Graphic*. There are to be all kinds of items that will make listeners rack their brains, and prizes to the value of £500 are to be awarded to those who send in the best solutions to the various problems provided. Amongst the artistes who will contribute to a splendid evening's entertainment are Sir Gerald du Maurier, Mr. Henry Ainley and Miss Gladys Cooper. That great favourite of a few years ago, Miss Violet Lorraine, is to emerge for one night only from her retirement, and we are to have the famous Kneller Hall Band, under the conductorship of Lieut. A. E. Adkins. Altogether, the *Daily Graphic's* programme promises to be the best and most interesting that we have had for many a day. The programme has been organised on behalf of the Infants Hospital, Westminster.

Strafing the Pirates

It was stated in the House of Commons the other day by Lord Wolmer, the Assistant P.M.G., that so far proceedings have been taken against one hundred and thirty-five users of unlicensed receiving sets and that all but one have been convicted. If I remember aright, the one case that failed was that of a man who had a receiving set put in on trial and intended to take out a licence immediately if he decided to purchase it. With those who were fined for their folly no right-thinking person can have the smallest sympathy. A licence costing 10s. a year works out at *one-third of a penny a day*, and surely no reasonable man or woman could object to paying this for the entertainment. Compare the cost with that of a library subscription or of a weekly (not daily) visit to the theatre or the cinematograph. With the wireless set you have a different programme every night; if you are favourably situated you may have a choice of two or three. How many gramophone records could you buy for the cost of a receiving licence?

Take Care of Your Loud-speaker

Very few amateurs realise how important it is that the diaphragm should never be removed from a loud-speaker or pair of telephones. If only they could see the care that is taken to place the diaphragm on the magnets immediately after magnetising them and without breaking the magnetic field when doing so they would realise how important this is. It is a well-known fact that the radio amateur is a source of steady revenue to telephone manufacturers owing to the fact that he cannot restrain the curiosity which prompts him to remove the diaphragms in order to peer underneath. The truth of the whole matter is that the loud-speaker magnets are much the same as any other magnets and that they will lose as much as 50 per cent. of their pulling power should the diaphragm be removed. It should also be remembered that a knock may cause a loss of magnetism, so that the instrument should be placed in a position where such an accident is not likely to occur.

Testing Transformers

Many experimenters are somewhat puzzled at times as to the correct method of wiring up an unmarked transformer, and there is often no possibility of examining the windings in order to see which is the output side of the primary and secondary. It is of advantage to have a method available with the aid of which it is possible to solve this problem. All the apparatus required is a moving-coil voltmeter and a flashlamp battery. If the windings are not known it is an easy matter to ascertain which is the primary and which is the secondary by the drop in voltage as shown by the battery and voltmeter connected in series with the windings. The drop in voltage shows a high resistance and the highest voltage reading is the lowest resistance, or, in other words, a low voltage reading indicates a high resistance.

On Your Wavelength! (continued)

Winding Direction

A point which may cause some concern is which way we should connect up the transformer. In order to ascertain this, we have to connect the voltmeter across the secondary whilst the battery is connected across the primary, but only momentarily. It will be observed that the voltmeter will show a deflection by reason of the voltage induced into it through the primary winding. The deflection should be carefully observed, as it will take place in two directions, either across the scale or backwards. For this reason it is better to use an instrument with a central zero mark, although this is not an important matter. If the deflection is in the reverse direction, the connections should be reversed to the battery, so that the first movement is in an upward direction. The second deflection is not of importance. The experiment should be repeated with the voltmeter and battery connected in both directions, and that which gives the biggest deflection in an upward direction should be adopted and the markings made accordingly. When the initial deflection is in an upward direction, the terminal which is connected to the positive terminal of the voltmeter is the "out" secondary and the positive pole of the battery is marked "in" primary. We are now in a position to insert the transformer in the circuit with the windings the right way round.

Insulation Resistance

Another matter with which we are concerned is the insulation resistance between the windings. This test may be very easily carried out with the same apparatus, except that the battery should be the high-tension battery which it is intended to use in the set. The battery is connected by the positive pole to one side of the primary winding and the voltmeter is connected between the secondary winding (one end only) and the other end of the primary winding. No deflection should be observed when a steady voltage is applied, but if the voltage is momentary (as used for the previous test) a slight deflection may be observed, which means nothing. If a steady reading is observed the insulation is faulty and the transformer should not be used.

These tests are far more certain if a sensitive milliammeter is used. The instrument should not on any account be any less sensitive than one which will give a full-scale deflection for a current of three milliamps.

The Draped Studio

A short while ago an active discussion was being carried on regarding the merits or otherwise of the draped studio. Some preferred the pure note and absence of extraneous noise during broadcasts from a heavily draped studio. Others wanted the inclusion of the natural echo.

Undoubtedly perfection lies between these two points, and it is interesting to note the work being done in this direction. The B.B.C. are experimenting with the New Chenil Galleries and are producing a series of chamber-music concerts there to which the public are admitted, but further they are using the Galleries as a studio in order to get more natural tone into musical performances. It is a curious fact that no two buildings possess the same acoustic properties—the ideal being an undraped hall from which the mellow tones of a studio transmission may be obtained. Readers may call to mind the tone of the transmissions which emanate from the Grand Hotel, Eastbourne. The room from which they come has many different angles, being of an L shape.

It is understood that the engineers of the B.B.C. are not in favour of heavily draped studios, but are desirous of finding some system whereby the effects of a large building can be obtained by mechanical means. Listeners should note the origins of various broadcasts and decide which type of transmission is to their taste. Some transmissions are "killed" by over-draping. An example of this is the effect produced when dance bands are playing in Savoy Hill. The whole question of acoustics is a very thorny one, as can be realised from the numerous buildings with which the B.B.C. engineers have experimented.

Signs of the Times

It was regrettable from all points of view that the recent performance of *La Traviata* at 2 L O was curtailed owing to a technical interruption. The B.B.C. deserve every listener's sympathy, for no pains had been spared to make the transmission a success.

It may be remembered that the B.B.C. announced that a little booklet had been prepared for the guidance of listeners and that this could be obtained for the asking at 2 L O. I was passing down the Strand when the announcer's words of the night before came to mind, and, turning down Savoy Hill, I arrived at the north entrance of the B.B.C. One would naturally expect that a few people might be moving in and out, but I was not prepared for the sight that met my eyes, for at the entrance there waited a veritable queue. Slipping past these patient people, whom I took to be sightseers, I gained admission to a point where, to my astonishment, I found that the whole concourse were calling for the little booklet on *La Traviata*.

But this was not what caused me the greatest surprise. It was the type of individual composing the queue that brought astonishment, for the majority were of the working class and consisted of people drawn from every trade. I got behind a burly van-driver, whose dappled greys harnessed to a delivery van stood outside. When eventually we gained the table my van-driver friend asked if several copies could be spared, as he represented a number of listeners. Yet he was all for the "common weal," for he declared that a few would do, as his friends could look over each other's shoulders.

Frankly, I was amazed. I had long been of the opinion that it was this class of individual who formed the "high-brow school." Obviously here was the force who support Opera and on whom the production of British grand opera must rest. In my mind's eye I visualised a new opera house designed to accommodate this wage-earning class. There need be no boxes and no discrepancy in price. It is to be hoped the B.B.C. will note these outward signs and launch out with a popular theatre, where their followers can find accommodation at a reasonable price. The moral to be drawn from the demand for that "little booklet" was glaringly obvious.

Ceremonies by Wireless

The other day Captain Eckersley, by depressing a key at Radio House in London, switched on a receiving set at a wireless exhibition at Staten Island, New York, and caused a great hall to be filled instantly with strains of music. The distance between the key and the switch was 3,000 miles, yet the time that elapsed between the pressure of Captain Eckersley's finger and the coming into action of the loud-speaker in America was but the sixty-second part of a second! In that space of time the speediest human sprinter would cover rather under five *inches*, an express train about a foot and a half, and a racing motor-car a little more than a yard!

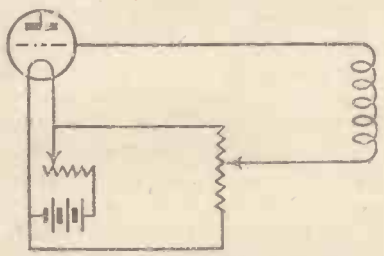
Wireless Pictures

In conjunction with the Marconi Co. in this country, an attempt is shortly to be made to send pictures from photographs across the Atlantic. This feat has already been performed, but so far no very ambitious scheme has been tackled. This summer it is hoped to send across the Herring Pond pictures of the Derby, which, if the attempt is successful, will appear in American newspapers within half-an-hour of the finish of the great race. So novel a project certainly deserves to succeed, and I hope with all my heart that it may do so. Personally I do not think that many years will elapse before we shall be able to see the Derby even if we are unable to go to Epsom. THERMION.

PRACTICAL ODDS AND ENDS

A Potentiometer Switch

ALTHOUGH a good potentiometer passes very little current it is always advisable to incorporate a switch in the receiver to disconnect the resistance when not required. The potentiometer can, if desired, be connected to one terminal of the filament rheostat so that no current is passed, either through the valve or potentiometer, when the rheostat is in the "off" position. It must be remembered, however, that under these circumstances the full voltage of the accumulator is not across the potentiometer. A certain amount of the filament rheostat is usually left in circuit when the valve is alight, and this cuts down the voltage applied to the potentiometer as well as to the filament. R. B.



Wiring of Potentiometer Switch.

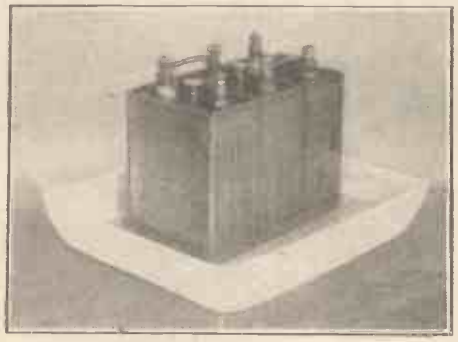
Preventing Acid Stains

CARPETS and table tops are often marked and damaged by the minute quantities of battery acid which seem to be able to leak even through the best storage-battery containers.

The best way of preventing damage by escaped acid is shown in the photograph, where the battery has been placed in a large porcelain dish, as used for photographic work. Many now enthusiastic radio experimenters were formerly just as keen amateur photographers, having deserted their first love for the greater charms of radio. No doubt they will already possess some porcelain dishes of suitable size for the purpose.

Slightly damaged or cracked dishes can often be secured for a few pence from photographic dealers, as they are practically useless for photographic work. Any cracks in the dish can be made acid-proof in the following manner, when the dish will be as good for our purpose as a perfectly new one.

After cleaning the dish thoroughly, warm it in the oven until it is as hot as the hand can bear. Handle the dish with a cloth or towel wrapped around one end, and place it on the table. Rub a candle end over the cracks; the candle grease will melt when in contact with the hot dish and all cracks will be filled up with



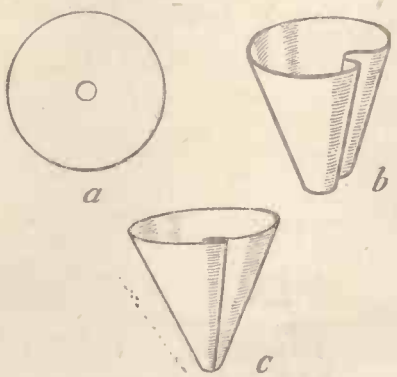
Method of Preventing Acid Stains.

wax. When cold, the dish should be tested for leakage by filling it with water and letting it stand over night.

C. A. O.

An Accumulator Filler

ACCUMULATOR filling should always be carried out carefully so that no acid splashes on the terminals. No dirt or chemical impurities of any kind should be allowed to mix with the acid or water, and for this reason it is best to keep a funnel specially for the purpose, and not to use one which has been in general use for photographic or other purpose.

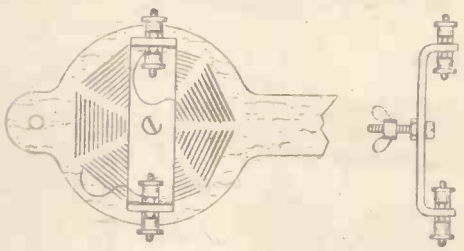


Accumulator Filling Funnel.

A suitable funnel is shown in the diagram; it consists of a disc of thin sheet-lead (*a*) 3 in. in diameter, which has a hole of about ¼ in. in diameter in the centre. The funnel is shaped by overlapping a portion of the material as shown at *b*. The finished funnel is depicted at *c*, its final diameter at its top end being approximately 1½ in. M. R.

Mounting Basket Coils

A VERY effective method of mounting home-made basket coils is shown below, the special clamping device being easily adapted to many different types of amateur-made coil holders. A strip of thin ebonite about 3 in. long by ½ in. wide is bent at right-angles at the ends, fitted with two double terminals, and drilled through the centre to take a bolt with a fly-nut. The bolt carrying the fly-nut should be firmly clamped to the ebonite by means of an ordinary nut, as shown, so that it will be prevented from turning when making adjustments. The circuit leads to the coil are joined to the two outer terminals, stiff wires being used in the case of fixed coils and flexible leads for movable coils. Thus it is possible to



Details of Coil Mounting.

arrange a series of basket coils on the interchangeable system without providing a separate mount for each coil. J. R.

Glass Pins

THE small glass-headed pins sold by stationers, although primarily intended for tacking up prints and photographs, can be put to a number of uses for wireless purposes.

They make first-class small insulators and will support a light indoor aerial. When pushed into the picture moulding they are almost invisible, a consideration where appearance is concerned. The pins may also be used on the "hook-up" board to keep loose connecting wires in position; the wires can be given a turn or so round each pin where required. Experimental low-loss short-wave coils can also be constructed by inserting four pins in the form of a square on a block of wood and winding the wire on these.

The construction of frame aerials is greatly simplified by the use of these "insulators," as there is no need for grooved ebonite supports or spacers. Other uses will doubtless suggest themselves to amateurs. W. B

THE EDITOR BROADCASTS FROM W G Y

A Chance for Short-wave Enthusiasts

The Studio at W G Y, Schenectady

READERS will be interested to know that on Tuesday, May 4, Mr. Bernard E. Jones, the Editor of AMATEUR WIRELESS and the WIRELESS MAGAZINE, will broadcast from W G Y, Schenectady, United States of America, and that his remarks will be to some extent addressed to listeners in the British Isles. Mr. Jones is at present making a tour of the broadcasting and wireless centres of America for the purpose of studying the conditions in that country. It is expected that the speech will be relayed on this side of the Atlantic by the B.B.C., and therefore all our readers should have an opportunity of receiving it, regardless of the type of set which they possess.

The Schenectady Station

W G Y, the broadcasting station of the General Electric Co. of America, is situated at Schenectady, N.Y., and is the station operating on the broadcast waveband most easily heard in this country. Its normal wavelength is 379.5 metres, but in addition a wavelength of 32 metres is used, this being the wavelength which the B.B.C. generally relay. Short-wave enthusiasts may be glad of the opportunity to attempt reception direct on the short wavelength. The precise time of the broadcast is not known, but it is expected that it will be between 11.15 and midnight, or even a little later.

Wavelengths

The short-wave transmissions are broadcast from 2 X A H, the experimental station of the General Electric Co., situated at Schenectady. Programmes are usually simultaneously broadcast from W G Y and 2 X A H, all speech and music being sent to the latter station from the W G Y station by land-line.

It is a fairly easy matter to receive W G Y on both 32 and 379·5 metres in this country.
Will you try next Tuesday?

It is of interest to note that although it is possible to hear the transmissions on both 379.5 and 32 metres, the B.B.C. engineers obtain the best results on the short wavelength, and when possible relays are conducted through the medium of the 2 X A H station. We shall be pleased to hear from readers who receive the transmission direct on 32 metres.

We give below a list of components which the amateur (who is not already in possession of a short-wave receiver) can easily connect up for receiving the 32-metre transmission. Suitable circuits, such as the Reinartz, have been described in previous issues of AMATEUR WIRELESS (Nos. 187, 191 and 197). Pranco ultra short-wave tuner (or Dimic coil); .0003-microfarad variable condenser (low-loss); fixed condensers for shunting phones and potentiometer; potentiometer for control of grid potential; filament rheostat; DEQ, or other similar low-capacity valve; valve-holder.

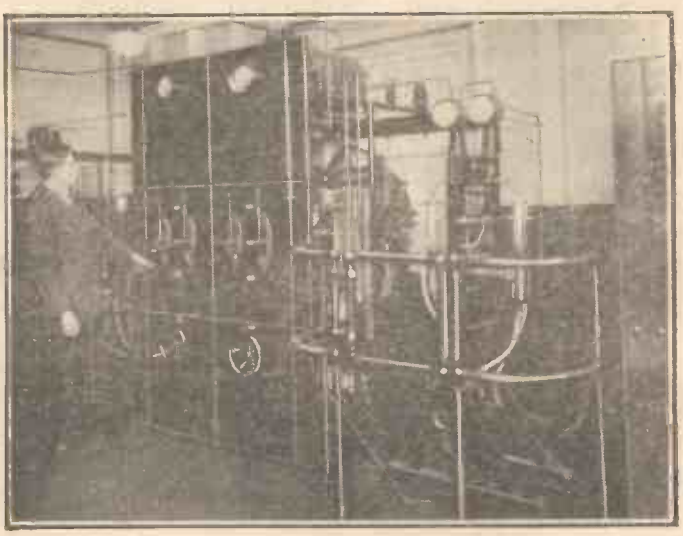
PANEL MARKING

A NEATLY engraved panel considerably enhances the appearance of a receiver, yet few amateurs take the slight trouble necessary to produce a panel clearly marked in bold, white lettering.

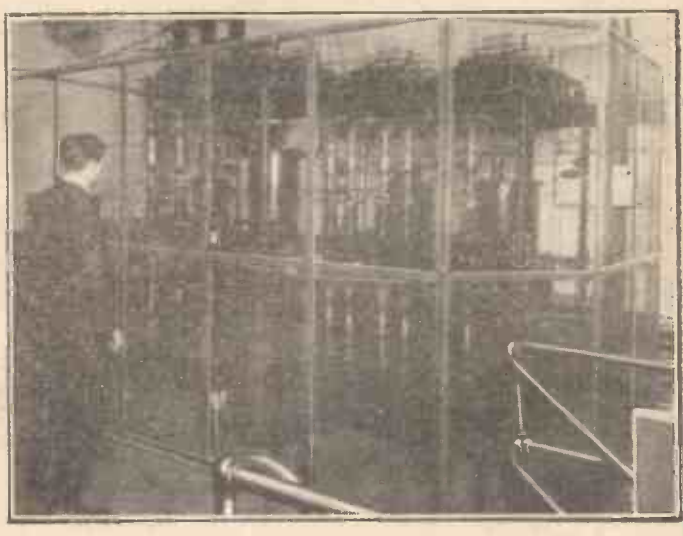
Two small punches should be made out of hardened steel, and for convenience the edge of one should be about half the length of the other so that short and long strokes may be made. The chisels should be used with a small mallet, and care must be taken in the operation of forming the letters or the panel will be damaged.

When all the lettering is neatly engraved, the cuts being clean and sharp, the slots may be filled in with white paint smoothed over the surface of the panel, the surplus being removed with a clean rag.

K.



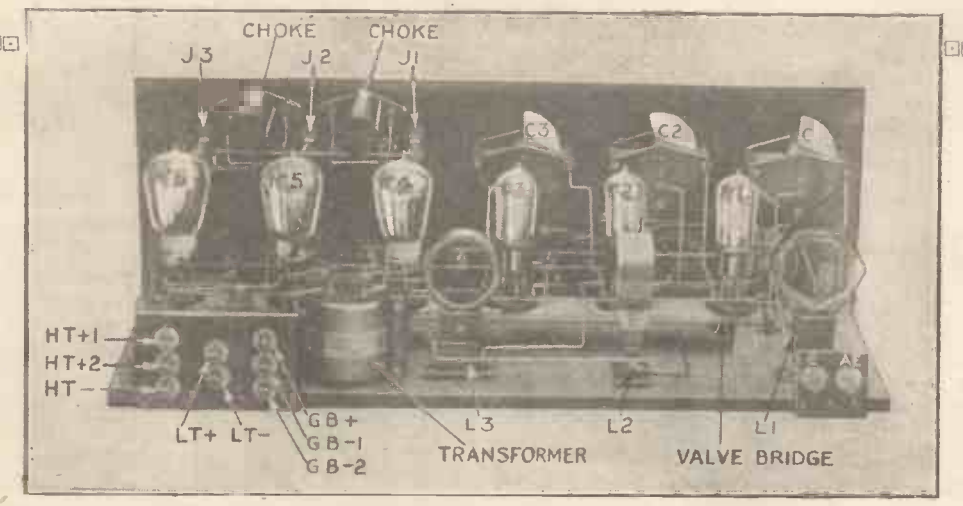
The Main Transmitter and Oscillator Panels



The Kenotron Rectifier Assembly

THE "CONCERT SIX" IN USE

How to get the best out of the All-station Loud-speaker Set



Back-of-panel View of Receiver.

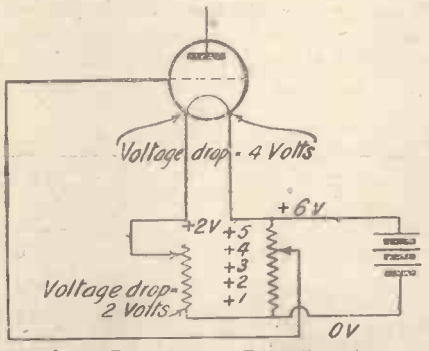
ONCE you have grown accustomed to its little ways, which do not require a great deal of learning, the "Concert Six" (see "A.W." Nos. 201 and 202) is an easy set to operate, and with it one can be absolutely certain of causing no interference whatever with other people as soon as it has been stabilised.

The first operation should be performed on a wavelength outside the broadcast band. Six hundred metres, upon which there is always something to be heard at any hour of the day or night in the way of spark signals, will do very well indeed. Your task will be made easier if you make use of a wavemeter; probably some friend will oblige with the loan of one if you do not possess a meter of your own. Set the potentiometer near the negative end of its travel and screw the variable resistance right out.

Spark Signals

Your endeavours to tune in spark signals will certainly be enlightening, for they will show you what a handful a pair of *uncontrolled* tuned-anodes can be. You will be rewarded only by hearing mushy signals, followed by loud plocks as the set falls into oscillation when you try to sharpen the tuning. Let the set oscillate and screw in slowly the first variable resistance. As it goes in you will find that the set shows immediate signs of calming down. Now make the tuning of the second condenser as sharp as you can, which will probably cause the set to oscillate once more. Turn in the second resistance until it has almost ceased, and then stop it by means of the first resistance. A setting will be found which allows the spark signals to be tuned in sharply without the slightest tendency on the part of the set to oscillate. As a rule the first resistance will have to be screwed fairly well in, whilst the second may remain at a high value.

The ideal setting is obtained under the following conditions. The potentiometer is turned until the grid potential of the first and second valves is approximately zero. This can be judged without difficulty. If you are using a general-purpose valve requiring about 4 volts on its filament with a 6-volt accumulator, the voltage drop across the rheostat is roughly 2 volts. As the rheostat is in the negative filament lead, the grid, if connected direct to H.T. −, will thus be at a potential 2 volts more negative than the negative leg of the filament. This will be readily understood by reference to the diagram. If we take it that the filament negative lead is at zero potential, then the filament positive lead is 6 volts positive to it. Since the voltage drop through the filament is 4 volts, the potential of the negative filament leg will be 6 − 4, or 2 volts positive. If, therefore, we move the slider of the potentiometer right over to the negative



Voltage Drop Across Potentiometer.

end the grid of the valve will be 2 volts more negative than the negative end of the filament.

Now the voltage drop across the potentiometer is 6 volts and, provided that the windings are properly put on, it is perfectly regulated throughout the travel of the slider. If, therefore, we set the slider exactly at its mid point, its potential will be 3 volts positive. As the negative end of the filament is, as we have seen, 2 volts more positive than the negative filament lead, the grid if connected to the potentiometer slider placed in the mid-position will be 1 volt positive to the negative end of the filament. The two will be at the same potential if we set the slider of the potentiometer at 2 volts positive, that is, at approximately one-third of the way from the negative to the positive end. Should you have a rotary potentiometer whose scale is marked off into ten divisions, the required setting with a 6-volt battery and a general-purpose valve will be between the divisions 3 and 4. The required settings for other valves and filament batteries at different potentials can easily be worked out on the lines indicated.

Having set your potentiometer so that the grid is at the same potential as the negative end of the filament, stabilise the set as previously described by means of the two variable resistances. You now have an extremely handy method of applying reaction, not by means of an inductance, but through the help of the capacity coupling between the plates and grids of the high-frequency valves. When a very weak signal is coming in it may be strengthened by turning the potentiometer very slowly towards the negative end of its travel, thus giving the grids of the high-frequency valves a small negative bias. The closest watch must be kept for the rushing sounds which betoken the approach of oscillation. As soon as these are heard the potentiometer must be turned in the opposite direction until they cease.

Potentiometer Control

As soon as you can handle the set competently on 600 metres or any other wavelengths outside the broadcast band it may be used with confidence for the reception of programmes. The setting of the resistances may be slightly different, but now that you have, so to speak, "got the hang of things," you will find no difficulty in adjusting them in a moment so as to bring the set under full control. When the set has been properly stabilised a strong transmission may be tuned in dead sharply without a sign of oscillation, and any or

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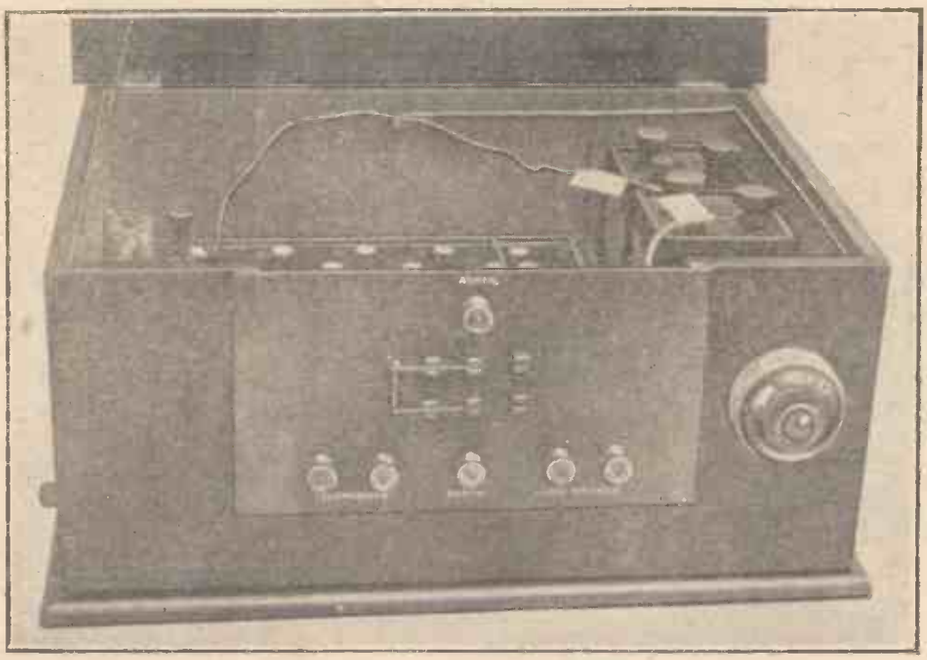
THE "HOM
DU

A Straight-circuit Two-v
for Daventry or t



The Dual Receiver in its Cabinet.

THE keynote of the "Homestead" Dual is simplicity in operation combined with economy in construction. It may perhaps be fairly described as a set calling for average constructional ability in the making but for no skill in handling—one, in fact, which the family expert can put together with the minimum expense to his pocket, and, having once adjusted it, can safely leave it in the hands of the old folk at home to turn on and off as they please.

The Circuit

The word "dual" applies solely to the fact that the set is so designed that it will bring in either the high-power station at Daventry or the local station, as desired, by simply turning over a double-pole switch. Otherwise the circuit is perfectly straightforward, and does not involve reflexing or any other complication. The tuning condensers are home-made, and although naturally somewhat limited in capacity, will be found to have ample margin for the purpose in view.

The cabinet is compact in size and neat in appearance. If dull-emitter valves of the .06 type are used, the set is completely self-contained, both the H.T. and L.T. batteries being housed inside the box, together with the valves, tuning condensers, coils and other components.

In the interests of economy and simplicity the number of valves has been limited to two, namely, a detector and one note magnifier. One outside switch is provided for changing from Daventry to the local wavelength and a second, or tumbler switch, for turning the set on or off.

A separate pair of terminals are provided for headphones, a special resistance being included so as to moderate the volume of sound.

Another special feature is the use of a single movable reaction coil located between two fixed aerial coils, one of the latter being tuned to Daventry and the other to the local station. By suitably selecting the size and position of the reaction coil, it can be made to assist reception from both stations, extra strength being given to the weaker signal, according to the precise location of the set.

Tuning is effected by means of two very compact and inexpensive variable condensers of special construction, one condenser being placed in parallel with each tuning coil. The theoretical circuit is shown by Fig. 1.

Materials

Ebonite panel, 8½ in. by 4¾ in. by

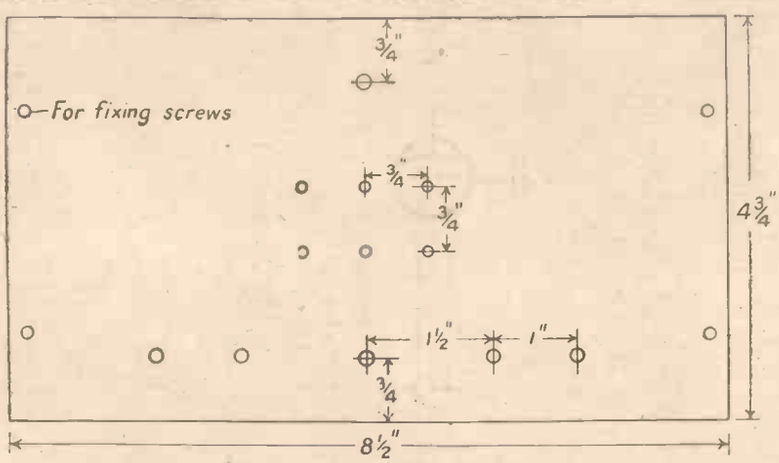


Fig. 3.—Panel Drilling Diagram.

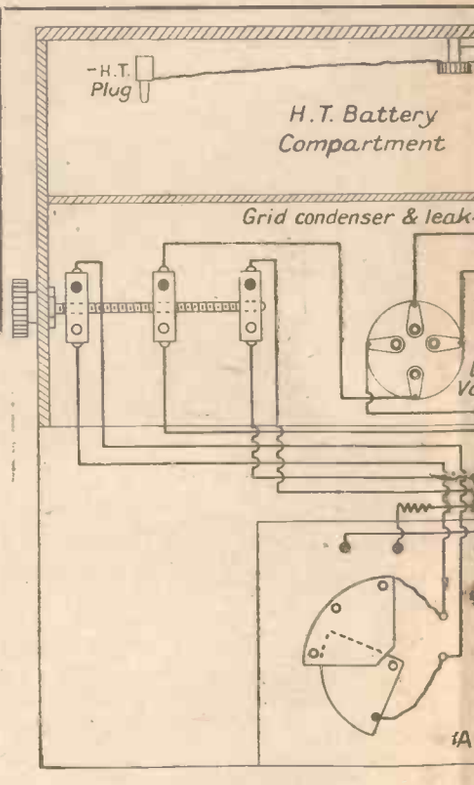


Fig. 4.—Arrangement of Co

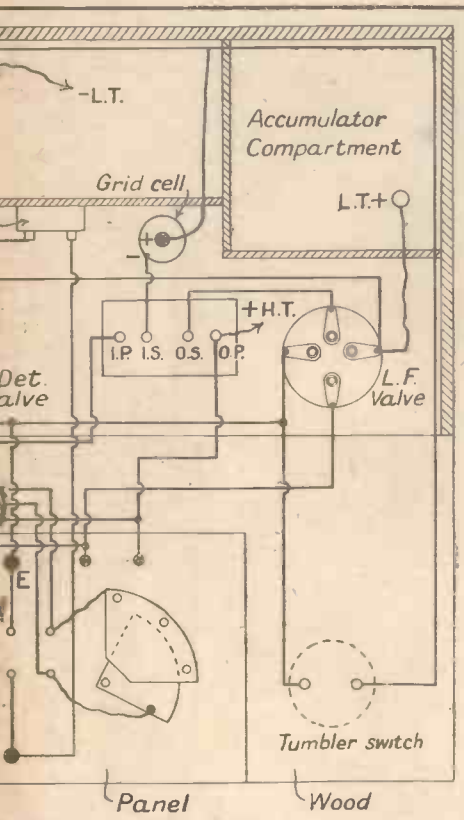
MESTEAD" AL

alver specially designed he Local Station

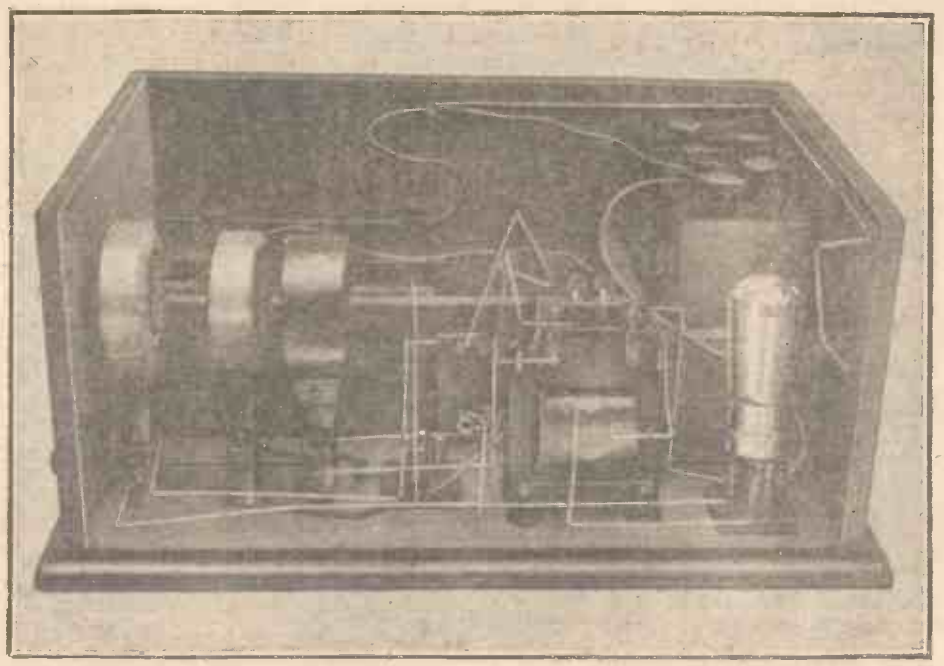
$\frac{3}{16}$ in.; L.F. transformer; D.P.D.T. switch; two valve holders; six W.O. terminals; three coil plugs; stiff sheet brass, about .015 in. thick; two fixed condensers, .002 microfarad; two wander plugs; one pair hinges for lid; one tumbler switch (electric-light pattern); one grid condenser and leak; a few square feet of $\frac{3}{8}$-in. mahogany; a few yards of No. 16 or 18 gauge square tinned-copper wire; some rubber-covered flexible wire; 6 in. of screwed 2 B.A. brass rod; one 2 B.A. ebonite knob; sundry screws, varnish stain, etc.

The Cabinet

It is wise to make the cabinet first so that ample time may be allowed for the varnish to dry before assembly. Assuming that dull-emitter valves of the .06 type are to be used, with a couple of Exide D.T.G.



nponents and Connections.



Interior View of Receiver showing Wiring.

or similar small accumulators, the case should be built 14 in. long, 9¾ in. deep and 6 in. high. The lid should have a couple of battens screwed on inside to prevent warping, and both the lid and the bottom should project about ⅜ in. at the front and sides.

A rectangular piece 7 in. by 4½ in. must be cut out of the front to receive the ebonite panel. The bottom, sides and back should be fixed together by screws, but the front must not be finally screwed until the internal wiring, etc., is finished.

Smooth the wood with glasspaper and give it a coating of thin varnish stain. Smooth again and varnish with copal varnish. Put in partitions for the H.T. and L.T. batteries. If bright-emitter valves, involving larger accumulators, are to be used, the cabinet should be made 8 in. high inside and about 15½ in. long.

Positions of Components

The positions of the L.F. transformer and the two valve holders will be seen quite clearly from the photograph. The grid leak and condenser are fixed to the H.T. battery partition near the detector valve and transformer. Leave room behind the latter for one or two grid cells, as the use of grid bias is strongly recommended.

The holders for the tuning coils are fixed by 4 B.A. screws passing up through the bottom of the box and tapped into the coil plugs. They should be 3¼ in. apart. The centre coil holder is moved by means of the 2 B.A. screwed rod, which rests loosely in holes in the fixed outer coil holders, but passes through a tapped hole in the centre coil holder.

When the rod is turned by means of the knob at the left of the cabinet, the

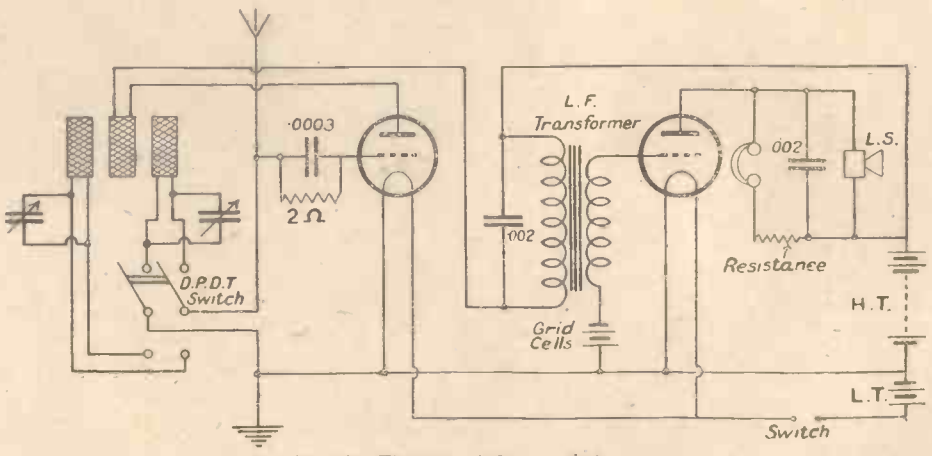


Fig. 1.—The Theoretical Circuit Diagram.

reaction coil is moved to and fro between the tuning coils. A nut and lock-nut on the screwed rod, just inside the cabinet, permits rotation whilst preventing any endwise movement of the rod.

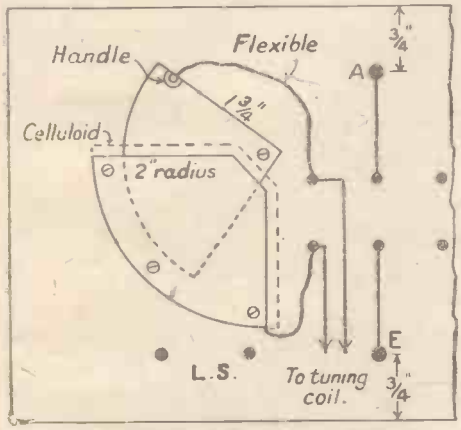


Fig. 2.—Details of Condenser Plates.

The edges of the panel should be bevelled or rounded and the holes drilled for the terminals, switch and four fixing screws according to the drilling diagram Fig. 3. It is well to tap the holes for the terminals 4 B.A. The switch and terminals should then be fixed in place.

Tuning Condensers

The tuning condensers are of the solid dielectric type, and are not only compact but also inexpensive to make. It must be understood that they are not designed for use over a wide range of wavelengths, but for the final adjustment of standard coils for only Daventry and the local station.

For the fixed plates, cut out four pieces of sheet brass about .015 in. thick of the size and shape shown in the drawing Fig. 2 and two more of the smaller size for the movable plates. Flatten them very carefully and drill holes as indicated in the diagram.

Remove all burrs and sharp edges and smooth all over with fine emery-cloth. Cut four pieces of thin sheet celluloid, a little larger than the fixed plates, and drill or punch holes to correspond with those in the fixed plates. All the holes should be of ample size to receive the fixing screws, preferably No. 6 B.A.

Place one of the fixed plates in position on each side of the switch on the back of the panel, and mark the panel for drilling; similarly mark out the holes for the pivot screws of the movable plates. Drill and tap these holes in the panel.

Solder a thin wire to the edge of each fixed plate for connecting purposes, and solder the head of a 6 B.A. screw to the edge of each movable plate. Assemble the condensers as follows: Fixed plate on panel, celluloid, movable plate, celluloid, fixed plate. Insert screws and tighten up until the plates are in close contact but allow smooth movement of the centre plates.

The maximum capacity of these condensers is about .00025 microfarad with celluloid about .01 in. thick. Flat photographic films can be used if the gelatine is first removed with warm water. Connect each pair of fixed plates by their wires to the lower outer screw of the nearest pair of switch back-screws, and connect each movable plate by a flexible wire to the corresponding upper switch screw. A nut on the 6 B.A. screw soldered to the movable plate can be used to clamp the end of this flexible wire, and a small knob made from a piece of ebonite rod should be screwed on to the same 6 B.A. screw to form a handle for moving the condenser plate in tuning.

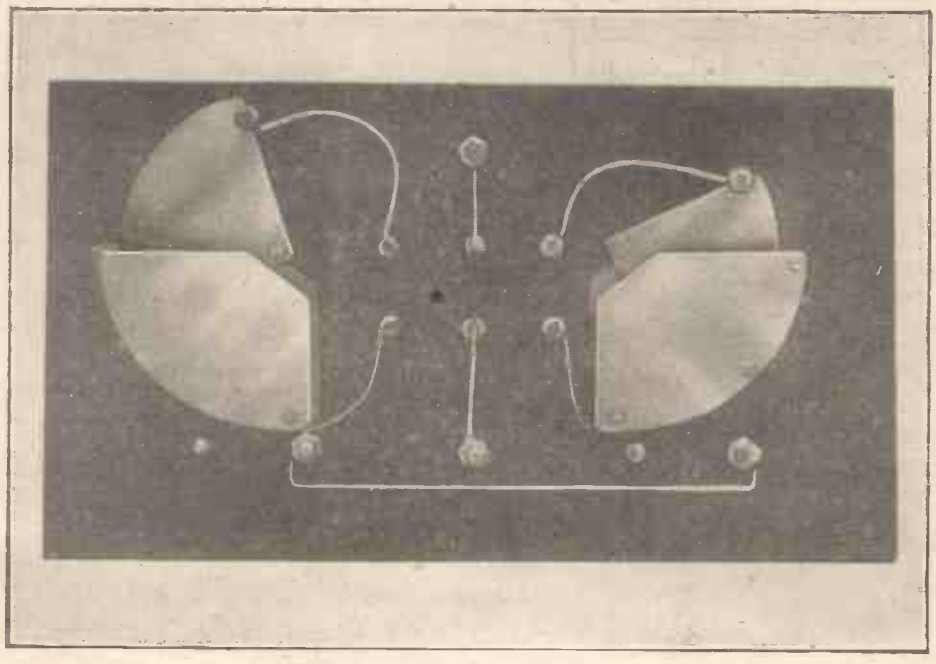
Wiring

Although the wiring can be carried out quite easily by reference to the diagrams and photographs (see Fig. 4), the following few hints may prove useful.

Employ flex for connecting the reaction coil holder with IP of transformer and plate socket of detector valve, also for connecting grid cell or cells to IS of transformer and to negative L.T. wire running round the back of the cabinet; likewise for L.T. and H.T. battery leads.

A thick bare wire can be run from the tumbler switch to a terminal in the wood at the back of the cabinet. The negative L.T. and negative H.T. flexibles can be fixed to this.

The remaining wires should be fixed in place and bent to the correct shape, as shown in the photograph, before putting on the front of the cabinet with the panel. There will then be no difficulty in connecting them to their proper terminals at the back of the panel.



The Tuning Condenser Panel.

The condenser across the transformer primary can be supported by its connecting wires if these are fairly thick, and the same applies to the loud-speaker condenser. The proper values of condenser to use should be obtained from the makers of the transformer and loud-speaker, but .002 microfarad will not be far out in the absence of special instructions.

To moderate the sound in the phones, a resistance may be inserted in one of the wires connecting its terminals with those of the loud-speaker. For this purpose a piece of card, 1 in. by 3/8 in., soaked in indian ink and dried will give the required result.

Operating the Set

If 2-volt valves are preferred, then the two accumulators should be connected in parallel and no regulating resistance is necessary. If .06 valves are used, the cells had better be connected in series and a piece of resistance wire included in the circuit. Insert the resistance wire between the negative L.T. pole and the terminal at the back of the cabinet, or a coiled-up piece of resistance wire can be used for connecting the cells to one another. The resistance used must be chosen to suit the valves, but about 12 ohms is usually sufficient.

The size of the tuning coils will naturally depend upon the dimensions of the aerial. For a standard P.O. aerial, coils No. 50 and 175 will be required for London and Daventry respectively.

The size of the reaction coil must be found by trial—start with a No. 50. Tune with the variable condensers, and then adjust reaction by moving the position of the coil by means of the knob at the left of the set. If necessary, try out a No. 60 or No. 75 until good loud-speaker signals are obtained from both stations.

Once these preliminary adjustments have been made, the only manipulation necessary is (*a*) the tumbler switch to bring the set in and out of action, (*b*) the double-pole switch to change over from Daventry to the local station. P. H.

"A.W." TESTS OF APPARATUS

Conducted in the "Amateur Wireless" Research and Test Department

Puremax Loud-speaker

SELDOM have we seen a loud-speaker with such a well-designed magnetic system as is found in the Puremax loud-speaker, produced by Lee and Churchill, Ltd., of 3, Hanover Court, Milton Street, London, E.C.2. In some respects the magnetic system is unique. The diaphragm is made of mica, operated by a toggle lever fixed to a balanced armature situated between two magnets. The whole unit is enclosed and bolted between two aluminium castings, presenting a clean appearance. A highly polished nickel-plated cover encloses the aluminium castings.

On test the loud-speaker was connected to our low-frequency oscillator, and the output of sound from the loud-speaker measured over a frequency range of 100 cycles to 3,000 cycles per second. The "response" curve so obtained was found to be very even over the higher frequencies

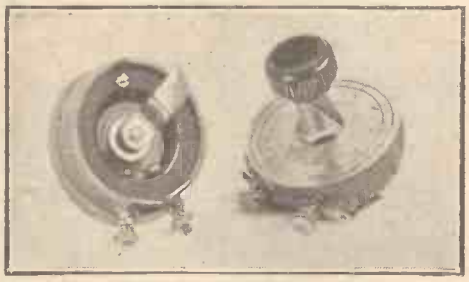
Puremax Loud-speaker.

but dropped slightly on the lower frequencies. Although for a given input the volume of sound obtained is not so great as our standard, the purity of reproduction is excellent. Especially is this noticeable on speech.

Rheostats and Potentiometers

WE have received from the sole concessionnaires, The London Electric Stores, Ltd., of 9, St. Martin's Street, Leicester Square, London, W.C.2, some samples of rheostats and potentiometers of various resistances. These components are cheap, but are exceptionally well made, possessing a small ebonite knob and pointer and an engraved metal circular scale. The resistance is wound on an insulating, heat-resisting strip over which the contact arm rotates. Connections to the latter and to the resistance winding are brought out to two terminals mounted on the side of the instrument.

The dual rheostat has its resistance



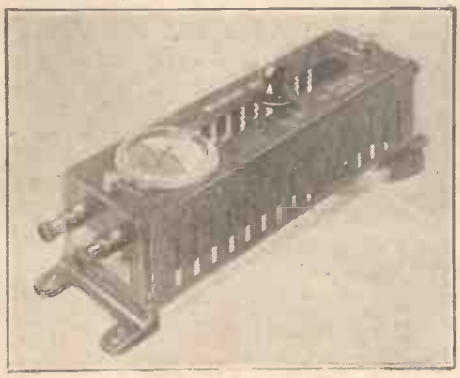
New L.E.S. Rheostats.

winding divided into two portions, one suitable for bright- and the other for dull-emitter valves. The position for contact with either winding is clearly marked on the scale. Similar in design to the filament rheostats, the potentiometer has a resistance winding of 300 ohms and is provided with three terminals, making contact with the two ends of the winding and with the slider.

The filament rheostats (excluding the dual type) are made in three resistances, 7, 15 and 30 ohms. Although the instruments are small, they can handle a fairly large current, and they have a very smooth contact. They are neatly made, and present a very pleasing appearance on a panel.

G.E.C. Battery Charger

A VERY compact D.C. charging resistance is manufactured by The General Electric Co., Ltd., of Magnet House, Kingsway, London, W.C.2. It consists of a slate

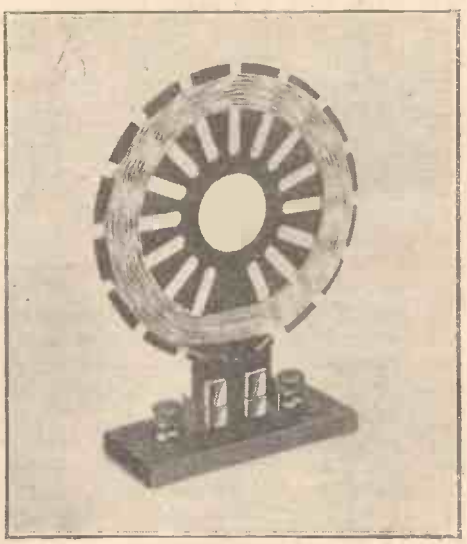


G.E.C. H.T. Battery Charger.

former on which is wound resistance wire of a gauge large enough to pass sufficient current for charging H.T. accumulators without overheating. The resistance winding is treated with heat-resisting cement. By means of an adjustable current regulator, consisting of a self-aligning brush which slides over the turns of wire, the charging of a 60-, 100- or 150-volt accumulater up to .15 ampere (150 milliamps) is possible from a D.C. supply.

The complete instrument is self-contained and is mounted between two cast-iron end-pieces with a sheet-metal cover finished in black. Input and output terminals are mounted at each end, the polarity being clearly marked.

On test the instrument was connected to 210-volt D.C. mains, and it was found that a very fine regulation of the current passing through a 60-volt H.T. accumulator could be obtained by means of the slider, whilst the resistance does not overheat, although, naturally, a certain amount of heat is generated. Care must be taken not to decrease too far the amount of resistance in circuit.

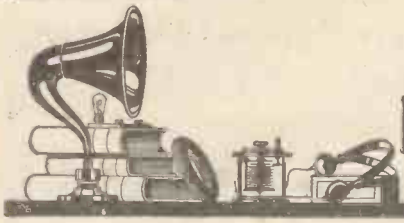


H.T.C. Plug-in Coil.

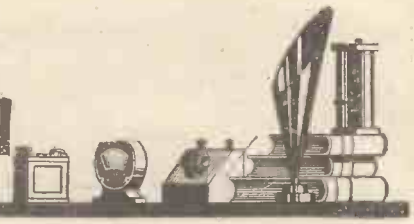
An Efficient Coil

AN efficient coil mounted on a simple but ingenious holder is manufactured by The H.T.C. Electrical Co., Ltd., of 2, Boundaries Road, Balham, London, S.W.12. The coil is wound basket-weave fashion on an insulating circular former, which has slots cut out to accommodate the winding. The two ends of the latter are brought out to two flat contact strips, each of which has a small circular indentation which ensures a good contact when the coil is inserted in its special socket.

The coil which we tested has a fairly low H.F. resistance and self-capacity. With a .0005-microfarad condenser in parallel, the broadcast range of wavelengths is fully covered.



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. Always send stamped, addressed envelope and attach Coupon (p. 680).

Measure of Capacity

Q.—*What is the capacity, in microfarads, of a condenser the capacity of which is stated to be one "jar"?—S. L. P. (Glossop).*

A.—The jar, which consists of 1,000 cms., is a measure of capacity used in many scientific calculations. The jar is equal to .0011 microfarad.—J. F. J.

End-turn Losses

Q.—*Are the losses caused by the unused turns of a tapped A.T.I. really worth while worrying about?—M. A. H. (Burnley).*

A.—This depends upon circumstances and upon the proportion of the coil not in use. In an otherwise very efficient aerial circuit the losses will be considerable, but may be unnoticeable when the rest of the circuit has a fairly high resistance.—R. W.

Condensers

Q.—*If ten fixed condensers, each having the same individual capacity, are connected in series and the total capacity of the whole lot is .001 microfarad, what will be the individual capacity of each of the separate condensers?—N. C. M. (Bournemouth).*

A.—In a case such as you mention, where the total capacity of several equal condensers, connected in series, is known, the capacity of each separate condenser is found by multiplying the total capacity by the number of condensers in series. In your case each condenser has a capacity of .001 × 10 microfarad = .01 microfarad.—J. F. J.

Connecting Cells in Series

Q.—*I have three dry cells each provided with a terminal in the centre and a piece of wire at the side. How do I connect them in series?—D. P. (York).*

A.—The terminal represents the positive pole and the wire the negative pole, and one of the cells should be joined by the former to the positive side of the external circuit. The wire of this cell is connected to the terminal of a second cell and the wire of the second to the terminal of the third. The wire of the third cell is connected to the negative side of the external circuit.—B.

Heaviside Layer

Q.—*What is meant by the "Heaviside layer"?—D. S. (Cambridge).*

A.—This is a semi-conducting layer of ionised air supposed by many scientists to exist at an average height of about 60 miles above the earth's surface. Many theories relating to the cause of certain effects noticed when long distance reception is being carried out have been built up on the hypothesis that such a layer exists. Nevertheless, there are some eminent wireless engineers who consider that the proof of the existence of the Heaviside layer is not conclusive.—R. W.

Shrouded Transformers

Q.—*What is the object of shrouding L.F. transformers by an iron case?—H. B. (Barnet).*

A.—This is done principally in order to shield the windings of the transformer from electric or magnetic fields due to other parts of the set or to electric light or power mains which may exist in the vicinity of the receiver. Any metal might, of course, be used for the casing as far as electric fields are concerned, but it is important to use a material having a high magnetic conductivity (or permeability) in order to secure immunity from magnetic interference.—B.

Reaction Reversing Switch

Q.—*My four-valve set is provided with a switch by means of which the first valve, a tuned anode H.F. stage, may be cut out at will. I find it necessary to reverse the polarity of the reaction coil (which is coupled to the aerial tuning coil) whenever the first valve is switched in or out. I do this reversing at present by changing over the actual leads, but should like to fit a reaction reversing switch in order to make the change easier. What kind of switch is required and how should it be connected?—H. D. R. (Oxford).*

OUR WEEKLY NOTE

POOR CONNECTIONS

The man who is troubled with crackling noises, if told that these are due to poor or loose connections, will probably reply indignantly that every joint has been carefully soldered and that he is positive that such a thing as a poor connection does not exist in his set.

He forgets that there are several joints in every valve set which are never soldered, and that an uncertain contact set up at one of these may cause considerable trouble.

Take, for instance, plug-in coils and valves. The split legs of these are seldom or never cleaned or examined to see whether they are a tight fit in their respective sockets, and yet that they make a good contact is taken for granted. A valve may appear to be quite firm in its holder if three of the legs are a good fit, yet the remaining leg may be making very indifferent contact.

Then take the moving contacts, such as those between the arm and the wire of the filament rheostat or between the spindle and end-plate bush of the variable condenser. After having been in use for some time these usually require a little adjustment in order to ensure good contact for every setting. A little attention to the above points will be amply repaid by an immunity from extraneous noises.

THE BUREAU.

A.—A switch of the D.P.D.T. type will be suitable for your purpose. The leads which at present go to the reaction coil should be taken, instead, to the two centre contacts of the switch which, of course, are connected to the arms of the switch. One pair of side contacts should be connected to the reaction coil, and each of these contacts should be connected to the one of the other pair of side contacts which is diametrically opposite to it. Throwing over the switch arms from one pair of side contacts to the other pair will then result in the polarity of the reaction coil being reversed with respect to the aerial coil.—R. W.

Earth Connection

Q.—*I understand that a good earth connection may be made by soldering the earth lead to a sheet of copper or zinc buried beneath the aerial. What is the best size for the metal sheet and should it be buried in a horizontal or vertical position?—C. K. D. (S.W.6).*

A.—The larger the metal sheet the better, and 2 ft. square is the minimum that should be used. It is better to bury the plate in an upright position with the top edge at least 2 ft. below the level of the ground.—B.

Corks on Aerials

Q.—*What is the reason for threading a number of corks on an aerial? Does it improve reception in any way?—G. T. (Leeds).*

A.—The corks have nothing to do with the efficiency of the aerial from a wireless point of view, but are placed on the aerial in order to render this more readily visible to birds, which might otherwise kill or injure themselves by striking the wire when in flight.—B.

Coupling Sets Together

Q.—*If two two-valve sets, worked off independent aerials, were both connected to the same loud-speaker, would the result be equal to that given by a four-valve set?—T. N. (Bolton).*

A.—It most certainly would not. The most that could be expected from the arrangement you suggest would be that the signals might be twice as loud as was given by one set alone, though for various reasons this would not be the case. The extra two valves of the four-valve set, on the other hand, could each increase the strength of the signals several times, so that the total strength would be very many times greater than that given by the first two valves alone.—J. F. J.

Earthing Aerial

Q.—*How is the aerial earthed for protection against lightning when a counterpoise is employed? Is it sufficient to connect the aerial and counterpoise together or is it necessary to connect the aerial actually to the ground?—R. M. (Ealing).*

A.—It is no protection merely to join aerial and counterpoise together. For the greatest safety they should *both* be put into actual connection with the ground. If the aerial only is earthed there is still danger of the counterpoise being struck. Although owing to its low height above the ground this danger is not great it is practically no extra trouble to earth the counterpoise as well as the aerial when the set is not in use.—J. F. J.

Crackling Noises

Q.—*What is the cause of crackling noises in the loud-speaker which have suddenly made their appearance after the set has worked perfectly for several months? The receiver is of the four-valve type.—P. E. R. (N.3).*

A.—Many possible causes might account for the trouble, but it is fairly safe to assume that an uneven flow of current is responsible. If the H.T. battery is becoming exhausted the voltage of this may be fluctuating and thus affecting the anode current of the valves. The L.T. battery may be to blame, in which case it should be possible to see the valve filaments flickering when the crackling occurs. Again, the L.T. accumulator might be in perfect condition, but the brightness of the filaments might be varying in intensity owing to defective rheostats. There may be a loose connection somewhere in the set, or one of the valves is perhaps fitting but loosely in its holder, where its legs make uncertain contact with the sockets. Possibly the primary of one of the L.T. transformers is broken or the grid leak or grid condenser may be defective. A few simple tests should enable you to track down the fault by a process of elimination.—J. F. J.

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LIST OF TWENTY RESORTS.

SCARBOROUGH.	WHITBY.	YORK.	REDCAR.	DUNBAR.
BRIDLINGTON.	YARMOUTH.	CROMER.	CLEETHORPES.	NORTH BERWICK.
WHITLEY BAY.	LOWESTOFT.	CLACTON.	HARROGATE.	EDINBURGH.
NORFOLK BROADS.	FELIXSTOWE.	SKEGNESS.	SALTBURN.	ABERDEEN.

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"Edinburgh is the most beautiful city in the world. Its picturesque charms appeal to all lovers of nature; its romance and history to all students. With its bright sunshine and bracing climate, it forms the ideal holiday resort."

NORTH BERWICK. By A. D. WALLACE, ESQ., Town Clerk.
"North Berwick is the world's golfing centre. It has 9 first-class golf courses within 6 miles; tennis courts; finest safety swimming pool in the country; safe, sandy beach; picturesque sea-board."

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WHITLEY BAY. By ARTHUR BARKER, ESQ., Clerk to the Whitley Urban District Council.
"Whitley Bay is well known as Northumbria's happy holiday centre-by-the-sea. For bracing air and facilities for every form of outdoor recreation and indoor amusement, it would be hard to beat."

CLACTON. By COUNCILLOR W. FENTON-JONES, J.P., Chairman of the District Council.
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"Cleethorpes provides bracing air with facilities for golf, tennis, bowls, boating, fishing, and it possesses Britain's largest bathing pool. The sands are safe for children."

SALTBURN. By SAM H. RAPP, ESQ.
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ABERDEEN. By COUNCILLOR DOEG, Convener of Public Health and Advertising Committees.
"For a bracing holiday there is no place in the British Isles can surpass Aberdeen, 'The Silver City by the Sea,' with its fresh air from the North Sea and the Grampian Mountains."

DUNBAR. By J. B. BROOK, ESQ., Town Clerk.
"Dunbar is a main-line seaside resort with a most bracing climate, and ample facilities for holiday recreation and amusement. The affection visitors acquire for Dunbar brings them back year after year."

ALL ENTRIES MUST BE POSTED TO Cassell & Co., Ltd., "HOLIDAY BALLOT COMPETITION," La Belle Sauvage, London, E.C.4, NOT LATER THAN MAY 12th, 1926, and the result will be published in the JUNE 19 ISSUE of this paper.

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A.W.3 .....

AN interesting experiment in the relay of an international transmission was made on April 23, when an attempt was made to transmit the concert given in the Buda-Pesth studio to the high-power station at Vienna. Owing to the congestion already existing in the present Austrian telephone cable system, a method was adopted by which it was found possible to use the lines in order not to interfere with the usual telephone traffic.

The new 6-kilowatt transmitting station erected for the Polish Broadcasting Co. at Warsaw was formally inaugurated on Sunday, April 18. The station operates every evening from 5 to 10 p.m. on a wavelength of 480 metres. The Polish authorities now contemplate the erection of a 25-kilowatt transmitter, on the completion of which the present station will be transferred to Cracow.

According to a Netherlands wireless journal, the Morse interference which has recently somewhat spoilt the reception of the Hilversum and Daventry transmissions in Holland has been traced to the Dutch cruiser *Sumatra*.

Over 500 further applications for licences to erect broadcasting stations in the United States of America have been received during the past few months by the Department of Commerce, New York. There are now 530 licensed stations, and it is stated that no new permits have been granted by the authorities since October, 1925.

The P T (Bordeaux) relay station has been testing almost every night during the last ten days. The French Posts and Telegraphs now propose to open in quick succession the Lille, Angers and Strasburg stations, which will possess a power of 500 watts. Their official opening should coincide with the increase of power of the Paris P T T station to 10 kilowatts.

The Hilversum high-power broadcasting station is now effecting test transmissions on 1,060 metres.

It is hoped to broadcast the Trooping of the Colours on the King's birthday, June 3.

It has been decided to give special "Staff" nights at intervals from the London station.

Readings by well-known authors from their books will be given on Mondays during the next two or three months; in some cases, by arrangement with publishers, they will include works not yet issued. Authors taking part in this series include Stacey Aumonier, C. S. Evans, A. E. Coppard, John Metcalfe, Miss E. M. Delafield and others.

F. Tennyson Jesse and H. M. Harwood's comedy *Billeted* will occupy the whole of the evening programme at Cardiff on April 28. It will revive memories of the lighter side of the Great War.

On Thursday evening, April 29, the London station will broadcast a radio version of Oscar Wilde's play *Lady Windermere's Fan*.

The *Daily Graphic* concert will be given on Friday, April 30.

A special concert is to be broadcast from the New Verrey's Restaurant on Saturday, May 1.

In memory of the late district engineer, Mr. Charles A. Falconer, the gift of a wireless set has been made to the Riccarton Railway Institute, Kilmarnock.

Glasgow Corporation still forbids the erection of aerials across public streets. Amateurs persist in trying to obtain consent, however, and at the last meeting of the Town Council three applications were submitted. As in previous cases, they were refused.

Pouishnoff is playing at Glasgow at the end of May. This is a return visit, the great pianist having expressed much appreciation of the Glasgow station orchestra.

With the broadcast of *Till Eulenspiegel* from the Glasgow station, it is believed that the first transmission of a Strauss symphonic poem has been accomplished. The music was introduced by a spoken explanation of the work in furtherance of the plan to make the talks have a bearing on the programme which follows.

The education authorities of Aberdeen are pleased with the way in which the B.B.C. has co-operated in the endeavour to instil a love of good music in school children. This season the Aberdeen station orchestra has assisted in eight concerts, which more than 4,000 children have attended.

In connection with the Glasgow Children's Corner, a public concert for children is being arranged for May 29. Lady Weir will preside, and the profits of the undertaking are to be handed over to the Wireless for Hospitals Fund.

Fishermen in the north of Scotland are now installing receiving sets on their boats. When working on the west coast, between Oban and the Clyde, they can usually pick up Glasgow, Belfast, Dublin, Cardiff and Bournemouth.

Mr. Matheson Lang broadcast for the first time on April 23. He gave half an hour of excerpts from Shakespeare from the Glasgow station.

A special section for the display of radio apparatus is to be organised at the forthcoming Sample Fair at Padua, which is to be held from June 5 to 20. Prizes will be offered for the best types of apparatus, and the competition is open to manufacturers of all nations.

Alfresco concerts from the London parks are now being organised by the B.B.C., and the first of these will probably be given on May 5.

Speeches and part of the musical programme at the annual dinner of the Dorset Men in London are to be relayed from Daventry and Bournemouth. The function takes place on May 3.

Mr. John Galsworthy will probably broadcast from the London studio early in May.

The first relay from Cambridge is announced to take place on Sunday, May 2, when a choral service from King's College Chapel will be broadcast.

A new transmitting station has been recently heard in England, giving the call-sign "Monza." This is a new station situated near Milan.

A wireless amateur at Melbourne, whose call-sign is 3 B H Benalla, has clearly picked up a message from the Wilkins expedition, addressed to the Federal Prime Minister, reporting progress. Mr. Bruce replied by wireless, tendering his congratulations.

In order to devote a considerable part of his time to literary work, Mr. C. A. Lewis has resigned his appointment as chairman of the Programme Board. Mr. R. H. Eckersley succeeds Mr. Lewis in the programme department.

A new Polish broadcasting station was opened at Warsaw recently, the ceremony being attended by Count Skrzynski, the Prime Minister.

Negotiations are still proceeding regarding Australian control of the beam wireless station in England. Mr. Bruce has emphatically renewed the request that Australia be not denied privileges granted to the Marconi Co. for communication with foreign countries.

Music by winning bands at Brighton Musical Festival on May 15 is to be included in the programmes from 2 L O and other stations.

Lord Riddell will take the chair at the London School of Economics on May 4, when the question "Is there too much broadcasting?" will be debated by Miss Sheila Kaye-Smith and Capt. P. P. Eckersley. The discussion will be broadcast.

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				Aerial circuit using standard P.M.G. aerial.	Closed circuit.	
L. 25	29	12	36	220—280	85 225	5/-
L. 30	49	14	50	250—360	110—280	5/-
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One side of coil bears coil No. and approximate wavelength range in aerial circuit with .0005 mfd. condenser. On either side is stated inductance in micro-henries and wavelength range in closed circuit with .0005 mfd. condenser. Write for the Igranic leaflet D.6. which describes the Igranic "XLLOS" Coil in detail, or see the coil at your dealers.

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WHA — WIRELESS HAPPENINGS ABROAD

OPPORTUNITY makes the linguist! That is the secret reason why Continental people we have met in the past, say at Paris, Brussels, Berlin or Monte Carlo—or wherever it was you were enjoying yourself—have always shone as accomplished linguists compared with Britons, who, it was said, never learnt any language but their own. But things are all changed now, and the solution of the language question will prove to be that in the very near future English people will easily understand two or three languages besides their own. It is an utter mistake to get the idea that to understand a foreigner is useless, if not impossible! This old British dogma simply came about because of our insular position; we never had the opportunity, as a nation, to mix with foreigners. It has all been changed by wireless. Opportunity makes the linguist, and to-day we have all the nations of Europe talking to us. To learn a foreign language is really a pleasure, if you do not worry yourself and make a torment of it. Don't worry! Listen! That is all that is necessary. It comes like learning to swim. It is all a matter of opportunity. Whoever learnt to swim without any water?

In the very near future the home-loving population of the British Isles will find that they can understand French, German, Spanish, Italian and so on quite well. On the Continent to-day everybody who is anybody can talk, or at any rate understand, at least two or three languages—simply because of their opportunity, nothing else. It is not a matter of cleverness; anybody can do it, and it is humanly natural to be able to understand what you are accustomed to hearing. All opportunity! Probably as time goes on new generations will look back with astonishment at the dark ages when human creatures were so shut away from the world that they only understood one language. The average man might know fifteen or twenty languages quite easily; there is no insurmountable barrier in the way. It is all a matter of taking your opportunities and sticking at it! Don't be lazy! It is always the lazy person that has no time for anything! Most people have already a bit of a grounding in some of the Continental languages.

The Wanderer

Of course Daventry, or your local station, is out and away the best to listen to so far as purity of tone and strength in musical transmissions are concerned; but it is grand sport hunting and wandering about all over the Continent listening to what they are talking about.

Don't bother about interference. Some people are always complaining; if it isn't the receiving set, then it is the transmitting station, or some harmless little oscillator, or if for the moment there is nothing to grumble at here, then they find fault with the speaker or musician.

Some of the anecdotes told by the French speakers in the Journal Parlé at the Tour Eiffel station, or about 8.30 p.m. at the Radio-Paris station are very smart. In fact some people think too smart! I came across a complaint the other day in a well-known German radio paper saying that they thought it was a shame and an international disgrace that such anecdotes laughing at the Germans should be transmitted all over Europe from Paris. So I tuned in the Parisian station in question at the appointed time just to see if I could catch some of these "smart" anecdotes which have been so upsetting to the German listener. And I caught a good one, but it was a joke against the English this time. Never mind! They were jolly good anecdotes, both of them, and I shall be glad to hear more.

I see no harm in a little international banter through the ether like this. I think, perhaps, it makes people more friendly to laugh at each other a bit, and when the joke is good it is easy to take it in good part.

The afternoon language courses at Königswusterhausen that come on at two o'clock G.M.T. are remarkably interesting. They say it took a year to prepare these courses of instruction, and they really are well worth listening to. Some of the young lady leady teachers sound quite pretty! I am beginning to think German is really quite a sweet language.

H. C. S. C.

THE WAVELENGTH RE-SHUFFLE

IN consequence of the proposals agreed to at the recent Geneva Conference, the broadcasting authorities in each country are now studying the requirements of their several stations to determine the best distribution of wavelengths in their allotted wavelength range.

It is understood on good authority that the provisional acceptance of the proposals by the delegates to the conference will be ratified by their respective Governments, so that the new system may very shortly be in operation.

So far as Great Britain is concerned, it is understood that the B.B.C. have already formulated a provisional re-distribution of wavelengths to its stations, and this will be submitted to various experts for full consideration, so that nothing may stand in the way of an all-round improvement in reception conditions. The expected wavelengths of most of the main stations are shown below, but it should be clearly understood that these are only those at present suggested and may be subject to modification.

Station	*Suggested New Wavelengths*	*Old Wavelengths*
Aberdeen ...	491.8	495
Glasgow ...	405.4	422
Belfast ...	326.1	440
London ...	361.4	364
Newcastle ...	312.5	407
Manchester ...	384.6	378
Cardiff ...	353	353
Bournemouth	306.1	387
Birmingham	288.5	479

The most drastic proposed change is in Birmingham's wavelength, which it is proposed to reduce very considerably. In all probability the wavelengths of Belfast, Bournemouth and Newcastle will also be reduced appreciably, but to a lesser extent.

In the case of Bournemouth the change will be welcomed, as many listeners have experienced strong interference from stations on the Continent. Probably London will retain its present wavelength to within a metre or two, but the slight change will render reception of Cardiff, which is still on 353 metres, even more difficult in London than is at present the case.

Aberdeen is well separated on 491.8 metres from the other stations, so that the scattered population served by the station should enjoy complete freedom from interference.

Now that the new Prague broadcasting station is in daily operation, the old ½-kilowatt transmitter will shortly be erected at Bratislava, where it is expected it will work on a wavelength of 264 metres.

NOTE.—*In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.*

GREAT BRITAIN

The times given are according to British Summer Time.

London (2LO), 364 m. 1-2 p.m., con. (Tues., Thurs, Fri.); 3.15-3.45, transmission to schools; 3.30-5.30, con. (Sun.); 4-5 p.m., con.; 5.15-5.55, children; 6 p.m., light music; 7-8 p.m., time sig., news, music, talk; 8.10-10 p.m., music; 9.0 news (Sun.); 10.0-10.30 p.m., time sig., news, talk; 9.30-10 p.m., special feature (Mon., Wed., Fri.). Tues. and Thurs. the Savoy Bands are relayed until 11.30 p.m., and on Sat. until midnight.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 440 m. **Birmingham** (5IT), 479 m. **Bournemouth** (6BM), 387 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 422 m. **Manchester** (2ZY), 378 m. **Newcastle** (5NO), 407 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 315 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 321.5 m. **Liverpool** (6LV), 331 m. **Nottingham** (5NG), 326 m. **Plymouth** (5PY), 338 m. **Sheffield** (6FL), 306 m. **Stoke-on-Trent** (6ST), 301 m. **Swansea** (5SX), 482 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 4 p.m. onwards, own con. on Mon. Dance music daily (exc. Sun.) till midnight; on first Friday in each month until 2 a.m.

IRISH FREE STATE.

Dublin (2RN), 397 m. Daily (exc. Sun.), 7.30 p.m.

CONTINENT

The Times are according to the Continental system; for example, 16.30 *is* 4.30 *p.m., and* 08.00 *is* 8 *a.m. B.S.T.*

AUSTRIA.

Vienna (Radio Wien), 582.5 m. and 541 m. (temp.) (10 kw.). 11.00, con. (almost daily); 15.30, con.; 19.25, news, weather, time sig.; con., lec., news; 20.00, con.; 22.00, dance (Wed., Sat.).

Graz, 402 m. (1 kw.). Relay from Vienna. Also own con. (Tues., Wed., Fri.), 20.10.

BELGIUM.

Brussels, 264 m. (1½ kw.). 17.00, orch. (Tues., Thurs., Sat. only), news; 20.00, lec., con., news (opera, Mon. and Wed.).

CZECHO-SLOVAKIA.

Prague, 368 m. (5 kw.). Con., 20.00-23.00, daily. Also tests on 800 m.

Brunn (OKB), 521 m. (2.4 kw.). 10.00, con., news (Sun.); 19.00, lec., con. or dance (daily).

DENMARK.

Copenhagen (Radioraadet), 347.5 m. (2 kw.). Sundays; 15.30, lec.; 17.30, children; 20.00, play; 21.15, news, con.; 21.15, news, Esperanto (Mon.), silent night. Weekdays (Tues., Fri., Sat.); 20.00, lec., con., news, con.; 21.30, dance (Sat.).

Ryvang, 1,150 m. (1 kw.). Sundays: 09.00, sacred service; 17.30-21.30, same as Copenhagen; 20.00 (Wed., Thurs.), lec., con., news, orch.

Sorö,* 1,150 m. (1½ kw.). Occasionally relays 5XX. Also broadcasts at times on 1,500 m.

* Relay Copenhagen.

FINLAND.

Helsingfors (Skyddskar), 504 m. (500 w.). Temporarily closed down.

Helsingfors, 440 m. Con., 18.00 (Tues., Thurs., Sat., Sun.).

***Tamafors,** 368 m.

***Jyvaskyla,** 561 m. (200 w.).

***Uleaborg,** 233 m. (200 w.).

* Relay Helsingfors.

GRAND DUCHY OF LUXEMBURG.

Radio Luxemburg (LOAA), 1,200 m. Con.: 14.00 (Sun.), 21.00 (Thurs.).

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 11.00, markets (exc. Sun. and Mon.); 11.20, time sig., weather; 15.00, 16.45, Stock Ex. (exc. Sun. and Mon.); 18.00, talk, con., news; 19.00 and 23.10, weather; 21.00, con. (2,740 m.) (daily).

Radio-Paris (CFR), 1,750 m. (about 3 kw.). Sundays: 12.45, con., news; 16.30, Stock Ex., con.; 20.15, news, con. or dance. Weekdays: 12.30, con., markets, weather, news; 16.30, markets, con. (irr.); 20.15, news, con. or dance.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (800 w.). 14.00 or 15.00, studio con. or outside relay; 20.30, lec. (almost daily); 21.00, con. (daily).

"Le Petit Parisien," 333 m. (temp.) (1 kw.). 21.15, con. (Tues., Thurs., Sat., Sun.).

Radio-Toulouse, 430 m. (2 kw.). 12.30, con., time sig. (daily); 17.30, news (exc. Sun.); 20.45, con.; 21.25, dance (daily). Also operatic relays on 500 m., occasionally.

Radio-Lyon, 280 m. (2 kw.). 20.20, con. (daily).

Radio Agen, 318 m. (250 w.). 12.40, weather, Stock Ex.; 20.00, weather, Stock Ex.; 20.30, con. (Fri.).

***Lyon-la-Doua,** 488 m. Own con., 20.00 (Mon., Wed., Sat.).

***Marseilles,** 351 m. (500 w.).

***Toulouse** (PTT), 280 m. (2 kw.).

***Bordeaux,** 411 m.

* Relays of PTT Paris.

Montpellier, 240 m. (1 kw.). Relays Radio Toulouse.

Angers (Radio Anjou), 300 m. (500 w.). Daily: 20.30, news, lec., con.

GERMANY.

Berlin, on both 504 and 571.5 m. (4 kw.). 09.00, sacred con. (Sun.); 11.00, con. and tests; 12.55, time sig., news, weather; 15.00, educ. hour (Sun.), markets, time sig.; 17.00, orch.; 20.30, con., weather, news, time sig., dance music until 24.00 (nightly). Relayed on 1,300 m. by Koenigswusterhausen and Stettin (241 m.).

Königswusterhausen (LP), 1,300 m. (8 kw.). 11.30-12.50, relays Berlin (Sun.); 15.00, lec. (daily); 18.30, relay of Berlin (Vox Haus) con. (daily). 2,525 m. (5 kw.), Wolff's Buro Press Service: 06.45-20.10. 2,880 m., Telegraphen Union: 08.30-19.45, news. 4,000 m. (10 kw.), 07.00-21.00, news.

Breslau, 418 m. (4 kw.). 12.00, con. (daily), Divine service (Sun.); 12.55, time sig. (Sun.), weather, Stock Ex., news; 16.00, children (Sun.); 17.00, con.; 19.00, lec.; 20.30, con., weather, time sig., news; 21.45, dance (Sun., Thurs.). Relay: Gleiwitz, 251 m.

Frankfort-on-Main, 470 m. (1½ kw.). 08.00, sacred con. (Sun.); 11.55, time sig., news; 12.55, Nauen time sig.; 16.00, con. (Sun.); 16.30, con.; 18.00, markets, lec.; 20.00, lec., con., weather, dance. Relay: Cassel, 273.5 m.

Hamburg, 392 m. (4 kw.). Relayed by Bremen (279 m.), Hanover (294 m.), Kiel (233 m.) Sundays: 07.25, time sig., weather, news, lec.; 09.15, sacred con.; 13.15, con.; 18.00, con.; 19.15, sports, weather, con. or opera, dance. Weekdays: 06.55, time sig., weather; 07.00 and 07.30, news, weather; 12.55, Nauen time sig., news; 14.00, weather, con.; 16.15 and 18.00, con.; 19.00, lec.; 19.55, weather and con.; 22.00, dance (daily, exc. Tues.).

Königsberg, 462 m. (1 kw.). 09.00, sacred con. (Sun.); 12.55, time sig., weather, news; 16.30, con.; 17.00, con. (Sun.); 19.30, lec.; 20.00, con. or opera, weather, news, dance (irr.).

Leipzig, 452 m. (700 w.). Relayed by Dresden (294 m.). 08.30, sacred con. (Sun.); 11.00, educ. hour (Sun.); 12.00, con. (daily); 12.55, Nauen time sig., news; 16.30, con., children (Wed.); 20.15, con. or opera, weather, news, cabaret or dance (not daily).

Munich, 487.5 m. (3 kw.). Relayed by Nuremberg (340 m.). 11.30, lec., con. (Sun.); 14.00, time sig., news, weather; 16.00, orch. (Sun.); 16.30, con. (weekdays); 18.30, con. (weekdays); 19.15, lec.; 19.30, con. (Sun.).

Munster, 412 m. (2½ kw.). Relayed by Elberfeld (259 m.), Dortmund (283 m.). 11.45, radio talk, Divine service; 12.00, news (Sun.); 12.30, news (weekdays); 12.55, Nauen time sig.; 15.30, news, time sig.; 16.00, con.; 17.00, children (Sat.); 19.40, news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 24.00 and 04.00, weather and news.

Stuttgart, 447 m. (1½ kw.). 11.30, con. (Sun.); 16.30, con. (weekdays); 17.00, con. (Sun.); 18.30, time sig., news, lec., con. (daily); 21.15, time sig., late con. or cabaret.

HOLLAND.

Amsterdam (PCFF), 1,955 m. (1 kw.). Daily: 06.35-15.30 (exc. Mon. and Sat., when 12.30-13.30), news, Stock Ex.

Hilversum (HDO), 1,050 m. (2½ kw.) 09.00, sacred service (Sun.); 19.10, con.; 21.00, news, etc. Will shortly test on 25 kw.

HUNGARY.

Buda-Pesth (Csepel), 560 m. (2 kw.). 09.00, news; 12.00 and 15.00, weather, news; 17.00, dance music; 20.00, con. or opera, dance.

Kosice, 2,020 m. (2½ kw.). 19.00, con.

ICELAND.

Reykjavik, 327 m. (700 w.). Tests: 22.30, 24.30.

ITALY.

Rome (IRO), 425 m. (2½ kw.). 10.30, sacred con.; 13.15, official communique; 17.00, children; 17.30, relay of orch. from Hotel di Russia; 17.55, news, Stock Ex., jazz band; 20.30, news, weather, con.; 22.15, late news.

Milan, 320 m. (2 kw.). 20.00-01.00, con., jazz band. Testing on 425 to 430 m.

JUGO-SLAVIA.

Belgrade (Rakovitza) (HFF), 1,650 m. (2 kw.). 17.00, news (daily), con. (Tues., Thurs., Sat.).

LETTLAND.

Riga, 488 m. (2 kw.). Con. daily, 21.00-22.00.

NORWAY.

Oslo, 382 m. (1.2 kw.). 11.00, Divine service (Sun.), Stock Ex. (weekdays); 13.15, markets; 19.15, news, time, lec., con.; 22.00, time, weather, news, dance relayed from Hotel Bristol, Oslo.

Bergen, 358 m. (1½ kw.). Testing.

POLAND.

Warsaw, 480 m. (6 kw.). Daily: con., 11.00-13.00; 15.00-23.00, daily.

RUSSIA.

Moscow (RDW), 1,450 m. (12 kw.). Weekdays: 13.30 and 18.55, news and con.

(Popoff Station), 1,010 m. (2 kw.). 11.00, 12.00, lec.; 14.00, 20.00, con. (Tues., Thurs., Fri.).

Radio Peredacha, 410 m. (6 kw.).

Trades Union Council Station, 450 m. (2 kw.). 19.00, con. (Mon., Wed.).

Leningrad, 940 m. (2 kw.). Weekdays: 16.00.

Nijni Novgorod, 1,400 m. (1.2 kw.). 21.30, con.

SPAIN.

Madrid (EAJ6), 392 m. (1½ kw.). Daily: con. (times vary daily). Closes at 24.00 on Sun., Wed., Sat.

Madrid (EAJ7), 373 m. (4½ kw.). 17.30-24.00, con. (almost daily).

Madrid (EAJ4), 340 m. (3 kw.). 16.00, con.

Barcelona (EAJ1), 324 m. (3 kw.). 17.00-

(*Concluded in second column on page* 676)

SIGNING CHEQUES BY WIRELESS

IN a recent demonstration of the possibilities of autographic radio by Captain Ranger, of the Radio Corporation of America, one of the tests consisted in transmitting in facsimile the signature to a cheque signed in New York and payable in London. Although the general procedure is somewhat similar to that employed in transmitting still-life photographs over a line-wire, the Ranger apparatus operates through the medium of a light-sensitive cell, as distinct from the older method of traversing a stylus over a specially prepared photographic record.

The message or signature to be transmitted is first written upon a transparent sheet of special material with an ordinary pen and black ink. The sheet is then inserted inside a cylinder containing an electric light focused into a powerful beam, which is moved to and fro, in a series of parallel movements, so as to cast a shadow of the writing, piece by piece, upon a photo-electric cell. This in turn modulates the radiated carrier-wave in accordance with the varying light and shade effects.

The apparatus at the receiving end is synchronised by means of a specially designed tuning-fork control, causing an inking-device to travel over a sheet of paper at the same speed as the movement of the light-beam at the transmitting end. The incoming signals cause the inker to make contact with the paper at the proper intervals and so reproduce the outlines of the original signature. M. A. L.

"BROADCAST TELEPHONY" (*cont. from page 674*)

21.00, news, lec., con. (Sun.); 18.00-23.00 (daily).

Barcelona (Radio Catalana) (EAJ13), 462 m. (4½ kw.). 19.00-24,00, con., weather, news.

Bilbao (EAJ9), 415 m. (1 kw.). 19.00, news, weather, con. Close down 22.00.

Bilbao (Radio Vizcaya) (EAJ11), 418 m. (2 kw.). 22.00-24.00, con. (daily).

Cadiz (EAJ3), 357 m. (550 w.). 19.00-21.00, con., news. Tests daily (Mon., Tues., Wed., Sat.), 24.00.

Cartagena (EAJ15), 335 m. 19.00-22.00, con. (daily).

Seville (EAJ5), 357 m. (1½ w.). 21.00, con., news, weather. Close down 23.00.

Seville (EAJ17), 300 m. 19.00-22.00, con. (daily).

San Sebastian (EAJ8), 346 m. (500 w.). 17.00-19.00, 21.00-23.00 (daily).

Salamanca (EAJ22), 405 m. (1 kw.). 21.00, con. (daily).

Saragossa, about 325 m. Testing.

SWEDEN.

Stockholm (SASA), 428 m. (1 kw.). 11.00, sacred service (Sun.); 12.30, weather; 14.00, con. (Sun.); 17.00, children (Sun.); 18.00, sacred service; 19.00, lec.; 21.15, news, con., weather. Dance (Wed., Sat.).

SWITZERLAND.

Lausanne (HB2), 850 m. (1½ kw.) (temp.). 20.00, lec., con. (daily).

Zurich (Hongg), 513 m. (temp.) (500 w.). 11.00, con. (Sun.); 12.00, weather; 12.55, Naden time sig., weather, news, Stock Ex.; 13.30, piano solo; 17.00, con. (exc. Sun.); 18.15, children, women; 19.00, news, weather; 20.15, lec., con., dance (Fri.).

Geneva (HB1), 760 m. (2 kw.). 20.15, con. (daily).

Berne, 434 m. 10.30, organ music (exc. Sat.); 16.00, 20.30, con.

Basle. Testing.

The arrangements for a wireless exhibition at Bingley Hall, Birmingham, May 19 to 29, in connection with the Queen's Hospital Extension Fund, have been abandoned owing to insufficient support accorded by the trade.

CHIEF EVENTS OF THE WEEK

SUNDAY, MAY 2

London	3.30	Choral Service, relayed from King's College Chapel, Cambridge.
Aberdeen	9.15	Light Orchestral Concert.
Birmingham	3.30	Grieg Programme.
Bournemouth	9.15	Light Symphony Programme.
Manchester	4.40	The Lancashire Military Band.

MONDAY

London	8.30	The Music Society String Quartet.
Aberdeen	8.0	Scottish Programme.
Belfast	10.0	Chamber Music.
Mancheste.	8.0	Solos and Songs at the Harp.
Newcastle	8.0	Chamber and Vocal Music.

TUESDAY

London	8.5	Popular Orchestral Concert.
Daventry	9.0	The String Players of the Modern Chamber Orchestra.
Birmingham	8.0	Welsh Programme.
Bournemouth	8.0	"Conviviality."
Cardiff	8.0	Musical Comedy.
Manchester	8.0	Launched on the Ether.

WEDNESDAY

London	8.0	*Dido and Æneas.*
Aberdeen	8.0	Variety.
Birmingham	8.0	Lightsome Items.
Bournemouth	8.0	Music and Plays.
Belfast	8.0	Concert Music.
Dundee	8.0	Scottish Programme.
Edinburgh	8.0	A Spring Programme.
Hull	9.0	Easthope Martin Programme.
Leeds (Bradford)	8.0	The Sheffield Orpheus Male Voice Quartet.
Manchester	8.0	An Hour with Herbert Bedford.
Newcastle	8.0	*Acis and Galatea.*
Nottingham	8.0	Concert by Blind Artistes.
Sheffield	8.0	A Night of Variety.

THURSDAY

London	8.0	Band Programme.
London	10.0	Pianoforte Recital by Frederic Lamond.
Aberdeen	8.0	Symphony Concert.
Birmingham	8.0	*Les Cloches de Corneville.*
Bournemouth	9.0	Orchestral Spanish Feature.
Cardiff	8.0	Cotswold Breezes.
Glasgow	8.0	Programme commemorating the accession of King George V.
Manchester	8.0	Listeners' Leisure.

FRIDAY

London	10.0	Brahms' Commemoration.
Aberdeen	8.0	Children's Orchestral Concert.
Birmingham	8.0	Playlets.
Birmingham	9.5	Light Interlude.
Bournemouth	8.0	The Royal Tank Corps Band.
Belfast	8.15	*A Mid-Victorian Hour.*
Newcastle	8.0	Light Orchestral and Vocal Concert.

SATURDAY

London	8.0	Students' Choruses.
London	8.30	*Listening Time.*
Aberdeen	8.15	Pianoforte and 'Cello Recital.
Birmingham	8.0	Popular Programme.
Bournemouth	8.0	Winter Gardens Night.
Cardiff	8.0	"Listening?"
Glasgow	8.0	Music and Dance Programme.
Manchester	8.0	A Popular Concert.
Newcastle	8.0	A Saturday Night Concert.

"Some Novel Baskets and How to Make Them" is the title of a well-illustrated article appearing in the current issue of "The Amateur Mechanic and Work" (3d.). Other articles appearing in the same issue are: "Pendulums for Electric Clocks," "A Frieze that Saves Whitewashing," "Toy Furniture from Waste Tins: The Kitchen," "The Reflecting Telescope and How to Use It," "Accumulators: Their Action, Care and Maintenance," etc. etc.

Is this a Record?

SIR,—On Easter Monday we logged between 00.00 G.M.T. and 06.30 G.M.T. one hundred and seventy American stations on *one* valve. This breaks G 6 T M's record for the largest number of stations logged at one sitting.

Stations were heard in every district and in Porto Rico, Mexico, Brazil, Canada and New Zealand, and all on wavelengths between 35 and 42 metres.

Conditions seemed ideal, but atmospherics were very bad owing to local thunderstorms. Stations as far as Washington and California were received at good strength, and it is seldom this can be done on a single-valver.

The set used was a Reinartz, and the aerial 50 ft. long and 27 ft. high.—T. A. AND F. C. STUDLEY (G 5 T D) (Harrow).

Grid Bias

SIR,—With reference to the remarks on grid bias as part of the H.T. battery, I beg to point out that the General Radio Co., 235, Regent Street, London, W.1, now issue their H.T.B. of 99 volts with grid bias at the negative end tapped at every 1½ volts up to 9 volts. The arrangement is very effective.—C. W. S. (Cheltenham).

A Novel Aerial

SIR,—I would like to give you my experience with an indoor aerial which I fixed up as an emergency a short while ago.

At the head of the stairs leading to the rooms above is a banister guarding the landing above, the banister being composed of vertically fixed rails.

Having a ¼ lb. of No. 24 insulated wire, this was wound in and out of the rails until they were entirely wound with the wire, the turns being about 2 in. apart. The end was then connected to the set in the room below. The results obtained were quite satisfactory considering the temporary and roughly made nature of this aerial.—C. A. L. C. (Winchester).

Morse Interference

SIR,—I have read with interest THERMION'S remarks on morse interference on the south coast, and I am writing to tell you of my experiences in Dover during the last three months.

The set I used was an O-V-2 three-valver and was reasonably selective; I am able to cut out 5 X X and receive Radio-Paris and also able to separate most stations on the broadcast band.

On the broadcast band it was impossible to get a quiet period free from morse for more than a minute at a time, and most of the morse signals could not be tuned out anywhere on a .0005 condenser in parallel or series.

On the Daventry wavelength there was always a background of morse more or less powerful; this was not the mush brought in by an oscillating receiver, but ordinary spark signals.

At fairly frequent intervals Daventry is blotted out by morse signals. I could not get rid of these between 100 and 400 metres. I could not read morse fast enough to copy the signals, but I suspect the cross-Channel steamers, for a friend of mine who lives on the "front," and also gets them, tell me they usually coincide with the arrival of a steamer.—S. F. (Chatham).

Tramways and Interference

SIR,—I was very interested in E. M. R.'s letter "Interference from Tramways" in No. 202. May I be allowed to add the following remarks on the subject.

For a little more than the last two years I have suffered from interference caused by the local tramways, and so far have not been able to eliminate it in any way. Unfortunately I live near a terminus, and, consequently, besides hearing the ordinary kind of interference, I also hear a series of loud reports every time the pole is replaced on the overhead wire (one night there were over fifty of these crashes in one attempt to replace the pole!). Some of the cars also spark continuously all the way. The noise then heard is so bad that it is advisable to close down until the car is out of the first section.

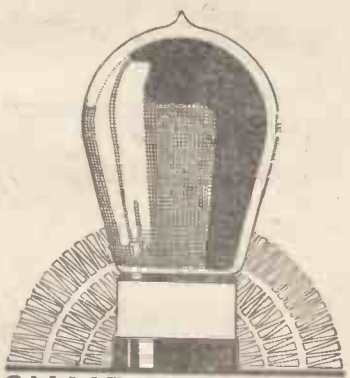
Although the lighting circuit is the chief cause of interference, I find that the driving circuit is also responsible for enough to make listening to stations farther off than about fifty miles an impossibility.

I am wondering whether it would be possible through your columns to organise a campaign against this very unnecessary interference, as I am sure there are a large number of listeners suffering in the same way.—V. G. H. (Reading).

John Henry will broadcast from an aeroplane on May 11.

It is reported that the Commonwealth Government is likely to take over the whole of the broadcasting operations in Australia shortly.

Louden Valves



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You are at liberty to make whatever use you like of this letter, as I feel that the public ought to know the full value of good reception combined with economy.

Yours faithfully,
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P.E.R.1	6	0·2	60 to 200	For Transformer Coupled Amplifiers	12/-
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F.1	5 to 5·5	0·4	40 to 80	Detection & L.F. Amplification	4/6
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E.P.S. 83

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Dennis Noble.

NEXT WEEK AT 2LO

By "THE LISTENER"

Mavis Bennett.

PROGRAMMES of next week offer considerable variety. On Sunday afternoon, May 2) the choral service from King's College, Cambridge, will be relayed. This will be followed by a recital given by Ben Davies, the famous tenor.

At 5.30 commences the series of new weekly broadcasts, illustrating, by excerpts from the plays, the characters of some of Shakespeare's heroines, the parts being taken by famous actresses. For next Sunday the ever-popular Rosalind has been chosen from *As You Like It,* and the part will be taken by Edith Evans. At 8.40 the choral singing of the united choirs of New College, Magdalen and Christ Church, Oxford, under the direction of their respective organists, will be relayed.

As a contrast will follow a light programme by the Wireless String Orchestra. In this the favourite works of Grieg will be found, with two well-known singers. Ida Kiddier, who sings "Solveig's Cradle Song," which is less known than the more hackneyed "Solveig's Song" but sometimes thought to be still more beautiful. Dennis Noble is the companion singer, and he will sing a poem for voice and stringed orchestra entitled "Alone."

A well-varied programme also is announced for Monday evening. Ruth Anderson and Le Breton Martin will give readings of poems by old English poets, followed by a short recital of songs of Schubert. Tom Goodey is the singer. At 8.30 the second of the Chenil Galleries' concerts is to be relayed. The Music Society String Quartet, on this occasion augmented to a quintet, will be heard.

A more popular type of music is promised for Tuesday, when an orchestral concert will be given by the Wireless Orchestra, conducted by Dan Godfrey. The soloists are Kate Winter (soprano), and Roy Henderson (baritone).

Old English music is heard again on Wednesday, when a concert performance of Purcell's fine opera *Dido and Æneas* will be given, the singers being Elsie Suddaby, May Blyth, Mavis Bennett, Gladys Palmer and Roy Henderson.

A unique feature is promised us for Thursday, when listeners will hear between 8 and 9.30 a programme of music given by the Royal Parks Band, relayed from the Hyde Park bandstand. Later follows a recital by Frederick Lamond.

On Friday listeners will hear the third part of *That Child,* by Florence Kilpatrick and songs by Blanche Tomlin.

The features on Saturday are entertainment by the "Vicar of Mirth" and the final edition of the revue *Listening Time.*

THE "CONCERT SIX" IN USE (*continued from page* 663)

all of the variable condensers may be turned rapidly in either direction without producing so much as a squeak. When the transmission comes from a near-by station and is therefore very powerful, it may be necessary to reduce the value of the first resistance to rather a smaller amount by screwing its knob in, in order to produce complete stability. This will make the set less sensitive, so that when you turn from the powerful transmission to a more distant one a slight unscrewing of the knob will be necessary.

One rather interesting point about the set is that 5XX, Radio-Paris, the Eiffel Tower and other long-wave stations may be received without using any coils at all in the anode-tuning inductance holders. If the tuning condensers are turned to zero the high-frequency valves become resistance-capacity coupled and long-wave signals come in very well indeed. Any tendency to oscillate when the set is used in this way may be checked by adding a little capacity in parallel with the resistances by means of one or both of the anode-tuning condensers.

When the set is first tried out only one note magnifier should be used. If reception is not so pure as it should be, condensers of different values should be tried across the primary of the transformer. The effect of shunting its secondary with a variable resistance may also be tried. As soon as you have obtained the desired standard of quality with one stage of low-frequency amplification, place the plug in the second jack and get this stage to your liking. It may be found necessary to reverse the leads to the primary of the low-frequency transformer, whilst if the second stage produces any kind of distortion, different condenser values must be tried in parallel with the choke. Be very careful to use a high voltage on the plates of the note-magnifying valves and to apply suitable negative bias to their grids. The best way I know of accomplishing this is as follows: If you do not possess a milliammeter, borrow one from a friend and wire it in series with the H.T. + 2 lead. When the right grid bias and plate voltage are applied its needle will remain absolutely steady when the loudest signals are coming in. Any jumps or kicks on the part of the needle show that the low-frequency side of the set is not doing its work properly and that distortion is present. The third note magnifier may be tested out in the same way, though here it is advisable to tune in a signal which in the ordinary way is not a powerful one; otherwise the last valve and probably also the loud-speaker will be overloaded and distortion will result. Actually the first five valves give for most B.B.C. stations a volume of sound large enough to satisfy anyone who is not a confirmed "noise." maniac.

J. H. R.

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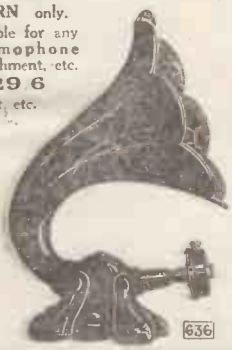

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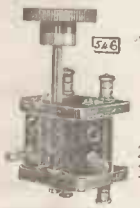

548

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JUDD

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A SEMI-PORTABLE THREE-VALVER

IMPROVING AN OLD SET

Amateur Wireless And Electrics

Vol. VIII. No. 205 SATURDAY, MAY 8, 1926 Price 3d

PRINCIPAL CONTENTS

WELL ILLUSTRATED

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This well-known station was used during the French Revolution (1791) as a semaphore signalling post.

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

Technical Adviser: SYDNEY BRYDON, D.Sc., M.I.E.E.

Vol. VIII. No. 205 — MAY 8, 1926

Chief Contents

"Amateur Wireless and Electrics." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to the Proprietors, Cassell and Co., Ltd.

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," La Belle Sauvage, London, E.C.4.

IMPROVING AN OLD SET

WHILST many wireless men delight in constructional work and keep their sets always up to date by making frequent alterations, or by entirely rebuilding them at intervals, there are many enthusiasts who have neither the skill nor the inclination for undertaking ambitious schemes of reconstruction. Hence it comes about that there are in use to-day a great number of sets built a year or two ago which are still in their original condition. These do not and cannot give first-rate results, since they were designed in the days when selectivity was almost unnecessary owing to the small number of broadcasting stations in operation and when long-range work was seldom undertaken by any but experts.

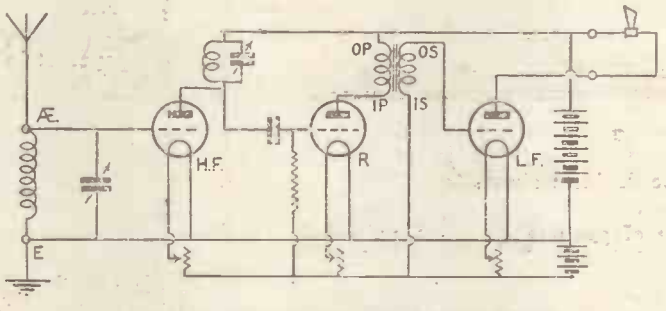


Fig. 1.—An Old-fashioned Three-valve Circuit.

Fig. 1 shows a typical three-valve circuit of an old-fashioned type; I am going to suggest some very simple ways of bringing it, or any other valve set, up to date. Examine the diagram carefully. It is naturally unselective owing to its single-circuit tuner, in which the whole coil is common to both the aerial and grid circuits. Further, in order to stabilise the first valve the earth terminal has been connected to L.T. +, so that there is a strong positive bias upon the grid. The grid leak of the rectifying valve goes to L.T. −. This was a fairly common practice some years ago when many valves worked almost equally well with the leak connected to L.T. + or L.T. −.

Looking at the wiring of the third valve, we see that there is no provision for grid bias, whilst the plate potential of the note magnifier is the same as that of the other two valves. Condensers are not used across the primary of the intervalve transformer, the high-tension battery or the phone terminals. Such a circuit will work, but it will give flat tuning combined with reproduction of poor quality.

Now look at Fig. 2. It shows the same circuit when a few simple improvements have been made. The cost of making them is quite small, and both it and the trouble taken will be amply repaid by results. The first thing to deal with is the A.T.I. Here the alteration is simplicity itself. Remove the wire which runs from the aerial terminal to the top of the coil and attach to this terminal a short length of flex provided with a spade tag. Replace the original plug-in inductance with an "X" coil, which is tapped at two points. When the aerial is connected by means of the spade tag to one of these points (X and Y in the drawing), it will be found that selectivity is very greatly improved, whilst possibly an improvement in signal strength will result. Experiment will show whether X or Y is the better.

Disconnect the earth terminal from L.T. + and connect it to the slider of a potentiometer wired across the L.T. leads. Do not forget to place a condenser of .005 microfarad between the slider and L.T. −. The potentiometer allows the set to be stabilised with the minimum amount of positive potential on the grid of the first valve. Connect the grid leak of the rectifier to L.T. + instead of to L.T. −; all modern valves work best with the leak in this position. If the leak itself is of

(Concluded at foot of next page)

SIMPLE HOME-MADE GRID LEAKS

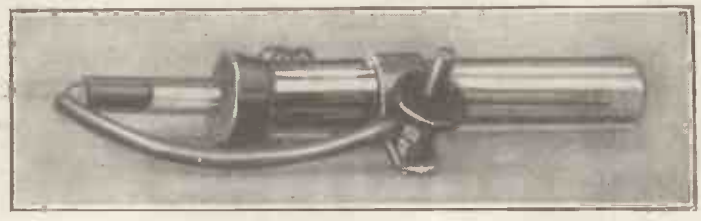
ALTHOUGH the commercial types of grid leak are, generally speaking, superior to the home-made article, the experimenter frequently needs fixed leaks of certain values. Or, still more often, all available grid leaks have been built into finished sets and a temporary leak must be improvised.

This can be done in many ways; thick pencil lines can be made on paper and the line "tapped" at various points, or ink lines may be used instead of pencil. Very good improvised grid leaks can be made from narrow strips of carbon paper as used for typewriters; as the carbon layer of different makes seems to differ considerably in their electrical qualities, no definite dimensions can be given. For a first attempt, a strip about $\frac{1}{16}$ in. wide and 1 in. long could be used.

The "housing" question is really the greatest difficulty with home-made grid leaks. We can imitate the manufacturer and enclose the strip of carbon paper in a thin glass tube, but the arrangement of the end connections will usually give trouble. In addition, such grid leaks cannot be modified without taking the device to pieces again.

A very satisfactory type of home-made grid leak is shown by the photograph. It can be easily and quickly made, and the resistance element is accessible for modification.

The leak may be composed of a narrow strip of carbon paper; if this is not available, a strip of notepaper with a fairly wide ink line may be used instead. This



An Easily-made Grid Leak.

line should be made with drawing ink. For the last $\frac{3}{16}$ in. at each end of the paper the whole width of the strip is blackened with ink; if a strip of carbon paper is used, it may be cut with wider end lugs. The strip is carried by a small glass tube, the ends of the strip being bound to the tube by several turns of thin bare copper wire.

One of the end connections is made from the lower binding, the wire passing through the inside of the small glass tube. Sufficient wire for connections should be left when cutting the wire. The upper end of the resistance strip is provided with a similar connecting wire.

As the whole width of the paper strip has been blackened at the ends a good connection is ensured. To protect the leak, the glass tube carrying the resistance strip is placed in a small test-tube or similar glass container. A cork which fits the test-tube is bored out to take the smaller tube and slipped over it. Small tube and cork are then slipped into the test-tube, and our grid leak is complete.

The connecting wire from the upper end of the resistance strip is drawn through between cork and test-tube.

To mount the grid leak, a small clip may be made and placed over the outer tube. One connecting wire may be soldered to this clip. If the upper end of the smaller tube is now closed with a small cork stopper or a drop of sealing-wax, the resistance element is enclosed in an airtight chamber, and consequently it cannot be affected by atmospheric changes, and it is also kept quite free from dust.

If the resistance of the leak is to be modified, the inner tube is withdrawn and the line thickened or partly erased. The leak shown in the photograph was originally merely intended as a temporary one, but it gave such excellent results that it formed part of the set for several months without any alteration in its value becoming apparent.

C. A. O.

"IMPROVING AN OLD SET" (*continued from preceding page*)

poor quality, or if you are doubtful about its condition, it may be as well to replace it with an up-to-date one of good make. If possible, try grid leaks of various values in order to find that which gives the best working.

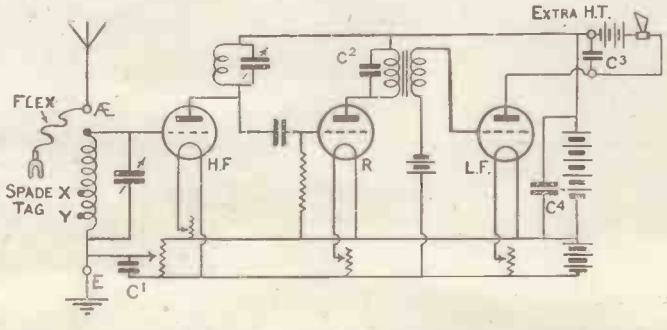


Fig. 2.—Simple Alterations Make a Vast Difference to Results.

It is most desirable that the plate voltage of the low-frequency valve should be considerably higher than that of the others. This can be accomplished as shown in Fig. 2 by wiring a 36-volt high-tension battery between the positive phone terminals and the loud-speaker. But if the plate potential of the note magnifier is increased, it is essential to furnish its grid with a negative bias. One of the easiest ways of doing this is to replace the last valve-holder with one of a special type, obtainable quite cheaply, which allows the grid-battery connections to be made to two small terminals. Another simple way is to remove the existing lead from 1S of the transformer to L.T. – and to place the grid battery between the 1S terminal and the L.T. – terminal.

We may improve both the stability and the tone of the set by shunting the primary of the L.F. transformer with the condenser C2, which acts as a by-pass for unwanted high-frequency currents. The condenser C3 will enable us to adjust the pitch of the telephones or loud-speaker to our liking; the larger the condenser, the lower will be the pitch. C4 is a condenser with a value of from 1 to 2 microfarads placed across the high-tension battery. Its main purpose is to pass away to earth both high- and low-frequency currents that have done their work. The addition of this condenser will often stabilise an otherwise unruly set.

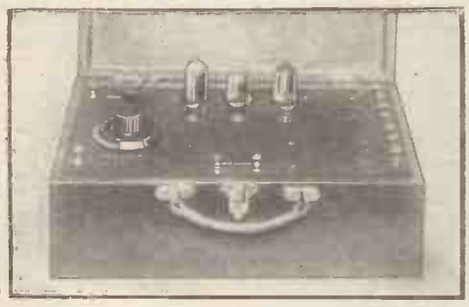
There are one or two other ways in which the performances of any old-fashioned valve set can be improved. In many cases the variable condensers used are not such as we should recommend nowadays. One particularly bad type is that which has metal end-pieces electrically connected to the fixed vanes, whilst the spindle carrying the moving vanes is insulated by nothing better than two thin washers made of ebonite of very doubtful quality. Condensers of this kind need not be discarded. Ebonite end-pieces (ready drilled and tapped when necessary) are obtainable for a few pence a pair, and the substitution of these for the existing metal end-pieces frequently makes a very welcome difference.

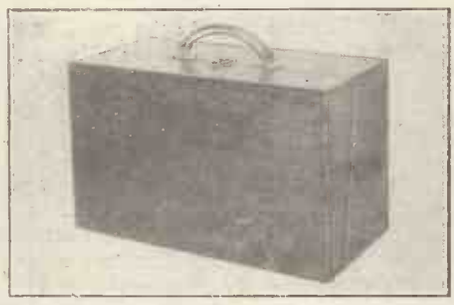
Where dull-emitter valves, particularly those of the .06-type, are used in an old set, microphonic noises will usually be rather bad. They can be done away with by fitting spring valve-holders, and preference should be given to a type in which the legs are air-spaced, for these add considerably to the efficiency of the receiving set.

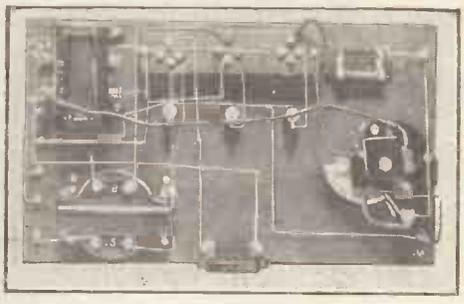
J. H. R.

A SEMI-PORTABLE THREE-VALVER

A receiver of this type fulfils a special purpose when it is not convenient to install a set permanently in one place







Three photographs showing respectively the set open and closed and the back of the panel.

IT is an advantage to possess a receiver so designed that it can be conveniently and easily moved from room to room or stored out of the way when desired. The receiver shown by the photographs was designed to fulfil this requirement, and employs a three-valve straight circuit, comprising detector with reaction on the aerial, followed by two stages of note magnification (see Fig. 1).

Grid bias can be applied to the last valve, and both transformers have a ratio of 1-4, and were so chosen in order that comfortable loud-speaker results of reasonable quality could be obtained from the local station on an inside aerial without recourse to reaction. The components and accessories are specified in the article, as the writer believes that this is a point of considerable interest to intending constructors. Other equally reputable goods can, of course, be substituted if desired, but this may entail alteration of the drilling plan to suit.

Components

One Radion panel, 14 in. by 8 in. by $\frac{3}{16}$ in.; one ebonite strip, 6¾ in. by 1 in. by $\frac{3}{16}$ in.; one Seamark Connode variable condenser, .0005; one Dubilier fixed condenser, .0002; one Edison Bell fixed condenser, .001; one E.B. fixed condenser, .006; one Mullard grid leak, 2 megohms; three Lissen Minor rheostats; twelve valve socket; eleven terminals; one R.I. inter-valve transformer; one Marconi Ideal transformer (ratio 1-4); one 12-in. length of 4 B.A. rod; sixteen 4 B.A. nuts; six 4 B.A. flat-headed screws, with nuts; panel transfers; No. 16 tinned-copper wire; 1 yd. flexible wire; cabinet to specification.

The Cabinet

The cabinet should be constructed to the dimensions given in Fig. 2. As can be seen from the photograph of the set when closed, it takes the form of an attaché case, a leather carrying handle and snap clip being fitted. It should be constructed of oak or other hard wood, and be preferably dovetailed together.

The original was built to order by a jobbing cabinet-maker for 12s. 6d., inclusive of staining and polishing, the handle and clip being fitted later.

Panel and Valve Platform

The layout of the panel is shown by Fig. 3, and this should be copied full size on to a sheet of drawing-paper, which is attached to the panel by a trace of gum on each corner. The centres are then punched through to the panel when the template is removed for drilling.

In the absence of a suitable cutter for the 1¼-in. holes, the circles should first of all be marked on the panel with a pair of compasses. A ¼-in. hole is then drilled just inside the circumference to allow a fretsaw blade to be inserted, when the hole can be neatly cut out. A half-round file, followed by sandpaper, will smooth up any rough edges left by the saw. The transfers should be attached at this stage, when the panel can be conveniently laid on a flat surface.

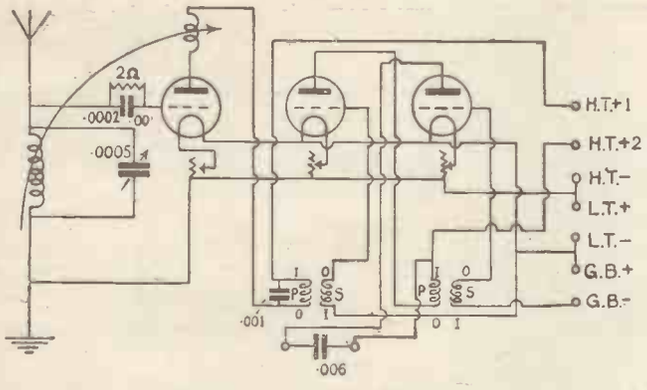


Fig. 1.—The Circuit Diagram.

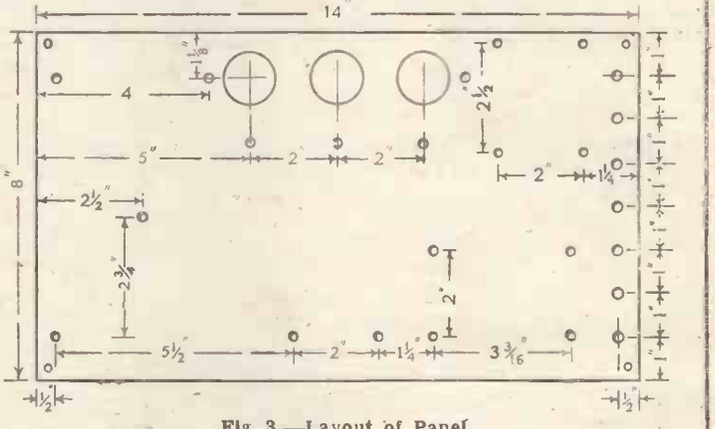


Fig. 3.—Layout of Panel.

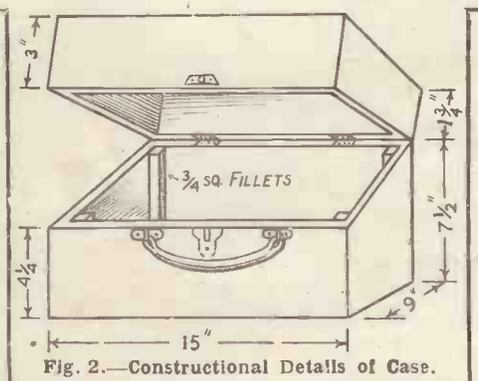
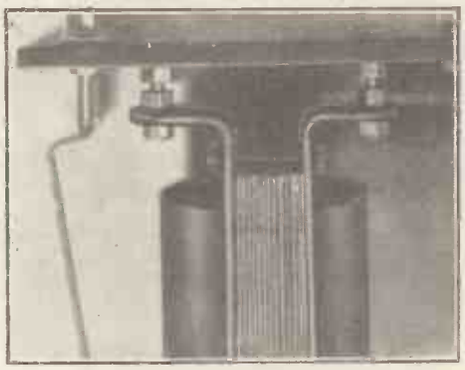


Fig. 2.—Constructional Details of Case.

The ebonite strip is marked off as indicated in Fig. 4. The position for the valve-socket holes are marked on the ebonite, the centres being indicated in the diagram. After marking off the drilling can be proceeded with, a $\frac{3}{16}$-in. drill being used throughout.



Method of Fixing Transformer.

For the panel the following drills are required: Terminals, $\frac{3}{16}$ in.; rheostats, ¼ in.; Seamark Connode, $\frac{3}{8}$ in.; transformer screws, ⅛ in.; fixing screws, ⅛ in.

The transformers are mounted first of all, and the method of mounting the R.I. instrument should be carefully noted. Two 1¼-in. lengths of 4 B.A. rod are locked into two of the holes provided in the base of the transformer by means of two nuts arranged as shown in the photograph. The rods are then inserted in the panel through the holes marked A in Fig. 3, and locked in place by means of two nuts, one above and one below the panel. The remaining two legs of the component are attached to the panel in the usual manner by means of two screws and nuts. This method is necessary, for should this component be screwed flat to the panel in the ordinary way, it will foul the side of the cabinet when the panel is placed in position.

The Valve Platform

The valve platform is held below the panel by two 3½-in. lengths of 4 B.A. rod. The rods are held to the platform between two nuts, the rods being fixed to the panel in the same manner as those supporting the transformer.

Wiring is carried out with No. 16 bare copper wire, with the exception of the leads to the reaction coil holder, which are made with flex. These leads, together with those going to the variable condenser and the transformers, terminate in copper spades, so that they can be firmly screwed down under their respective terminals.

The terminal shanks and rheostats are tinned preparatory to soldering, and the filament circuit is wired up first. After this the wiring is straightforward, care being observed that the lead from H.T. 2 to L.S. terminal is not fouled by the reaction coil when this is being adjusted.

The disposition of the various leads is shown in one of the photographs.

Two Cossor W1's are used in the detector and first low-frequency positions, a Cossor W3 small power-valve doing good service in the last stage. The anode potential is supplied by a large-capacity 120-volt Siemens high-tension battery, and the filament current by an Oldham 2-volt 60-ampere accumulator.

The operation is very simple, the reaction coupling and tuning condenser being adjusted by one hand. The aerial,

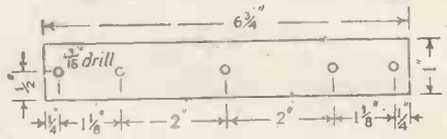


Fig. 4.—Details of Ebonite Strip.

earth and batteries being correctly connected, the reaction coupling is set as loose as possible. The condenser dial is then set to tune in the local station, when alteration of H.T. and G.B. values should be tried to obtain the best results. The filament controls are then set to their best positions. The set is capable of receiving several British and Continental stations on a good outside aerial. W. A. A.

WHEN FLAT TUNING IS ADVISABLE

DO you know that it is sometimes good policy to detune your set a little? If you happen to be listening to a military band or to an orchestral piece in which the drums are concerned, the latter are frequently apt to become unpleasantly loud and produce an undesirable muffled sound in volume quite out of proportion to the rest of the instruments.

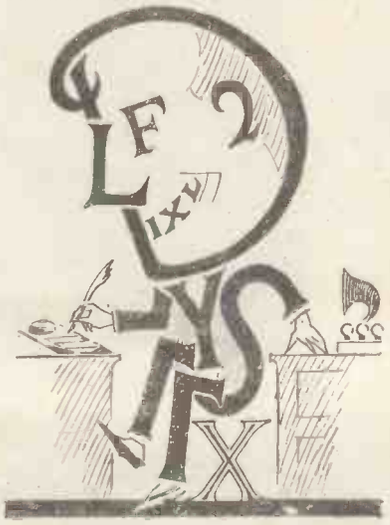
Alternatively, in the case of a broadcast organ recital, some of the deep bourdon notes which form the bass accompaniment appear, in reception, to monopolise the ear, to the exclusion of the lighter and higher notes, and thus disturb the balance of the whole.

This trouble may be lessened by detuning from the incoming wavelength. The effect of this is not to interfere so much with the higher notes, but just to cause an appreciable lessening of the intensity of the lower notes.

The reason is, of course, that the waveband is very much wider in the case of the higher notes than in the case of the lower notes. The vibrations of a drum produce only a very slight change in the wavelength of the incoming signals, whereas the higher notes produce a greater change.

Particularly in the case of reaction circuits, where the selectivity for a given wavelength is very high, by detuning a little it is possible to receive the higher notes, which really come in on slightly different wavelengths, with a decrease in the intensity of the lower notes, owing to the fact that, comparatively speaking, the degree of detuning for the waves carrying the lower notes is considerably greater. A. J. B.

"A.W." Wireless Limericks



A listener wrote to FL,
To the announcer, saying "YL?
You're not really DX,
As I live in SX,
And with Det. 2LF 1 XL."

Can you write a Wireless Limerick? We pay half-a-guinea for each one published. Mr. F. W. Newling Jones, of Outwell, is responsible for that above.

A TIME-SAVING CATWHISKER

WITH some types of crystal it is on occasions quite a business to find a really sensitive spot when a catwhisker of the ordinary type is used in the detector. An excellent tip which saves a great deal of time and trouble is to do away with the catwhisker made from a single piece of fine wire and to substitute for it a short length of stoutish flex, both ends of which are bared. One end is attached to the arm of the detector; the wires of the other are spread a little after the manner of the hairs of a paint brush. These form a multiple contact, meeting the surface of the crystal at many points. However the brush-pointed catwhisker is placed, one of its points is almost sure to make contact with a sensitive spot on the crystal. J. R.

THE CHEAPEST LOUD-SPEAKER

An article describing how to make an excellent loud-speaker for 15s.

THIS article describes the construction of a loud-speaker horn, which, when attached to a loud-speaker unit, will afford full-toned mellow reproduction of ample volume for a large-sized room. The construction of the horn will be described in both cardboard and wood. The horn has been carefully designed to give good, loud, full-toned reproduction, without echo or "woolliness," and will give good results whether made of cardboard or wood.

The necessary materials are as follow: one piece of cardboard, say 16 in. by 30 in. by ⅛ in.; one piece cardboard, say 30 in. by 12 in. by $\frac{1}{16}$ in.; glue; brown paper or wallpaper; small piece of ⅛-in. wood; one ⅝-in. brass curtain rod socket. The loud-speaker unit used was the Lissenola.

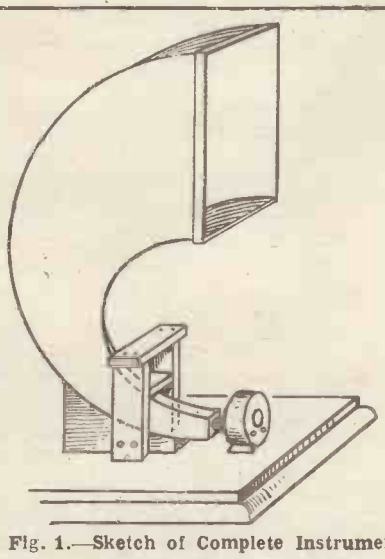


Fig. 1.—Sketch of Complete Instrument.

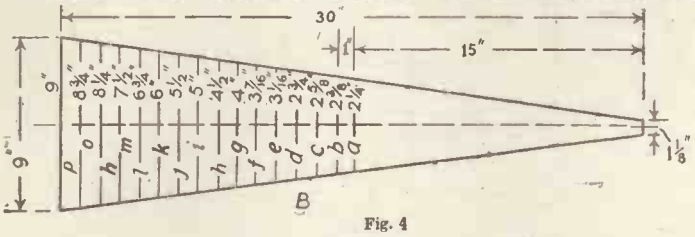


Fig. 4

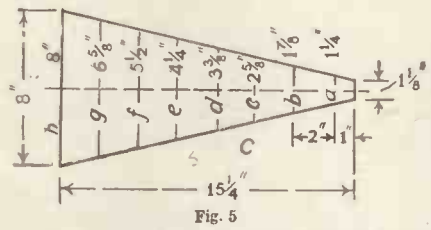


Fig. 5

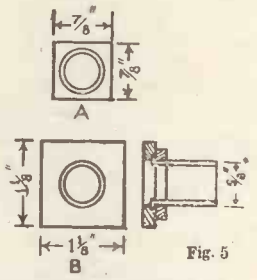


Fig. 5

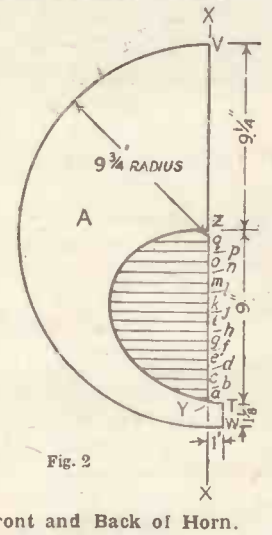


Fig. 2

Fig. 2.—Pattern for Side of Horn. Figs. 4 and 5.—Patterns for Front and Back of Horn. Fig. 6.—Details of Unit Attachment.

Construction

The first thing to be done is to make a full-sized drawing of one of the sides (Fig. 1) on the piece of ⅛-in. cardboard. Draw a perpendicular line distant 11 in. from the left-hand edge of the cardboard, and from a point 11 in. distant from the edge strike a semicircle to the left having a radius of 9¾ in., as shown in Fig. 2, continuing the bottom of this 1 in. beyond the vertical line; from the point where the semicircle cuts this line measure upwards along the line 1¼ in., and from this point continue along the vertical line, stepping off at every ½ in. until 9 in. have been so subdivided, leaving, say, 9¼ in., which will, of course, be the height of the flare. Next, a straight-edge is placed exactly flush with the perpendicular line XX, and against this straight-edge, and facing the semicircle already drawn is placed a square, by means of which right-angle lines (*a* to *q*) are drawn at each ½ in., as shown in Fig. 2. This done, the lines *a* to *q* are measured off from line X X in the direction of the semicircle and dots placed in accordance with the following table:

a	1½ in.	*g*	4$\frac{13}{16}$ in.	*m*	4$\frac{15}{16}$ in.
b	2$\frac{7}{16}$,,	*h*	5$\frac{1}{16}$,,	*n*	4$\frac{9}{16}$,,
c	3$\frac{1}{16}$,,	*i*	5¼ ,,	*o*	4⅛ ,,
d	3$\frac{11}{16}$,,	*j*	5$\frac{5}{16}$,,	*p*	3$\frac{7}{16}$,,
e	4⅛ ,,	*k*	5$\frac{5}{16}$,,	*q*	2½ ,,
f	4½ ,,	*l*	5$\frac{3}{16}$,,		

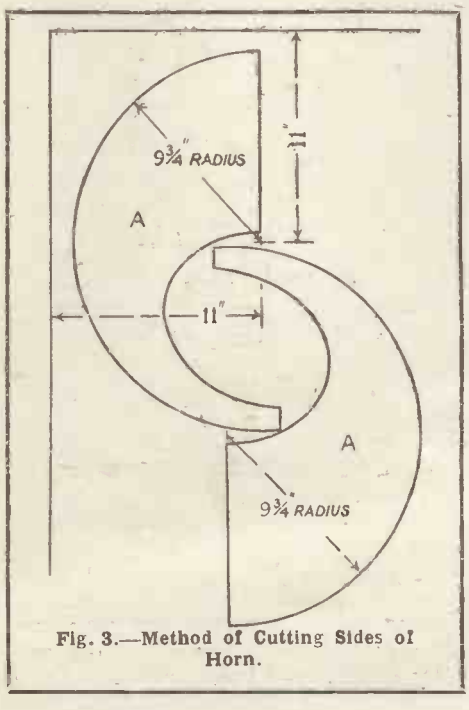


Fig. 3.—Method of Cutting Sides of Horn.

The dots are then connected, starting at Y, then *a*, *b*, etc., touching all points and finishing at Z. The side A may then be cut out with a sharp knife—along the semicircle (plus 1 in. as shown)—being line W to V; the involute may next be cut out along line T to Z, and finally the two straight cuts may be made along W to T and Z to V. This will complete one side of the horn. This completed side is then reversed and laid at the bottom right-hand corner of the ⅛-in. cardboard as shown by Fig. 3, the outline traced around it and the second side cut out.

Next the $\frac{1}{16}$-in. cardboard is taken, and on it are drawn the shapes B and C in accordance with Figs. 4 and 5 and the following tables.

In these drawings the sides are shown straight, but the correct curvature when drawn full size can be obtained from the measurements.

	B (top)				C (bottom)
a	2¼ in.	*i*	5 in.	*a*	1¼ in.
b	2⅜ ,,	*j*	5½ ,,	*b*	1⅞ ,,
c	2⅝ ,,	*k*	6 ,,	*c*	2⅝ ,,
d	2¾ ,,	*l*	6¾ ,,	*d*	3⅜ ,,
e	3$\frac{1}{16}$,,	*m*	7½ ,,	*e*	4¼ ,,
f	3$\frac{7}{16}$,,	*n*	8¼ ,,	*f*	5½ ,,
g	4 ,,	*o*	8¾ ,,	*g*	6⅝ ,,
h	4½ ,,	*p*	9 ,,	*h*	8 ,,

B and C having been traced, may next be cut out with a pair of scissors. B and C are damped with warm water, and when pliable are rolled roughly into the final shape they have to assume and tied with string, the inner surface of each being well coated with hot glue.

(*Concluded at foot of next page*)

The Complete Coil.

AN EASILY-MADE LOW-LOSS COIL

A GOOD low-loss coil should show the following features: The wire used for the winding should be thick enough to offer a comparatively low resistance to the high-frequency currents; the turns of wire should not lie close together but should be spaced; all insulating material should be cut down to a minimum.

The writer has wound a good many low-loss coils and on the whole obtained quite good results. His only objection to low-loss coils was that a great deal of time and trouble were required to construct his favourite type of self-supporting coil.

So when a new version of the well-known Browning-Drake receiver was rigged up on the experimental board, ordinary "medium-loss" coils were used, consisting of 3-in. diameter cardboard tube formers wound with No. 24 gauge d.c.c. wire.

The results obtained with this set were most encouraging, and the receiver proved far more sensitive than any previous set.

Although it did not seem possible that low-loss coils could improve the set much, a new set of coils was wound. No skeleton former was at hand, so the writer attempted to make a spaced winding by winding on two wires simultaneously from two reels. When the coil was completed, one wire was to be removed, leaving only one well-spaced winding.

Like so many seemingly simple stunts, this method was far from satisfactory when working single-handed. A simpler method had to be tried, and just at that time Messrs. Belling-Lee introduced their new air-spaced wire. A sample reel of No. 24 gauge was obtained and a coil wound without any difficulty.

Air-spaced Winding

In the new air-spaced wire, the copper wire is not completely encased in an insulating covering, for only two strands of insulating material are wound spirally around the copper wire which forms the core. The second photograph shows an enlarged view of a section of a coil wound with this wire, and it will be seen that the spiral strands separate the wires quite evenly. A further advantage is that the wire does not touch the coil former at all, for the insulating strands raise the wire above the former. This is a step in the right direction, since inexpensive cardboard-tube formers serve just as well as the more costly ebonite tubes used previously. In this manner the wire is almost completely surrounded by air, the ideal dielectric medium. The appearance of a coil wound with the new Belling-Lee air-spaced wire is shown by the second photograph.

When tried in the four-valve Browning-Drake a great improvement in both range and selectivity was noticed straight away; this improvement was by no means expected, seeing that the original coils had been wound with great care. On the loud-speaker increased volume was obtained, and several stations which formerly were received at good phone strength could now be brought in at good loud-speaker strength, certain proof of the advantages that low-loss design provides. A. C.

Enlarged View of Winding.

"THE CHEAPEST LOUD-SPEAKER" (*continued from preceding page*)

The sides A A then have pasted on the outside of each a piece of strong brown-paper, overlapping about 1 in. all round as shown in Fig. 7, and nicked or cut out to assist in assembling the four pieces.

The adaptor to carry the curtain rod socket bracket is made as shown by Fig. 6, *a* being a square of ⅛-in. wood ⅞ in. square to fit into the small end of the horn and having in it a circular hole of ⅝ in. diameter, *b* a piece of wood 1 in. or 1⅛ in. diameter with a hole to take the brass socket, this socket being mounted between the two pieces *a* and *b* as shown in Fig. 6. A suitable baseboard may be made of a piece of ¾-in. hard wood as shown in Fig. 1.

Assembly

It will assist assembly if a piece of ¼-in. wood is shaped to fill the flare and temporarily tacked into position about 1 in. or so from the edge. The adaptor *a* may then receive a coat of hot glue and be glued and tacked into position. The "nicked" edges of A A are then glued and pressed over *c* and *d*. Allow a day to dry, when the outside of the whole may be covered with paper and varnished.

Hard-wood Horn

The construction in wood will follow very closely that in cardboard, except, of course, that the $\frac{1}{16}$-in. top and bottom in wood will have to be placed in hot water and carefully bent over jigs or rough shapes of wood and tied up and allowed to dry. The assembly will present a little more difficulty, as there will be no "nicked" edges of paper to hold the four sides in position, string and cramps having to be employed instead. If the adaptor is glued and screwed into position first this may be then placed in a vice or cramp, thus permitting the gluing of B and C over the top and bottom respectively, all being tied together as the work proceeds.

W. P. AVELING.

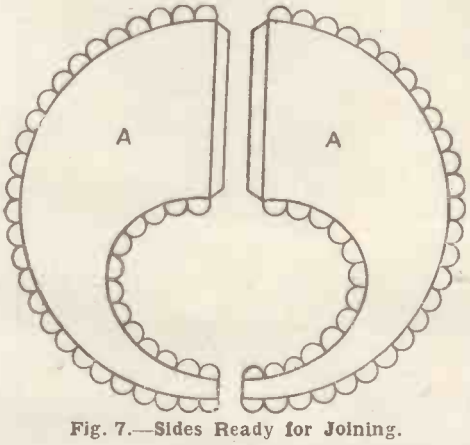


Fig. 7.—Sides Ready for Joining.

SQUARE WIRE

THE appearance of the set is always improved if the wiring is neatly carried out with square-section tinned wire. The point-to-point connections should be quite straight and the corners made at right-angles. Unfortunately it is no easy matter to get the connections quite straight, as the wire is usually sold in coiled-up lengths. Before wiring up, always stretch the wire between a vice and a pair of pliers, and straight lengths of wire with no tendency to curl up will be obtained.

R. B.

On May 26 London listeners will hear a "ghost" programme, consisting of an hour of ghost music, songs and a "bogey" talk.

ADVERTISEMENT INSTRUCTIONS for "Amateur Wireless" are accepted up to first post on Thursday morning for following week's issue, providing space is available.

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As the Publishers cannot accept responsibility for the bona fides of Advertisers in this publication they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The Deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom, double fees are charged.

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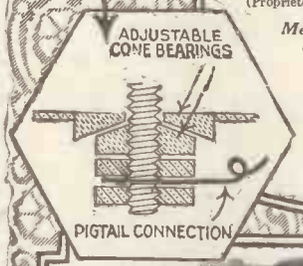

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"Whitley Bay is well known as Northumbria's happy holiday centre-by-the-sea. For bracing air and facilities for every form of outdoor recreation and indoor amusement, it would be hard to beat."

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On Your Wavelength!

Hallo, New York!

THE experiments in wireless telephony between Rugby and New York continue to go forward most successfully. The other day an American visitor to this country was able to speak from a London hotel to her children at their home some miles from the capital of the States. Both she and her children made use of the ordinary household telephone instruments, and the conversation was carried on as easily as if those taking part in it had been in the same town. I have no doubt that a good many readers have picked up both the Rugby and the New York signals on Sundays by putting in large coils and searching between 5,000 and 6,000 metres. Many of them wonder why it is that they cannot hear clearly unless the receiving set is made to oscillate, which seems at first to be a direct contradiction of the rule that if you want to receive telephony well you must avoid the slightest oscillation in your set. In this case the telephony is effected by a special method, both the carrier wave and one of the side bands being eliminated from the radiations. What you pick up with a non-oscillating receiver is the lonely side band, which does not produce intelligible sounds until it has been provided once more with a carrier. To do this you must make the receiving set oscillate. Once you have succeeded in tuning in these transmissions you will be surprised to find how clear they are and how well those from the American end come in. Sometimes these are actually louder than Rugby's signals.

Cr-r-ackle, Zip!

For the last couple of weeks we have certainly been having our whack of atmospherics. Though I have been using wireless sets ever since pre-war days, I cannot remember any time at which they were as bad as they have been lately so early in the year. Not only have they been persistent, but they have also been of a peculiar type, some of the tearing noises lasting for quite a long while. The record atmospheric, so far as my experience goes, occurred on Sunday, April 25, at twenty minutes to nine in the evening. Its strength was not quite so great as some of the others that butted in during the evening, but for a full thirty seconds it gave one the impression that someone was slowly tearing a gigantic strip of emery-cloth.

There has been a certain amount of thunder about, but I am inclined to believe that the majority of recent atmospherics have been caused by magnetic storms. Just before I returned home from a recent visit to the north of England, I was waiting for a train at a small wayside station, when the station-master asked me to look at his telegraph instruments. The only way that I can find of describing their behaviour is to say that they were going on simply anyhow. There was not a sign or a sound of thunder in the locality, and the instruments were undoubtedly being upset by a magnetic storm of some intensity. Personally, I fancy that the spots which are at present decorating (or the reverse) the face of Old Sol are responsible for the present outburst of unwanted noises in our receivers.

Ether Deadness

If you have tried to do any long-distance reception of late you will probably have noticed how extraordinarily "dead" the ether has seemed at times. I tried round the other night, using a wavemeter and a very sensitive set, for some of the foreign stations. What I found was either that I could not get them at all or that if I did they came in with much less than their usual strength. The signal weakness was not due to daylight saving or to the approach of summer, for on certain nights one has had no difficulty in receiving any number of foreign stations at good strength. If I am right in attributing the present prevalence of atmospherics to magnetic storms, the same cause will probably account for one's difficulty in receiving distant transmissions.

'Ware Sunlight

Though at the moment of writing the sky is leaden and I am sitting before a warm fire, it is highly probable that we shall have *some* sunshine this summer. Possibly you may read this note whilst taking a sun bath in a deck-chair in your garden. Anyhow, I would like to give my readers one word of warning about the harmful effects that strong sunlight may have upon wireless gear. Ebonite is—or should be, anyhow—largely composed of rubber, a substance which suffers seriously from the effects of bright light. If the ebonite of wireless panels or of insulated parts of components is left exposed to the sun's rays for any length of time, two things are likely to happen to it. In the first place, its beautiful deep black hue will give place to a hateful greenish or yellowish tinge. This is bad enough, but there is worse to follow. The discoloration is only skin deep, but radio-frequency currents concern themselves chiefly with the skin of an insulator. The surface of discoloured ebonite may be a very poor insulator indeed, allowing leakages to occur between points at different high-frequency potentials. Be careful, therefore, not to leave your set in a place where it will be exposed to the sun's rays, and do not use the window-sill as a storage place for spare components.

Do not forget, either, that sunshine is very bad for dry-cell high-tension batteries. Besides causing the moisture in the cells to evaporate, it may produce an expansion of the gases within them, with the result that the wax or pitch covering is pushed up by the pressure into unsightly lumps, whilst not infrequently the cell cases give way under the strain.

Antediluvian ?

Whenever I am condemned to wear headphones for any length of time I begin to wonder why we adhere rigidly to a design of headgear that is at least as old as wireless itself, and probably a good deal older. Even if the phones are of the lightest weight and of the best type, those headbands make their presence felt after an hour or two, and the grip of the receivers upon the ears is far from being comfortable. The discomfort caused by the pressure of the receivers can be remedied considerably by fitting them with sponge-rubber pads; but the headbands remain, and there is no escape from their clinging embrace. Cannot some genius manage to forget the conventional type altogether and to design a head-set that is really comfortable. I am sure that if anyone will get right away from the stereotyped ideas and will turn out a pattern that does not cling or press, he will reap a rich reward for his pains.

Those H.T. Batteries

I have recently had some difficulties with H.T. batteries on account of the fact that some of the cells were reversed in wiring when connected up by the makers. The net result of this was a slight drop in the overall voltage of the battery, the reason for which was impossible of identification without the use of a moving-coil voltmeter. With this instrument I was able to check the readings of individual cells. Imagine my surprise when I found that one cell in each of two batteries gave a reversed reading, thus indicating that the polarity was reversed.

Shellac

At one time we had a perfect orgy of shellac varnishing; our coils were impregnated with the stuff, as were also our transformers or any other component part which offered a tempting subject for the brush. We did not at that time realise the futility of our labours; in these days the shellac pot is rarely seen! It has still its uses, however. Any coil, the electrical characteristics of which are required to be permanent, can safely be treated to

On Your Wavelength! (continued)

a coat of this useful varnish in order to keep out detrimental atmospheric effects. At the same time, it must not be forgotten that a coat of shellac applied after a coil has been made and calibrated will alter altogether the wavelength of the coil, especially if it has a low value of inductance.

Sometimes the varnish is useful in order to keep loose turns of a coil *in situ*. When it has been properly dried it will be glass hard and the coil will be beautifully rigid. Another use to which the varnish may be put is the lacquering of brass parts. It is not generally an easy matter for the amateur to lacquer his terminals in the orthodox manner, but he will find that it is a comparatively easy matter to lacquer with shellac.

Overdone?

There is, I think, rather a tendency at the present time to devote too large a proportion of programmes to a single item or subject. What most listeners seem to want is variety. However good, for instance, a singer may be, a long series of songs by him is apt to become tedious. Two or three as a group would be splendid, but when it comes to more than this one sometimes feels that one can have too much of a good thing. The same criticism applies to whole evenings devoted to the works of one composer with the idea of commemorating the anniversary of his birth or death. It must always be remembered that there will be a great number of listeners to whom a thing of this kind makes no appeal at all. If, on the other hand, a programme consists of a number of items of widely different kinds, then there will always be a great deal in it that will appeal to nearly everyone. You can always switch off any short item that you do not care about, but it is rather hard lines if you have to put your set out of commission for a couple of hours or so during the performance of a long item that does not please you.

Use More Valves!

Other enthusiasts of various causes have their slogans, so why should not we wireless folk adopt one of our own? I suggest "Use more valves," for I am quite sure that the pleasures of wireless are greatly enhanced by so doing. By fitting note magnifiers the crystal man can release himself from the rat-trap grip of headphones and can listen comfortably to the loud-speaker. By adding another valve the single-valve man can get that distant station which is now just outside his range, and being content he ceases to emit howls of despair. Heaps of people do not realise how very cheaply valves may be added or how small is the cost of running the modern dull-emitter. I venture to predict that shortly we shall see a considerable reduction in the prices of dull-emitters. These have come down a great deal in the last year or two, but they are still high. In America, for example, D.E. valves cost a little more than half what we pay for those of the same class in this country. When the .06 valve comes down to ten shillings, manufacturers will find an astonishing increase in their sales, and the crystal set will no longer be used by something like ninety per cent. of listeners.

Hardy Veterans

One is often asked how long valves should last. It, of course, depends upon the way in which they are used, for a very small increase from the maker's rating in the filament current may materially shorten their useful lives. In the old days we used to think it satisfactory if we obtained 800 working hours from a valve, though I had two of the original tubular Oras which, after giving 2,500 hours apiece, were intentionally broken so that their filaments could be examined. From the modern dull-emitter, if carefully used, we should expect a working life of at least 1,200 hours. This is a conservative estimate.

Is this a Record?

The other day I stopped at a wayside inn for tea, and found a four-valve wireless set installed. The host told me that it was so popular with his customers that its average working time was fifty hours a week. In spite of the hard wear and tear that this entails the dull-emitters now upon the set have been in service for over two years, so that they must have done more than 5,000 hours apiece. I myself have in use at the present time a number of D.E.'s that are in their fifth year—in fact, except for power valves I do not think that I have a single "tube" in my possession that is less than three years old. My set is in pretty constant use—it must average something like four hours a day—so that most of these veterans have thousands of hours of working to their credit. I take their curves every now and then just to see that all is well with them, and in most cases there is not the slightest appreciable difference between the most recent and those that were made some years ago.

The Havanah Band

Listeners the country over will, I think, be sorry to lose the services of the Savoy Havanah Band. This famous band was the first to broadcast, and its quiet musical tone has always been a welcome contrast to some of the more "powerful" bands. Owing to various rearrangements, the Havanah Band will not be available for broadcasting dance music at the normal times, but listeners may hear this band in special concerts. The band is one of the oldest in London, and I feel sure that the listening public will be loth to part with the pioneer.

The Story of a Four-valver

The hasty snapping-up of what looks like a good bargain is only too frequently the forerunner of a period for cooling-off and repentance. This applies with particular force to wireless auctions, where sometimes junk of the most hopeless and obsolete type is put up for disposal. A friend of mine, who is an optimist by nature, and therefore knows very little about wireless, informed me the other day that he had just made the bargain of his life. A four-valve set complete with valves for —— (I can't bring myself to repeat the price). Would I come round and see it?

Of course I would, and did. It was undoubtedly a handsome outfit, with four hefty-looking valves standing across the face of the panel. A closer inspection raised some doubts. The valves were strangely unlike any standard British make. A little further investigation, assisted by removing the panel, and the doubts were confirmed. No tuning coils or condenser; no grid leak or any other evidence of rectification. Nothing inside the case but four massive transformers of a type obviously unsuitable for broadcast reception. I do not, even now, know exactly what the contraption was, but I judged it to be a mutilated note magnifier belonging to the pioneer days of German wireless.

I broke the sad news, and departed. My friend has lost all his optimism, but is developing a useful sense of discrimination in wireless matters. He tells me he has managed to convert his bargain, with a coal-hammer, into the makings of quite a nice little cabinet for a crystal set he is now building.

Diamond Cut Diamond

One of the most admirable traits in the normal Scotsman's character is the broad-minded way in which he will retail jokes aimed at what may be called the national weakness. One of my friends, who hails from across the border, told me this one with considerable gusto.

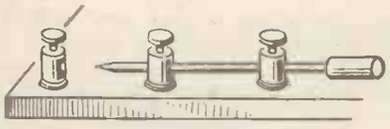
A Hebrew gentleman bought his little son a wireless set, and as usual in these circumstances proceeded to monopolise it himself. The boy, who also ran true to type, consoled himself by playing with his money-box. At first the father had poor luck, but presently he managed to tune-in a station, and heard the voice of the announcer. Turning to his son, he let out in an excited stage-whisper: "Ikey, thtop rattling that money-box, I can hear Aberdeen calling."

THERMION.

PRACTICAL ODDS AND ENDS

A Simple Switch

A SUBSTITUTE for a S.P.D.T. switch can be neatly made by inserting on the panel three telephone terminals in a row, with their holes in a straight line. The arm of a crystal detector is passed through one of the outside terminals and



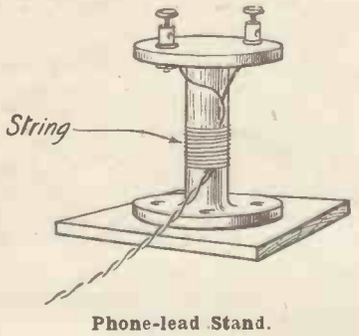
A Simple Switch.

the central one, and the arm is changed over as required. The S.P.S.T. switch needs only two terminals. E. S.

Phone Extension Stand

AN extension stand is convenient for occasional use when a listener is sitting at some distance from the set. One is very cheaply made as follows.

A large empty wire reel is chosen with wide end pieces, and in one end two holes are made to take telephone terminals. The other end may be fixed with screws to a block of wood to form a base. The whole is then enamelled or varnished, passing the brush inside the holes. The flex is laid loosely on the reel and bound to it firmly with a layer of fine string. The other ends of the flex are furnished with pin tags for attachment to the set.



Phone-lead Stand.

The lead is wound upon the reel, and only the necessary length released, thus avoiding the usual loose tangle of wire.

E.

Anti-microphonic Supports

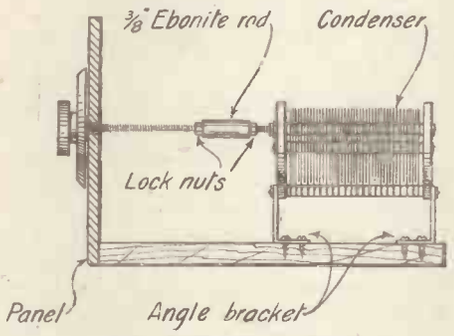
ALTHOUGH there is always a decided advantage in fitting some form of antiphonic device to valve holders, one may go a step further by rendering the entire receiver immune from external vibrations

This may be done by providing the cabinet with four antiphonic feet. Procure two sponge-filled rubber balls, cut each in half and glue each piece to the under side of the panel, thus forming four very resilient supports. No amount of external vibration will now disturb the valve filaments. B.

Avoiding Capacity Effects

IN some receiving sets hand-capacity effects are most annoying. Here is a very simple way of getting rid of the trouble.

Cut off a piece of ⅜-in. round ebonite rod 2 in. in length, drill a No. 12 hole through it from end to end, and tap 2 B.A.



Condenser Extension Device.

It is essential that this hole should be perfectly central. Remove the knob and dial of the condenser and fix the piece of ebonite rod to the spindle, allowing the latter to enter for only about ⅜ in., and locking it in position with a nut. At the other end of the ebonite rod fix a straight piece of 2 B.A. studding of the required length, locking it as before with a nut. This piece of studding is insulated from the moving plates of the condenser by the ebonite rod, hence capacity effects will not occur when the knob is touched. R.

Cleaner for Terminals

USEFUL cleaners for brass sockets or terminals can be made from matches, grooved or otherwise shaped. They are thickly coated with Seccotine, and then stuck into a packet of knife-polish powder for a few hours.

These can be used for cleaning the insides of valve and coil sockets, and a slight increase in signal strength may be expected as the result. Take care, however, that no loose polishing powder is allowed to stay in the interior of the sockets. P.

A Soldering Tip

THE novice at soldering finds it difficult to keep two wires together firmly during the process of making a joint, especially if one of them is flex. A good plan is to bind them together with a short length of very fine bare wire, after applying the flux. Only a few turns are neces-

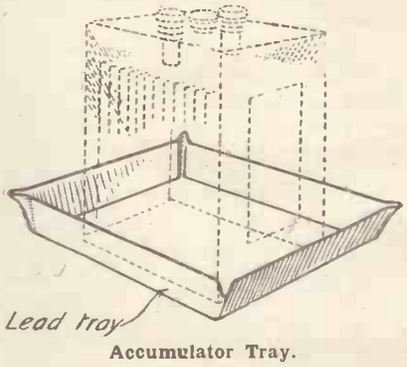
Method of Soldering Flexible Wires.

sary, and they should not be placed closely together. A length of flex divided up into strands will provide "binders" for a number of joints S.

Accumulator Charging Tip

ACCUMULATORS on charge are very liable to overflow when gassing and when near the end of the charge. Unless the accumulator is placed in an acid-proof tray of some kind considerable damage will be done to the bench on which the accumulator is standing.

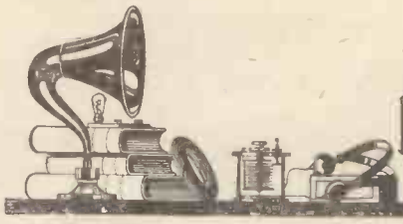
A simple way of overcoming the trouble is to stand the accumulator in a sheet-lead tray as shown in the diagram. This can be made up at home quite cheaply from a rectangular piece of sheet slightly larger in each dimension than the accu-



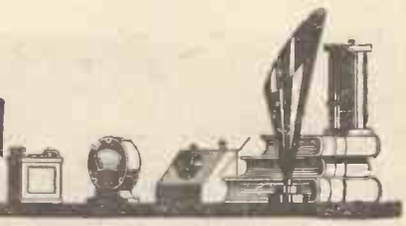
Accumulator Tray.

mulator itself. The sides can easily be bent up with a pair of flat-nose pliers, and the completed tray will hold any acid which is expelled from the accumulator during charging.

Lead must be used for the tray as it is not affected by the acid. Other metals, of course, would corrode. A deal of damage to carpets and table-tops can be prevented by the use of a tray such as that described. M. R.



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. Always send stamped, addressed envelope and attach Coupon (p. 712).

Microphone Transformer

Q.—*Can you give me the main details of a transformer suitable for use in the "A.W." crystal loud-speaker system, with which it is desired to use a 2,000-ohm loud-speaker?—H. R. T. (Cardiff).*

A.—No. 20 or No. 22 gauge iron wire should be used for the core, and this should be cut into lengths each 10 in. long. Enough of these will be required to build up a core of circular cross-section $\frac{7}{16}$ in. in diameter. The length occupied by the windings is $3\frac{1}{2}$ in. and the primary winding consists of six layers of No. 20 s.s.c. wire, while the secondary contains 4 oz. of No. 42 d.s.c. wire. For full constructional details see the Handbook "Loud-speaker Crystal Sets," price 2/6, or 2/9 post free.—J. F. J.

Valves

Q.—*Why should a higher H.T. voltage be required with a hard valve than with a soft one? One would think that the electrons would pass more readily from filament to plate when the interior of the valve was almost completely exhausted of air.—I. R. (London).*

A.—Good rectification may be obtained with either type of valve when using quite low H.T. voltages. For amplification a high voltage is, however, very desirable as this makes the characteristic curve both steeper and longer. With a soft valve it is impossible to use a high plate voltage (even though it would be very advantageous to do so) on account of the electrons attaining sufficient velocity to ionise the residual air by collision with its molecules. Hence soft valves are poor amplifiers. In the case of hard valves, on the other hand, there is very little residual gas and the mean free path of each electron is comparatively long. It is therefore possible to use a high H.T. voltage with valves of the latter type, resulting in excellent amplification.—R. W.

Fixed Condenser

Q.—*What is the purpose of the .001- or .002-microfarad fixed condenser connected across the primary of the first L.F. transformer in some valve sets? Why is it omitted in other, but similar, sets?—T. C. (E.5).*

A.—The current flowing in the detector plate circuit is rather complex in character. In the first place there is the D.C. component drawn from the H.T. battery, then there are the H.F. fluctuations corresponding to the fluctuations of the grid potential caused by the signals, and lastly, there are the L.F. impulses corresponding to the rectified signals. For best results each of these components must be offered the easiest possible path. The condenser to which you refer is provided so that the H.F. impulses may pass easily across the transformer winding, which has a very high inductance. These H.F. impulses in the plate circuit are often required to flow through a reaction coil in order to obtain regeneration, when the subject of offering them a path of low impedance becomes even more imperative. However, often the self-capacity of the transformer winding is sufficient for the purpose of by-passing these currents, in which case the condenser may safely be dispensed with.—R. W.

Directional Effects

Q.—*What is the theory explaining why an inverted L aerial should be directional away from the free end?—O. P. (Blackburn).*

A.—Perhaps the most likely theory is that which assumes that the tops of wireless waves become, after travelling a certain distance, bent over in the direction of travel. This is supposed to be caused by the "feet" of the waves travelling over the surface of the ground more slowly than the upper part of the waves through the air. If this really happens the tops of the waves would eventually become bent in the form of an inverted L and would therefore produce the greatest effect in an aerial when the shape and direction of this latter coincided most nearly with their own. This explanation must be accepted guardedly, but it certainly explains the observed fact remarkably well, while no one has yet succeeded in disproving it.—B.

OUR WEEKLY NOTE

OBTAINING STABILITY

There are many ways of stabilising a set which employs two or more H.F. stages. For instance, a positive bias may be applied to the grids of the valves through a potentiometer, or the coils in the plate circuits may be wound with fine copper (or even resistance) wire. In both these cases the result is the same, namely, the introduction of damping. Though preventing self-oscillation, such methods are very undesirable, and though by their use the effect is counteracted the cause is not affected.

The correct method of attacking the problem is to eliminate the cause, or at least to reduce it as much as possible. The cause of the trouble is, of course, the existence of couplings which link up the grid and plate circuits of the valves, and which are in the right sense to produce regeneration.

The oft-repeated warning about the care to be taken with regard to the spacing of the leads and components of H.F. amplifiers has become so familiar that its importance is liable to be underrated. Besides capacity couplings, however, it is also very difficult to prevent some slight magnetic coupling between the various tuning coils. Care taken in this respect, however, is well worth while as, even if some damping has to be introduced at the finish, much less will be required than would be the case were no care taken to reduce these unwanted couplings.

THE BUREAU.

Accumulators

Q.—*Does the ampere-hour capacity of an accumulator hold good for any rate of discharge? For instance, would it be possible to take 20 amperes for one hour from a battery having a capacity of 20 ampere-hours (actual), and would it be possible to get 100 hours use if the current were reduced to 1/5 amperes?—K. S. (Hastings).*

A.—The ampere-hour capacity at which an accumulator is rated refers principally to its *normal* discharge rating, which is usually also stated. If this rate is exceeded the capacity will be less than 20 ampere-hours, while if the current taken from the battery is less than the discharge rate for which the battery was designed more than 20 ampere-hours will be obtained. You should note particularly that an accumulator should not be discharged at a rate which would result in its being run down in less than eight hours of use or the battery may be seriously damaged. Such a high rate as for a 20-ampere accumulator would have disastrous results.—B.

Atmospherics

Q.—*What exactly is the cause of the noises known as "atmospherics"?—L. V. (Berkhamsted).*

A.—Continual changes of potential take place in the atmosphere and when a cloud, for instance, becomes charged and approaches another cloud (or an earthed object), which is at a different electric potential to itself, a transference of electricity may take place in the form of a huge spark. This, of course, is what we know as a flash of lightning. The spark or lightning flash sends out a powerful electro-magnetic wave in all directions, and this is exactly the same kind of wave as is radiated by a wireless transmitter with the exception that it is highly damped or, in other words, untuned. It is therefore capable of affecting any wireless aerial within its range no matter to what wavelength such an aerial be tuned. This causes a reproduction in the aerial circuit of the flow of current which produced the wave originally, though on a very much smaller scale. As the spark was irregular in nature so also will be the current produced in the receiving aerial and that is why the atmospherics heard in the telephones take the form of irregular crackling noises.—R. W.

Damping

Q.—*I understand that when a crystal detector is connected in series with the telephones across the anode circuit of an H.F. valve, the damping will be greater the less the resistance. Why should this be so? Surely the reverse should be expected.—B. C. (Ilford).*

A.—It is quite true that the damping of a circuit increases with an increase in the resistance when such resistance is in series with the circuit concerned. In the case you mention the resistance (that of the crystal) is connected in parallel with the tuned circuit. Now if a series resistance is increased in value the effect will be to cut down the current which will flow through the circuit when a given difference of potential is applied across the circuit. In the case you mention, supposing a constant voltage to be applied across the anode circuit a total current will flow, the value of which will depend upon Ohm's law. The proportion of the total current which will flow through each branch of the circuit will be determined by the resistances of the tuned circuit and the crystal and phones respectively. By increasing the resistance of the crystal the relative resistances of the two branches are altered in favour of the tuned circuit, through which, consequently, a greater proportion of the total current flows while that through the crystal becomes less. You will, therefore, see that increasing the value of a parallel resistance has the same effect as decreasing that of a series resistance, that is, a reduction in the damping of the circuit.—J. F. J.

Crystal Combination

Q.—*What crystal should be used with bornite?—S. F. R. (Blackpool).*

A.—Zincite should be used in conjunction with bornite to obtain the best results.—R.

WHAT ARE HARMONICS?

IN the early days of broadcasting most listeners, if asked "What are harmonics?" would have answered, "A beastly nuisance!" In those days there was a deal of interference with broadcasting from the harmonics of powerful spark, arc, and continuous-wave transmitting stations. Now, happily, these stations on the longer wavelengths have most of them so reduced their harmonics that interference from this cause is reduced to almost nothing.

Fig. 1.—Diagram of Pure Wave.

Broadcasting stations also emit a very fine series of harmonics, and the great increase of interest in short-wave sets and short-wave listening has made a number of folk familiar with this curious and fascinating phenomenon of wave transmission. It is because of this renewed interest in the subject that an attempt will be made to answer the question at the head of this article without going into any of the rather complicated mathematics which surround it.

Harmonic Motion

If an instrument which propagates waves —it doesn't matter if it is a violin, a human throat, an electric lamp or a wireless transmitter—emits an absolutely pure wave that vibrates regularly, like that shown in Fig. 1, that wave has no harmonic. It is in itself the result of what may be called "pendulum motion," a smooth equal swing which covers equal space in equal time. Mathematicians call this "simple harmonic motion," meaning thereby that every part of the rise and fall of the wave is in "harmony" or proportion.

But suppose that our transmitting instrument emits a wave which rises and falls quickly at one instant of time and slowly at another, as in Fig. 2. Then we have a wave that is not pure. Its parts are not in harmony. Such a wave will, however, be made up of a "fundamental" and one or more "harmonics," and both fundamental and harmonics are of pure wave form.

Now let us look at Figs. 1 and 2 again. These two waves have one thing in common: They each complete one cycle—that is, one complete rise and return and fall and return in the same time, which, for the sake of convenience, I have put down at one-forty-thousandth of a second. Such a wave is said to have a frequency of 40,000 cycles a second and would correspond to a wavelength of roughly 8,000 metres. You will note that the diagram has had to be vastly contracted in length to get it on the page. All waves in the ether travel at a uniform speed, the speed of light, 186,000 miles a second. The frequency of the wave determines its wavelength, and its amplitude or maximum height above the zero line determines its

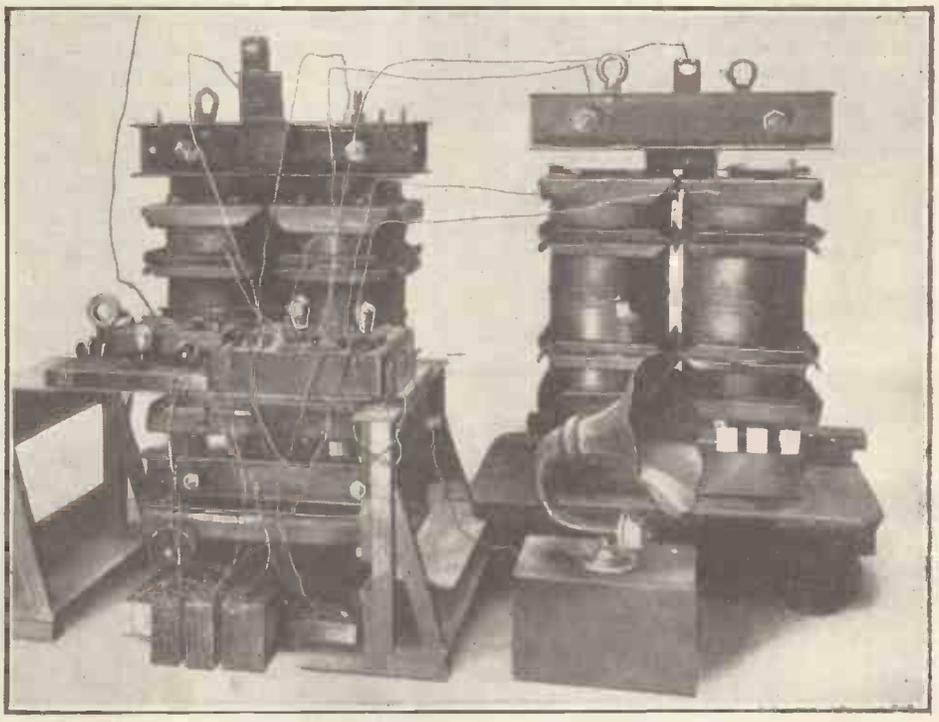
Fig. 2.—Diagram of Impure Wave.

intensity or size. The amplitude has nothing to do with the frequency, but is governed by the power of the transmitting instrument. Thus, suppose you strike middle C on the piano, you send out a sound wave in the air with a frequency of about 256 cycles per second. You can put down the soft pedal or you can put down the loud pedal. You still send out middle C, but the pedals have altered the amplitude of the wave.

Now we come to the explanation of how harmonics are produced. Let us put it very simply first, and say that waves prefer to travel in a pure form, and so when an impure wave is sent out it breaks itself up into a fundamental and several harmonics, the frequency of the harmonics all being an exact multiple of the frequency of the fundamental. In other words, our impure wave, with a frequency of 40,000 cycles per second, might have harmonics of 80,000, 120,000, 160,000, 200,000, 240,000, 280,000, 320,000, 360,000, 400,000 cycles per second and so on, the wavelength getting shorter and shorter as the frequencies get higher and higher. If our 40,000-cycles wireless transmitter had still more harmonics developed, those between 600,000 and 1,000,000 cycles per second might interfere with some of our broadcasting stations.

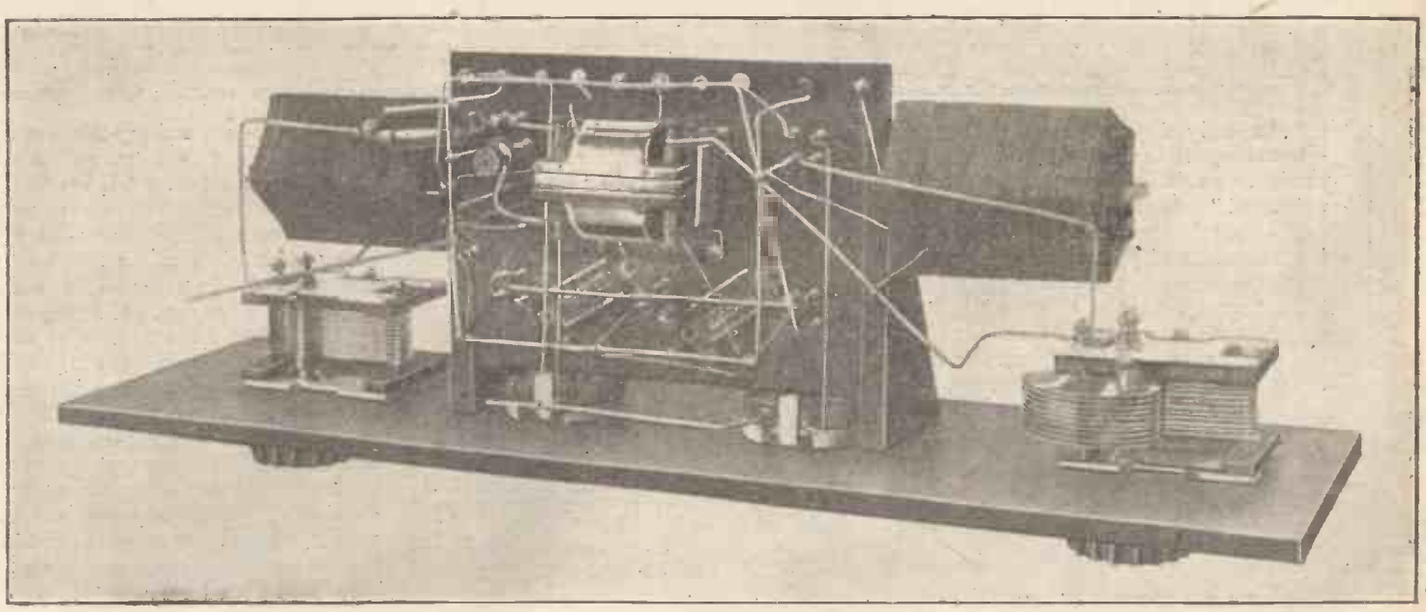
In Fig. 3 we have a diagram of an impure wave with its fundamental and one harmonic. If I tell you how I drew it you will see how very easy it is to understand the theory without referring to tiresome mathematics. First of all I drew a pure wave fundamental, shown as a "chain" line. This I drew to scale to represent a frequency of 40,000 cycles. You will see that the chain line does one complete rise and fall and return in a length of paper —between A and B—which is a frequency of 40,000. Next I drew a "harmonic" wave —the first harmonic—to a scale represent-

(*Concluded on page 700*)



OUTSIDE SIZES IN L.F. TRANSFORMERS!

Strange as it may seem, when recently two Ferranti **150** *K.V.A. power transformers were tried in a receiver, almost perfect results were obtained.*



Three-quarter Plan View of the "Selectone" Receiver.

THE "SELECTO

Quality Combined with Selectivity—

THE majority of readers have doubtless noticed the fine external appearance of most commercial sets, and wished that an efficient home-made article could compete in every way with its factory-produced rival. A glance at the photographs of the finished set, the design of which is explained in this article, will assure the reader that his desire is not only capable of accomplishment but has actually been secured.

The Circuit

Although the circuit (Fig. 1) embodies a valve acting in the dual capacity of H.F. and transformer-coupled L.F., it is entirely free from any of the troubles frequently experienced in reflex working, and has the additional advantage that the filament resistance of this valve acts as a convenient volume control.

The detector has a tuned grid circuit, and the plate circuit is non-regenerative, thereby obviating the necessity for a further control and preventing any possibility of re-radiation.

Volume is obtained without distortion and by the cheaper method of amplification, as the last three stages are resistance-capacity coupled. The parts enumerated in the list below are identical with those incorporated in the original set, and it is advisable that those wishing to reproduce it should follow the list closely, as experiments have proved the combination ideal. Some may prefer to substitute some other reliable parts, and this may be done, but such changes will naturally necessitate alteration in the drilling of the holes, etc.

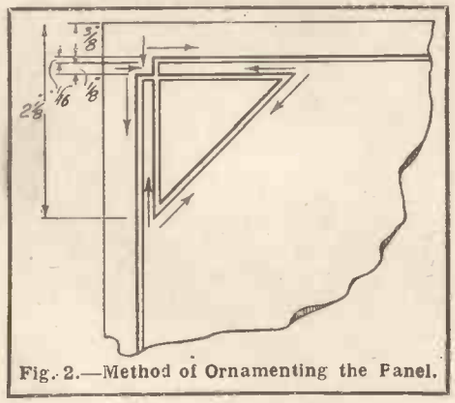


Fig. 2.—Method of Ornamenting the Panel.

Materials Required

One Radion panel, 7 in. by 24 in. by $\frac{3}{16}$ in.; one Radion panel, 6 in. by 9 in. by $\frac{3}{16}$ in.; two filament resistances; two Radion dials, N.Y.7; two Ormond low-loss condensers (.0005); one Energo shrouded L.F. transformer, 5-1; two Radion low-loss formers, 3 in. by 6 in.; three McMichael special anode resistances (80,000 ohms); three McMichael grid leaks and clips (2 megohms); one Erla fixed condenser (.00025, with clips); one Erla fixed grid leak (2 megohms); two Erla fixed condensers (.001); three Erla fixed condensers (.0005); twenty Seleezi valve legs; 16-gauge sheet metal, 3½ in. by 13 in.; 1 lb. of 22 d.c.c. wire; 12 ft. of tinned square connecting wire; six 2 B.A. R.H. screws $\frac{3}{16}$ in. under head; twenty 4 B.A. by ½ in. C.H. screws, nuts and washers; ten 4 B.A. terminals complete; two cycle spokes and nipples.

The tools required are a scriber, square, rule, centre-punch, hammer, carpenter's

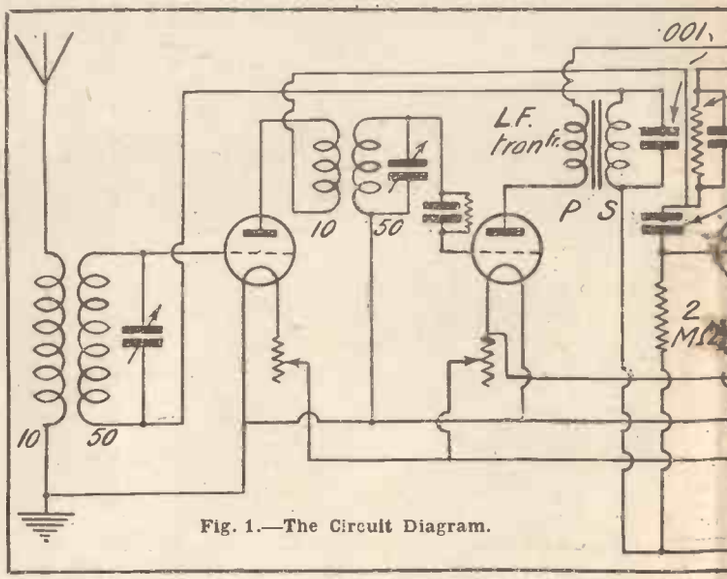
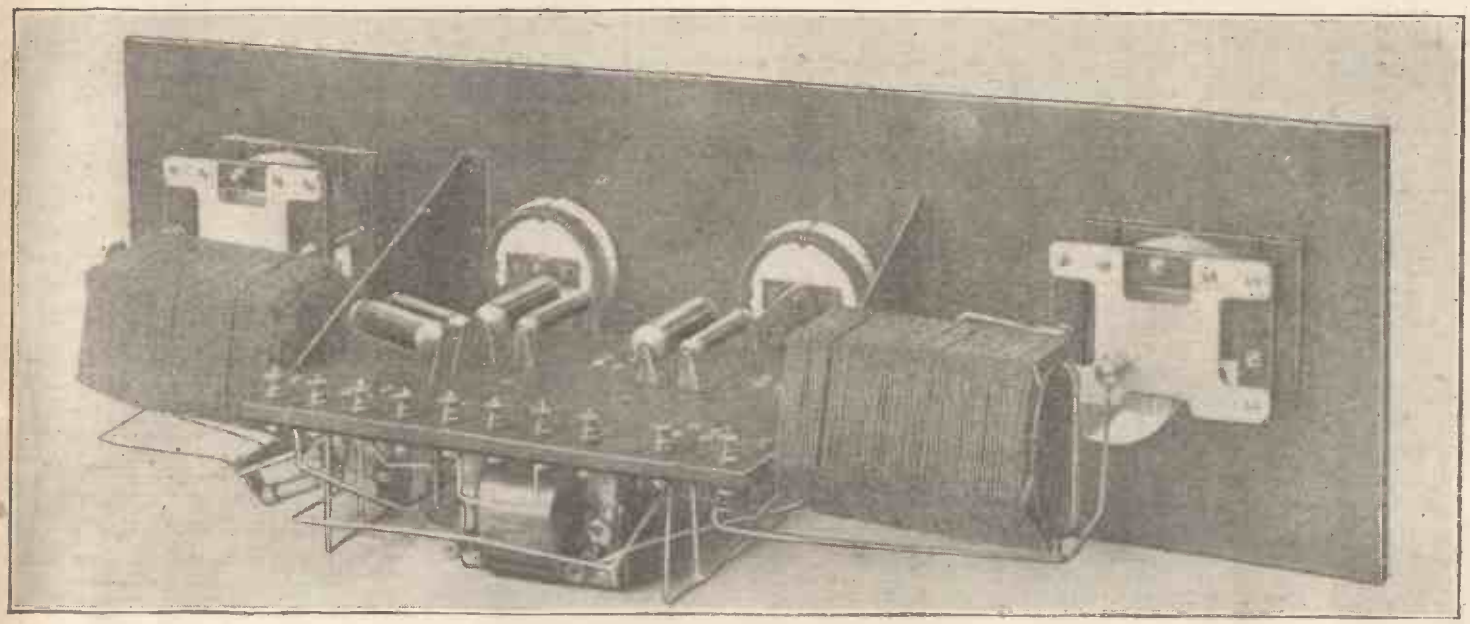


Fig. 1.—The Circuit Diagram.



Another View, showing the Back of the Fanel and Top of Sub-panel.

NE" RECEIVER

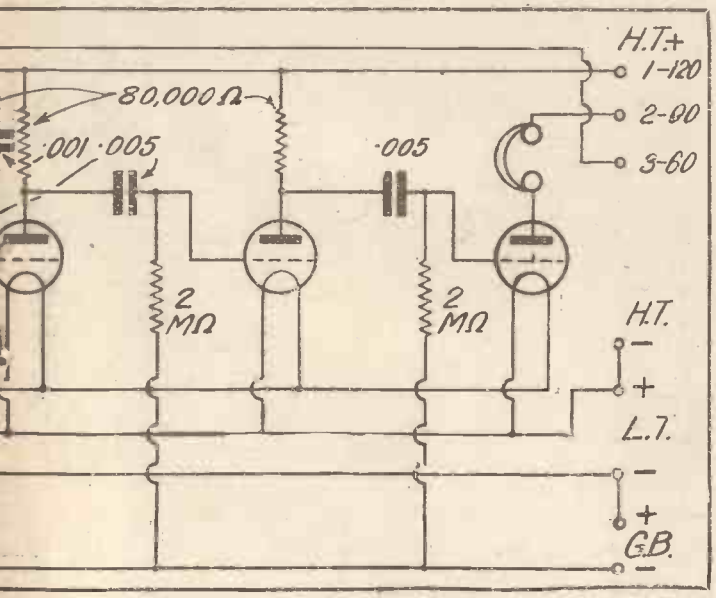
Features of a Set of Unique Design

marking-gauge, small hand-drill, drills, screwdriver, small soldering-iron, and a pair of pliers, all of which are to be found in the tool-kit of the home-constructor.

Considerable time is saved by the use of Radion or other proprietary panels, as all edges are perfectly straight and the corners accurate. To produce the design on the front panel, as illustrated by Fig. 2, the cutters (about $\frac{1}{16}$ in. by $\frac{3}{16}$ in.) should be ground as in the diagram (Fig. 3), refitted into the holder with the cutting edge projecting about $\frac{1}{16}$ in. and the gauge set at $\frac{3}{8}$ in. It is now ready for use, but tests should first be carried out on a waste piece of ebonite to ensure accuracy of grinding and to gain confidence in manipulation. It is quite an easy matter to engrave long lines in this way, providing the panel and marking-gauge are held firmly during the process and the face of the gauge at the same time kept pressed against the edge of the panel.

The start and finish should always be made a little away from a corner, as it is impossible to start or stop exactly where desired. However, corners and short lines should be done by holding the cutter in the hand like a pencil in a perpendicular position, with the first finger on the back edge.

A Starrett combination square will be found very useful here, as it is easily held in position with one hand, leaving the other free to engrave the line by drawing the cutter along the edge of the rule. The panels should be marked off as in Fig. 4 (p. 698) before filling in the engraving with a mixture of fine plaster-of-paris and white enamel.



Tuning Coils

The coils are identical and should be wound on the low-loss formers with ten turns for the primary and fifty turns of the same gauge for the secondary, leaving a small space of about $\frac{1}{32}$ in. between turns.

When residing close to a station, the best results are obtained by winding the secondary ¼ in. or more from the primary, but in the other areas (that is, when the minimum of interference is experienced) louder signals are obtained with little loss of selectivity by winding the primary close to or even on top of the secondary.

The layout of the sub-panel is shown by Fig. 5. The brackets supporting the horizontal panel are shown by Fig. 6, and when these have been cut to size and drilled, the two ½-in. projections should be folded over at right angles, care being taken to ensure that the brackets are folded on reverse sides to form a pair.

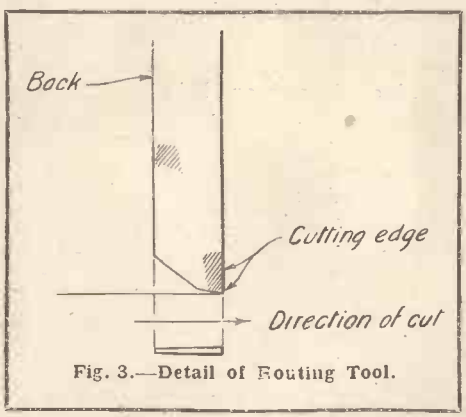


Fig. 3.—Detail of Routing Tool.

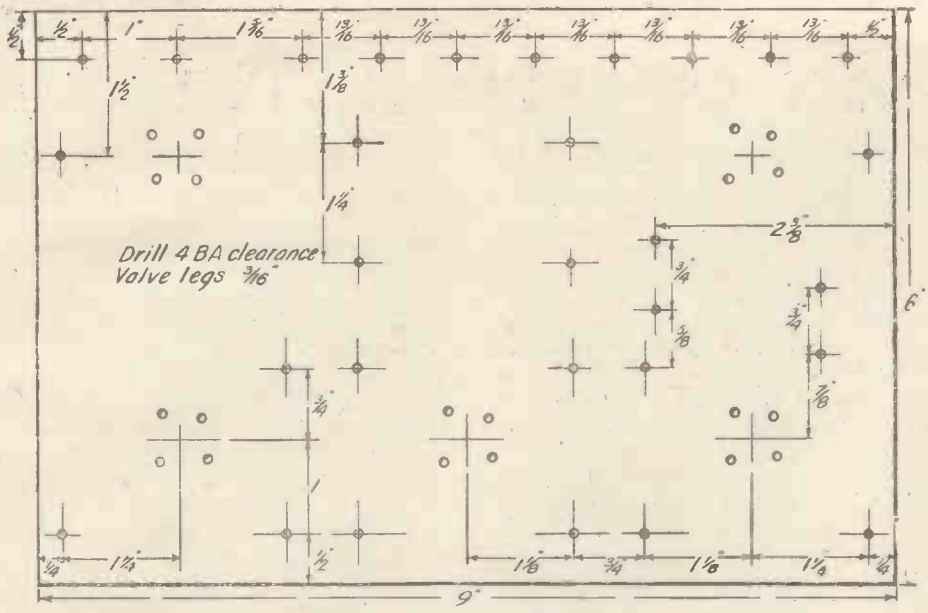


Fig. 5.—Layout of Sub-panel.

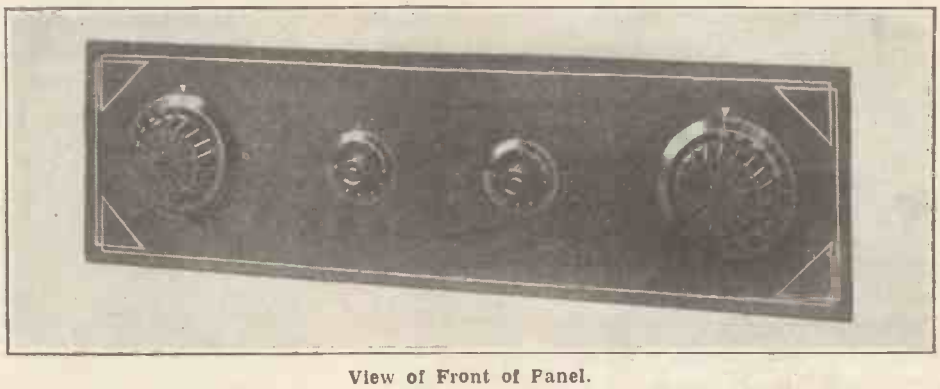
MOUNTING TERMINALS

THE easiest way of mounting terminals upon a panel is to make clearance holes and to secure them with nuts upon the under side. There are, however, several drawbacks to this method. The way that the writer has found most satisfactory is this: Instead of a No. 26 hole for a 4 B.A. terminal, make a hole with a No. 34 drill and tap it. When this hole has been made in the panel, place the piece of studding in the chuck of a hand drill, put the tapered end into the hole and run the emergency tap through quite quickly. The terminal is now screwed in and locked with a nut and a washer. Terminals secured in this way will never work loose. W.

On May 11 music will be relayed from the Hyde Park bandstand, and on the same evening at 10 p.m. "John Henry" is to broadcast from an aeroplane.

The valve legs, grid and anode clips, terminals, Energo transformer, filament resistances, and Ormond condenser should be bolted in their respective positions as shown in the photographs. As the dials are liable to get scratched during the operation of wiring, they should be fitted last.

If the instructions have been carried out correctly the set, when in the normal position, will rest on the case of the transformer. A cycle spoke passed through the hole in the bracket, down the centre of one of the coils and through the centre of a cross-piece of wood or ebonite at the free end, and the whole tightly bolted up by means of a nipple will secure absolute rigidity.



View of Front of Panel.

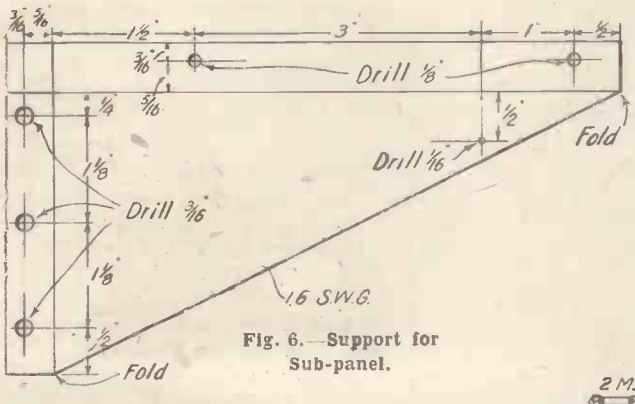


Fig. 6.—Support for Sub-panel.

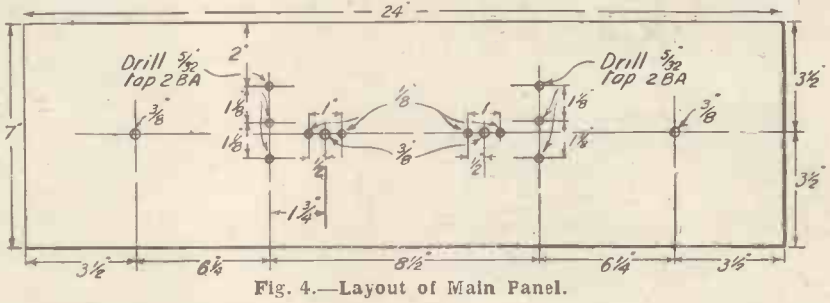


Fig. 4.—Layout of Main Panel.

The fixed condensers are held in place by their connections. The actual placing of all the wires as shown by Fig. 7 should be strictly adhered to, as their positions have been scientifically arranged for the maximum efficiency. The tuned secondary or grid circuits, which are incorporated in this design make for ease in tuning, as the condenser capacities are nearly, if not exactly, the same, and both increase and decrease equally.

The correct adjustment of the grid bias will tend to economy of high-tension current. B. C. C.

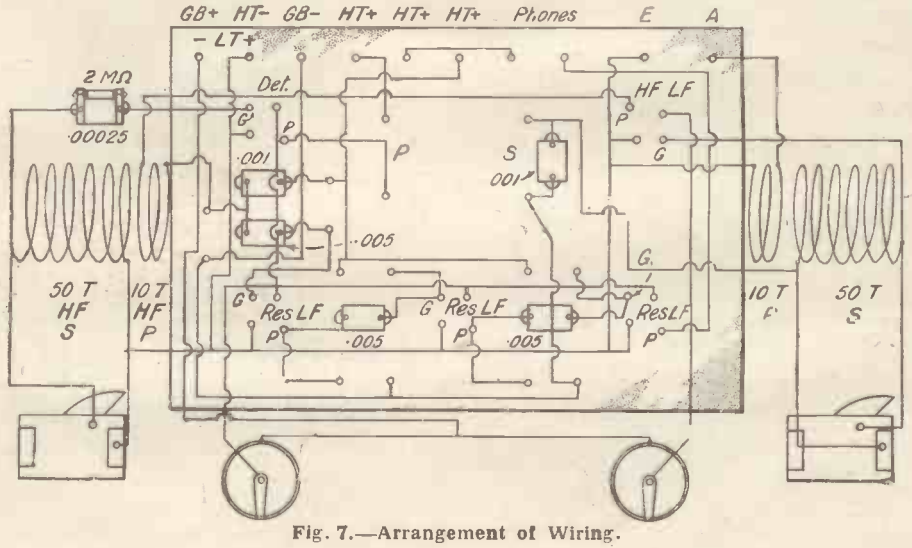


Fig. 7.—Arrangement of Wiring.

"A.W." TESTS OF APPARATUS

Conducted in the "Amateur Wireless" Research and Test Department

A New Grid Leak

WE have received from J. Martin Blair, M.I.E.E., of Amberley House, Norfolk Street, Strand, samples of a grid leak which has been placed on the market. In outward appearance the grid leak resembles the usual type, having a cardboard container with metal contact pieces at each end. On examining the internal construction of this particular grid leak we found a small cylindrical rod of glass, on the surface of which some high-resistance compound has been painted. Over the glass rod a small tube of insulating material is placed which effectually protects the resistance element from climatic conditions.

On test the rated resistances of three samples submitted (.5, 1 and 2 megohms) were found to be within 3 per cent. of the actual resistance. This shows a high degree of accuracy. The leaks were then left for some time and tested at frequent intervals, and it was found that their resistances remained constant. Inserted in the detector circuit of a multi-valve receiver, the grid leak is quite noiseless.

Radion Non-ring Valves.

Radion Non-ring Valves

RADIONS, LTD., of Bollington, near Macclesfield, have solved the problem of producing non-microphonic valves in a very unique and efficient manner. The Non-ring valve, as this valve is called, is enclosed in a cylindrical cardboard container, which is slotted to take elastic bands. Connections to the valve are made by short pieces of flexible wire attached to the usual type of four-pin base. When in position the valve is held upright between the elastic band.

Two types of Non-ring valve are made, for both H.F. and L.F. amplification, whilst it will be found that the H.F. valve is an excellent detector. For portable receiver, or those in which the loud-speaker is incorporated, these valves are ideal, for they do not pick up the mechanical vibrations caused by the loud-speaker. The L.F. valve gives good low-frequency amplification with no distortion, and for an .06-ampere type is one of the best we have tested. With 100 volts on the plate and about 4½ or 6 volts negative grid bias, results are exceptionally good.

A table of the electrical properties of the two types of Non-ring valve are given herewith.

Characteristic	*H.F. Type*	*L.F. Type*
Filament Volts	2.7–3.0	2.7–3.0
Filament Current	.06	.06
Anode Volts	40–120	20–100
Impedance	59,000	19,000
Amplification Factor	16.8	6.0

Pacent S.L.F. Condenser

OF the various Igranic-Pacent components, obtainable from Igranic Electric Co., Ltd., of 147, Queen Victoria Street, London, E.C.4, perhaps the most interesting is the straight-line-frequency variable condenser, which is constructed on low-loss principles, the fixed plates having only two supports with an extremely small amount of porcelain insulation. The moving plates are mounted on a special adjustable bearing at one end of the shaft only, whilst for strengthening purposes the plates are soldered to a small metal strip, which effectually prevents them from bending or buckling.

The moving plates are shaped so that the frequencies to which an oscillatory circuit, consisting of an inductance and one of these condensers, will respond are evenly distributed over the scale. A one-hole fixing device is employed, and by means of the adjustable bearing the friction between spindle and bearing may be reduced or increased at will.

Pacent S.L.F. Condenser.

On test we found that the losses occurring in a sample of this variable condenser are negligible, whilst the capacity varied between .000012 and .00051 microfarad (approximately). The curve obtained by plotting the frequencies of an oscillatory circuit against the dial settings is practically a straight line.

The advantages of the S.L.F. condenser cannot yet be fully realised in an ordinary receiving set, for at present the transmitting stations do not work at equal fixed frequency intervals. For the construction of experimental apparatus, however, such as frequency meters, etc., the value of this type of condenser is very real.

T.M.C. Switches

TOO much emphasis cannot be laid on the necessity of using low self-capacity switches for H.F. work, and even in L.F. amplification it is possible to cause "howling" by the use of switches or jacks having a high self-capacity. The T.M.C. key switches, manufactured by The Telephone Manufacturing Co., Ltd., of Hollingsworth Works, West Dulwich, London, S.E.21, are well made and, when mounted on a panel, present a very pleasing appearance.

The contact blades and points are mounted on a small block of good-quality ebonite, and are brought out to soldering tags. The lever which closes the contacts possesses ebonite rollers, thus giving a very smooth action, whilst special metal contacts are provided on the blades ensuring a positive contact when the lever is pushed to one side or the other. Where several circuits are to be operated, this type of switch may be obtained with multi-contact points. The panel-fixing plate is finished in lacquered brass, with an imitation ivory operating knob. Two fixing screws for bolting the switch to the panel are supplied with each switch.

T.M.C. Key Switches.

"WHAT ARE HARMONICS?" (*continued from page 695*)

ing twice the frequency of the fundamental. It makes *two* rises and falls and returns whilst the fundamental makes one.

Having drawn the two curves, the next job, and the exciting one, was to find out what sort of a wave they would combine into. This is really quite simple. All that has to be done is to combine the values of the amplitudes of the fundamental and the harmonic and plot these values. Thus at "a" the fundamental is 7 units above 0, and the harmonic is 5 units above 0. That adds up to 12, and so we make a point at plus 12 units. At "b" the fundamental is plus 10 units and the harmonic is zero. We make a point at plus 10. At "c" the fundamental is plus 7 and the harmonic minus 5. We plot a point at plus 2, and so on until the whole cycle from A to B is complete, and we can draw the thick-line curve representing the impure transmitted wave.

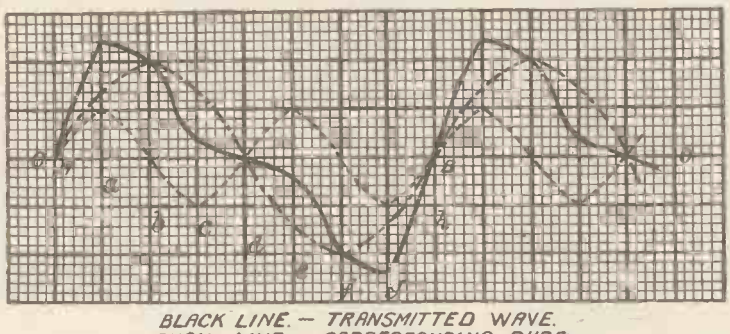


Fig. 3.—Diagram of Impure Wave with its Fundamental and One Harmonic.

Almost without exception wireless waves and the waves sent out by musical instruments are impure, but most of them have far more complicated shapes than that shown in the figure.

Separating the Waves

Now we must go back and reconsider our first simple explanation. As a matter of fact, waves are compelled to keep very nearly to the shape they were given by the transmitter. But the impure wave really does consist of a fundamental and a number of harmonics. With suitable apparatus we can detect them, separating the impure wave into its component parts.

By referring to Fig. 3 again it becomes evident that the amplitude, or intensity, of any given wave at any given point in its vibration is the sum of the amplitudes of the fundamental and all the harmonics at that same point. Or, putting it the other way round, the shape of the emitted wave will determine the amplitude of the fundamental and the amplitude and number of the harmonic waves. Some evening when you are not interested in the broadcast programmes, or when the accumulators have run down, you can amuse yourselves by plotting the impure waves that correspond to fundamentals and harmonics of differing amplitude. Do not try more than two harmonics at first, and, unless you are a very "high-brow" mathematician, don't attempt to work out the fundamental and harmonics that will result from an impure wave of any given form.

The aim of the constructor and operator of an efficient transmitter is to emit a wave as nearly pure in form as is possible. By this means he gets a fundamental wave of large amplitude or intensity and harmonic waves of small amplitude. In other words, he is putting the major part of his power into the fundamental, which is the frequency to which his transmitter is tuned, and wasting little on the harmonic components. The easiest way to get a pure wave from an impure source is to put the emitted wave through a tuned circuit consisting of a coil and condenser which is tuned to the frequency of the fundamental. That is why a loose-coupled aerial circuit is used in many transmitters.

Sometimes, as in broadcasting stations, it pays, in results, not to worry too much about harmonics, because harmonics are very difficult to get rid of in telephony circuits and still keep other desirable attributes of the emitted wave.

In speech and music harmonics are desirable. It is the number and intensity of the harmonics that make the characteristic sound of any particular voice or instrument. Here we come to an important point in reception. To get absolutely good reproduction, with the characteristics of all instruments in an orchestra, not only should the fundamental come through but all the harmonics as well. Good transformers used for note magnification bring out the harmonics very well, but they do not amplify equally fundamentals below middle C. And though the harmonics are important, the fundamentals, particularly the bass notes, are even more important, as they give fullness and richness to the music. It is because resistance-capacity amplification magnifies almost all frequencies equally, both the lower fundamentals and the harmonics, that those who are keen on really good reproduction use it in preference to any other. 5 Y M.

The output of companies manufacturing wireless apparatus in the United States is now valued at about £130,000,000 a year, as compared with £400,000 in 1920.

WIRELESS IN DENMARK

By a Danish Correspondent

THE wireless movement in Denmark is just about three and a half years old, as the first broadcasting was done in October, 1922. The station used for the first experiments was owned by the State. Although this station was quite unsuitable for broadcasting of music and speech, it was—in want of any better—used for the first two years, and it is only a little more than a year ago since the first real broadcasting station was built and started its operations. This station — Kobenhavns Radiofonistation—is situated in the centre of Copenhagen and is still in use. It is transmitting on a wavelength of 340 metres with a power of 1 kilowatt.

Nearly a year ago all broadcasting was taken over by the State, and three new stations have since been taken into use—two relay stations at Hjorring (1,250 metres) and Odense (950 metres) and one at Ryvang (1,160 metres), just outside Copenhagen. A licence fee is enforced from all holders of wireless sets, graduated according to the efficiency of the apparatus; crystal-set owners pay 10 kroners (about 10s.) and valve-set owners 15 kroners (15s.), whilst receiving sets equipped with loud-speakers for public entertainment pay 200 kroners. Default in taking out a licence renders the offender liable to have his set confiscated and to a fine of £20. A board of about thirty-five members supervise the preparations of the programmes, and the Telegraphic Department controls the technical side. This arrangement is to be tried for twelve months, after which period it will be decided whether the Government is still going to control and lead the broadcasting or whether some private concern will be granted a concession. At present there is a strong feeling in favour of a system like the one adopted in Great Britain; an organisation comprising nearly all Danish listeners has made a request to the Government to the effect that a broadcasting concession should be granted a company formed on the same lines as the British Broadcasting Co.

In spite of the fact that Danish broadcasting was not properly organised until a few months ago, the wireless interest is very great, and it must be admitted that the programmes are of an exceptionally high standard.

It is estimated that about 70,000 persons are owners of receiving sets. EDAN.

WHEN Mr. Matheson Lang gave a recital recently from the Glasgow studio, he was greatly interested in the Children's Corner scheme for providing wireless sets for hospitals. As a result, instead of being given a fee for his broadcast, Mr. Lang requested the B.B.C. officials to pay a certain sum into the hospital fund.

During the summer months it is hoped that the band and concert party performances in Glasgow's public parks will be broadcast from the local station. The corporation is favourable to the proposal, which is being eagerly looked forward to by Scottish listeners.

A novel complaint against wireless is being made in Dundee. A listener is being sued by a neighbour, who alleges that the former erected an aerial in close proximity to his clothes rope, with the result that clothing was blown across the aerial and torn.

So much interest was aroused by a wireless talk by Mr. Ludovic Mann on archæological remains in the Glasgow district that the lecturer arranged an expedition of listeners to visit a sand-pit a few miles from the city, where various fossils have been found. A large party made the trip.

The French Under-Secretary of State for Technical Instruction has arranged for a course of lessons in physical culture to be given by wireless. The lessons have been drawn up by the Army Gymnastic Department at Joinville, and a microphone is now being installed which will be linked up with the transmitting station.

The Manchester station has been heard in California. A listener in San Pedro heard the announcer very plainly. This reception shows that the broadcasting of the Manchester station is being kept at a high level, for reports from time to time have shown it to be received in many parts of the world, including Cape Town and Cairo.

Wireless pirates are now being proceeded against without further warning by the Postmaster-General. The Post Office consider that quite enough has been done to inform people that every receiving set must have a licence.

Numerous reports have been received of extensive interference by oscillation among wireless listeners in Hastings and district. So serious has been the disturbance that an endeavour is being made to trace the offender and take drastic action.

A new concert party, "Radio Follies," will give their first performance from 2 L O on May 12.

The Cyclists' Memorial Service (conducted by the Bishop of Coventry at Meridan Village) will be broadcast from Birmingham on May 16. This service is of a national character, and over 12,000 cyclists from all parts of the country attended last year.

As a result of the recent conference of representatives of twenty European countries in the Palais des Nations at Genoa (organised by the principal broadcasting organisation), Great Britain seems likely to lose one or more of its broadcasting stations.

More Scottish hospitals are being equipped with wireless. Both the county fever and accidents hospitals at Alloa have received installations as the gift of the local branch of the British Red Cross Society. In Edinburgh the employees of a local firm have taken similar steps with regard to two wards of the Royal Infirmary.

G 5 Y G (Newlands, Glasgow) has carried out two-way communication with the Brazilian station B Z 6 Q A. The low power of 8½ watts was used to maintain this communication over approximately 4,300 miles, which is understood to be a record for low-power work in Scotland. The Glasgow signals were reported of very good strength in Brazil, the only trouble being with local atmospherics.

Sir John Lavery, the painter, will talk on pictures on May 10 from London and Daventry.

A special service at Carlisle Cathedral is to be relayed on Sunday, May 23.

A new mystery serial, with £100 in prizes, will be broadcast early in June.

On Derby Day the B.B.C. will give listeners an impression of the racecourse from Tattenham Corner by broadcasting the noises of the crowd.

The ceremony of the changing of the Guard at Buckingham Palace will be broadcast on Whit Monday, May 24.

The Bee-bee Cabaret has been chosen as the title for the new revue, to succeed *Listening Time* and *Radio Radiance*, and the first performance will be from London and other stations on May 29.

Further cross-Atlantic wireless telephony experiments, carried out by Post Office officials during the week-end, produced very satisfactory results. Sir Evelyn Murray, secretary of the G.P.O., exchanged greetings with a friend in New York from his home in Manchester Square, W.

Transmissions from the Royal Opera House, Covent Garden, include *Othello*, Act II, on June 1, and *La Boheme*, Act I, on June 4.

Mr. Dan Rolyat, comedian, will be heard again from London on May 14.

Bridgwater, which claims to be the oldest borough in Great Britain, is commemorating the granting of its charter by a special ceremony on June 26. Daventry is to broadcast the proceedings, which will consist of music, songs, and a description of how the charter was secured.

St. Joseph's Hospice for the Dying, Mare Street, Hackney, has been presented with a complete wireless installation, with phones for each bed.

During the coming season several extracts from operas are to be relayed from Covent Garden. There are likely to be three such broadcasts next month, acts from *Figaro*, *The Valkyries* and *Gotterdammerung* being included.

The broadcast of a burlesque of a village concert, in which Mr. Vivian Foster was to have appeared but was prevented by an accident, is now arranged for May 20.

The number of prosecutions to date against persons for installing wireless sets without a licence is 135, the convictions secured being 134.

By the end of this month the first of the new direction-finding motor-vans will, it is expected, be delivered to the Post Office engineers who are specially concerned with stamping out oscillation.

The wireless telephone service recently installed on two fast trains running between Berlin and Hamburg has proved successful, and two more trains on the same line have since been similarly equipped. A service is also being installed on the line between Berlin and Munich.

The Canadian Marconi Co. have signed an agreement with the British Post Office, by which, when the "beam" system of transmission is perfected between Great Britain and Canada, telegrams under the new system will be received for transmission at any Post Office in the British Isles.

Readers may remember Datas, the man with the wonderful memory, who appeared at music-halls in London some twenty years ago. He will broadcast for the first time from the London station on May 11.

Wireless listeners have already been searching the ether in order to pick up signals from Amundsen's airship *Norge*. On the voyage from Italy to England the wavelength of 1,400 metres was employed, but a wavelength of 900 metres, as well as 1,400, is to be used during the trip.

H.T. from the Mains

SIR,—In consequence of the increasing use of eliminators operating from the electric-lighting circuit in place of high-tension batteries, I should like to call attention to the importance of good insulation on phones, should phones be used in association with an eliminator. My reason for writing you is that I recently came across the case of a person who suffered a very severe nervous shock by reason of the fact that there was a low insulation between the coils on the phones and the metal headband.

Of course an unpleasant shock might equally have occurred had there been a high-tension battery of 100 volts or over used, but as an eliminator on a 200-volt circuit was used, you can imagine that the effect was very unpleasant, and the results might have been serious.—F. W. L. (Manchester).

The "Concert Six"

SIR,—The letter by J. H. S. F. in No. 203 certainly makes interesting reading. In the main his experience coincides with my own. I will certainly need some convincing that two stages of H.F. amplification, unless neutralised in some manner or other, are any more effective than one. It is really surprising what a large amount of sensitivity and selectivity can be obtained by using one H.F. valve in a correctly designed receiver, assuming that the correct type of valve is also used. A colleague and myself communicated with a well-known firm of valve makers on this subject, and they, in addition to supplying us with lists of valve data and formulæ, advised us to try a V24 type for H.F. magnification. However, about this time the DE8 was put on the market, and we obtained two of these (H.F. type), using one as detector. The results surpassed all expectations. The signal strength was so great that with two note magnifiers it was necessary to apply reverse reaction to tone it down. This, of course, was for the local station, 5 N O (40 miles away) and 5 X X. Several, but not all, of the B.B.C. stations and most of the Continental could be brought in at full loud-speaker strength with a minimum of reaction. The selectivity left nothing to be desired, it being possible to tune out the local station to receive the nearby Continental stations. Reaction when used was on to the aerial, but no loose coupling was employed.

We then turned our attention to the L.F. side of the set. To commence with, we used a resistance coupling for the first L.F. and a Marconi Ideal 6-1 transformer for the second, and B.T.H. B4 valves. By experimenting with different plate voltages and G.B. values, we managed to get the milliammeter to remain nearly stationary, which is better than relying solely on the acoustic properties of the reception for discovering distortion. Undoubtedly to the ear this arrangement was almost perfect.

We noticed, however, that certain words and instruments were not quite as natural as we would have liked. This did not in any way make speech indistinct, but it did not appear quite balanced, notably the "S's" seemed less prominent than other consonants. It was therefore decided to replace the resistance with another good transformer, and we obtained a G.E.C. 2-1 and also a DE5A valve to handle the increased voltage on the last stage. This resulted in an improvement in tone, and we think that we have now, as nearly as possible, reached perfect reproduction.—RICHARD YORK (Saltburn).

Low-frequency Transformers

SIR,—If I am not trespassing too much on your space, I should like to reply to the letter of S. A. J. in No. 202. He states that I speak with the voice of great authority; if this is so, the reason is that I am fully acquainted with the subject concerning which I wrote, and would now point out that the whole of your correspondent's statements are wrong.

When I stated that the impedance of a transformer primary should be infinitely great compared with that of the valve preceding it, it was not intended that the transformer impedance should be infinite in the absolute sense, since obviously its windings would then be equivalent to an insulator and no current whatever would flow through them. What was meant, and what is perfectly correct, is that it is only possible to obtain the maximum amplification out of a valve by arranging matters so that the impedance at any particular frequency in its plate circuit is very many times greater than the impedance of the valve itself.

This may more clearly be shown in the following manner. The impedance of the valve between its plate and filament may be considered as being a resistance in series with the impedance of the transformer primary, the voltage applied across the ends of the resistance and impedance being equivalent to the signal applied to the grid of the preceding valve, multiplied by the amplification factor of the valve.

It is very easy to see that if the valve impedance matches the transformer impedance the proportion of the valve amplification of which use is made is only about .7 of the total amplification available.

The mathematical formula relative to this question is as follows:

Amplification = $M \times \text{ratio}$

$$\sqrt{\frac{r^2 + Z^2}{(R + r)^2 + Z^2}}$$

Where M = Amplification factor of valve.

Z = Reactance of transformer = $2\pi fL$.

r = D.C. resistance of transformer primary.

R = Impedance of valve in the plate circuit of which the transformer primary is connected.

It will be noted that the fraction behind the square-root sign can never be equal to unity, but it may be made to approach unity by making Z sufficiently great or, what is more difficult, R sufficiently small.

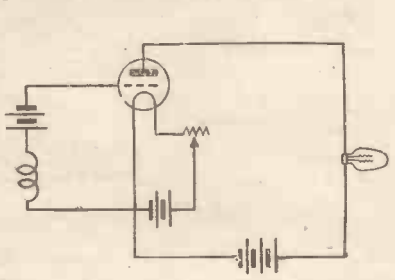
Your correspondent's remarks in the second paragraph of his letter are also incorrect, since he has apparently overlooked the fact that the voltage applied across the primary of the transformer is equivalent to the impedance of that winding multiplied by the current flowing through it, and that although increasing the impedances lessens the current, the product of the two remains unaltered, particularly as the increased impedance is obtained by adding increased turns which make up for the reduced current.

Your correspondent is again wrong in the last paragraph of his letter, and if he had considered the question of transformer design at all he would not have made such a statement. Ohmic resistance in the transformer winding is unfortunately unavoidable and merely wastes energy. The position may be seen more clearly if we consider the case of a transformer having no resistance in its primary, but having a high resistance connected in series with it, which acts in exactly the same way as though the resistance were in the winding itself. It will be noted that the signal voltage from the valve is applied across the ends of the resistance and the transformer winding, so that only a small proportion of the total voltage is actually across the transformer primary winding itself, and since it is this portion only which is stepped up, increasing the primary resistance merely reduces the amplification given by the transformer.

If it had been resistance-capacity coupling that was under consideration it would be a different matter, since it may be shown that by using anode resistances of the order of 1 megohm, advantage may be taken of almost the whole of the amplification factor of the valve.—J. B. (New Moston).

THE TELORAMA LAMP

PRACTICALLY every big newspaper office in the United States will before long be fitted up with the necessary apparatus for telegraphing photographs. One of the leading experts of the Bell Telephone Co., Mr. H. E. Ives, described to me the other day the rapid progress that is being made with telegraphed pictures in America. The quality has for some time been so good that many people are not even aware, when they see them reproduced in their morning's newspaper, that they are not reproductions of the original photographs! Mr. Ives is one of the four inventors of the Bell system, which was specially worked out for use on the network of telephone lines owned by this gigantic organisation. It is significant that the telegraphed picture is now so common in several of the big American newspapers that the fact that it *is* telegraphed is not even mentioned.



Telorama Lamp in Receiving Circuit.

One of the latest novelties in this direction is the Telorama lamp of Mr. D. McFarlane Moore, a vacuum gas lamp that has been designed entirely for wireless television. Whatever be the form of transmitting apparatus, the signals picked up by the receiving aerial are, after amplification, passed into the Telorama lamp, the light of which varies in strict accordance with the signal strength, and is thrown upon the viewing screen.

The new lamp depends on the power of neon at low pressure to glow vividly under the influence of a high-tension discharge. Its luminosity can be brought to a maximum, or extinguished, in a millionth of a second, and it thus compares well in the rapidity of working with a photo-electric cell. The method of connecting the lamp is, as will be seen from the diagram, quite simple.

Mr. Ives, who is now on his way back to the States, was reticent as to the prospects of television. That it can be done without much further experimental work is fully recognised, but the amount of attention that will be directed to a solution of the problem depends to some extent upon its commercial possibilities.

The aim of most experimenters is to provide the amateur with television apparatus which he can adapt to an ordinary receiving set, rather than to solve the bigger and more doubtful problem of wireless motion pictures for the theatre.

T. THORNE BAKER.

NOTE.—*In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.*

GREAT BRITAIN

The times given are according to British Summer Time.

London (2LO), 364 m. 1-2 p.m., con. (Tues., Thurs, Fri.); 3.15-3.45, transmission to schools; 3.30-5.30, con. (Sun.); 4-5 p.m., con.; 5.15-5.55, children; 6 p.m., light music; 7-8 p.m., time sig., news, music, talk; 8.10-10 p.m., music; 9.0 news (Sun.); 10.0-10.30 p.m., time sig., news, talk; 9.30-10 p.m., special feature (Mon., Wed., Fri.). Tues. and Thurs. the Savoy Bands are relayed until 11.30 p.m., and on Sat. until midnight.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 440 m. **Birmingham** (5IT), 479 m. **Bournemouth** (6BM), 387 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 422 m. **Manchester** (2ZY), 378 m. **Newcastle** (5NO), 407 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 315 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 321.5 m. **Liverpool** (6LV), 331 m. **Nottingham** (5NG), 326 m. **Plymouth** (5PY), 338 m. **Sheffield** (6FL), 306 m. **Stoke-on-Trent** (6ST), 301 m. **Swansea** (5SX), 482 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 4 p.m. onwards, own con. on Mon. Dance music daily (exc. Sun.) till midnight; on first Friday in each month until 2 a.m.

IRISH FREE STATE.

Dublin (2RN), 397 m. Daily, 7.30 p.m. Sundays, 8.30 p.m. until 10.30 p.m.

CONTINENT

The Times are according to the Continental system; for example, 16.30 is 4.30 p.m., and 08.00 is 8 a.m. B.S.T.

AUSTRIA.

Vienna (Radio Wien), 594 m. and 541 m. (temp.) (10 kw.). 11.00, con. (almost daily); 15.30, con.; 19.25, news, weather, time sig.; con., lec., news; 20.00, con.; 22.00, dance (Wed., Sat.).

Graz, 402 m. (1 kw.). Relay from Vienna. Also own con. (Tues., Wed., Fri.), 20.10.

BELGIUM.

Antwerp, 250 m. (1½ kw.). Relays Brussels.

Brussels, 264 m. (1½ kw.). 17.00, orch. (Tues., Thurs., Sat. only), news; 20.00, lec., con., news (opera, Mon. and Wed.).

CZECHO-SLOVAKIA.

Prague, 368 m. (5 kw.). Con., 20.00-23.00, daily. Also tests on 800 m.

Brunn (OKB), 521 m. (2.4 kw.). 10.00, con., news (Sun.); 19.00, lec., con. or dance (daily).

DENMARK.

Copenhagen (Radioraadet), 347.5 m. (2 kw.). Sundays: 15.30, lec.; 17.30, children; 20.00, play; 21.15, news, con.; 21.15, news, Esperanto (Mon.), silent night. Weekdays (Tues., Fri., Sat.); 20.00, lec., con., news, con.; 21.30, dance (Sat.).

Ryvang, 1,150 m. (1 kw.). Sundays: 09.00, sacred service; 17.30-21.30, same as Copenhagen; 20.00 (Wed., Thurs.), lec., con., news, orch.

Sorö,* 1,150 m. (1½ kw.). Relays Copenhagen. Also broadcasts at times on 1,500 m.

FINLAND.

Helsingfors (Skyddskar), 504 m. (500 w.). Temporarily closed down.

Helsingfors, 440 m. Con., 18.00 (Tues., Thurs., Sat., Sun.).

***Tamafors**, 368 m.

***Jyvaskyla**, 561 m. (200 w.).

***Uleaborg**, 233 m. (200 w.).

* Relay Helsingfors.

GRAND DUCHY OF LUXEMBURG.

Radio Luxemburg (LOAA), 1,200 m. Con.: 14.00 (Sun.), 21.00 (Thurs.).

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 11.00, markets (exc. Sun. and Mon.); 11.20, time sig., weather; 15.00, 16.45, Stock Ex. (exc. Sun. and Mon.); 18.00, talk, con., news; 19.00 and 23.10, weather; 21.00, con. (2,740 m.) (daily).

Radio-Paris (CFR), 1,750 m. (about 3 kw.). Sundays: 12.45, con., news; 16.30, Stock Ex., con.; 20.15, news, con. or dance. Weekdays: 12.30, con., markets, weather, news; 16.30, markets, con. (irr.); 20.15, news, con. or dance.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (800 w.). 14.00 or 15.00, studio con. or outside relay; 20.30, lec. (almost daily); 21.00, con. (daily).

"Le Petit Parisien," 333 m. (temp.) (1 kw.). 21.15, con. (Tues., Thurs., Sat., Sun.).

Radio-Toulouse, 430 m. (2 kw.). 12.30, con., time sig. (daily); 17.30, news (exc. Sun.); 20.45, con.; 21.25, dance (daily). Also operatic relays on 500 m., occasionally.

Radio-Lyon, 280 m. (2 kw.). 20.20, con. (daily).

Radio Agen, 318 m. (250 w.). 12.40, weather, Stock Ex.; 20.00, weather, Stock Ex.; 20.30, con. (Fri.).

***Lyon-la-Doua**, 488 m. Own con., 20.00 (Mon., Wed., Sat.).

***Marseilles**, 351 m. (500 w.).

***Toulouse** (PTT), 280 m. (2 kw.).

***Bordeaux**, 411 m.

* Relays of PTT Paris.

Montpelier, 238 m. (1 kw.). Relays Radio Toulouse.

Angers (Radio Anjou), 300 m. (500 w.). Daily: 20.30, news, lec., con.

GERMANY.

Berlin, on both 504 and 571.5 m. (4 kw.). 09.00, sacred con. (Sun.); 11.00, con. and tests; 12.55, time sig., news, weather; 15.00, educ. hour (Sun.), markets, time sig.; 17.00, orch.; 20.30, con., weather, news, time sig., dance music until 24.00 (nightly). Relayed on 1,300 m. by Koenigswusterhausen and Stettin (241 m.).

Königswusterhausen (LP), 1,300 m. (8 kw.). 11.30-12.50, relays Berlin (Sun.); 15.00, lec. (daily); 18.30, relay of Berlin (Vox Haus) con. (daily). 2,525 m. (5 kw.), Wolff's Buro Press Service: 06.45-20.10. 2,880 m., Telegraphen Union: 08.30-19.45, news. 4,000 m. (10 kw.), 07.00-21.00, news.

Breslau, 418 m. (4 kw.). 12.00, con. (daily), Divine service (Sun.); 12.55, time sig. (Sun.), weather, Stock Ex., news; 16.00, children (Sun.); 17.00, con.; 19.00, lec.; 20.30, con., weather, time sig., news; 21.45, dance (Sun., Thurs.). Relay: Gleiwitz, 251 m.

Frankfort-on-Main, 470 m. (1½ kw.). 08.00, sacred con. (Sun.); 11.55, time sig., news; 12.55, Nauen time sig.; 16.00, con. (Sun.); 16.30, con.; 18.00, markets, lec.; 20.00, lec., con., weather, dance. Relay; Cassel, 273.5 m.

Hamburg, 392 m. (4 kw.). Relayed by Bremen (279 m.), Hanover (294 m.), Kiel (233 m.) Sundays: 07.25, time sig., weather, news, lec.; 09.15, sacred con.; 13.15, con.; 18.00, con.; 19.15, sports, weather, con. or opera, dance. Weekdays: 06.55, time sig., weather; 07.00 and 07.30, news, weather; 12.55, Nauen time sig., news; 14.00, weather, con.; 16.15 and 18.00, con.; 19.00, lec.; 19.55, weather and con.; 22.00, dance (daily, exc. Tues.).

Königsberg, 462 m. (1 kw.). 09.00, sacred con. (Sun.); 12.55, time sig., weather, news; 16.30, con.; 17.00, con. (Sun.); 19.30, lec.; 20.00, con. or opera, weather, news, dance (irr.).

(*Concluded in second column on page 706*)

"BROADCAST TELEPHONY" (*cont. from page 704*)

Leipzig, 452 m. (700 w.). Relayed by Dresden (294 m.). 08.30, sacred con. (Sun.); 11.00, educ. hour (Sun.); 12.00, con. (daily); 12.55, Nauen time sig., news; 16.30, con., children (Wed.); 20.15, con. or opera, weather, news, cabaret or dance (not daily).

Munich, 487.5 m. (3 kw.). Relayed by Nuremberg (340 m.). 11.30, lec., con. (Sun.); 14.00, time sig., news, weather; 16.00, orch. (Sun.); 16.30, con. (weekdays); 18.30, con. (weekdays); 19.15, lec.; 19.30, con. (Sun.).

Munster, 412 m. (2½ kw.). Relayed by Elberfeld (259 m.), Dortmund (283 m.). 11.45, radio talk, Divine service; 12.00, news (Sun.); 12.30, news (weekdays); 12.55, Nauen time sig.; 15.30, news, time sig.; 16.00, con.; 17.00, children (Sat.); 19.40, news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 24.00 and 04.00, weather and news.

Stuttgart, 447 m. (1½ kw.). 11.30, con. (Sun.); 16.30, con. (weekdays); 17.00, con. (Sun.); 18.30, time sig., news, lec., con. (daily); 21.15, time sig., late con. or cabaret.

HOLLAND.

Amsterdam (PCFF), 1,955 m. (1 kw.). Daily: 06.35-15.30 (exc. Mon. and Sat., when 12.30-13.30), news, Stock Ex.

Hilversum (HDO), 1,050 m. (2½ kw.). 09.00, sacred service (Sun.); 19.10, con.; 21.00, news, etc. Will shortly test on 25 kw.

HUNGARY.

Buda-Pesth (Csepel), 560 m. (2 kw.). 09.00, news; 12.00 and 15.00, weather, news; 17.00, dance music; 20.00, con. or opera, dance.

Kosice, 2,020 m. (2½ kw.). 19.00, con.

ICELAND.

Reykjavik, 327 m. (700 w.). Tests: 22.30, 24.30.

ITALY.

Rome (IRO), 425 m. (2½ kw.). 10.30, sacred con.; 13.15, official communique; 17.00, children; 17.30, relay of orch. from Hotel di Russia; 17.55, news, Stock Ex., jazz band; 20.30, news, weather, con.; 22.15, late news.

Milan, 320 m. (2 kw.). 20.00-01.00, con., jazz band. Testing on 425 to 430 m.

JUGO-SLAVIA.

Belgrade (Rakovitza) (HFF), 1,650 m. (2 kw.). 17.00, news (daily), con. (Tues., Thurs., Sat.).

LETTLAND.

Riga, 488 m. (2 kw.). Con. daily, 21.00-22.00.

NORWAY.

Oslo, 382 m. (1.2 kw.). 11.00, Divine service (Sun.), Stock Ex. (weekdays); 13.15, markets; 19.15, news, time, lec., con.; 22.00, time, weather, news, dance relayed from Hotel Bristol, Oslo.

Bergen, 358 m. (1½ kw.). Testing.

POLAND.

Warsaw, 480 m. (6 kw.). Daily: con., 11.00-13.00; 15.00-23.00, daily.

RUSSIA.

Moscow (RDW), 1,450 m. (12 kw.). Weekdays: 12.30 and 17.55, news and con.

(Popoff Station), 1,010 m. (2 kw.). 10.00, 11.00, lec.; 13.00, 19.00, con. (Tues., Thurs., Fri.).

Radio Peredacha, 410 m. (6 kw.).

Trades Union Council Station, 450 m. (2 kw.). 18.00, con. (Mon., Wed.).

Leningrad, 940 m. (2 kw.). Weekdays: 16.00.

Nijni Novgorod, 1,400 m. (1.2 kw.). 21.30, con.

SPAIN.

Madrid (EAJ6), 392 m. (1½ kw.). Daily: con. (times vary daily). Closes at 24.00 on Sun., Wed., Sat.

Madrid (EAJ7), 373 m. (4½ kw.). 17.30-24.00, con. (almost daily).

Madrid (EAJ4), 340 m. (3 kw.). 16.00, con.

Barcelona (EAJ1), 324 m. (3 kw.). 17.00-21.00, news, lec., con. (Sun.); 18.00-23.00 (daily).

Barcelona (Radio Catalana) (EAJ13), 462 m, (4½ kw.). 19.00-24,00, con., weather, news.

Bilbao (EAJ9), 415 m. (1 kw.). 19.00, news, weather, con. Close down 22.00.

Bilbao (Radio Vizcaya) (EAJ11), 418 m. (2 kw.). 22.00-24.00, con. (daily).

Cadiz (EAJ3), 357 m. (550 w.). 19.00-21.00, con., news. Tests daily (Mon., Tues., Wed., Sat.), 24.00.

Cartagena (EAJ15), 335 m. 19.00-22.00, con. (daily).

Seville (EAJ5), 357 m. (1½ w.). 21.00, con., news, weather. Close down 23.00.

Seville (EAJ17), 300 m. 19.00-22.00, con. (daily).

San Sebastian (EAJ8), 346 m. (500 w.). 17.00-19.00, 21.00-23.00 (daily).

Salamanca (EAJ22), 405 m. (1 kw.). 21.00, con. (daily).

Saragossa, about 325 m. Testing.

SWEDEN.

Stockholm (SASA), 430 m. (1 kw.). 11.00, sacred service (Sun.); 12.30, weather; 14.00, con. (Sun.); 17.00, children (Sun.); 18.00, sacred service; 19.00, lec.; 21.15, news, con., weather. Dance (Wed., Sat.).

Relays.—Boden (SASE), 1,200 m.; Eskilstuna, 250 m.; Falun (SMZK), 370 m.; Gothenburg (SASB), 288 m.; Gefle, 325 m.; Helsingborg, 235 m.; Joenkoeping (SMZD), 265 m.; Kalmar, 253 m.; Karlsborg, 1,250 m.; Karl-Sundsvall (SASD), 545 m.; Trollhattan scrona (SMSM3), 196 m.; Kristinehamm (SMTY), 202 m.; Karlstadt (SMXC), 221 m.; Linkoeping, 467 m.; Malmo (SASC), 270 m.; Norrkoeping (SMVV), 260 m.; Orebro, 218 m.; Ostersund, 720 m.; Säffle (SMTS), 245 m.; (SMXQ), 322 m.; Umea, 215 m.; Varborg, 340 m.

SWITZERLAND.

Lausanne (HB2), 850 m. (1½ kw.) (temp.). 20.00, lec., con. (daily).

Zurich (Hongg), 513 m. (temp.) (500 w.). 11.00, con. (Sun.); 12.00, weather; 12.55, Nauen time sig., weather, news, Stock Ex.; 13.30, piano solo; 17.00, con. (exc. Sun.); 18.15, children, women; 19.00, news, weather; 20.15, lec., con., dance (Fri.).

Geneva (HB1), 760 m. (2 kw.). 20.15, con. (daily).

Berne, 434 m. 10.30, organ music (exc. Sat.); 16.00, 20.30, con.

Basle. Testing.

EIFFEL TOWER CALIBRATION SIGNALS

ON the first and fifteenth of every month the following calibration signals are transmitted by Eiffel Tower, Paris:

At 11.50 a.m. B.S.T., for a period of one minute, a series of A's on a wavelength of 5,000 metres; from 11.51-11.54 a continuous dash on 5,000 metres; from midday to 12.01 a series of B's on 7,000 metres, followed until 12.04 by a long dash on the same wavelength. The exact wavelengths on which these signals have been transmitted are then wirelessed in morse by Lyon-la-Doua (YN) at 13.00 B.S.T. on 15,500 metres.

GRIDDA.

In accordance with the wish expressed by listeners, the German stations are gradually abandoning the use of morse signals in the intervals of programmes. Berlin has adopted the method utilised for some time by Breslau, and uses a ticking metronome.

REMOVING VALVE CAPS

THE amateur sometimes requires the cap of a valve to be removed either for short-wave working in order to reduce the capacity effects or else to overcome some obvious defect in the valve, such as crossed wires in the seal or foot tube or a faulty connection. The removal of the cap may seem at first sight to be a very easy operation, but in practice it is more difficult than one would expect and the glass is often cracked in the operation. In general, most valves of British manufacture are either capped with what are known as hot or cold cements, and the first thing to do is to examine the cap and determine the nature of the cement which has been used; if it is the "hot kind," then the cap may be removed by unsoldering the wires connected to the four pins and immersing the cap in methylated spirit, because the hot cement consists chiefly of shellac and is of a brown appearance. On the other hand, if the cement appears to be white, then cold capping has been employed, and after the wires have been unsoldered the cap should be inserted in a strong solution of hypo such as is used for fixing photographic prints. The white capping takes some considerable time to loosen, and it is a good plan to try to make some inlet in the cap to enable the hypo to soak through to the cement.

A. H. H.

Amateurs living in the Black Forest (Germany) are complaining that this part of the country is badly served by the broadcasting authorities, and a movement is on foot to obtain the erection of a relay station in Freiburg and Karlsruhe. Until these transmitters are in operation this particular district will be compelled to rely on the new Basle station for its broadcast entertainment.

The new Frankfort-on-Main broadcasting station (10 kilowatts) will be opened within the next two months.

Billy Leonard and Mr. T. Sterndale Bennett are the principal artistes in the humorous portions of the Birmingham and Cardiff programmes on May 14 and 15.

CHIEF EVENTS OF THE WEEK

SUNDAY, MAY 9

London	Shakespeare's Heroines.
Manchester	Mendelssohn's "Hymn of Praise."

MONDAY

London	"What Would You Do?"
Glasgow	The Pianoforte Sonatas of Beethoven.

TUESDAY

London	John Henry from an Aeroplane.
Birmingham	*Marriage by Lantern Light* (Offenbach)
Cardiff	*Young England.*
Manchester	The Lure of the West Country.

WEDNESDAY

London	The Wireless Follies Concert Party.
Aberdeen	Choral Music by The Aberdeen Railway Male-voice Choir.
Edinburgh	The Embassy Orchestra.
Nottingham	An Evening of Variety.
Stoke-on-Trent	The Longton Town Band.
Swansea	The Swansea Police Band.

THURSDAY

London	The Wireless Symphony Orchestra.
Birmingham	Lightsome Programme.
Bournemouth	A Sussex Evening.
Belfast	Ascension Day Music.
Newcastle	Gems of Opera.

FRIDAY

London	*The Valkyrics.*
London	Meeting of National Savings Association. Jack Payne's Hotel Cecil Dance Band.

SATURDAY

London	Brighton Competitive Musical Festival.
Aberdeen	The Aberdeen Radio Players.
Cardiff	The Station Orchestra.
Manchester	The Tyldesley Temperance Prize Band.
Newcastle	A Brass Band Night.

Holiday Resorts.—A useful guide to holiday resorts has been issued by the publishers of the *Weekly Telegraph,* of 180, Fleet Street, E.C. The guide, the price of which is 6d., is arranged in sections in the order of England, Wales, Scotland, Irish Free State and Northern Ireland. All the resorts mentioned are arranged in alphabetical order under the section to which each belongs, with exceptions in the case of the Isle of Man and the Isle of Wight, where the resorts are arranged rather in their order of importance. A section describing holiday tours in Belgium is also included.

The wireless operators attached to R. E. Byrd's United States Arctic Expedition this summer have applied to the Department of Commerce for the purpose of obtaining authority to use 13-, 20-, 40- and 80-metre wavelengths for their transmissions. The call-sign assigned to the expedition is K E G K.

The Air Ministry is erecting a number of short-wave stations in the British Empire for communication with aircraft. The following are five stations in the course of erection: G F C, Cranwell (England); G F P, Calstock (England); G F C, Leuchers (Scotland); G E H (Cairo) G H A (Malta).

Radio-Belgique (Brussels) having been granted temporary permission to broadcast on a wavelength of 508 metres, has effected a few experimental transmissions since May 1. Should the Belgian authorities agree to the continued use of this wavelength, the new Antwerp station will effect its transmissions on 265 metres.

Edward Clark.

NEXT WEEK AT 2LO

By "THE LISTENER"

Herbert Heyner.

VARIETY is the keynote of next week's programmes at 2LO, and one is glad to note that a lighter texture prevails in most of the programmes.

On Sunday afternoon a hearty welcome will be extended to the String Band of the Royal Regiment of Artillery, assisted by the well-known soloists, Florence Holding, Herbert Heyner, and Martha Baird, a young Californian pianist.

At 5.30 it is hoped that Mrs. Patrick Campbell will be the actress for the second of the series of "Shakespeare's Heroines." She will play the part of Lady Macbeth.

In the evening the wireless orchestra will be conducted by Edward Clark, the musical director of Newcastle. The programme includes items from Rimsky-Korsakov's opera *Sadko,* the vocalist being Janet Hensley, while violin solos will be contributed by William Primrose.

Many listeners appear to like "query" programmes, and on Monday from 8 o'clock to 8.50 there will be a competition entitled "What Would You Do?" with prizes to the value of £500. Later follows Act II of Mozart's opera *The Marriage of Figaro,* relayed from the Royal Opera House, Covent Garden. At 10 o'clock chamber music will be given by the Virtuoso String Quartet, led by Marjorie Hayward, the well-known violinist. The pianist is Miss Kathleen Long, a distinguished classical pianist.

Tuesday's programme is of a variety nature. It includes at 8 o'clock the fourth episode of *That Child,* by Florence Kilpatrick, syncopated duets by Johnson and Greenop, and the appearance of that famous variety star, Datas, the man of phenomenal memory. At 10 p.m. John Henry will give a broadcast entertainment from an aeroplane.

Wednesday marks the first appearance of the new "Radio Follies" concert party.

As Sullivan, the greatest of our native composers, was born on May 13, it is only appropriate that a Sullivan program should be given. He is so intimately c nected with light operas that many peo seem to overlook his genius in other for of musical composition. Probably the le known of all is his symphony, entit "The Irish Symphony," which will be cluded on this occasion, together w other lesser known works. These inclu three dances taken from the incider music to *The Tempest* and excerpts fr *Ivanhoe.*

On Thursday the week's feature 10 o'clock is by Ivy St. Helier, assis by the London Radio Dance Band.

Friday's programme includes speec from the Albert Hall, where the Natio Savings Association is holding its te meeting.

On Saturday the Brighton Competit Musical Festival will be relayed from Dome.

WIRELESS PICTURES FOR ALL

A DEMONSTRATION was recently given in London of the Izon apparatus for the transmission of photographs by wire or wireless. The system is the invention of Mr. T. Thorne Baker, and is of such a simple character that anyone can use it after a little practice. When used for wireless reception the Izon receiver is simply connected up to an ordinary valve receiver in place of the loud-speaker. It consists essentially of a cylinder which is rotated by means of a clockwork motor. On this cylinder paper of a special character is placed, and on bars parallel with the cylinder a travelling frame carries a platinum point. During transmission this platinum point makes contact with the emulsified paper and records the picture, music, or whatever subject transmitted.

The platinum point is moved over the length of the cylinder by means of a rotating micrometer screw. The effect on the paper is produced by a current from a special battery circuit which operates through the platinum point.

Synchronisation with the transmitter is effected by means of a pendulum timed to oscillate at a pre-determined rate, and this operates a release circuit at the end of every complete revolution.

The transmitter is similar to the receiver except that upon the cylinder a flexible metal negative, prepared in the same manner as a process block, is fixed, and the contact point is of steel instead of platinum.

Messrs. W. Watson and Sons, Ltd., of 313, High Holborn, W.C.1, will shortly place the machine on the market, and later it is expected that suitable transmissions will be made from B.B.C. stations.

TRADE NOTES AND NEWS

THE "A.D." primary cell, a special type of battery obtainable in both dry and wet forms, is described in a catalogue issued by Le Carbone, Ltd., of Coventry House, South Place, E.C.2. The A.D. cell is capable of producing very heavy currents, and is suitable for use with either bright- or dull-emitter valves.

Details of the Dubilicon condenser, a new Dubilier product of great use to the experimenter, are given in a folder issued by the Dubilier Condenser Co., Ltd., of Ducon Works, Victoria Road, North Acton, W.3. A novel competion is being organised in connection with this component, with a cash prize of £200, particulars of which can be obtained from most wireless dealers or the Dubilier Co.

Trelleborg, Ltd., of Audrey House, Ely Place, E.C.1, have issued an attractive showcard for Trelleborg guaranteed ebonite.

How to get the best out of your low-frequency transformer is fully explained in the illustrated booklet issued by the Power Equipment Co., Ltd., of Kingsbury Works, The Hyde, Hendon, N.W.9. A copy of this interesting booklet will be sent free to any reader who sends a post-card to the Power Equipment Co.

The Igranic Electric Co., Ltd., have published an interesting folder giving particulars of the Igranic super-heterodyne receiver. A complete set of parts is supplied for building a powerful six-valve receiver.

Mr. G. Marcuse has recently been in telephonic communication with CIAR (Dartmouth, Nova Scotia) using a power of 500 watts. Marconi valves were used for transmitting and receiving purposes.

Ipswich and District Radio Society

Hon. Sec.—MR. H. E. BARBROOK, 22, Vernon Street, Ipswich.

ON Monday, April 12, the above society held their last public meeting at the Museum Lecture Hall, High Street, Ipswich. Mr. Whitehouse, of the B.B.C., gave a most interesting lecture. The lecturer showed how the simple early discoverers of the last century—and scientists such as Sir Isaac Newton, who discovered the light spectrum—were in reality the pioneers of modern wireless transmission. Gradually Mr. Whitehouse went through the development of broadcasting, leaving the technical side severely alone, and finally gave a description of 2LO. Actual photographs of the station and of Daventry, including a number of slides, concluded his programme.

Croydon Wireless Society

Hon. Sec.—MR. H. T. P. GEE, Staple House, 51-52, Chancery Lane, W.C.2.

A DEMONSTRATION was given by representatives of Peter Curtis, Ltd., of their double-circuit super-heterodyne receiver before the members of the Croydon Wireless Society on Monday, April 12. The set can be used either with an ordinary Reinartz circuit for reception of the local station on the loud-speaker, or as a super-heterodyne circuit of eight valves for the long-distance stations and for greater selectivity. In the latter case the super-heterodyne circuit is superimposed on the two- or three-valve circuit, the extra valves being brought into operation by means of a single switch. In both cases a special frame aerial is used. Transmissions from a number of Continental stations were heard, and the ease at which these stations were brought in, and the stability of the set, were much appreciated. There was a good discussion, and the representatives of the firm were accorded a vote of thanks for the demonstration.

"A Bird's House for the Garden" is the title of a seasonable article appearing in the current issue of "The Amateur Mechanic and Work" (3d.). Other articles appearing in the same number are: "Materials for Bungalow Building," "How to Make Putty," "Pendulums for Electric Clocks: The Electro-magnet," "Accumulators: Their Action, Care and Maintenance," "Welding Cast-iron Pipes with Bronze," "A Microscope of Simple Design," "A Variable Circuit Four-valve Cabinet Set," "Renovating Mahogany Dining-room Chairs," "Whitening Stone Steps and Window Sills," "Roofing Sheds, etc., with Corrugated-iron," "Amateur Cinematography," "Overhauling a Motor-cycle."

From Our Own Correspondent.

MR. HARRISON asked the Minister of Agriculture whether, seeing that the fishing industry, both in the interests of the nation and of the industry itself, required stimulating, he would consider arranging a series of wireless lectures by his experts to bring before the nation the value of fish as a foodstuff.

Mr. Guinness said he should be glad to try to arrange suitable wireless talks on fish and fisheries.

Major Sir Archibald Sinclair asked the Postmaster-General whether His Majesty's Government refused to conduct experiments in wireless telephony with either Australia or Canada on account of their commitments in the United States of America; and, if so, whether he would explain the nature of those commitments and how long they would last?

Sir W. Mitchell-Thomson replied that the only reason why the experiments had so far been confined to the United States was that the United States was the only country equipped with suitable transmitting and receiving apparatus for the purpose of reciprocal experiments. The Government were under no obligations to the United States which would preclude their undertaking experiments with Canada or Australia in the event of stations equipped for the purpose being provided in those Dominions.

Kelly's Directory of the Electrical Industry, Wireless and Allied Trades 1926.—The new edition of this valuable directory has just been published. The information given is arranged in a simple manner, facilitating quick reference, and is divided into the following sections: (1) An alphabetical arrangement of towns, with information as to the population and sources of electrical supply; (2) a list of public lighting, power and traction undertakings, with particulars of systems and voltages; (3) an alphabetical list of the names in London and suburbs; (4) alphabetical classifications of trades, with the names of each profession arranged in alphabetical order under their particular trade heading; (5) a list of branded articles, together with the names and addresses of the manufacturers. The price of the volume is 30s., and it will be found a valuable asset to all connected with the electrical and wireless industries. The publishers are Kelly's Directories, Ltd., 186, Strand, W.C.2.

The Elder Brethren of Trinity House have granted permission for wireless sets to be installed on board certain light-ships. They have decided on the type of installation most suitable.

The "Permatector" is heavily nickelled and costs only **3/-** From your dealer or send direct.

"A permanent contact which cannot be put out of action."

WE said the "Permatector" was "as stable as a valve"—proof against vibration—always set for the loudest possible signals. And now that crystal users are fitting this unique crystal detector our claims have been proved up to the hilt. Here is a letter from one satisfied user showing the results *you* can obtain with the "Permatector."

"Thank you for prompt delivery of Permatector, I feel that you have solved the irritating difficulty of adjusting catwhiskers on crystals, and have now given the public a permanent contact, which cannot be put out of action by any vibration whatsoever. It is really a boon, and should have a great sale."

The "Permatector" costs but 3/-, and definitely provides trouble-free crystal detection. It has been built to fit instantly any model "Brownie Wireless" Receiver, and brackets, screws, and nuts are provided in each box to allow it to be fitted to any other crystal set in a very few minutes. The outer case is turned out of solid brass rod and heavily nickel-plated; the finished product being a handsome addition to any receiver.

For trouble-free crystal reception use

THE "PERMATECTOR"

—the always "ever-set" crystal detector

Built by
the makers of the famous "Brownie Wireless" Crystal Receiver

THE BROWNIE WIRELESS CO. (of Gt. Britain) Ltd.
(Incorporating the J.W.B. Wireless Co.)
310a-312a, Euston Road, London, N.W.1
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The secret of success in soldering—FLUXITE

FLUXITE SOLDERING SET—complete 7/6

All Hardware and Ironmongery Stores sell FLUXITE in tins, price 8d., 1/4 and 2/8.

Another use for Fluxite—Hardening Tools and Case Hardening. Ask for leaflet on improved method.

FLUXITE, Ltd.
(Dept. 326),
Rotherhithe, S.E.16.

Try the coil that "makes all the difference"!

Every listener who has tried the new LEWCOS Coil is talking about the difference it makes. Some say that this coil in the blue box is as different from ordinary coils as "Glazite" is from the old connecting wire.

The LEWCOS Coil embodies high electrical efficiency with great mechanical strength. It gives extremely fine tuning and, having an exceptionally low high-frequency resistance, increases signal strength.

Try the LEWCOS Coil for yourself—it makes *all* the difference!

Your radio dealer stocks or can obtain this new coil.

No.	25	35	40	50	60	75	100	150	200	250	300
Price	4/6	4/6	4/6	5/-	5/6	5/6	6/9	7/6	8/6	9/-	10/-

LEWCOS *Inductance Coil*

The LONDON ELECTRIC WIRE COMPANY & SMITHS, LTD.

Manufacturers of Glazite Connecting Wire

Playhouse Yard, Golden Lane, London, E.C.1.

This mark  *guarantees quality.*

JUDD.

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A NEW SET FOR THE SHORT WAVES

RIBBON COILS—AND HOW TO MAKE THEM

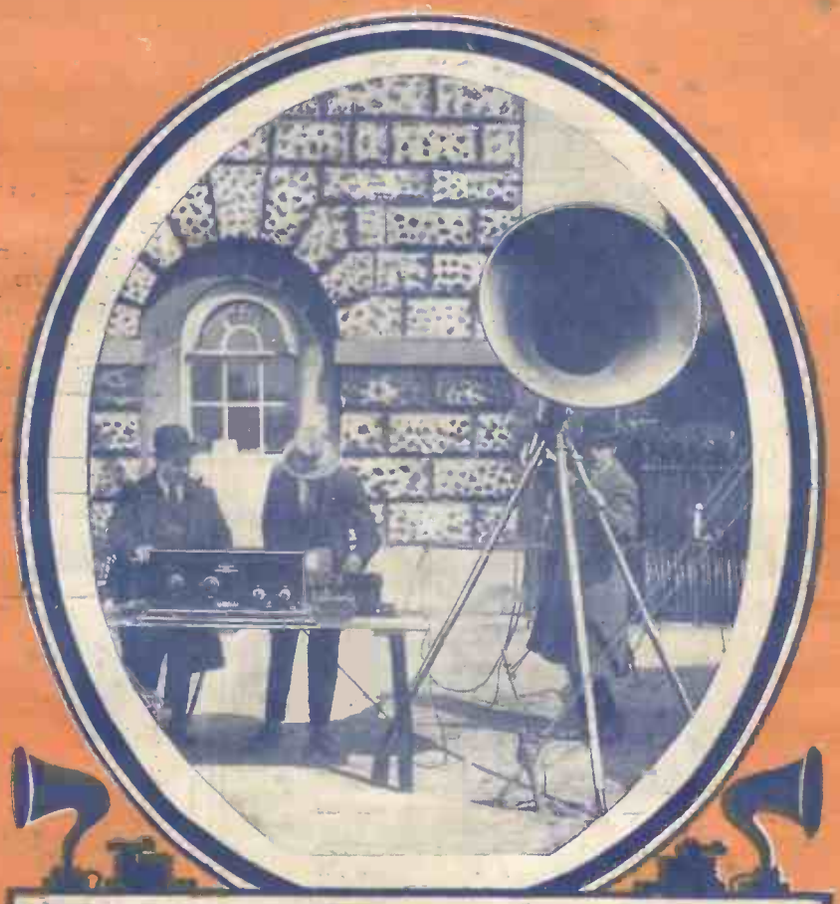
Amateur Wireless And Electrics

Vol. VIII. No. 206 SATURDAY, MAY 22, 1926 Price 3d

PRINCIPAL CONTENTS

WELL ILLUSTRATED

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



WIRELESS DURING THE STRIKE

A Brown Power Loud-speaker on the Horse Guards' Parade Ground Used to Broadcast the News Bulletins

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenter

Edited by BERNARD E. JONES

Technical Adviser: SYDNEY BRYDON, D.Sc., M.I.E.E.

Vol. VIII. No. 206 — MAY 22 1923

Chief Contents

"Amateur Wireless and Electrics." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to the Proprietors, Cassell and Co., Ltd.

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," La Belle Sauvage, London, E.C.4.

"LOW-LOSS" AND LONG WAVES

LOW-LOSS coils are usually rather bulky and differ in several respects from plug-in coils, so that amateurs are often perplexed as to how to use them in a receiver in which they have enjoyed the flexibility resulting from the use of plug-in coils. The great advantage of plug-in coils is their interchangeability; it takes but a moment to change the tuning range of a receiver from a few hundreds to thousands of metres. They are compact, too, and all very much of a size, so that coupling one to another presents no difficulties. Most of them have the additional advantage of being robust.

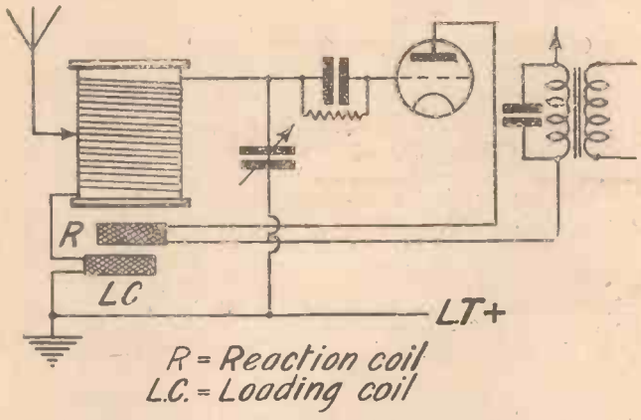


Fig. 1.—A Satisfactory Arrangement for an Ordinary Circuit.

Low-loss coils are generally much larger owing to the thicker wire used and the spacing of the turns. They are seldom suitable for plugging into the ordinary coil holder, and in any case the mounts are more widely spaced than in the standard coil holder in order to reduce capacity effects. They are seldom so robust as plug-in coils.

Owing to the manner of their construction they are generally made only for the lower and broadcast wavelengths, and if these were the only wavelengths to be received their use would not present difficulties. But the amateur likes to be able to receive Daventry, Radio-Paris and other stations on the higher wavelengths for which plug-in coils are so suitable, and it is this fact which makes the difficulty.

The arrangement shown in Fig. 1 will be found a very satisfactory and efficient solution of the problem. A low-loss coil of the skeleton type is shown permanently mounted in the receiver, the coil being tapped to permit of auto-coupling. A two-way coil holder, in which the coils move across their axes, is mounted near the earth end of the low-loss coil. The moving holder is used for the reaction coil, and the fixed holder for the loading coil for the higher wavelengths. The tuning condenser is connected across the low-loss coil and loading coil.

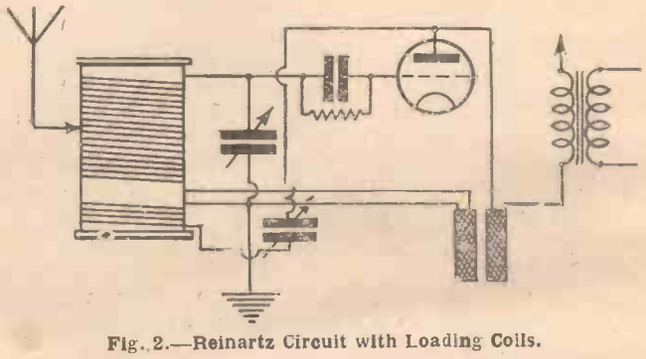


Fig. 2.—Reinartz Circuit with Loading Coils.

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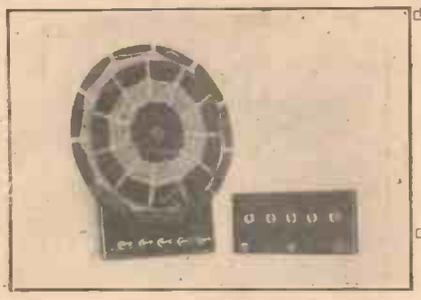


Photograph of Complete Transformer.

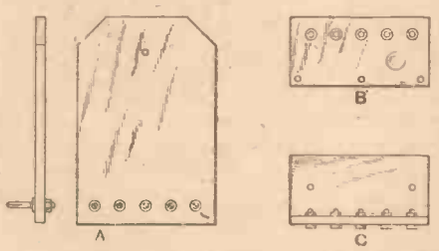
A NOVEL PLUG-IN H.F. TRANSFORMER

THE neutrodyne method of coupling high-frequency amplifying valves is rapidly gaining favour amongst those amateurs who believe in combining efficiency with stability and ease of control, but it is perhaps not quite so popular as it might be, since by using fixed transformers, the tuning range of the set becomes somewhat limited. The obvious method of extending this range is to arrange the transformers on the interchangeable principle, so that one may be wound to cover the low band of wavelengths, another for the medium wavelengths, and so on. The photograph and sketch shows how simple it is to effect this very desirable modification.

Construction

The transformer, instead of being of the more usual cylindrical type, is wound as two separate card inductances, the two coils being tightly coupled by means of a small bolt which also clamps them to the upper portion of a piece of sheet ebonite fitted with five valve pins. The ebonite is 4½ in. long by 3 in wide, and is arranged as shown at A in the sketch. The coils are, of course, connected to the nuts on the valve pins, the central tapping of the secondary winding being then joined to the central pin, and the ends of the primary and secondary windings to the remaining two pairs of pins. The pins are spaced ⅝ in. apart and fitted about ½ in. from the lower edge of the ebonite support.

A glance at the photograph should now make the idea quite clear; the complete transformer is simply plugged into a socket consisting of a piece of sheet ebonite 3 in. long by 1½ in. wide, which is drilled and fitted with five flush-type valve sockets and screwed to one edge of a supporting wooden base. In the sketch B shows a front view of the socket panel and C represents a plan or top view of the panel attached to the wooden baseboard. The latter is 3 in. long and about 1½ in. wide, and two small holes should be drilled through same to take fixing screws or bolts so that it may be firmly attached to the baseboard of the set.



Constructional Details of Transformer Mount.

The circuit leads to the sockets are, of course, arranged to correspond with the coil-to-pin connections, or *vice versa,* and matters are simplified if the socket is connected permanently in circuit before connecting the coils to the pins; after checking all connections the sockets and pins should be carefully marked. Thus it becomes a simple matter to "standardise" the ebonite coil support or plug and the coil connections, and experiment with the system on various different wavelengths by using different transformers.

A very efficient transformer for the ordinary B.B.C. wavelengths may be made by winding 25 turns of No. 24 d.c.c. wire on one former to constitute the primary winding, and 60 turns of No. 28 d.c.c. wire on another former, to constitute the secondary winding, which is tapped off at the thirtieth turn.

O. J. R.

The new association of Swiss broadcasting stations, L'Union Radiophonique Suisse, has now completed its arrangements for the interchange and relay of Helvetian programmes. In future, on certain days of the week, concerts organised by either Berne, Lausanne, Geneva or Zurich will be simultaneously broadcast to all four stations.

The Arbroath Infirmary wireless fund now stands at £214.

"'LOW-LOSS' AND LONG WAVES" (*continued from preceding page*)

When receiving the lower wavelengths, the loading coil is removed and the holder shorted, a suitable reaction coil being inserted in the moving holder. For the higher wavelengths suitable loading and reaction coils are inserted in the appropriate holders. The position of the aerial connection will not give a proper auto-coupled effect on the higher wavelengths, and it will practically amount to direct coupling. This is not, of course, of any disadvantage, it being practically the same as if a single plug-in coil were used.

Fig. 2 shows the arrangement when a Reinartz circuit is used. In this it is quite usual for the coupling between the aerial and reaction coils to be fixed, the two coils often being wound on the same former and reaction varied by means of the variable condenser C2. In this circuit an H.F. choke is used, and this can consist of a large plug-in coil, say No. 200 to 300. In the arrangement shown a two-way coil holder is used to accommodate the H.F. choke and the loading coil. When receiving the lower wavelengths, the loading-coil holder is shorted. When changing to the higher wavelengths, the loading coil is inserted and the H.F. choke coil changed for one of a size suitable for reaction. By setting the reaction condenser at minimum this circuit is virtually broken and will not affect the reaction control with the moving coil.

All Wavelengths

If the position of the aerial and earth connections are reversed, or if aperiodic coupling is used, the same arrangement can be used for the higher wavelengths by using flexible connectors and clips for the aerial and earth connections to the low-loss coil, an arrangement very useful for varying the tapping positions.

If these suggestions are adopted a receiver can be made to cover all wavelengths from the lowest to the highest, but two or more low-loss coils will, of course, be required, one for the low and the other for the broadcast wavelengths. It will not be necessary to change them often, and this can be arranged for quite easily by fitting plugs and sockets at the opposite ends of the coil formers.

It is usually possible to arrange the two-way coil holder in such a position that the control arm passes through the panel, or the holder can, of course, be mounted on the panel.

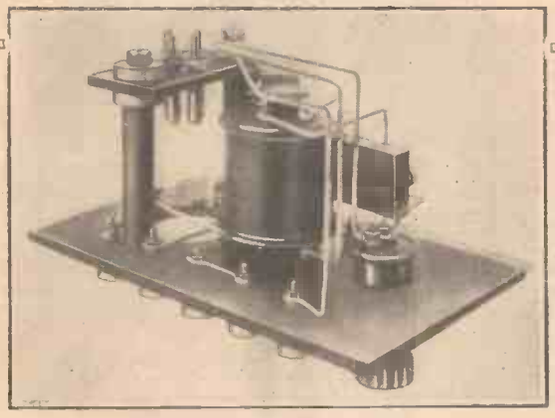
A switch can be used instead of a shorting plug for the loading-coil holder. As it is connected on the earth side of the low-loss coil, it need not introduce any inefficiency, and when the receiver is being used for the local station and Daventry, so that any slight losses would not matter, the loading coil can often be left in the holder for convenience.

R. H. B.

A Viennese wireless amateur claims to have received transmissions from Rome, Paris, Daventry, Berlin and Königswusterhausen on an ordinary crystal receiver.

A USEFUL ONE-VALVE AMPLIFIER —AND HOW TO MAKE IT

SIGNALS obtained from an existing crystal or valve set are not always sufficiently loud to be really satisfactory. An H.F. stage, if not already fitted, would, of course, enable signals to be brought in at greater strength, but providing signals are already audible, the use of a low-frequency amplifier valve, such as is described in this article, will increase considerably the volume of sound without complicating the tuning of the set.



View of Underside of Panel.

Components

The materials required for the construction of the amplifier are as follow: Two No. 2 B.A. screwed rods each 3⅜ in. long; two pieces ebonite tube each 2¼ in. long by ¼-in. bore; four rubber tap washers; six No. 2 B.A. lock-nuts; one ebonite panel, 7 in. by 4¼ in. by $\frac{3}{16}$ in.; one Wates Bros.' Supra L.F. transformer (5-1); one Microstat filament resistance; ten terminals, marked H.T. +, H.T. −, L.T. +, L.T. −, grid +, grid −, input, input, phones, phones; four valve-leg sockets; one cabinet of the dimensions shown in Fig. 1; one .0005-microfarad mica-insulated fixed condenser; 6 ft. No. 16 S.W.G. tinned-copper wire (for connections); one brass valve-window ring, 2¼ in. outside diameter by 1¾ in. inside diameter by $\frac{1}{16}$ in. thick (for valve-hole edging); one ebonite strip, 1½ in. by 3¼ in. by $\frac{3}{16}$ in.

Construction

After drilling the panel and the valve-holder mounting strip as shown in Figs. 2 and 3, the assembly of the shock-absorbing valve holder may be taken in hand. The two screwed brass rods should be fixed into the two tapped holes in the panel and the ebonite tubes, nuts, washers and valve-holder strip mounted over the rods as shown in detail (Fig. 4). When complete and properly adjusted, this valve holder will be found to absorb any vibration or shocks which would otherwise be transmitted to the valve. The remaining components should be fitted in position to agree with the wiring diagram (Fig. 5).

It will be noted that the feet of the transformer have been altered from the position as purchased, so that the end of the coil faces the panel surface; this will entail no difficulty, as the feet are easily removable by unfastening one nut.

For the sake of appearance, a brass ring (Fig. 6, p. 776) has been fitted to the valve-hole edge; this, of course, plays no part in the working of the amplifier, and may be omitted if found difficult to construct.

Wiring Up

The wiring of the amplifier will be found to present no difficulty, and is shown clearly in the under-panel wiring diagram (Fig. 5) already referred to. The ordinary circuit diagram (Fig. 7) may be used in conjunction with the under-panel diagram.

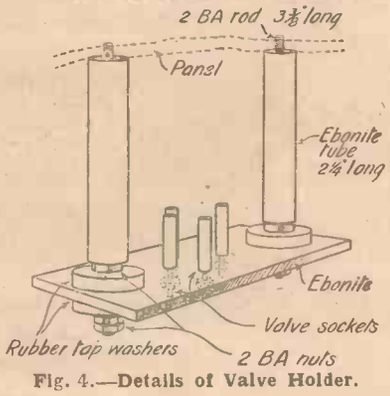


Fig. 4.—Details of Valve Holder.

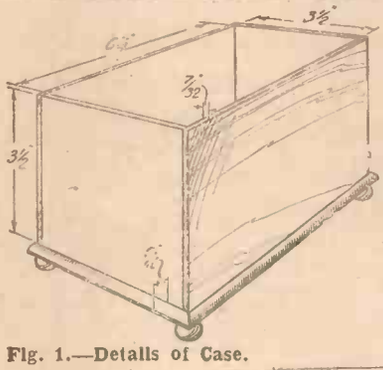


Fig. 1.—Details of Case.

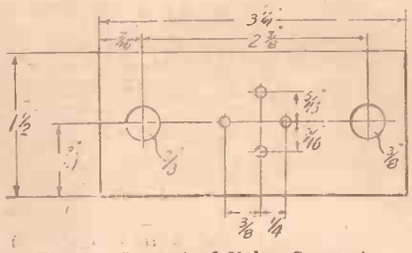


Fig. 3.—Layout of Valve Support.

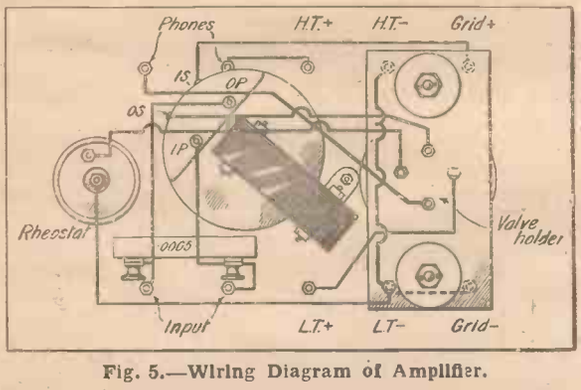


Fig. 5.—Wiring Diagram of Amplifier.

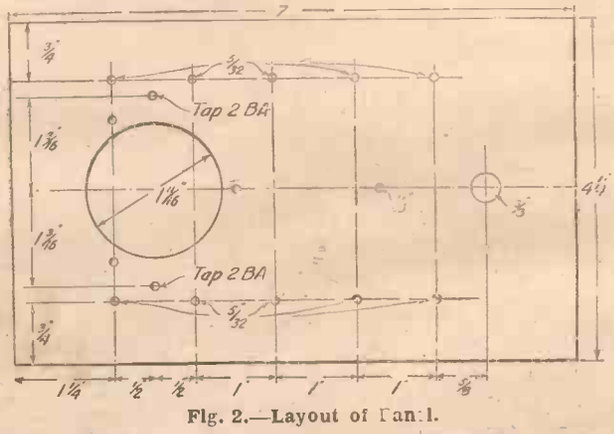
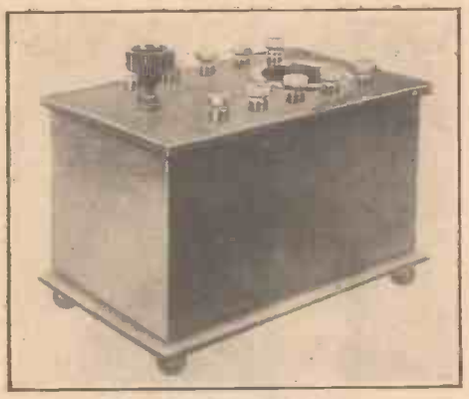


Fig. 2.—Layout of Panel.

Using the Amplifier

If signals are already fairly loud without the addition of the amplifier, a small power valve may be advantageously used in the amplifier. Such valves as the B.T.H. B4, B.T.H. B6, Mullard PM4, Marconi DE4, DE5, etc. etc., will be found to give very satisfactory results, providing suitable values of H.T. and grid bias are used. Where signals are weak, however, no advantage will be gained by fitting a power valve; in this case an ordinary general-purpose valve, such as the Marconi DE3, Marconi DE2 L.F., Mullard PM3, B.T.H. B5, etc., can be employed. Fig. 8 shows the correct connections when the amplifier is used in conjunction with an ordinary crystal set. If the amplifier is to be employed to strengthen signals from an existing valve receiver, the method of which is shown in Fig. 9, a difficulty occurs when it is proposed to use the same batteries.



The Complete Amplifier.

The battery terminals in an existing valve set may be wired up in two ways, as shown at A and B (Fig. 10). A set wired as shown at A, where the H.T. – and L.T. – terminals are common, is suitable for connection to the amplifier, but if it is found that the receiver is wired as at B, some alterations will have to be made in the wiring before the amplifier is coupled up. If the wiring of the existing receiver is as shown at B (Fig. 10), probably the simplest way out of the difficulty is to wire up the amplifier to the alternative circuit diagram shown by Fig. 11.

M. R.

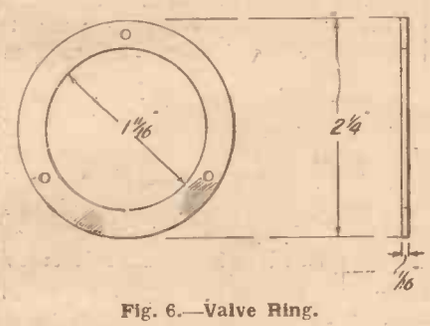


Fig. 6.—Valve Ring.

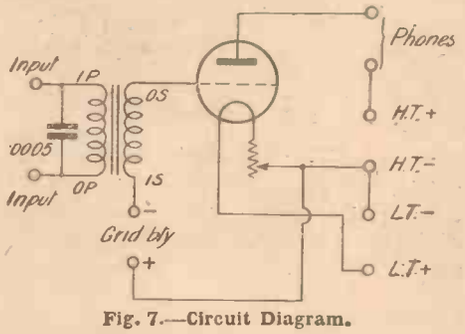


Fig. 7.—Circuit Diagram.

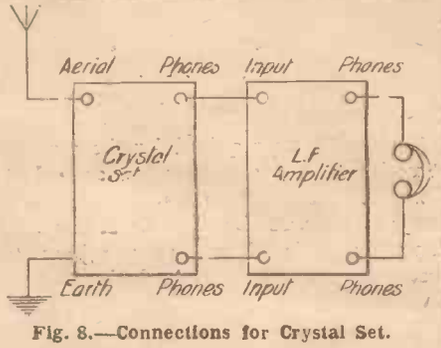


Fig. 8.—Connections for Crystal Set.

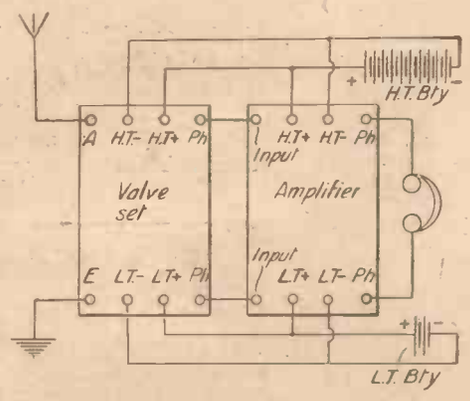


Fig. 9.—Connections to Valve Set.

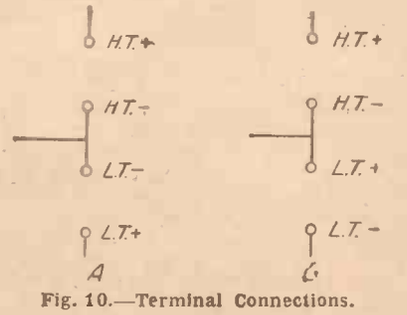


Fig. 10.—Terminal Connections.

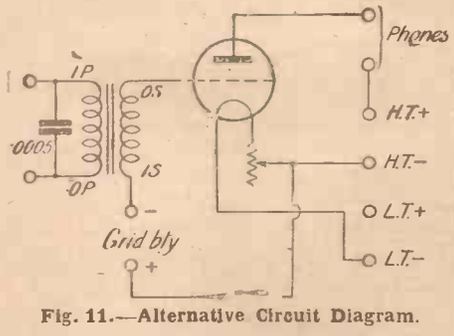


Fig. 11.—Alternative Circuit Diagram.

BROADCASTING AND THE STRIKE

IT is only at the time of a national crisis such as that occasioned by the recent almost General Strike in the United Kingdom that the man in the street realises the far-reaching power of broadcast telephony. Since the advent of this service in Europe much has been predicted in respect to its possible use, and even novels have been based on stories dealing with the indispensibility of radio in cases of dire emergency. Now the practical benefits of the system have been proved from the very moment the Press was prevented from publishing its daily newspapers. Whilst negotiations were being carried out between the Government and the diverse factions interested in the political situation, the broadcasting system was able to convey to a vast population all information regarding the various stages of the conference. The B.B.C. on this eventful occasion opened its twenty-one transmitters at intervals of fifteen minutes until well into the hours of the morning in order to disseminate the latest news.

Ordinary channels for news had been ruthlessly closed, and the public therefore could only rely for its information regarding incidents in this great national struggle on the bulletins broadcast at various intervals through the medium of wireless telephony. What would have happened in these circumstances in any country not endowed with so extensive a service is difficut to imagine. Few of us have ever lived in districts entirely cut off from the outside world, and there is no doubt that in occurrences such as the recent one the great power of wireless telephony was revealed in its possibility to disseminate truthful and official facts, thus preventing the circulation of wild rumours and to a great extent averting a more or less general panic. In this manner confidence was maintained.

J. G. A.

WIRELESS EQUIPMENT ON SEAPLANES

By Dr. ALFRED GRADENWITZ

A SPECIAL type of receiver developed by Dr. Erich F. Huth, and installed on several German flying boats, will, in the event of an emergency landing, afford a means of calling for help by wireless telegraphy or telephony. Each of these receivers covers wavelengths from 300 to 1,500 metres, the output being 70 to 90 watts, and range under normal conditions 500 and 1,000 kilometres in the case of telephony and telegraphy respectively. Provision is made for a three-hours' service with full load should an emergency landing on water prove necessary.

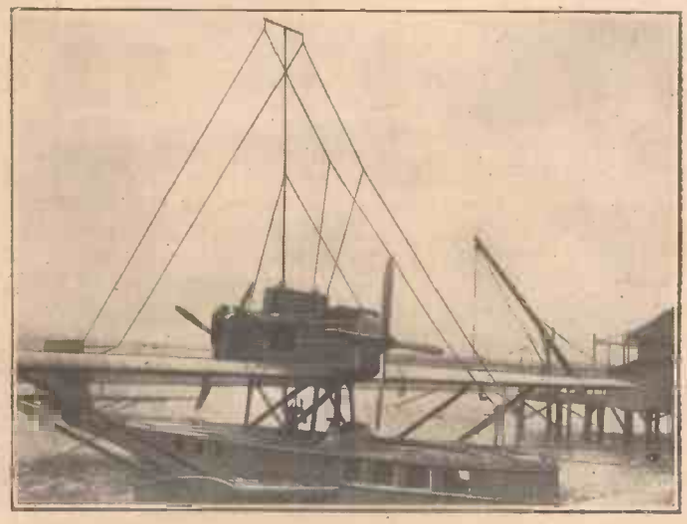
Current Supply

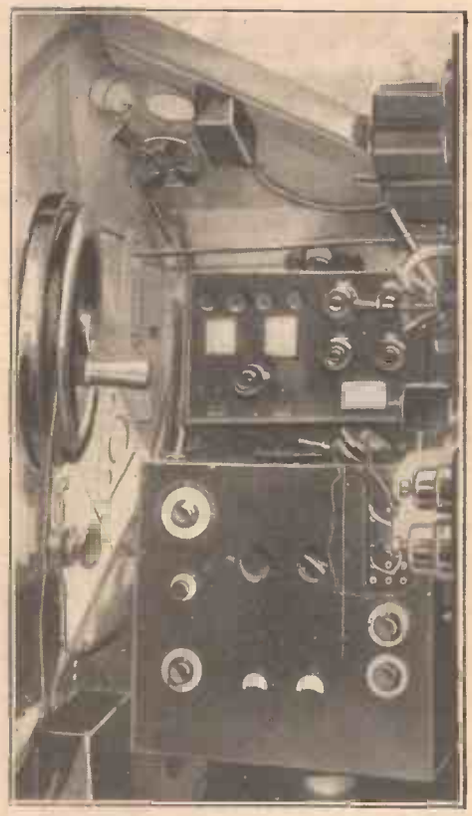
A continuous-current generator, driven by a wind motor (made of metal), is used to produce current when in the air. This provides a working pressure of 2,000 volts in the transmitter and 18 volts low tension, which is used for lighting and charging accumulators. The generator is mounted on a bracket below the engine nacelle on the deck of the flying boat, directly in the air current of the propeller.

Transmitter and Receiver

The photograph of the cabin shows the apparatus. A double valve transmitter is seen below and, above this, a four-valve receiver. Both instruments are very simple to operate and are worked on the familiar Kühn-Huth "hook-up." On the right-hand side wall there is the switchboard, which carries all switches, measuring instruments, fuses, etc. The aerial winch on the left-hand wall carries a 92-metre phosphor-bronze aerial, with a weight at its end of 1.5 kilogrammes. The aerial passes through a pit and is freely suspended in the air. The all-metal aeroplane is used as counterpoise or earth. All apparatus is suspended from springs in order to avoid any risk of shocks in landing.

An emergency plant is provided, as these flying boats, even in a rough sea, are likely to keep afloat for several days. A special aerial can be put up at a moment's notice. This small plant comprises a multi-section telescoping aluminium mast 8 metres long, braced by three cables, carrying the double-wire aerial. The arrangement of the emergency aerial is shown in the first photograph.





Three interesting photographs of wireless-equipped seaplanes. The first shows the emergency aerial and the third the cabin and apparatus.

CONNECTING LEADS

A GREAT deal of time can be saved by those who often try out new circuits if a box containing leads of various lengths is kept upon the bench. These may be of several kinds, bare wire, covered stiff wire of different gauges and flex. Each end of every lead should be bared so that connections may be made in a moment. When flex is used it is a good tip to slip off the outer silk or cotton covering, which serves no useful purpose in experimental "hook-ups," and is rather a nuisance owing to the way in which its ends fray out. The box should be divided into three compartments for short, medium and long wires. When a circuit is taken down the leads that have been used are replaced in their compartments. W.

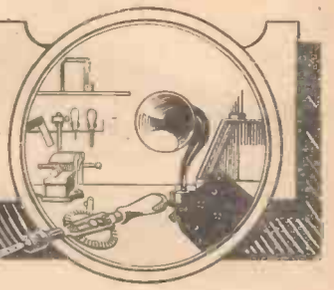
The total income derived from licences by the German Reichspost amounts to approximately twenty-eight million gold marks per annum, of which sixty per cent., or seventeen million marks, is paid to the nine programme companies running the broadcasting transmitters.

LOUD-SPEAKER RESULTS

IN order to get the best possible results from the loud-speaker, the magnets must be adjusted so that there is only a small air-gap between the poles and the diaphragm. A simple vernier control of this distance is obtainable by fitting an extension handle, either of metal or ebonite, to the control knob of the loud-speaker.

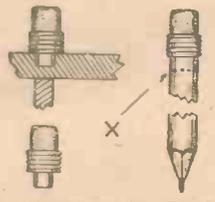
Care must be taken in operating not to force the magnets up against the diaphargm, as a considerable amount of leverage is obtained. P.

PRACTICAL ODDS AND ENDS



Shock Absorbers

IN order to provide the receiver with "shock absorbers," obtain four pencils with small rubber eraser attachments and cut off the ends containing the rubber at the dotted line X about ⅜ in. from the edge of the metal sleeve. File the wooden



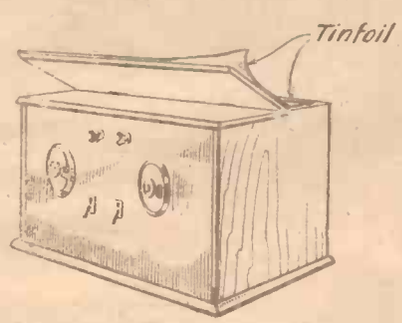
Shock Absorbers for Receivers.

projection down to ¼ in. in diameter, drill a suitable hole in each corner of the under side of the baseboard or cabinet, and drive in the wooden shanks until the edges of the metal sleeves are flush with the board. If necessary, a little Seccotine may be applied, but it will be found best to file the wooden shanks slightly taper and drive them into the holes. If desired, the metal sleeves may be soldered to the heads of countersink wood screws, the rubbers being previously removed, and replaced after screwing the prepared sleeves to the board. O. R.

A.C. Interference

IF a high-tension power line situated near a receiving aerial causes trouble by induction, the adoption of the following method will eliminate the undesired hum.

Obtain a large sheet of tinfoil (or a



Method of Eliminating Interference

number of small sheets folded and joined at the edges) and cut it to fit the four sides and the lid of the receiver cabinet. If a sub-panel is employed a sixth sheet may be fixed to the base of the cabinet. Otherwise the sheet must be made to fit the cabinet with slots cut out so that no actual contact with the components is made. All six sheets must then be joined together (the moving foil on the lid being connected by means of a short length of flex) and to the earth terminal of the receiver. Small metallic shields should be placed between the various transformers in the set and also connected, with the cores of the transformers, to earth.

Extra methods of eliminating the hum are also available. Loose-coupled tuners are also a great help in obtaining freedom from extraneous noises, but a connection should always be taken from the L.T. battery to earth. The number of L.F. amplifiers should be reduced to a minimum, as it must be remembered that all undesirable noise receives the same amplification as the original impulses and the hum is likely to drown out signals in the final stage. G. C.

How Hot Should the Bit Be?

ONE often sees it stated that it is important that the soldering-bit should be brought to the correct heat before it is used for making joints. How is the beginner at soldering to know when his iron is hot enough? It is rather important that he should have some means of telling, for if the iron is made too hot the tinning may be burnt off its point.

To test the temperature of an iron, withdraw it from the flame and lay the bit for about a second on a piece of paper. If the paper is just singed brown in this time, the temperature of the iron is as it should be. H.

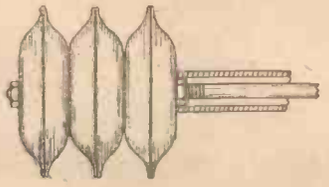
Care of Batteries

BOTH H.T. and L.T. batteries, accumulators and dry cells are apt to be affected by heat, and a little extra attention is necessary in summer. The acid level in the accumulator must be carefully checked and any deficiency must be made good with the addition of distilled water. Acid should only be added when it is known that any of the electrolyte has been spilled. Tap water must never be used for "topping up," as the impurities which it contains have a harmful effect on the plates.

Dry batteries must be kept in a cool place out of the heat of the sun, or the paste will quickly dry and the necessary chemical action will cease. K.

A Novel Earth

THE sketch shows how a cheap and efficient earth may be "built up" from a number of tinplate pans or dishes. One pan is inverted and placed over the top of another, and thus they are arranged in pairs. A hole is drilled through the exact centre of each to take a length of



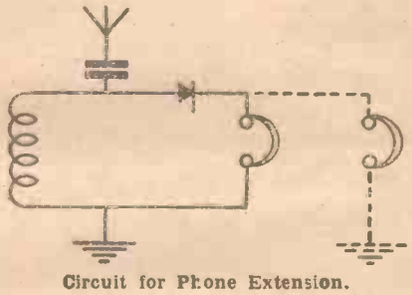
A Novel Earth Plate.

screwed brass rod, which clamps the pans firmly together in the manner shown. The rod is extended, by means of two nuts or a threaded sleeve, so that it may be used for making the connection above the ground level. The rod should be insulated by means of a thick rubber tube so that the actual earth contact takes place at the desired point. J. R.

Telephone Extension Device

LONG phone-extension leads, when used on a crystal receiver, are apt to cause a diminution of signal strength. There is, however, no need to use two wires in the extension, as the circuit diagram clearly shows. The dotted line represents the phone-extension lead.

The usual connection is made between the crystal detector and the phones, but the return connection from the lower end of the phones to earth is rendered un-



Circuit for Phone Extension.

necessary. There is usually no difficulty in finding a suitable "earth" in the room in which the phones are to be used, and this should be connected to the free phone lead. The phone circuit is then complete through the medium of the earth, and it will be found that little or no reduction in signal strength takes place. L.

ARE YOU A PATIENT MAN ?

£200

IF YOU ARE

"Let's see—five separate units give five capacities, taken singly. Then I can have the first two in series or parallel—total seven. Then the first three all in series or all in parallel—two more. The first and third and second and third in series, total 9. Ditto, in parallel, 11. First and second in series, and in parallel with the third—12 ..... And the total number of different capacities with the five units is ———— ?" What is it?

If you get it right, you win £200!

Whatever your skill in counting capacities, however, the purchase of a Dubilicon will bring you one sure reward. The Dubilicon gives any capacity up to 0·011 mfd. simply by varying the connections of the eight unit capacities of which it is composed; so that by using the Dubilicon you will be able to select with unfailing certainty the best value of fixed capacity for any desired part of your circuit.

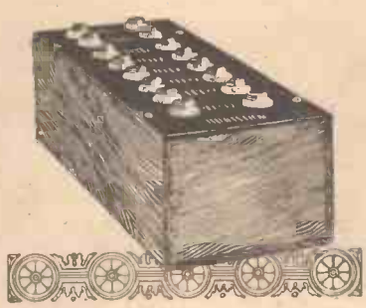
The Dubilicon is a multiple condenser containing eight separate units, the terminals of each unit being brought out to sockets on the lid. By using Clix plugs (made by Messrs. Autoveyors, Ltd., 84, Victoria Street, S.W.1) of which two are given with every Dubilicon, the units can be connected in a variety of series, parallel and combined series parallel arrangements giving a very large number of different capacities.

The uses and advantages of the Dubilicon, which we have summarised above, make it more than worth its low price of 30/-.

In addition, the purchase of a Dubilicon entitles you to enter for the £200 prize competition. All you have to do is to estimate the number of different capacities you can get by connecting up the first five units in various ways.

Ask your dealer about one to-day—and mind you enter for the £200 competition! He will tell you all about it!

The Dubilicon



REGISTERED DUBILIER TRADE MARK

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ADVERT. OF THE DUBILIER CONDENSER CO. (1925) LTD., DUCON WORKS, VICTORIA ROAD, N. ACTON, W.3. TELEPHONE: CHISWICK 2241-2-3.
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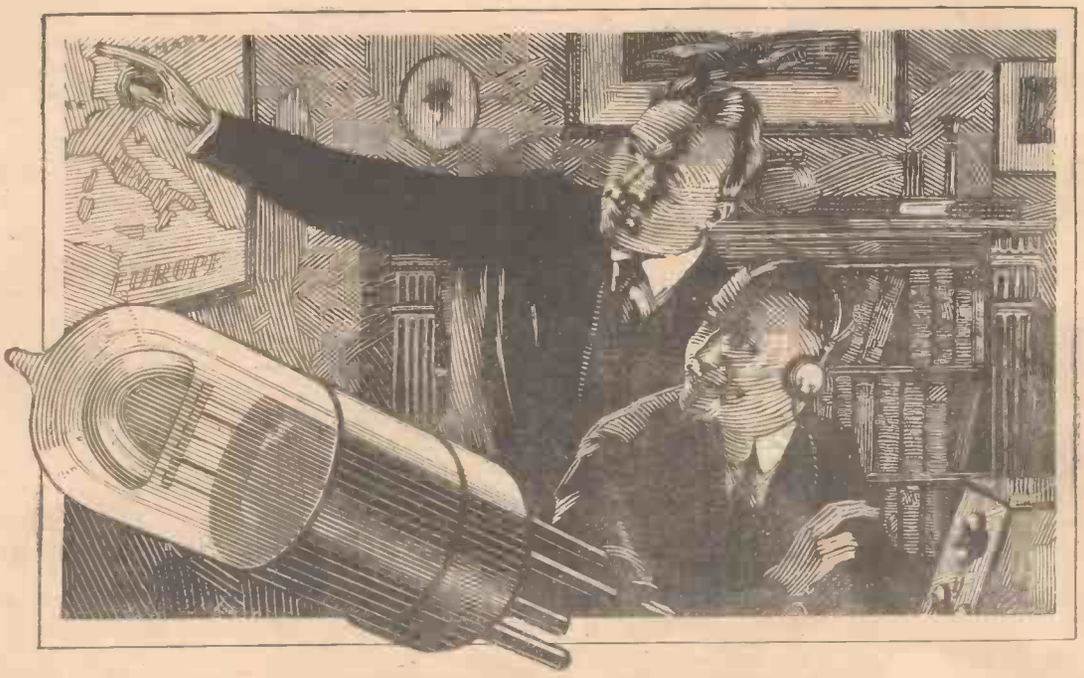


"Look, John, 450 miles—and in daylight, too"

"NOT a bad show for a home-built Set," grudgingly admitted John. "But then you are always dabbling in wireless. If only I knew," he said wistfully, "why I always have such rotten luck. I've spent pounds on my two Sets and neither gives the results you get."

"There might be lots of reasons," I replied, "but if you are sure you have followed the instructions exactly it is quite possible your valves are not suitable."

"But I thought all valves were more or less alike," interjected John, "after all a valve is a valve, surely it can't make all that difference? I always buy British valves, too," he added as an after-thought.

"Why, valves can make a tremendous difference to a Set," I exclaimed. "Let me show you a little experiment." So saying, I removed the three valves from my Set and re-inserted them in different positions. "There," I said, handing him over the Set, "now try to tune in Aberdeen again."

Poor old John fumbled and twiddled, but beyond picking up our local Station, the Set was mute. It was as though some one had put up an invisible barrier.

"I've learnt something this evening," admitted John somewhat crestfallen, "perhaps my Set might be alright after all if I had the right valves. By the way, whose are these?"

Again removing the three valves from their sockets, I said: "This one with a red top is the Wuncell W2 specially made for H.F. use. The green top one is the W3 Loud Speaker valve, and the third one is the Detector, a W1.

"But," he interrupted, "I don't see any difference between the W1 and the W2—they look exactly alike."

"There is a big difference," I replied, groping in a box where I kept some old Cossor valves. "Let me just break open these two and I'll soon show you. A pair of pliers, please .... Thanks .... Now look at the Grid of this W1—see how much more open is its mesh as compared with the W2." "Surely a little thing like that can't make such a big difference in results," he cried in amazement.

"Oh, yes, it does," I explained, "for the impedance of an H.F. valve should be very different to that of a detector valve. Incidentally the Cossor people were the first valve makers to put out a real H.F. valve." "After all," I asked with a smile, "you would hardly expect to get a satisfactory hole in an ebonite panel with a gimlet, would you? You would want to use the right tool for the job."

"And does the same thing apply to the W3," he asked. "Of course," I explained, "only in this case we want volume instead of sensitivity. And so a longer filament and a bigger grid and anode are used to get the best results from a greater electron emission."

"Finally," I warned him, "don't mix your valves. Use *all* Wuncells. In the ordinary valve a considerable amount of the electron stream leaks away from each end of the tubular anode." "Without doing any work, I suppose," added John. "Exactly," I replied. "Common sense proves that for this reason alone a Cossor must be better."

*W.1. For Detector and L.F. use - 14/- Consumption: ·3 amp.

*W.2. (With red top) for H.F. use 14/- Consumption: ·3 amp.

W.3. The Loud Speaker Valve - 18/6 Consumption: ·5 amp.

**All the above valves operate at 1·8 volts, but those marked * are also supplied with special base with resistance to suit 2, 4-or 6-volt Accumulator.* 16/-

Cossor Valves

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

Gilbert Ad. 5213

On Your Wavelength!

It's an Ill Wind—

THOSE who, a few weeks ago, were ready to argue that interest in wireless matters had already reached saturation point, and were inclined to take a gloomy view of the future of the industry, must now hold a very different opinion. It is difficult at present to estimate the number of new wireless sets that were installed during the general strike, but the figures must run into some hundreds of thousands.

It is equally difficult to estimate the true value of the part played by the B.B.C. during those days of crisis. Nothing is more likely to upset the *morale* of the community than many-tongued rumour which spreads like wildfire and does an infinite amount of harm. In ordinary times the public press stabilises public opinion and prevents any widespread uneasiness or panic arising from this cause. By disseminating official news at frequent intervals each day, the B.B.C. kept the general public in constant touch with the progress of events, and so reassured the nervous element against undue pessimism.

In short, the broadcast service was for the time being invested with new and grave national responsibilities. The manner in which these were carried out has enhanced the already high reputation of those in charge, who deserve the grateful thanks not only of the wireless public, but of the community at large.

A Matter of Detail

One result of the recent strike, to be placed to the credit side of the balance sheet, is a very considerable increase in the number of listeners-in. Many of those who for one reason or other had previously fought shy of the broadcast service, were suddenly converted when they found that it was the only available means of keeping in touch with the march of events.

The handling of a new set, particularly a multi-valve receiver, is not always smooth sailing, and as might be expected, there were some trying moments when paterfamilias tried his prentice hand at tuning-in on the wrong coil, or without first connecting up the aerial and the earth! A certain number of beginners also, no doubt, experienced for the first time, the agonising thrill which accompanies the burning-out of a perfectly good valve by contact with the high-tension. In one way or the other there are a surprising number of pitfalls lying in wait for the unwary novice.

One particular instance which came my way is worth recording as an illustration of the importance of attending to detail. The set was a four-valver and had at first given excellent loud-speaker results on two valves (detector L.F.) at 10 miles range. After the first few days the volume of sound on the two valves fell away most mysteriously, whilst the switching-in of the second L.F. valve merely produced a loud and horrible cacophony of distortion.

It was my luck to be called in to advise. The first point that struck me was that cutting out the first L.F. amplifier made no perceptible difference to signal strength. The detector appeared to be doing all the work, the first L.F. being merely a passenger. This made me look closely at the L.T. circuit, where I found that the proper connections from the set to the accumulator had been reversed, the L.T.+ on the panel being connected to the blue pole and the L.T.— to the red, instead of *vice versa*. This was the simple cause of all the trouble. Instead of carrying a negative bias the grids of both the note magnifiers were loaded with the full 6-volts positive charge of the accumulator. As soon as the L.T. leads were reversed, the volume of sound came back to its original strength and clarity. I left the owner of the set framing a solemn vow that next time the accumulator was removed for recharging it would be replaced strictly in accordance with the marking on the panel terminals.

As We Were!

Owing to the General Strike, which brought to a complete standstill for one whole fortnight the Printing Works of Messrs. Cassell & Co., Ltd., the proprietors of AMATEUR WIRELESS, it was found impossible to publish any issue of this journal for the week ending May 15th.

By working at great pressure the present issue, dated May 22, has been published. It is a few days late, but it is hoped that our next issue will be more or less to time, and that the following one will appear absolutely punctual.

We know we can depend upon the kindly indulgence of our readers in the difficult task which we and other weekly periodicals have to face.

Over the Pole

Amundsen's flight over the Pole in the dirigible *Norge* gives yet another example of the growing usefulness of wireless. From the time that he left Spitzbergen until he landed at Teller he was seldom out of touch with at least one receiving station. The outside world received no news of him because his messages were not passed on, but he was able by means of his wireless gear to hear of the preparations made for landing at the end of the journey. It had been intended originally to land at Nome, but while the ship was cruising near the North Pole a coating of ice formed upon one of the propellors. The effects of centrifugal force caused this suddenly to be flung off with such violence that one of the gas containers was torn and the ship was partially disabled. In the circumstances he decided to make for Teller, a tiny settlement with but a hundred and fifty inhabitants. Thanks to wireless the preparations for receiving him when he arrived were soon under way and a landing was made without mishap. The *Norge* was fitted with direction-finding apparatus which might have been of the greatest service to her had she been blown out of her course and lost her bearings. Probably, if any future expedition of the kind is undertaken, fixed D.F. stations will be erected at various points within the Arctic circle and the pilot will then know by means of the bearings taken just when he is exactly over the Pole.

A "Wet-weather" Fault

The other afternoon as I was listening to the latest "strike news" bulletin, a heavy storm of rain suddenly broke out. Usually I work on three valves, but in a spirit of economy I had switched off the second stage of L.F. and was satisfied with what might be called fair to moderate loud-speaker strength. Very shortly after the commencement of the downpour, I found the loud-speaker was fading away into a mere whisper. Thinking the accumulator might be the cause, I cut out some of the filament resistance without, however, securing much improvement. More or less mechanically, I turned to the tuning condenser and to my surprise recovered the original volume of sound about five degrees away from the usual condenser setting.

Apparently the heavy rain had had the effect of converting the insulator at the high-potential end of my aerial into a shunt path to ground for high-frequency currents. Quite apart from the actual leakage of energy across this new path, the introduction of the extra resistance upset the normal tuning of the aerial. This necessitated a resetting of the condenser, and a little extra reaction then made good the damping losses. The incident served as a timely reminder that an inspection of the aerial insulation was overdue, and I utilised some spare time the following day to carry out this good work.

On Your Wavelength! (continued)

Why, Oh Why?

I have never quite been able to understand the mentality of the howler. Not long ago I observed a brand-new aerial being erected not far away from mine. I feared the worst—and got it. I deduce that the owner of the aerial is working a single-valve set, for he is never quite satisfied with his signal strength. The other night when 2 L O put on a particularly good symphony concert this fellow completely ruined its reception for the whole town—and incidentally for himself, since only at odd moments was his receiver out of oscillation. For the greater part of the time he was radiating a steady heterodyne note, though every now and then he would move his condenser knobs or his reaction control slowly to and fro, running up and down the scale of squeals.

It is ridiculous at this time of day to say that such a man does not know that he is causing widespread interference. Even if he does not read a wireless paper he cannot help seeing frequent references to howling in the lay press. Further, he must at times have experienced himself the annoyance that is caused by other howlers. We have treated Ham-handed Henry and Oscillating Oswald very tenderly in the past, striving to reform them by moral suasion. Since they can no longer plead ignorance, the time has come when they should be smartly dealt with. No one using a single-valve set can avoid causing an occasional squeak when he is first tuning in; the man who ought to be gone for is he who can never let his tuning controls alone.

Dull-emitters

There are still many wireless enthusiasts who hold that the dull-emitter valve is not quite so good as the bright for what they call serious experimental work. I admit that *some* dull-emitters are not over constant, but the same criticism can be levelled against certain bright-emitters. Though it may be difficult to realise that a valve whose filament requires but a tiny fraction of an ampere of current can do the same work as one which needs five or six times more, yet the fact remains that the best type of dull-emitter is in every way as stable, as sensitive and as constant as the bright valve. The main difference between the two is that in the bright-emitter valve you are wasting a much greater proportion of energy in the production of entirely useless light.

A Hardy Heresy

There is an ancient and hardy heresy about low-frequency transformers, which is that when you are using two stages of note magnification you must use the transformer with the biggest step-up ratio next to the detector valve. Many wireless enthusiasts are completely in the dark over the question of transformers, as is shown by the question that one is frequently asked: Which is the best transformer? The truth is that there is no best transformer; that is to say, there is no transformer which when used with valves of all kinds will give better results than any other. The great thing to remember is that the impedance of the primary windings must be at least equal to that of the plate-filament path of the valve. The detector valve has usually a fairly high impedance; hence it must be followed by a transformer whose primary contains plenty of wire.

When there are a great many turns in the primary it is impossible to have a big step-up ratio without making the transformer unduly bulky. The number of the secondary turns is further limited by considerations of self-capacity. It follows that the transformer in the plate circuit of the detector valve must have a big primary and therefore a small step-up ratio. The first note-magnifying valve will usually be one whose plate-filament impedance is much smaller. To couple it to the next valve we can use a transformer with a comparatively small number of turns upon its primary; we can thus obtain a much larger step-up ratio. Despite the old superstition, the rule is that the low-ratio transformer must come first.

Selectivity

We are always reading a great deal about selectivity and efficiency. The two really come to very much the same thing, for the efficient set, in which losses are reduced to a minimum and damping is eliminated so far as may be, must be selective. Conversely, a set cannot be selective unless it is efficient. I do not think that everyone realises that there are two ideals in wireless which are quite separate and distinct. The one is to receive signals with purity and power, whilst the other is to be able to pick up very distant stations and to accomplish knife-edge tuning. My own view is that the set most suitable for really good loud-speaker reproduction is seldom a good long-distance performer, and, again, that the ultra-selective set does not as a rule make for great purity in reception. For the best loud-speaker results I would, for example, advise that no form of magnetic reaction be employed and that the tuning should not be too sharp. If high-frequency amplification has to be used, then it is probably preferable to fit aperiodic couplings rather than tuned. With a set of this type, provided that it is carefully designed and well constructed on the note-magnifying side, beautiful loud-speaker reproduction is obtainable; but it will not reach out to great distances except upon especially favourable nights, nor will it separate two stations whose wavelengths are very close together.

For long-distance work, on the other hand, give me a set that is as efficient as it possibly can be upon the high-frequency side. Reaction, either magnetic or by capacity, is essential and the tuning must be dead sharp. After all, your long-distance "fan" does not as a rule worry very much about the quality of what he is listening to; his pleasure is derived mainly from the fact that he is covering enormous distances. Regarded as a musical entertainment, no American programme as received in this country can compare for a moment in quality or purity with near-by broadcasting. Still, there is enormous joy to be derived from long-distance reception. I keep two different sets upon my wireless table, the one for family use being specially designed to give first-rate reproduction on the loud-speaker of our own broadcasting, whilst the other is kept for long-distance work.

Dust

Most of us have read, and some of us have written not a few articles on the subject of keeping the wireless set and its parts free from dust, but not everyone realises the importance of so doing. The high-tension battery, if it has a wax or a pitch covering, is one of the greatest of all sufferers from the evil effects of dust. This was strikingly brought home to me recently by an experiment made with two 36-volt high-tension batteries, both of them pitch covered. One was allowed to accumulate all the dust that settled upon it, whilst the other was kept covered up and clean. At the end of three months, though neither battery had been in use, the voltage of the one which had received proper attention was right up to the mark, whilst that of the purposely neglected one had dropped to a little over 20.

What apparently happens is this: Pitch if dry and free from dust is quite a good insulator. The dust which collects in our living rooms consists of minute particles, many of which are of a semi-conducting nature. A deposit of dry dust upon the pitch covering therefore materially reduces the insulating qualities of the pitch. But there is another point. Dust is more hygroscopic than pitch. There is always a considerable amount of moisture in the atmosphere and the dust soon becomes slightly damp, which naturally increases its conducting qualities. Some of the dampness is passed on to the pitch below with further bad effects upon the insulation. If you want to keep your apparatus and batteries in good condition, remove the dust every two or three days. THERMION.

GETTING THE BEST FROM THE L.F. SIDE

Careful attention to the note magnifier will result in increased volume and better quality. This article gives some useful hints.

THE note magnifier is one of the most important parts of the set, for to a very great extent it determines both the strength and the quality of the reception. Yet it is often woefully neglected by amateurs, who pay the most scrupulous attention to their high-frequency circuits and to the rectifier, but are apt to regard the low-frequency part of the set as a simple affair which does not require any particular care for its successful working.

The purpose of radio-frequency amplifiers is to increase the amplitude of the oscillations brought in by the aerial before passing them on for grouping and rectification by the detector, whether it be valve or crystal. The note magnifier deals with rectified and grouped oscillations which reach it in the form of impulses within the limits of audio-frequency—that is to say, with a frequency lying between about 16 and 12,000 per second.

We are apt to regard rectified impulses as having been so tamed that there is no difficulty in doing very much as we like with them. This is not quite the case, as we shall see in a moment.

To begin with, the rectifying valve does not deliver pure and unadulterated low-frequency impulses at the output terminals. A certain quantity of high-frequency oscillations pass through it whose presence on the low-frequency side of the set is most undesirable. It is partly for this reason that a condenser should always be wired as shown in Fig. 1, so that it is shunted across the primary of the audio-frequency transformer which immediately follows the rectifying valve. The mixed impulses on reaching the point X in Fig. 1 are offered two paths. They can pass either through the windings of the transformer primary or through the condenser. The windings of the transformer, owing to their big inductance value, offer a very great impedance to radio-frequency currents and a comparatively small one to those of audio-frequency. The condenser, however, provides an easier path for radio-frequency than for audio-frequency currents. Hence at the point X the two kinds of current will separate, low-frequency impulses passing into the transformer to do their proper work and the unwanted high-frequency oscillations being drained away through the condenser. If the condenser is not inserted reception will probably be woolly owing to the presence of high-frequency oscillations.

The next point to notice is that every circuit containing an inductance and a capacity has its own natural frequency, to which it responds more readily and more strongly than to any other. Now, in the transformer, whether it is shunted by a condenser or not, we have such a circuit, the inductance being provided by the windings and the capacity being that which exists between the turns of wire. Any transformer, therefore, will have one frequency to which it is particularly susceptible. If this frequency corresponds, for example, to that of the F sharp above the middle C on the piano this note will be unduly emphasised with most unpleasant results whenever it occurs, and notes immediately above and below it will be emphasised to a rather less degree, coming out with a harsh, cracked kind of sound.

The only way to get rid of this very unpleasant form of distortion is to make the natural frequency of the transformer so low that it is inaudible. This is done by the designers of first-class instruments, and the condenser across the primary of which we have spoken also helps by adding capacity and therefore decreasing the natural frequency of the circuit. This condenser, however, affects only the

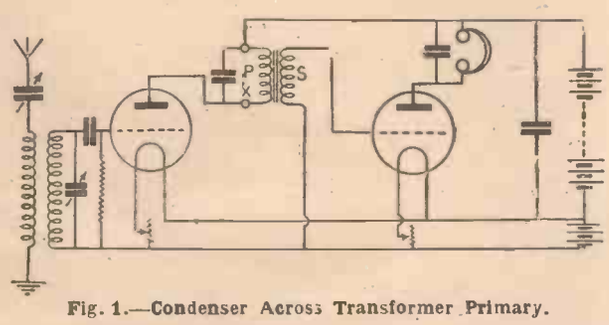


Fig. 1.—Condenser Across Transformer Primary.

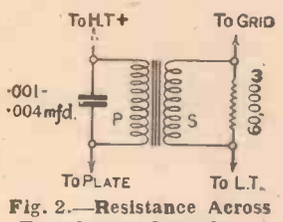


Fig. 2.—Resistance Across Transformer Secondary.

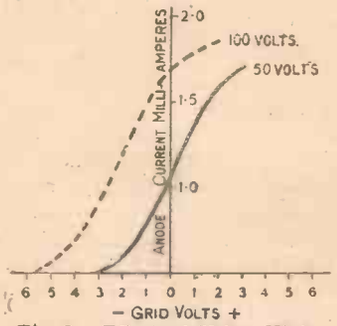


Fig. 3.—Effect of Using High-plate Voltage.

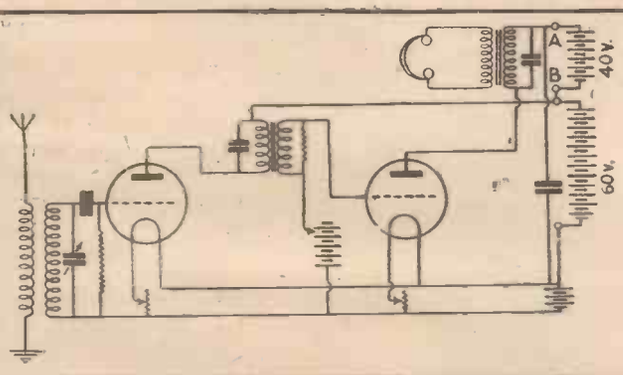
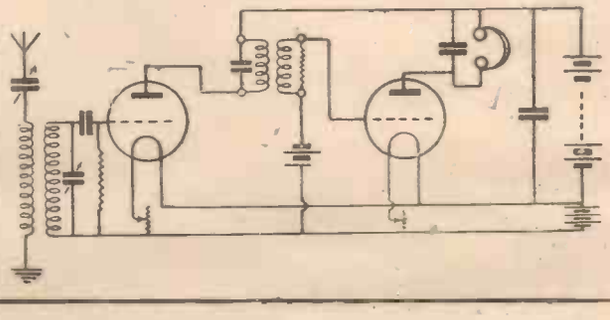


Fig. 4 (right).—The Use of Grid Bias.

Fig. 5 (left).—Different Values of H.T. Voltage.



primary. There is still the secondary to consider. The best way of dealing with it is to insert a resistance which has the effect of flattening the tuning. On the high-frequency side we want the sharpest tuning that we can get, but with note magnifiers the reverse is the case. Very sharp tuning means the emphasising of certain notes. A resistance placed across the terminals of the transformer secondary will produce the desired effect. This value will vary from 40,000 to 100,000 ohms according to the transformer, but, generally speaking, one of about 60,000 ohms will be about suitable. Its presence has a mellowing effect upon music and makes speech even and distinct and free from harshness.

The Valve

We come now to the valve itself. You are no doubt familiar with the typical grid-volts plate-current characteristic curve which has a concave bend at its lower end above a straight, steeply sloping portion followed by a convex bend at the top (Fig. 3). The impulses which reach the grid of a note-magnifying valve are of very much greater amplitude than those supplied to any of the high-frequency valves. Think for a moment of what happens in a set consisting of one stage of high-frequency, a rectifier and a note magnifier. If the top of a wave brought in by the aerial represents a rise of half a volt positive on the grid of the high-frequency valve, the rise will be about three times as great when the impulse has travelled after magnification to the grid of the rectifier. A further threefold amplification will take place between this valve and the note magnifier. Hence the original wave top representing a rise of only half a volt now causes a rise of 4½ volts positive. The more valves there are the greater will be the increase and the more positive will be the potential brought to the grid of the last note-magnifier by each wave top

Grid Bias

A little thought will show you that when the grid is made very much positive the working point of the valve must rise until it approaches the upper bend of the curve. Were it to do so the resulting distortion would be horrible for two reasons. In the first place the upper part of each impulse would be cut off, and in the second there would be a very large flow of grid current. We must therefore prevent any such thing from taking place. This we can do best by inserting cells wired as shown in Fig. 4, so as to give the grid a permanent negative bias. We thus lower the working point of the valve and prevent impulses from climbing so high up the straight portion of the curve as to touch the upper bend or to start excessive grid current.

Plate Voltage

If we are using a good low-frequency transformer, and if the points about the condenser and the resistance previously mentioned have been attended to, there is no reason why we should not very much increase the volume of sound in the telephones or the loud-speaker by using a considerably higher plate voltage. One effect of doing so, however, can be seen by an examination of the curve shown in broken lines in Fig. 3. It will be seen that by the increased voltage the whole curve is moved bodily to the left, which means that the working point is raised. Hence, if we use a bigger plate voltage we must also employ a more strongly negative grid bias in order to prevent distortion.

This is a point which is not always realised. One finds amateurs adding more and more high-tension voltage without making any change in the rest of the circuit. The result is a great deal of noise that is far from pleasant. If you intend to use 100 volts or more on your note magnifier you should provide a grid battery with 1¾ volt tappings up to at least 9 volts. This can be done most easily by making up a special grid battery from flashlamp cells which can be taken apart without difficulty.

As we do not want the extra plate voltage for all valves, it is best to use an additional high-tension battery for the note magnifier. A way in which this can be wired is shown in Fig. 5. Should additional voltage not be required the two terminals A and B are short-circuited. Remember that high plate voltage must not be applied unless the valve is of a kind that will stand it. Most hard bright-emitter valves can be used with anything up to 150 volts on the plate, but the same is not true of dull-emitters, few of which will carry more than from 60 to 80 volts without suffering ill effects.

Conclusion

To sum up, begin by eliminating the unpleasant "peak" effects in your transformers by the use of condensers and resistances; make use of grid-biasing cells, finding by experiment the voltage which gives the best results; use a high plate voltage for your note magnifiers if you will, but compensate for it by increasing the negative grid bias. Lastly, do not be led away, as so many people are, by the desire for mere noise. A pure, undistorted reception of moderate strength is infinitely preferable to one of great loudness distorted and indistinct.

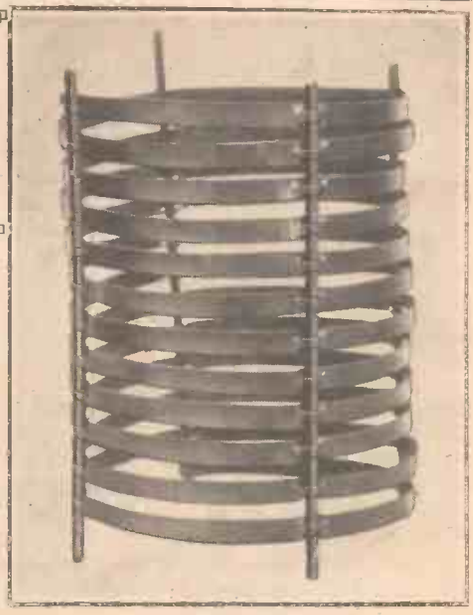
J. H. R.

In contradiction to the report that Mr. Matheson Lang first broadcast on April 23 from the Glasgow station, it should be noted that Mr. Lang broadcast the "Jealousy Scene" from Act III of *Othello* on April 15 from the Newcastle station.

WIRELESS AND THE STRIKE

The first photograph shows the announcer in the B.B.C. studio reading one of the news bulletins broadcast from London and Daventry stations and the second photograph the police guard at the London station at Savoy Hill.

RIBBON COILS—AND HOW TO MAKE THEM



Unmounted Ribbon Coil.

COILS constructed of copper ribbon or strip are greatly favoured amongst amateur transmitters in the construction of their short-wave transmitting tuning coils. For this purpose copper strip is to be preferred to the more conventional thick bare wire of circular cross-section, for not only is the self-capacity much less when the adjacent turns are wound edge on, but the amount of copper present in the centre of the conductor not utilised by the high-frequency currents is greatly decreased.

An additional advantage in using the ribbon is that constructors not in the possession of a lathe find the ribbon of greater flexibility and therefore much easier to shape and wind than thick wire.

The coil which is described in this article is primarily designed for low-power transmission on the shorter waves, but it can be used equally successfully in short-wave receivers for use on wave-lengths below 100 metres.

Construction

A length of just over 12 ft. is cut from the roll of copper ribbon, and beginning 1½ in. from one end it is marked off by scribed lines 3 in. apart. At each mark two lateral incisions ⅜ in. long are made. Fig. 1 will show their exact position with relation to the strip. The best instrument to use for this operation is an old ⅜-in. wide wood chisel; a piece of hard oak board will make a suitable cutting block. It is important that the cut should be made with one blow of the mallet on the chisel, but, on the other hand, too heavy a blow will force the chisel wedge-wise through the cut and in that way break the strip. It would be wise to make a few trial cuts before commencing on the coil.

Having completed the forty-nine pairs of incisions, each portion of the strip between the two cuts is prised upwards with a bradawl or some other pointed instrument; the incisions now present the appearance indicated in Fig. 2.

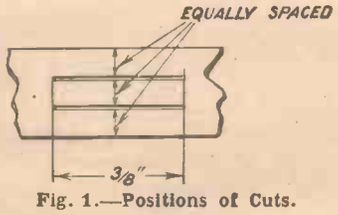


Fig. 1.—Positions of Cuts.

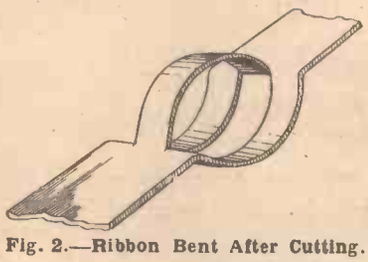


Fig. 2.—Ribbon Bent After Cutting.

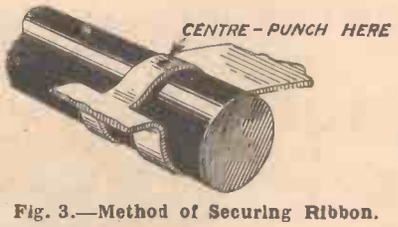


Fig. 3.—Method of Securing Ribbon.

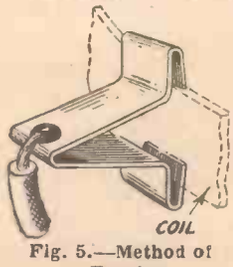


Fig. 5.—Method of Tapping.

The two main features of the coil are, firstly, simplicity of construction and secondly, the elimination of all unnecessary solid dielectric. In consequence, the solid dielectric, in this case ebonite (situated in the electrostatic field of the coil), is at a minimum, being only approximately .3 cubic in.

The size of the coil will be governed by the constructor's own particular requirements, and can be arrived at by consulting any good text-book on the subject, or from actual experience, but as a rough guide the coil illustrated here, and consisting of twelve turns spaced ⅛ in. and about 3¾ in. diameter will have an inductance of about 8 microhenries.

Assuming that a coil of this size is under construction, the following items will be necessary: Some copper strip such as is sold for aerials (this is quite satisfactory and was used for the particular coil in question); four lengths of good-quality ebonite rod ⅛ in. in diameter and each about 6 in. long.

As the coil when finished is to consist of twelve turns spaced ⅛ in., the four lengths of ebonite rod required for the supports will each be 6 in. long (assuming the strip to be ¼ in. wide, which is the usual width).

Each of the four rods is pushed through the first four pairs of cuts in such a manner that the centre portion of the strip is on one side of the rod, with the two outside portions on the opposite side.

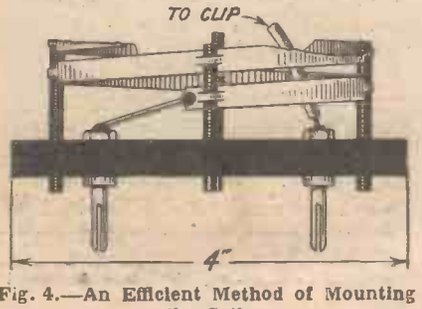


Fig. 4.—An Efficient Method of Mounting the Coil.

Fig. 3 will make this quite clear. Then the ribbon is bent in a circle so that the first rod can pass through the fifth cut, and the second rod through the sixth cut, and so on, until the whole length of strip is threaded on to the rods.

During the winding no attempt should be made correctly to space the turns, but when the whole of the strip is wound on, the turns can be equally separated so that there is a space of ⅛ in. between each turn. Shifting the position of the turns in this manner will tend to loosen the grip of the ribbon on the rods, so that there is a danger of slipping occurring. A remedy for this is to centre-punch the ribbon at the point where it passes over the rods. This has the effect of driving a small cone of metal into the ebonite; the recommended position for punching is shown in Fig. 3. One word of warning: See that the coil when the centre-punch is being used is adequately supported and that too heavy a blow does not split or crush the ebonite rods.

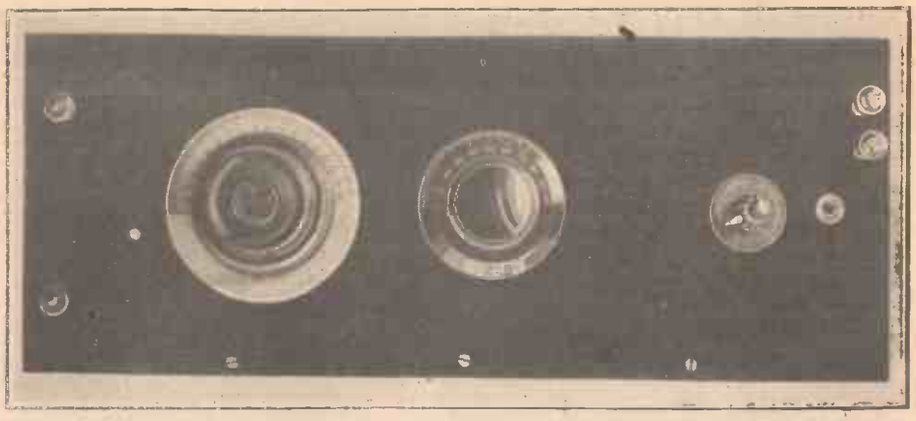
The coil in itself is now completed and presents an appearance as is shown in the photograph, but one or two tips with regard to mounting and making the necessary connections will perhaps be of interest.

Mounting the coil is quite a simple

(Concluded on page 744)

ONE can always tell an efficient low-loss set by the "feel" of it. Such a receiver will tune in distant short-wave signals quite easily, no matter how poor the aerial arrangement is as regards elevation. The reaction will be quiet and easily manageable, the receiver going into smooth oscillation with a very low anode voltage on the detector stage. Such a state of affairs is not possible with an ordinary tuner. The reaction will be "sticky" and the valve "plop" into oscillation without any warning. Weak signals will be unreadable as a consequence, and such a set may entirely refuse to oscillate below 100 metres; in other words, the set will not tune down. Furthermore, hand-capacity effects may be so noticeable that tuning will be a very difficult task.

It is claimed for the receiver shown by the photographs that: (1) there is little or no hand-capacity effect noticeable when using it (the reader will note that long control handles are not used); (2) the set is highly efficient and will work on the poorest of aerials, and will bring in very long distance signals at great strength; and (3) smooth reaction is obtained.



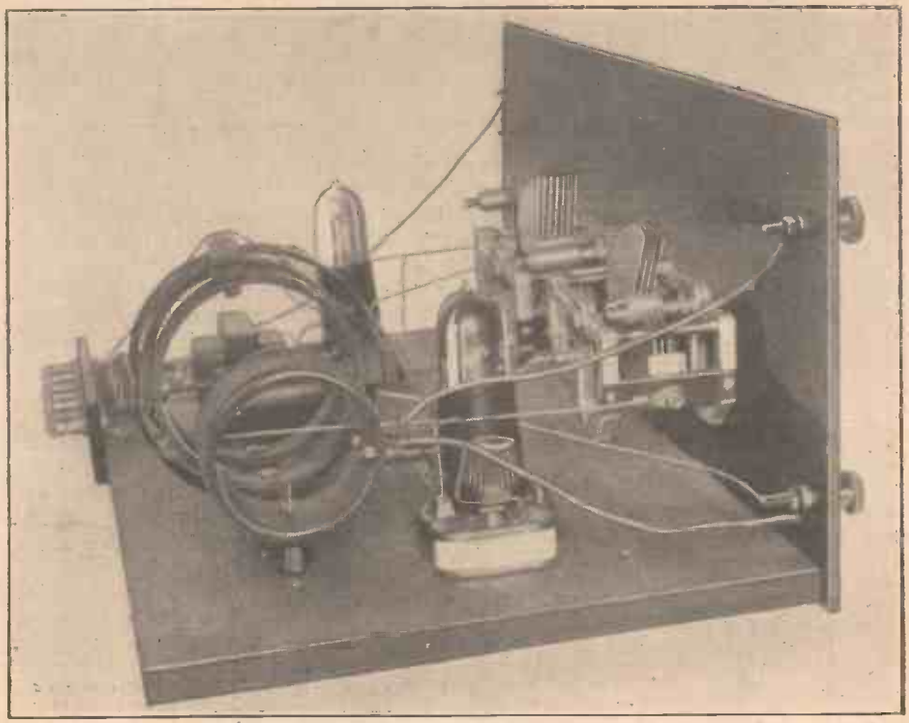
Photograph of Front of Panel.

A NEW SHOR
30 METRES—10,0

Layout

Fig. 1 (page 730) shows the layout adopted. The baseboard is 10 in. wide by 17 in. long. At first sight it would appear that this is unduly large for a two-valve set, but a number of experiments have proved that an efficient short-wave set requires more room than a long-wave set in order that the component parts may be laid out to the best advantage. Examining the photographs and the sketch, we see that on the extreme left of the board is the aerial coil which is tuned and loosely coupled to the closed-secondary tuning inductance on its right. This skeleton-wound tuning inductance has the reaction coil wound over it, whilst in the front and between it and the secondary tuning inductance is the detector valve. To the right of the inductances is a small high-frequency choke coil, whilst farther to the right and slightly to the front is the low-frequency amplifying valve. At the rear of the board, and screwed to the edge of it, is the terminal strip which carries seven terminals for connection purposes.

The panel consists of a piece of Radion about 18 in. by 7 in. This supports the secondary tuning condenser, the capacity reaction condenser, the filament rheostat and switch, and the aerial and earth terminals. A sketch of the layout and the dimensions are shown by Fig. 2.



Three-quarter View of Rear of Receiver.

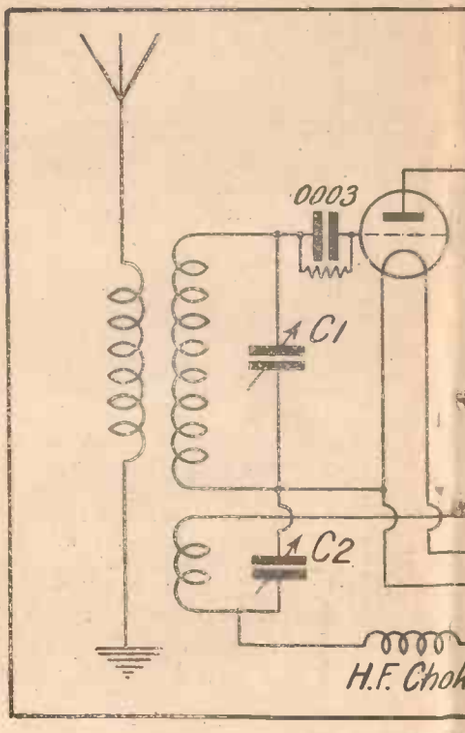
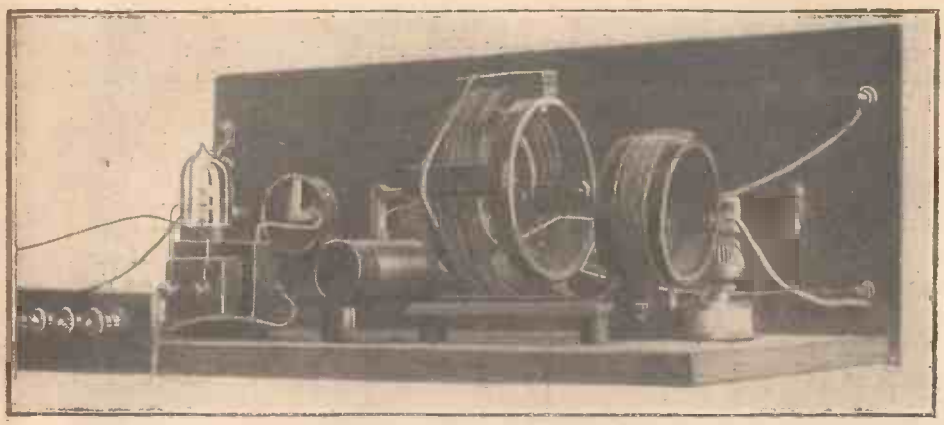


Fig. 7.—The Cir



Photograph of Rear of Receiver.

RT-WAVE SET
00 KILOCYCLES

The coils are an important part of the apparatus, and they must be carefully made exactly to the details given. Fig. 3 shows the construction of the tuner with the exception of the aerial loading inductance. This latter merely consists of ten turns of No. 18 S.W.G. wire wound on a solid ebonite former 2½ in. in diameter. It is fitted with a piece of stout brass bent and shaped as shown in Fig. 4, and the same fixing screw which holds the coils to the baseboard is used to fix this coil to the tuner.

The Tuner

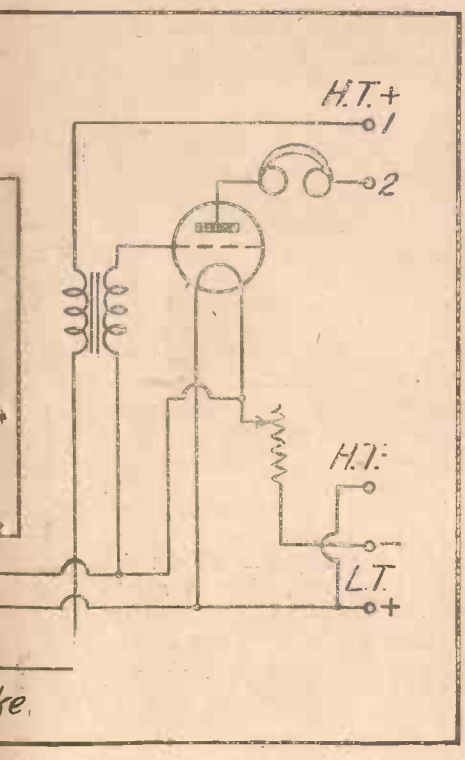
The tuner is built up as follows: Eight pieces of ebonite strip ½ in. wide by 2 in. long and ¼ in. thick are cut and drilled for No. 4 B.A. screws, as shown in Fig. 5. A piece of ebonite tube 3¼ in. outside diameter and 1 in. long is now carefully sawn in half so as to make two hoops of ebonite. Each of these hoops is drilled with four equidistant holes on the periphery. Next take 77 in. of No. 16 enamelled wire, and after carefully placing one end in a vice and stretching it until there are no kinks or bends, wind it on a former 3 in. outside diameter. In order to do this one end of the wire must be anchored to the former so that sufficient strain may be applied to wind the wire tightly. When wound on the former all the turns must be touching, and on releasing the end, the coil (seven turns of wire) will spring off the former as a spiral.

The ebonite strips (Fig. 5) are now utilised in pairs, one pair being bolted together across the length of the coil with the wire between the two strips. A 1-in. No. 4 B.A. screw is now passed through the strips and through one of the holes in one of the ebonite hoops and secured on the under side by a nut. The other three pairs of strips are dealt with in the same manner, but the last 4 B.A. screw is ¼ in. long in order to provide a fixing for the completed coil. Next working the wire nicely into position, with an air gap equal to the diameter of the wire between each turn, the other hoop is bolted to the coil.

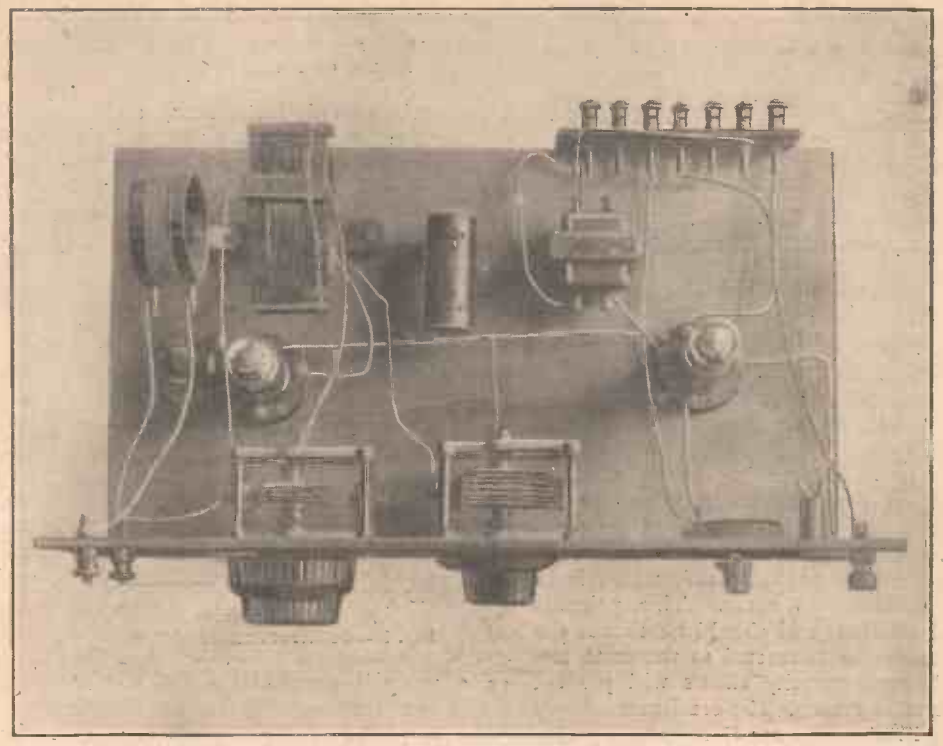
Completing the Coil

The finished coil, if properly made, should be rigid in structure, with three of the screws on each ebonite hoop inserted from the outside of the coil and the remaining long screw through from the inside, the projecting threaded portion being on the outside and finally bolted to another ebonite strip which acts as a support for the coil.

Next two pieces of ½ in. ebonite tube



cuit Diagram.



Plan View showing Arrangement of Components.

1 in. long are placed on the under side of the coil to act as distance-pieces or spacing washers, and through these and the base piece a long wood screw is passed and screwed into the baseboard, thus fixing the coil into position. One of these wood screws is also passed through the slot *a* (Fig. 4) cut in the brass strip which supports the aerial inductance.

The reaction coil merely consists of four turns of No. 36 d.c.c. wire wound in a pile at the filament end of the tuning inductance. The white cotton-covered wire can be clearly seen in the photographs.

lar design were available, though they are now to be obtained.

The small transformer was chosen because it has a slight peak frequency of about 1,000 cycles. It is a French instrument known as the Croix transformer, and costs but six shillings. Any standard transformer may be used.

The high-frequency choke will have to be constructed. This consists of 150 turns of No. 38 d.s.c. wire wound on a former 2¾ in. long and 1¼ in. in diameter. It is mounted on the baseboard in a similar manner to the tuner. The rheostat is a

After the set has been wired with stiff bare wire, and the batteries and aerial and earth have been connected, the preliminary adjustments may be made. The reaction condenser must be adjusted so that the set just goes into oscillation when the tuning condenser is set at ten degrees. Now rotate the tuning condenser with the aerial inductance fairly closely coupled, and note whether the set oscillates all round the dial. If it does not, vary the coupling of the aerial inductance so that the blind spot is moved to a more convenient part, or is not apparent at all. If the set does

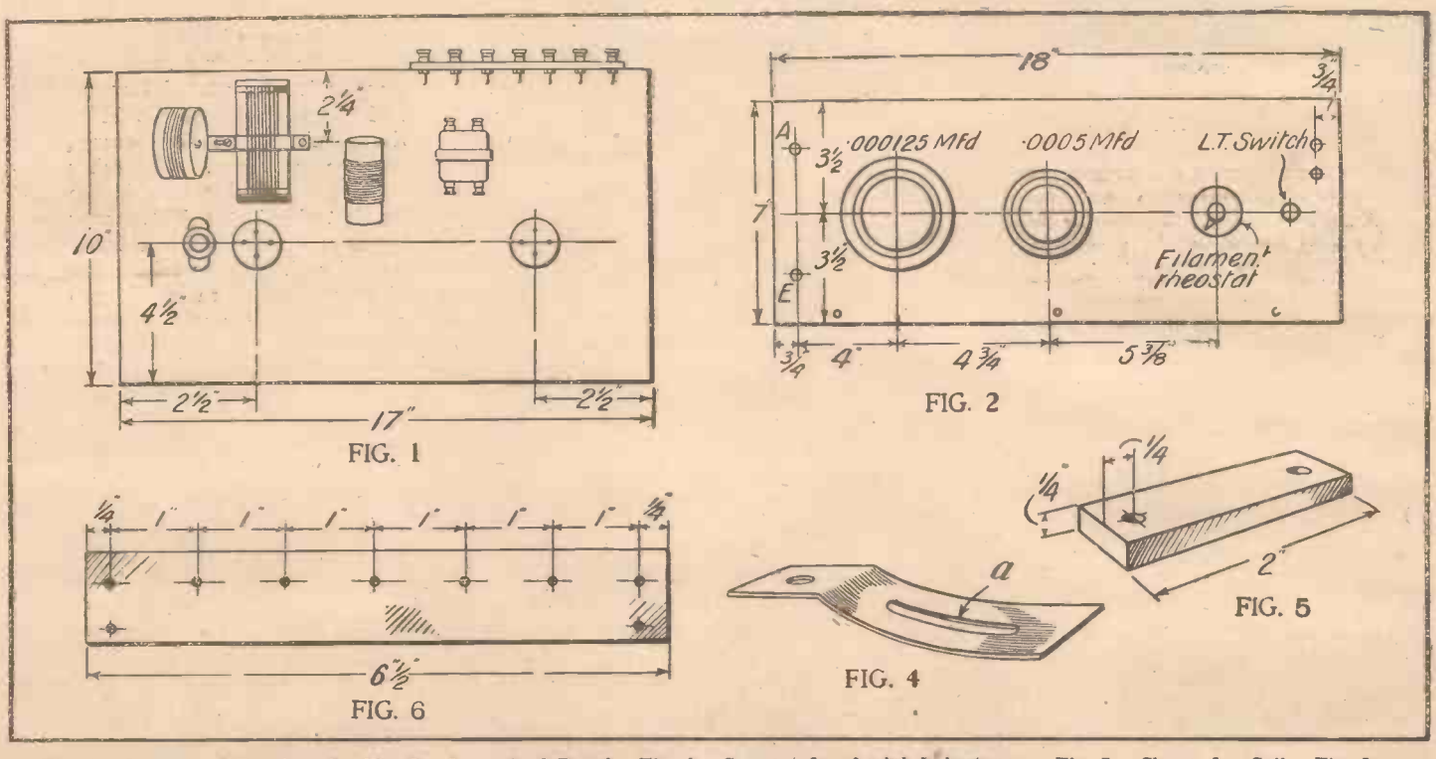


Fig. 1.—Layout of Baseboard. Fig. 2.—Layout of Panel. Fig. 4.—Support for Aerial Inductance. Fig. 5.—Clamp for Coil. Fig. 6.—Details of Terminal Strip.

No great care need be taken with this coil since we are not concerned with losses in the anode circuit, and the fine wire coil affords a minimum capacity coupling to the tuner coil. See, however, that the turns are not shorted through faulty insulation.

Circuit and Components

A diagram of the circuit is shown by Fig. 7. The tuning condenser C1 is a .000125-microfarad low-loss and the reaction condenser is a .0005 microfarad of a similar type.

The rotors or moving vanes of these condensers are electrically joined to the supporting metal framework of the condensers, and this is connected to the low-tension battery positive lead, which is in turn connected to earth. This point is very important, and should by chance the fixed vanes be connected to the earth terminal, hand-capacity effects will prevent comfortable tuning. The condensers shown in the illustrations are Bremer Tully condensers. At the time the set was constructed no British condensers of a simi-

Lissen wire-wound instrument, and the grid leak and condenser are mounted close to the detector valve, as may be seen from the photographs. The grid leak is of the carbon pellet variety. The valves used are Cossor W1's, which work admirably

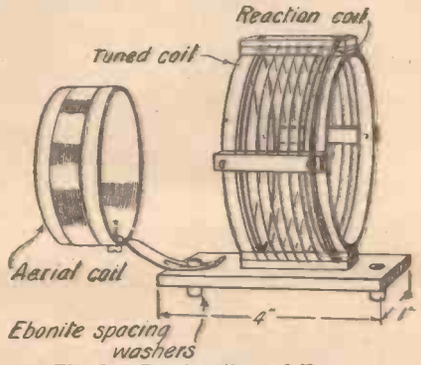


Fig. 3.—Construction of Tuner.

on a two-volt accumulator and oscillate freely on the very short wavelengths. Ordinary low-loss board-mounting valve holders are required.

The terminal strip is shown by Fig. 6.

not oscillate, reverse the reaction coil connections. If the set plops into oscillation, reduce the anode voltage to the detector valve considerably, increase the grid leak resistance, and dim the filament. The reaction should be quite smooth and easily controllable with 18 volts on the anode of the detector. When the correct degree of coupling between the aerial inductance and tuner has been ascertained, the aerial coil is fixed into position for all time by simply tightening up the fixing wood screw so as to lock the brass strip in position.

If after connecting up the set to an earth it is found that "hum" induced from neighbouring electric-light wires is too pronounced, the constructor should try using a single wire counterpoise spread under the aerial to reduce the nuisance, or, should this not be convenient, a small fixed condenser inserted in the earth lead may remedy the trouble.

The set described is for the 30-43-metre band, but coils for other wavelengths, interchangeable by means of clips or plugs and sockets, may be used. A. J. C.

"A.W." TESTS OF APPARATUS

Conducted in the "Amateur Wireless" Research and Test Department

Trix Phone-board

WHERE it is desired to connect several pairs of phones in series the use of a phone distributing board makes the actual connecting a quick and simple affair. A distributing board which we have examined

Trix Phone-board.

has been supplied to us by Eric J. Lever, of 33, Clerkenwell Green, London, E.C.1. It consists of a rotary switch which, when rotated, makes contact with five studs, which in turn are connected to five terminals marked o, 1, 2, 3 and 4. The telephones are connected between terminals marked o and 1, 1 and 2, and so on, whilst the leads coming from the set are connected to the two terminals unmarked.

Both terminals and switch are mounted on an engraved, polished, circular ebonite panel, which is screwed to a polished mahogany mounting board. An arrow engraved on the knob of the switch indicates how many pairs of phones are in circuit.

Philips Accumulator Charger.

Philips A.C. Rectifier

THIS rectifier, manufactured by Philips Lamps, Ltd., of Philips House, 145, Charing Cross Road, London, W.C.2, is a full-wave rectifier. both half-cycles of the A.C. mains being used. It will charge from one to six cells, (2 to 12 volts) at a charging rate of 1.3 amperes, and has the distinct advantage that no adjustments are necessary. By the use of specially designed transformers the rectifier is made in types suitable for periodicities varying from 40 to 100 cycles and voltages from 100 to 260. The rectifying bulb has an electron-emitting filament which operates at a comparatively low temperature. Two plates, one each side of the filament, are connected to the two ends of one of the secondary windings of the transformer. Another bulb, of a similar shape to the rectifying bulb, contains a resistance to limit the charging current. Both bulbs and transformer are mounted on an insulating plate, the whole being enclosed by a perforated aluminium casing.

Perhaps the chief advantage of the Philips rectifier is that it is absolutely foolproof. No knowledge of battery-charging apparatus is required for its use. We have tested the rectifier and found it to work exceedingly well. It is quite noiseless and gives a charging current that varies from 1.13 amperes to 1.38, depending on the arrangement of the batteries being charged. The life of the rectifying valve is about 1,000 working hours. Internal energy loss, including the heat necessary to bring the filament into an active state, is less than 4 watts.

The Ormond Condenser

WE have just received an improved model of the Ormond slow-motion variable condenser, manufactured by the Ormond Engineering Co., of 199 to 205, Pentonville Road, King's Cross, London, N.1. In appearance this model closely resembles the model described in these columns a short time ago, with the exception that a protective guard has been placed over the slow-motion mechanism, whilst the appearance of the knob and dial has been improved. Certainly the condenser is extremely well made and finished, and the adjustable slow-motion mechanism is one of the most ingenious we have seen.

Low-loss principals have been used throughout the construction. The insulating material—high-quality ebonite—consists of four small strips outside the electrostatic field of the condenser.

A quick motion can be obtained by rotating the knob moulded with the engraved dial, and a very fine slow-motion of the moving plates is accomplished by rotating the smaller knob.

On test we found the minimum capacity of a .0005-microfarad model to be approximately .000014 microfarad, whilst the maximum capacity was slightly in excess of the rated value. The motion is delightfully smooth and can be adjusted by the two small terminal screws situated on the slow-motion device.

Ormond Slow-motion Condenser.

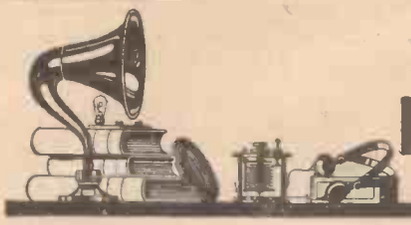
Hart Enduro Accumulator

WE have received from The Hart Accumulator Co., Ltd., of 35, Marshgate Lane, Stratford, London, E.15, a sample of their 2-volt accumulator, which is illustrated in the accompanying photograph. The container is made entirely of glass and possesses the advantage over the celluloid type of being entirely free from acid leakage. The plates are held at both sides of the container by grooves moulded in opposite sides of the glass container. A large clearance space is left at the bottom of the container for the accumulation of any sediment.

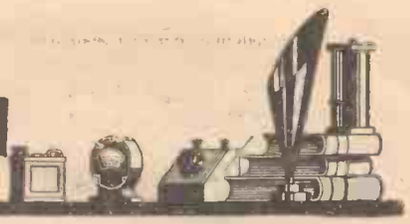
Altogether the accumulator is a fine

Hart Enduro Accumulator.

piece of work and is very strongly made. It is one of the cleanest cells we have used, and its efficiency is in keeping with its appearance. The actual capacity is 10 ampere-hours, a size suitable for the operation of most dull-emitter valves.



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. Always send stamped, addressed envelope and attach Coupon (p. 744).

Howling

Q.—*What causes howling in a three-valve set consisting of a detector and two transformer-coupled L.F. stages? The set is all right when the last valve is switched out, but the trouble occurs whenever all three valves are used.*—*C. S.* (*Birmingham*).

A.—Your trouble is obviously due to L.F. oscillation caused by interaction between the two transformers, and you must do your best to prevent this by suitably spacing them. You should also carry out a few experiments by reversing the connections to the different windings in turn, when you will probably find that by connecting these up in one particular way the trouble is eliminated. If the trouble still persists try the effect of connecting the two transformer cores together and to earth.—J. F. J.

Winding Non-Inductive Resistance

Q.—*How can I wind a non-inductive resistance?*—*C. V. N.* (*Isleworth*).

A.—Your problem is so to wind the resistance that the field of one half the winding neutralises, as nearly as possible, that of the other half. This will be accomplished if the current through one half of the turns passes round the former in the reverse direction to the current through the other half. A commonly-used method of obtaining the above result will now be described. First of all wind off half the total amount of wire on one bobbin and then wind the rest of the wire to be used on another bobbin. Join the outside ends of the wire on each bobbin together and commence winding the double wire on the resistance former as you would a single strand. When all the wire has been put on (the two bobbins should, of course, be finished together) the two remaining ends are connected up to the external circuit.—B.

Phone Connections

Q.—*I understand that the phones should be connected up in a special way to the phone terminals. What is the necessity for this and which is the correct way?*—*N. C.* (*Bolton*).

A.—If a direct current of electricity is to be passed through the windings of telephones it is obvious that when passing in one direction the magnetic field due to the current will assist the field of the permanent magnets and when passing in the reverse direction it will oppose this field. In other words, when the current flows through one way it strengthens the permanent magnets and when it flows through the windings the other way it tends to demagnetise them. As the last thing we desire is for the phones to become demagnetised it is obvious that the phones should be connected up in a certain way in all valve sets, except when the phones are coupled to the last plate circuit by a telephone transformer or through a choke and condenser. When the phones are coupled by either of the latter methods the current flowing through them is of an alternating nature, as it also is when phones are directly coupled to a crystal set when, of course, it is immaterial which way round they are connected up. In valve sets the positive phone lead should be joined to that telephone terminal which is internally connected directly to the H.T. positive terminal, while the negative phone lead should be joined to the other phone terminal (which is internally connected directly to the plate of the last valve). The positive phone tag is often stamped with a "plus" sign, while in other cases the positive phone lead has a thread of distinctive colour interwoven with the insulating covering.—J. F. J.

Tuning Reaction Coil

Q.—*Is there any real advantage to be gained by tuning the reaction coil to the wavelength of the station being received by means of a variable condenser connected across it?*—*T. M.* (*N.3*).

A.—Theoretically, signals should be stronger when the anode circuit is so tuned, but unfortunately most sets oscillate when the tuning of the plate circuit approaches the same value as that of the grid circuit. It is, however, a recognised practice in America (and also, to some extent, in this country) to obtain a regenerative effect by tuning the plate circuit almost to the same wavelength as the grid circuit by means of a variometer. In this case the inter-electrode capacity of the valve and the capacity between the leads and components of the plate and grid circuits form the reaction coupling.—R. W.

OUR WEEKLY NOTE

INTERFERENCE

Among the vast number of readers who seek the assistance of the Information Bureau each week there are unfortunately quite a lot whose trouble arises from interference caused by mains, electric trams or trains, or some form of electrical machinery. This is a type of interference with which it is very difficult to deal and in respect of which it is not possible to lay down definite instructions for its elimination which will hold good in every case.

Sufferers from this trouble should avoid L.F. amplification as much as possible and should not, above all, use reflex circuits. They should remember that in nine cases out of ten the interference is due to earth-currents picked up by the earth connection. Often a change of "earth" has beneficial results, while the use of a counterpoise sometimes cures the trouble completely. The aerial should be erected as far away from, and as nearly at right-angles to, the tramway route, railway-track, or electric cable as the case may be.

Beyond the above, little can usually be done, as the oft-quoted remedy of entirely enclosing the set and accessories in an earthed iron case is seldom practicable.

THE BUREAU.

Four-electrode Valves

Q.—*How does the introduction of an extra grid in a four-electrode valve make it possible to get the same results while using a much lower H.T. voltage?*—*O. R. T.* (*Morecambe*).

A.—The best way to deal with this question is to consider the need for such a high H.T. voltage in the case of the ordinary three-electrode valve. The "cloud" of electrons in the interior of such a valve is, of course, thickest in the space immediately surrounding the filament, from which they are copiously emitted. As the attraction of the positive anode for the electrons is weakest when they are near the filament (and therefore at the farthest distance from the anode) the electrons just emitted are in no hurry to leave the vicinity of the filament which they have, to some extent, made positive by leaving. The cloud of almost stationary electrons which surrounds the filament of any three-electrode valve while it is in operation is known as the "space-charge." As these electrons are particles of negative electricity they exert a repelling influence on electrons just emerging from the glowing filament behind them and tend to force these later electrons back into the filament. In order to attract the electrons, composing the space-charge, to itself as quickly as possible and also to counteract the effect of such electrons upon others following them, it is necessary to make the potential of the plate very high. In the four-electrode valve a positive grid is inserted in the place where the space-charge collects and therefore disperses this and counteracts its effect on the electrons just leaving the filament. It is therefore possible to obtain the same anode current as before when using a much lower H.T. voltage.—J. F. J

Condenser Sizes

Q.—*Some time ago I was advised to use a .001-microfarad condenser for aerial tuning and a .0005-microfarad condenser for tuning the anode circuit. Nowadays the figures usually given are .0005 and .0003 respectively. Why should the condenser used in the anode circuit be smaller than that in the aerial circuit?*—*P. S. G.* (*Winchester*).

A.—In the first place it should be noticed that the greatest potentials are set up across an oscillatory circuit when the inductance is high compared with the capacity. This is the reason for the change which you notice above. However, if the capacity of the tuning condensers is too low it becomes necessary to use an inconveniently large number of coils in order to cover any given wave-band. For best all-round results, therefore, it becomes necessary to use the smallest variable condenser consistent with a sufficiently wide tuning range. Now in the aerial circuit there is already the capacity of the aerial wire to earth in parallel with the tuning coil and this is often as high as .0003 microfarad. As the wavelength only increases as the square of the capacity it is found that a variable condenser of .0005 microfarad is the smallest which will give a really convenient tuning range on broadcast wavelengths. In the anode circuit there are only the stray capacities of the set with which to reckon, and as these can be taken (from the point of view of tuning) to be negligible a .0003 microfarad variable condenser is ample in this circuit. Looked at another way, if the aerial and anode condensers had the same capacity the aerial condenser (in consequence of the parallel capacity of the aerial wire) would have to be turned through a much greater angle than the anode condenser in order to change the wavelength of the circuit by a given amount. By using a larger condenser in the aerial circuit the respective movements of the two dials for a given change in wavelength is more nearly the same. Although it would hardly be possible so to choose the two capacities that the same movement of either condenser altered the wavelength to which the respective circuit was tuned by the same amount, it is an advantage to approach this condition fairly closely.—J. F. J.

WIRELESS MUSICAL COMEDY

A CONSIDERATION OF ITS POSSIBILITIES

AS one glances over the current programmes it becomes evident that the B.B.C. are attacking seriously the question of the presentation of musical comedy. Comparison with the programmes of a year ago will show how the method of presentation has improved. The biggest steps in this direction were made when the public was entertained with the first radio revue and burlesque,

"Winners"

Yet these efforts would appear to be experimental, and the observer can see that the producer at Savoy Hill is but making "casts," so that eventually the correct line may be taken and wireless develop for itself a keen and amusing branch of musical comedy entertainment.

It would appear to have been found that an inadequate entertainment is provided by stringing together with humorous dialogue, songs from past successes. Such an adaptation does not hold the listener, the artificial note being too apparent; yet this method of presentation is far more palatable than a programme of musical comedy items announced in the normal manner.

Revue

Next came the presentation of revue, and by enlisting help from the theatrical world the dramatic producer of the B.B.C. registered a big step forward by the production of *Radio Radiance* and *Listening Time*.

A word here would not be out of place as to some of the difficulties encountered. The theatrical revue hopes to continue for some months and so can retain its artistes over an extended period. Radio is either in for a one-night show or a half-dozen repetitions, so that some scheme must needs be devised to warrant the issue of contracts to artistes over a satisfactory period and distributing the performances of these. Then again radio production entails exhaustive rehearsal and perfection in all details except movement, so that it can be seen that the production of a radio revue is no easy matter.

How is it, then, that these polished productions written and devised by the best brains do not hold the listening public? Perhaps they should be considered in the light of pioneer productions for which the listening public will acquire a taste as time progresses.

Echoes of Revue

As a suggestion could not attention be turned to those successful productions which flourished during the war and even to those of some five years previously? There is most certainly a large body of listeners who would be delighted to hear wireless productions of *To-night's the Night, Theodore and Co., Bric-à-Brac*, etc., and how charming if some of the original artistes could be persuaded to give a helping hand.

Yet is it not asking too much of the B.B.C. to undertake these large productions? Were they to run for one night, the negative would be the correct answer, but each "show" could be sent to the various stations in turn with a final broadcast from Daventry.

Difficulties

In addition to the few difficulties already mentioned there is the question of the possession of the rights of these famous revues. Then the question of the cost follows, and finally rehearsal. But all such difficulties can be overcome.

A Change of Thought

A few years ago it took months for a popular "hit" to reach the country lanes—now it takes a week. This rapid propaganda, it is argued, shortens the life of popular ditties, but does it make their writing less remunerative? Does one hear of the royalties on thousands of records, on tons of sheet music, on countless editions of song publications? True they may be short-lived, but the return is far greater and much more speedy.

Let us hope that the same will come true of musical comedy. Cannot one conceive that in future an essential to the successful production of this type of entertainment will be that it shall first have been broadcast. ROBERT GLENDINING.

FURTHER ADVANCES IN TELEVISION

A GOOD deal of steady progress in the subject of television has been made during the last few weeks by Mr. John Baird, whose early apparatus has already been described in AMATEUR WIRELESS. Mr. Baird gave a private demonstration of his improved apparatus recently in London, and was able to demonstrate that it is now possible to see a recognisable image of a face by wire or wireless. Those present at the demonstration were able to recognise their friends, the latter sitting in one room and the visual examination being made in another in a different part of the building.

The system is based upon a clever mechanical device which explores every portion of the image placed before it and concentrates the light reflected upon a specially sensitive form of photo-electric cell; this cell, the inventor claims, gives him a good deal more current as the result of light action than any other type made so far.

At present the brightness of the illumination is very intense, but further amplification of the photo-electric current may in time obviate this. In a future issue a detailed description of the system will be given, as arranged by Mr. Baird for the broadcasting experiments he hopes to conduct within the next five or six weeks.

These experiments, by the way, should provide a good deal of real interest for amateurs. The proposal at present is to broadcast from the laboratory in London with an apparatus of such power that it will be possible to "see" over a range of fifty miles. This will, of course, be by wireless. A great deal of the laboratory testing is done over wires for the sake of convenience, but, just as in photo-telegraphy, the actual transmission over any distance is easier by wireless than by wire.

Considering the enormous difficulty of the problem, Mr. Baird has made remarkably good progress. A great deal will depend for the future on the success he is able to achieve with the many intricacies involved in mechanical construction. The simplification of apparatus of this kind is the sole means of making it available for the amateur. T. THORNE BAKER.

A Berlin inventor, Dr. Carl Mueller, has patented a new process for the manufacture of extra thin metal diaphragms, suitable for microphones, headphones and loud-speakers

SEVERAL enterprising wireless dealers took advantage of the recent stoppage of newspapers to publish the broadcast bulletins of the Government. By means of duplicating apparatus it was possible to turn out thousands of copies in a very short time, and these were bought up like hot cakes from newsvendors by an anxious public.

The number of licences in force on February 28 last was 1,906,000, but since then the Post Office authorities have instituted many prosecutions, which have led many unlicensed listeners to take out licences, and it is expected that the total will shortly reach 2,000,000.

The Berlin broadcasting station has ceased transmitting the letter B in morse during programme intervals; in its place may now be heard a ticking metronome as adopted many months ago by the Breslau and Cadiz transmitters.

A new Marconi 12 kilowatts broadcast telephony transmitter has been erected at Rome and tests are effected almost nightly on wavelengths of 420 to 425 metres.

Very interesting experiments have been made with a new form of receiving aerial recently placed on the American market. It takes the form of a copper ball measuring some ten inches in diameter and is stated to be suitable for any wavelength and to possess no directional effect.

It is more than probable that listeners will be given another opportunity of hearing Dame Nellie Melba during the present Covent Garden Opera Season. Although arrangements are being made, the actual date of the broadcast has not yet been fixed.

The comic opera, *Monsieur Beaucaire*, is to be broadcast on June 9 next and it is expected that the services of a well-known musician will be engaged to conduct the performance.

Arrangements are being made by the B.B.C. with a view to the broadcast in the United Kingdom of the first performance of several Viennese operas.

The co-operation of the Provosts and other authorities in the towns in the West of Scotland is being sought by the B.B.C. in order to arrange special programmes. Besides devoting attention to the historical and industrial aspects of each district, it is the intention to have local talent, as far as possible, providing the musical and artistic portions of each programme.

The Glasgow station hopes shortly to relay a "Camp Fire" programme from Balloch Park, on the banks of Loch Lomond.

Radio-Belgique (Brussels) is now broadcasting regularly on a wavelength of 487 metres, and its relay station Radio-Zoologie (Anewerp) on 265 metres.

In accordance with the wish expressed by many amateurs, the German broadcasting stations have decided to close down their transmitters at an earlier hour, on at least one night per week, namely at 10.30 p.m. B.S.T., thus giving listeners an opportunity of hearing stations in other countries. For the present the following programme will be carried out: On Mondays, Bremen, Breslau, Hamburg, Hanover, Gleiwitz, Kiel will conclude their programme at 10.30 p.m.; on Tuesdays, Berlin, Dortmund, Elberfeld, Muenster and Stettin; on Wednesdays, Frankfort-on-Main and Cassel; on Thursdays, Dresden, Leipzig and Koenigsberg and on Fridays, Muenich, Nuremberg and Stuttgart.

The 250-watt portable broadcasting station 6XBR (operated by Warner Brothers, the well-known film producers of Hollywood) has commenced a tour of the United States. The transmitter is incorporated in a motor van and broadcasts on a wavelength of 108 metres. After having visited most of the American states, it is hoped that suitable arrangements may be made in order to allow of a tour of England, Spain, France, Germany and Italy, after which it is proposed to visit the Orient and Australia.

Although it had been decided to allow the Odense station to return to its former military duties, it has been found that the Copenhagen broadcasting transmitter is not sufficiently powerful to reach out to certain districts of Denmark, and Odense will still continue to relay the programmes from the Danish capital on 810 metres.

Since the formation of the Union of Swiss Broadcasters (by which the Berne, Zurich, Lausanne and Geneva transmitters are able to put out an S.B. programme), much use has been made of the Lausanne opera-house. It will be found that the land-line relay of these performances can be best received by tuning-in to the Berne station on 434 metres.

WGY's transmissions on 33 metres are being heard regularly in Glasgow, but it is reported that the signals fade badly at times.

The Automobile Association has arranged with the B.B.C. for a further series of wireless talks. They will be given by Mr. Stenson Cooke, the Secretary of the A.A.

Marconi's Wireless Telegraph Co. have decided to put the "picture" radio service into commercial operation between London and New York. It will now be possible for a picture to be handed in at Marconi House for transmission to New York. The charge will be approximately £10 for a quarter-plate picture.

Sir Harry Lauder's next broadcast will take place on July 3.

A diving novelty will be broadcast on June 21, when Mr. F. Shield will make a descent in the Thames. He will also talk from 2 LO, describing the life of a diver.

The speech which will be given by H.R.H. the Prince of Wales at the dinner of the African Society to be held at the Savoy Hotel on June 9, will deal with his recent African trip. Both the Prince's and Earl Buxton's speeeches will be broadcast.

The B.B.C. contemplate a weekly series of relays of Continental programmes from June onwards. These will take place on Tuesdays, providing on those days the items broadcast by the Continental stations are suitable to British requirements.

Will Hay, "The Schoolmaster Comedian," will broadcast from the London station on May 31.

On June 15, excerpts of the Aldershot Command Searchlight Tattoo will be relayed to all stations; this will include the entry of the massed bands and torch bearers.

Carlton, "The Card King," will, on May 31, perform at the London studio some of his best sleight-of-hand and other tricks which he also proposes to explain to listeners.

On June 18 and 28 respectively, Act II of *The Jewels of the Madonna* and Act III of *Manon* will be relayed to all stations from Covent Garden Opera House.

An interesting experiment was recently made by WCCO, the Minneapolis-St. Paul broadcasting station. Three musicians, about twenty miles distant from each other, participated in the test, one playing an organ at the State Theatre, Minneapolis, another the violin in the St. Paul studio, and the third, a 'cellist, performing before a microphone installed for the purpose in WCCO's transmitting station at a distance of about eighteen miles from the city. In order that the musicians should keep time with each other, each one wore a pair of headphones adapted to a wireless receiver by which he was listening to the joint transmission. From the three microphones the signals were conveyed over short telephone wires to a special panel at the transmitting station, where the volume and modulation of each part was controlled by one operator.

Reaction

SIR,—With reference to Thermion's remarks on reducing reaction, I consider that another, and more frequent cause of variation is that the dampness in the atmosphere affects the tuning-coils and other parts of the set. The effect is more noticeable if unvarnished cotton-covered wire is used for the coils. Baking and varnishing reduces it. — C.C.J. (Canterbury).

The All-purpose Receiver

SIR,—With regard to the question, "Is there an all-purpose receiver?" I would like to endorse the opinion of J. C. S (Sheffield) concerning the Reinartz. It is undoubtedly the finest receiving circuit that exists, super-hets included. Especially is this with the circuit published in "A.W." dated May 2, 1925. On an indoor aerial 30 ft. long I have received morse from America, Canada, Brazil, South Africa, India, China, Australia and, last winter, W N P in the Arctic. Amateur telephony is to be heard practically any time; also the short-wave stations K D K A and 2 X A F come in well. On the broadcast waves efficiency is just as good. I can separate most of the B.B.C. relays whilst all are transmitting. Hamburg, Barcelona and Madrid I have received on a Primax loud-speaker. The chief point is that there is no need to make a "freak" set for short waves. The same receiver will do for family use and experimental use.—O. C. (Burton-on-Trent).

The "Concert Six"

SIR,—May I reply as briefly as possible to the points raised by J. H. S. F. regarding the "Concert Six" in No. 203?

Because both a potentiometer and variable resistances across the H.F. coupling coils are fitted, J. H. S. F. points the finger of scorn at the high-frequency circuit, which he decides must be exceedingly unstable if it needs a double "holding down" device. I had two reasons for fitting the potentiometer. The chief of these was that the valve which I generally use for H.F. work is the DEQ which, owing to its high impedance, makes for particularly good selectivity. This valve was designed primarily as an anode rectifier; its curve is such that with the grid at zero volts or with a small negative bias it will rectify without grid leak or condenser. By far the best degree of amplification is obtained with the grid at a tiny fraction of a volt positive. When trying the set with other valves I found that the potentiometer properly used in combination with the parallel resistances enabled one to obtain the most complete stability whilst introducing the absolute minimum of damping; I therefore retained it in the published design.

I can assure J. H. S. F. that as regards selectivity and range the high-frequency side of this set does not suffer by comparison with an elaborate neutrodyne receiver that I have since made. As an example of what it can do, the "Concert Six" was first tested early in the evening in summer-time whilst daylight still prevailed. During an hour's trial thirty-six stations, British and foreign, were tuned in directly on the loud-speaker, every transmission coming in with as much power as could be desired. It was then found possible to separate stations whose wavelengths lay within a few metres of one another, whilst London could be got rid of without the use of any kind of wave-trap. Further, once it has been properly adjusted, the receiver is perfectly stable over the whole range of broadcast frequencies.

Potentiometer control used to be decried by the "low-loss" school, but I notice that there is now a tendency to regard it more favourably. So long as the set is well designed with a view to avoiding what J. H. S. F. calls "accidental reaction," there is no need to use more than the slightest positive bias. The shunt-resistance method, again, is very effective, and since in the "Concert Six" a high value of resistance suffices to produce stability, the losses introduced are not serious. Once adjusted, the set is such that a beginner may be turned loose upon it to search the ether to his heart's content without the slightest fear that he will cause interference.

The low-frequency side of the receiver is the result of a considerable amount of experimental work. One of the most difficult tasks in making up a three-stage note amplifier is to produce a circuit in which there will be no tendency to audio-frequency oscillation, and the difficulty is increased if the complete receiver is to be so compact that its main panel is to be but 24 in. in length. I think that if J. H. S. F. tries out a receiver containing two stages of H.F. amplification, neutrodyned or otherwise, followed by the three-valve note-magnifier combination that he suggests, he will find it exceedingly hard to obtain anything like stability on the L.F. side, even if the set is made of much greater size than the "Concert Six." I gather from his remarks that J. H. S. F. has had no practical experience of the quality obtainable with the Ideal transformer used in combination with a suitable valve. To bring a very weak signal up to loud-speaker strength, the three L.F. stages in the "Concert Six" may be used without introducing the slightest distortion. I am quite sure that those who make up the set will find that it is a most satisfactory receiver, easy to operate and possessing that reserve of power which makes all the difference to results.—J. HARTLEY REYNOLDS.

Charging the H.T. Accumulator

SIR,—Honour to whom honour is due is quite a good maxim, and though A.W. is celebrated for the efficiency of its articles, I feel impelled to specially mention "How to Charge Your H.T. Accumulater at Home," by A. F. G. (No. 204).

Having handled accumulators of all sorts and sizes in the past 25 years I was struck most of all by the very practical knowledge displayed by A.F.G. He states, very wisely, "that the small cells had better get a touch up, as regards charge, each month or six weeks, and *he is right.* I have yet to come across a L.T. or H.T. accumulator which only needs recharging once every four or six months, whether in active use or not.

The very necessary, though rather laborious job of "topping" the cells with pure distilled water, when, through evaporation and gassing the tops of the plates are exposed to the air, thus encouraging sulphating, is helped greatly by using a cheap and simple gadget issued by Conway Stewart and Co., the fountain pen makers. This consists of a vulcanite tube with a rubber ball at one end, and the use of this prevents any spilling of liquid externally. It is also wise to "top" whilst on charge.—A.P.R. (Glasgow).

"Switch-on-and-off Loud-speaker Set"

SIR, — Referring to the article, "A Switch-on-and-off Loud Speaker Set," in No. 201, I should like to say that I consider a .0003 fixed reaction condenser would make this set oscillate violently with some makes of .06 DE valves. Also this circuit is very sensitive to low-tension voltage.

I am at present using a Reinartz two-valve set, and with a Philips .06 DE valve as detector the set will oscillate with the reaction condenser set at about 60 degrees (it is a .003-microfarad) with an H.T. voltage of 25 and an L.T. voltage of about 2. This is rated as a 4-volt valve. Regretting having to criticize unfavourably a set which otherwise appears to be a set that should suit many.—B.C. (King's Heath).

NOTE.—*In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.*

GREAT BRITAIN

The times given are according to British Summer Time.

London (2LO), 364 m. 1-2 p.m., con. (Tues., Thurs, Fri.); 3.15-3.45, transmission to schools; 3.30-5.30, con. (Sun.); 4-5 p.m., con.; 5.15-5.55, children; 6 p.m., light music; 7-8 p.m., time sig., news, music, talk; 8.10-10 p.m., music; 9.0 news (Sun.); 10.0-10.30 p.m., time sig., news, talk; 9.30-10 p.m., special feature (Mon., Wed., Fri.). Tues. and Thurs. the Savoy Bands are relayed until 11.30 p.m., and on Sat. until midnight.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 440 m. **Birmingham** (5IT), 479 m. **Bournemouth** (6BM), 387 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 422 m. **Manchester** (2ZY), 378 m. **Newcastle** (5NO), 407 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 315 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 321.5 m. **Liverpool** (6LV), 331 m. **Nottingham** (5NG), 326 m. **Plymouth** (5PY), 338 m. **Sheffield** (6FL), 306 m. **Stoke-on-Trent** (6ST), 301 m. **Swansea** (5SX), 482 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 4 p.m. onwards, own con. on Mon. Dance music daily (exc. Sun.) till midnight; on first Friday in each month until 2 a.m.

IRISH FREE STATE.

Dublin (2RN), 397 m. Daily, 7.30 p.m. Sundays, 8.30 p.m. until 10.30 p.m.

CONTINENT

The Times are according to the Continental system; for example, 16.30 *is* 4.30 *p.m., and* 08.00 *is* 8 *a.m. B.S.T.*

AUSTRIA.

Vienna (Radio Wien), 594 m. and 541 m. (temp.) (10 kw.). 11.00, con. (almost daily); 15.30, con.; 19.25, news, weather, time sig.; con., lec., news; 20.00, con.; 22.00, dance (Wed., Sat.).

Graz, 402 m. (1 kw.). Relay from Vienna. Also own con. (Tues., Wed., Fri.), 20.10.

BELGIUM.

Antwerp, 265 m. (100 w.). Relays Brussels.

Brussels, 487 m. (1½ kw.). 17.00, orch. (Tues., Thurs., Sat. only), news; 20.00, lec., con., news (opera, Mon. and Wed.).

CZECHO-SLOVAKIA.

Prague, 368 m. (5 kw.). Con., 20.00-23.00, daily. Also tests on 398.5 m.

Brunn (OKB), 521 m. (2.4 kw.). 10.00, con., news (Sun.); 19.00, lec., con. or dance (daily).

DENMARK.

Copenhagen (Radioraadet), 347.5 m. (2 kw.). Sundays: 15.30, lec.; 17.30, children; 20.00, play; 21.15, news, con.; 21.15, news, Esperanto (Mon.), silent night. Weekdays (Tues., Fri., Sat.); 20.00, lec., con., news, con.; 21.30, dance (Sat.).

Ryvang, 1,150 m. (1 kw.). Sundays: 09.00, sacred service; 17.30-21.30, same as Copenhagen; 20.00 (Wed., Thurs.), lec., con., news, orch.

Sorö,* 1,150 m. (1½ kw.). Relays Copenhagen. Also broadcasts at times on 1,500 m.

FINLAND.

Helsingfors (Skyddskar), 504 m. (500 w.). Temporarily closed down.

Helsingfors, 440 m. Con., 18.00 (Tues., Thurs., Sat., Sun.).

***Tamafors**, 368 m.

***Jyvaskyla**, 561 m. (200 w.).

***Uleaborg**, 233 m. (200 w.).

* Relay Helsingfors.

GRAND DUCHY OF LUXEMBURG.

Radio Luxemburg (LOAA), 1,200 m. Con.: 14.00 (Sun.), 21.00 (Thurs.).

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 11.00, markets (exc. Sun. and Mon.); 11.20, time sig., weather; 15.00, 16.45, Stock Ex. (exc. Sun. and Mon.); 18.00, talk, con., news; 19.00 and 23.10, weather; 21.00, con. (daily).

Radio-Paris (CFR), 1,750 m. (about 3 kw.). Sundays: 12.45, con., news; 16.30, Stock Ex., con.; 20.15, news, con. or dance. Weekdays: 10.40, news; 12.30, con., markets, weather, news; 16.30, markets, con.; 20.15, news, con. or dance.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (800 w.). 14.00 or 15.00, studio con. or outside relay; 20.30, lec. (almost daily); 21.00, con. (daily).

"Le Petit Parisien," 333 m. (temp.) (1 kw.). 21.15, con. (Tues., Thurs., Sat., Sun.).

Radio-Toulouse, 430 m. (2 kw.). 12.30, con., time sig. (daily); 17.30, news (exc. Sun.); 20.45, con.; 21.25, dance (daily). Also operatic relays on 500 m., occasionally.

Radio-Lyon, 280 m. (2 kw.). 20.20, con. (daily).

Radio Agen, 318 m. (250 w.). 12.40, weather, Stock Ex.; 20.00, weather, Stock Ex.; 20.30, con. (Tues., Fri.).

***Lyon-la-Doua**, 488 m. Own con., 20.00 (Mon., Wed., Sat.).

***Marseilles**, 351 m. (500 w.).

***Toulouse** (PTT), 280 m. (2 kw.).

***Bordeaux**, 411 m.

* Relays of PTT Paris.

Montpelier, 220 m. (1 kw.). Relays Radio Toulouse.

Angers (Radio Anjou), 300 m. (500 w.). Daily: 20.30, news, lec., con.

GERMANY.

Berlin, on both 504 and 571.5 m. (4 kw.). 09.00, sacred con. (Sun.); 11.00, con. and tests; 12.55, time sig., news, weather; 15.00, educ. hour (Sun.), markets, time sig.; 17.30, orch.; 20.30, con., weather, news, time sig., dance music until 24.00 (nightly). Relayed on 1,300 m. by Koenigswusterhausen and Stettin (241 m.).

Königswusterhausen (LP), 1,300 m. (8 kw.). 11.30-12.50, relays Berlin (Sun.); 15.00, lec. (daily); 18.30, relay of Berlin (Vox Haus) con. (daily). 2,525 m. (5 kw.), Wolff's Buro Press Service: 06.45-20.10. 2,880 m., Telegraphen Union: 08.30-19.45, news. 4,000 m. (10 kw.), 07.00-21.00, news.

Breslau, 418 m. (4 kw.). 12.00, con. (daily), Divine service (Sun.); 12.55, time sig. (Sun.), weather, Stock Ex., news; 16.00, children (Sun.); 17.00, con.; 19.00, lec.; 20.30, con., weather, time sig., news; 21.45, dance (Sun., Thurs.). Relay: Gleiwitz, 251 m.

Frankfort-on-Main, 470 m. (1½ kw.). 08.00, sacred con. (Sun.); 11.55, time sig., news; 12.55, Nauen time sig.; 16.00, con. (Sun.); 16.30, con.; 18.00, markets, lec.; 20.00, lec., con., weather, dance. Relay: Cassel, 273.5 m.

Hamburg, 392 m. (4 kw.). Relayed by Bremen (279 m.), Hanover (294 m.), Kiel (233 m.) Sundays: 07.25, time sig., weather, news, lec.; 09.15, sacred con.; 13.15, con.; 18.00, con.; 19.15, sports, weather, con. or opera, dance. Weekdays: 06.55, time sig., weather; 07.00 and 07.30, news, weather; 12.55, Nauen time sig., news; 14.00, weather, con.; 16.15 and 18.00, con.; 19.00, lec.; 19.55, weather and con.; 22.00, dance (daily, exc. Tues.).

Königsberg, 462 m. (1 kw.). 09.00, sacred con. (Sun.); 12.55, time sig., weather, news; 16.30, con.; 17.00, con. (Sun.); 19.30, lec.; 20.00, con. or opera, weather, news, dance (irr.).

Leipzig, 452 m. (700 w.). Relayed by Dresden (294 m.). 08.30, sacred con. (Sun.); 11.00, educ. hour (Sun.); 12.00, con. (daily); 12.55, Nauen time sig., news; 16.30, con., children (Wed.); 20.15, con. or opera, weather, news, cabaret or dance (not daily).

Munich, 487.5 m. (3 kw.). Relayed by Nuremberg (340 m.). 11.30, lec., con. (Sun.); 14.00, time sig., news, weather; 16.00, orch. (Sun.); 16.30, con. (weekdays); 18.30, con. (weekdays); 19.15, lec.; 19.30, con. (Sun.).

Munster, 412 m. (2½ kw.). Relayed by Elberfeld (259 m.), Dortmund (283 m.). 11.45, radio talk, Divine service; 12.00, news (Sun.); 12.30, news (weekdays); 12.55, Nauen time sig.; 15.30, news, time sig.; 16.00, con.; 17.00, children (Sat.); 19.40, news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 24.00 and 04.00, weather and news.

Stuttgart, 447 m. (1½ kw.). 11.30, con. (Sun.); 16.30, con. (weekdays); 17.00, con. (Sun.); 18.30, time sig., news, lec., con. (daily); 21.15, time sig., late con. or cabaret.

HOLLAND.

Amsterdam (PCFF), 1,955 m. (1 kw.). Daily: 06.35-15.30 (exc. Mon. and Sat., when 12.30-13.30), news, Stock Ex.

Hilversum (HDO), 1,050 m. (2½ kw.). 09.00, sacred service (Sun.); 19.10, con.; 21.00, news, etc. Testing on 25 kw.

HUNGARY.

Buda-Pesth (Csepel), 560 m. (2 kw.). 09.00, news; 12.00 and 15.00, weather, news; 17.00, dance music; 20.00, con. or opera, dance.

Kosice, 2,020 m. (2½ kw.). 19.00, con.

ICELAND.

Reykjavik, 327 m. (700 w.). Tests: 22.30, 24.30.

ITALY.

Rome (IRO), 425 m. (2½ kw.). 10.30, sacred con.; 13.15, official communique; 17.00, children; 17.30, relay of orch. from Hotel di Russia; 17.55, news, Stock Ex., jazz band; 20.30, news, weather, con.; 22.15, late news.

Milan, 320 m. (2 kw.). 20.00-01.00, con., jazz band. Testing on 425 to 430 m.

JUGO-SLAVIA.

Belgrade (Rakovitza) (HFF), 1,650 m. (2 kw.). 17.00, news (daily), con. (Tues. Thurs., Sat.).

LETTLAND.

Riga, 488 m. (2 kw.). Con. daily, 21.00 22.00.

NORWAY.

Oslo, 382 m. (1.2 kw.). 11.00, Divine service (Sun.), Stock Ex. (weekdays); 13.15, markets 19.15, news, time, lec., con.; 22.00, time, weather, news, dance relayed from Hote Bristol, Oslo.

Bergen, 358 m. (1½ kw.). Testing.

POLAND.

Warsaw, 480 m. (6 kw.). Daily: con. 11.00-13.00; 15.00-23.00, daily.

RUSSIA.

Moscow (RDW), 1,450 m. (12 kw.). Week days: 12.30 and 17.55, news and con.

(Popoff Station), 1,010 m. (2 kw.). 10.00 11.00, lec.; 13.00, 19.00, con. (Tues., Thurs. Fri.).

Radio Peredacha, 410 m. (6 kw.).

Trades Union Council Station, 450 m (2 kw.). 18.00, con. (Mon., Wed.).

Leningrad, 940 m. (2 kw.). Weekdays 16.00.

Nijni Novgorod, 1,400 m. (1.2 kw.). 21.30 con.

SPAIN.

Madrid (EAJ6), 392 m. (1½ kw.). Daily: con. (times vary daily). Closes at 24.00 on Sun., Wed., Sat.

Madrid (EAJ7), 373 m. (4½ kw.). 17.30 24.00, con. (almost daily).

Madrid (EAJ4), 340 m. (3 kw.). 16.30, con.

(*Continued on page* 740)

"BROADCAST TELEPHONY" *(cont. from page 738)*

Barcelona (EAJ1), 324 m. (3 kw.). 17.00-21.00, news, lec., con. (Sun.); 18.00-23.00 (daily).

Barcelona (Radio Catalana) (EAJ13), 462 m. (4½ kw.). 19.00-24.00, con., weather, news.

Bilbao (EAJ9), 415 m. (1 kw.). 19.00, news, weather, con. Close down 22.00.

Bilbao (Radio Vizcaya) (EAJ11), 418 m. (2 kw.). 22.00-24.00, con. (daily).

Cadiz (EAJ3), 357 m. (550 w.). 19.00-21.00, con., news. Tests daily (Mon., Tues., Wed., Sat.), 24.00.

Cartagena (EAJ15), 335 m. 19.00-22.00, con. (daily).

Seville (EAJ5), 357 m. (1½ w.). 21.00, con., news, weather. Close down 23.00.

Seville (EAJ17), 300 m. 19.00-22.00, con. (daily).

San Sebastian (EAJ8), 346 m. (500 w.). 17.00-19.00, 21.00-23.00 (daily).

Salamanca (EAJ22), 405 m. (1 kw.). 21.00, con. (daily).

Saragossa, about 325 m. Testing.

SWEDEN.

Stockholm (SASA), 430 m. (1 kw.). 11.00, sacred service (Sun.); 12.30, weather; 14.00, con. (Sun.); 17.00, children (Sun.); 18.00, sacred service; 19.00, lec.; 21.15, news, con., weather. Dance (Wed., Sat.).

SWITZERLAND.

Lausanne (HB2), 850 m. (1½ kw.) (temp.). 20.00, lec., con. (daily).

Zurich (Hongg), 513 m. (temp.) (500 w.). 11.00, con. (Sun.); 12.00, weather; 12.55, Nauen time sig., weather, news, Stock Ex.; 13.30, piano solo; 17.00, con. (exc. Sun.); 18.15, children, women; 19.00, news, weather; 20.15, lec., con., dance (Fri.).

Geneva (HB1), 760 m. (2 kw.). 20.15, con. (daily).

Berne, 434 m. 10.30, organ music (exc. Sat.); 16.00, 20.30, con.

Basle. Testing.

WIRELESS IN PARLIAMENT

From Our Own Correspondent.

IN reply to Mr. Day, who asked if his attention had been drawn to the expressed desire of the skippers of the Yarmouth and Lowestoft fishing smacks, urging that the British Broadcasting Company should give aid by broadcasting the daily state of the markets at the large ports, the catches landed, and the area where the fish had been caught; and, in view of the importance of such fishermen being able to locate herring shoals, if he would take such steps that would result in the industry being assisted in the required direction, Mr. Guinness said that no application had been received from the smackmen or from the herring fishermen for information of this kind to be broadcast. Before the English herring season commenced in the autumn, he would make inquiries as to whether such a service could usefully be instituted, but so far as his present information went the number of fishing vessels equipped with receiving sets remained small.

Mr. Duckworth asked the Postmaster-General whether he would arrange for the British Broadcasting Co. to continue permanently to broadcast part of its special service of news and comment initiated during the recent emergency?

Sir W. Mitchell-Thomson said that the arrangements for the distribution of news by means of the British Broadcasting Co.'s stations were governed by an agreement between the company and the Press. This agreement would expire with the termination of the present licence to the company on December 31 next, and the new broadcasting authority which it was proposed to set up would be free to make fresh arrangements for the broadcasting of news.

"Building a Poultry House" is the subject of an article in the current issue of "The Amateur Mechanic and Work" (3d.), and will doubtless be of use to many readers. Other articles appearing in the same number are: "Bent Cane Work and How to Do It," "Silver from Lead," "Pendulums for Electric Clocks: Metal and Wooden Rods," "Renovating Mahogany Dining-room Chairs," "Practical Photography," "A Hold-all Wireless Cabinet," "Working and Drilling Wireless Panels," "Improved Types of Funnels," "Frosting Electric-lamp Bulbs," "The Reflecting Telescope and How to Use It," "Accumulators: Their Action, Care and Maintenance," "A Scribing Table for the Lathe," "Replacing Spokes in Motor-cycle Wheel."

Ask "A.W." for List of Technical Books

CHIEF EVENTS OF THE WEEK

SUNDAY, MAY 23

London	Shakespeare's Heroines—Portia: Cathleen Nesbitt.
Birmingham	Wagner Programme.
Bournemouth	Verdi-Gounod Programme.
Glasgow	Symphony Concert.
Newcastle	Russian Opera and Ballet.

MONDAY

London	Band relayed from Hyde Park. Special Empire Day Programme.
Aberdeen	The London Radio Players in *The Last.*
Cardiff	To celebrate the Day—(1) Bank Holiday; (2) Empire Day.
Manchester	The Station Dramatic Company in *This Room is Engaged.*

TUESDAY

London	*Landing the Shark*, a Play by Vivian Titmarsh.
Birmingham	Tennyson's "Enoch Arden" with Richard Strauss music.
Belfast	Quotations—A Competition.
Glasgow	Characters in Literature, No. 6: "Caleb Plummer."
Newcastle	"All the Fun of the Fair."

WEDNESDAY

London	Beating Retreat relayed from Marine Parade, Dover. Ghost Programme.
Bournemouth	"The Wizard of Wireless"—a Romance of the Radio.
Cardiff	The Versatile Entertainers in "A Wireless Broadcasting Rehearsal."
Dundee	Palpitating Proteologue: "Ears Ain't Everythin'."
Edinburgh	Closing proceedings of the General Assembly of the United Free Church of Scotland.
Newcastle	*A Little Fowl Play*—a Farce in One Act.
Sheffield	"The Smilesmith's Remarkable Invention."
Stoke	The Potteries Choral Society.

THURSDAY

London	The Variety Artists' Benevolent Fund Concert.
Manchester	"In A Persian Garden"—Song Cycle for four solo voices.

FRIDAY

London	The Kneller Hall Band.
Glasgow	Pianoforte Recital by Leff Pouishnoff.
Manchester	The Cresswell Colliery Institute Prize Band.

SATURDAY

London	"The Bee-Bee Cabaret."
Aberdeen	"The May Queen"—a Pastoral for Choir and Orchestra.
Cardiff	The University of Bristol Department of Education Concert.

TRADE NOTES AND CATALOGUES

A COMPREHENSIVE catalogue of wireless components and accessories has been issued by Will Day, Ltd., of 18 and 19, Lisle Street, Leicester Square, W.C.2. Nearly every accessory that the constructor is likely to need is illustrated, and a number of useful theoretical circuits are given showing how the various components may be connected. A copy will be forwarded to any reader on receipt of sixpence, which is necessary to cover cost of postage and packing.

The National Physical Laboratory has recently conducted tests on a Dimic coil, manufactured by L. McMichael, Ltd., of Hastings House, Norfolk Street, Strand. At a frequency corresponding to 400 metres the effective resistance was found to be only 5.25 ohms. It is claimed that the Dimic coil has the lowest H.F. resistance of any coil on the market.

On the retirement of Mr. Donald Murray from business, the agency for the Morkrum-Kleinschmidt Corporation of Chicago has been taken over by Standard Telephones and Cables, of Connaught House, Aldwych, W.C.2.

An abridged price list of Chakophone wireless receivers, accessories and components has been issued by the Eagle Engineering Co., Ltd., of Eagle Works, Warwick.

Wright and Weaire, Ltd., manufacturers of Wearite components and accessories, have moved from their works at 29, Halton Road, N., to more commodious premises at 174, High Road, Tottenham.

A Marconiphone No. 1 public-address equipment has been installed in Bath Abbey in order to overcome the bad acoustic properties of the building.

A new branch and distributing centre for components manufactured by Philips Lamps, Ltd., has been opened at 34, Marsh Street, Bristol (Bristol 2746).

An illustrated folder describing various components manufactured by J. J. Eastick and Sons, including Eelex low-loss coils, Dewar switches, plugs and sockets, has been sent us by J. J. Eastick and Sons, of Eelex House, 118, Bunhill Row, E.C.

L.E.S. rheostats, described on p. 667 of No. 204, are manufactured by C. Ede and Co., of Byfleet, and the sole concessionnaires are The London Electric Stores, Ltd., of 9, St. Martin's Street, Leicester Square, W.C.2.

MORE RADIOGRAMS

THE German broadcasting authorities are taking vigorous proceedings against wireless pirates, and in the period between January and the end of March, 1926, 480 perons were prosecuted and convicted for illicit possession of apparatus. In each case heavy fines were inflicted and the receivers confiscated.

The Breslau broadcasting station has moved into more commodious premises and is now transmitting nightly on a power of 4 kilowatts, the wavelength remaining at 418 metres.

The Swedish broadcasting company makes a feature of the relay at regular intervals of concerts transmitted by Daventry. These British programmes are picked up by the Kungsbacka wireless telegraphy station in the vicinity of Gothenberg and conveyed to the Swedish capital by land-line.

The Prague station, although using a wavelength of 368 metres for its daily transmissions, is also experimenting on 395.8 metres.

The small wireless telephony transmitter run by the Radio Club de Liége is now broadcasting concerts on Monday, Wednesday and Friday at 9.30 p.m., B.S.T., on a wavelength of 185 metres.

The Eiffel Tower has now abandoned the use of the 2,740-metre wavelength, and daily concerts are transmitted on 2,650 metres only.

"RIBBON COILS—AND HOW TO MAKE THEM"

(*continued from page 727*)

matter. The ends of the ebonite rod, which are made to project about 1¼ in. from one end of the coil, are pushed into four ⅛-in. diameter holes drilled ¼ in. deep in the baseboard of the receiver and spaced to correspond. Fig. 4 illustrates how the coil can be mounted on an ebonite base 4 in. square in a similar manner, the base being fitted with two or more valve pins so that the coil is made interchangeable.

To avoid undue complications, connections are best made by soldering direct on to the copper strip, which is admirable for this purpose; but where a variable tapping is desired, a piece of sheet brass bent as in Fig. 5 is used. As shown, two jaws are bent and held towards each other by a V-shaped spring, to the apex of which is soldered the flex lead. The clip is sprung over the required tapping point, the two jaws firmly gripping the edges of the strip.

In conclusion, note should be made of the fact that no metal other than the copper ribbon is used in the construction of the coil itself, which is a desirable point when receiving or transmitting at very high frequencies.

B. H.

The Madrid (Radio Iberica) station is said to be testing experimentally on a wavelength of 347 metres.

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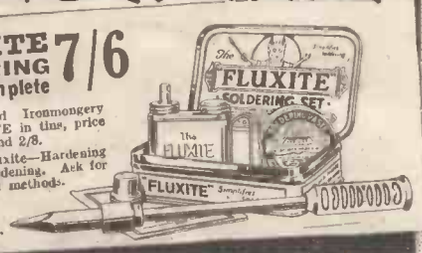

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BANISH YOUR BATTERY TROUBLES! *(See page 758)*

PRACTICAL HOME RADIO PICTURES

Amateur Wireless And Electrics

Vol. VIII. No. 207 SATURDAY, MAY 29, 1926 Price 3d

PRINCIPAL CONTENTS

WELL ILLUSTRATED

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

PENNY-IN-THE-SLOT WIRELESS

A recent development in America is the provision of slot machines which yield a short programme on inserting a small coin.

Amateur Wireless and Electrics

The Leading Radio Weekly for the Constructor, Listener and Experimenterr

Edited by BERNARD E. JONES

Vol. III. No. 207 — Technical Adviser: SYDNEY BRYDON, D.Sc., M.I.E.E. — MAY 29, 1926

Chief Contents

"Amateur Wireless and Electrics." Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. Post free to any part of the world: 3 months, 4s. 6d.; 6 months, 8s. 9d.; 12 months, 17s. 6d. Postal Orders, Post Office Orders, or Cheques should be made payable to the Proprietors, Cassell and Co., Ltd.

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," La Belle Sauvage, London, E.C.4.

CURIOSITIES OF WIRELESS

WIRELESS is full of oddities and queer happenings. Some of them can be explained, but the causes of others are either doubtful or altogether unknown. Take atmospherics, for instance, with whose crackling, tearing or rustling sounds everyone is familiar. It is pretty certain that they are produced sometimes by thunderstorms, sometimes by violent electrical disturbances in the atmosphere and sometimes by discharges between layers of air at different potentials.

The Nature of Atmospherics

Not long ago a great deal of research work was done with a view to discovering something about the actual nature of atmospherics. It was found that the waves produced by certain types of atmospherics were of much the same kind as those radiated by a spark transmitter; others again give rise to wave forms of all kinds of queer shapes. The average wavelength of an atmospheric appears to lie between 40,000 and 100,000 metres. From this it is easy to see why when atmospherics are about, the interference that they cause becomes more and more marked as the wavelength to which the receiving set is tuned is increased. But it does *not* explain other strange phenomena. If you have done any listening upon wavelengths of 100 metres and below you have probably found that there are numerous occasions when atmospheric interference may be pretty bad on, say, 60 metres but almost entirely absent on 100. Sometimes, again, when atmospherics are bad upon the broadcast wavelengths the short ones may be free from them; or conditions just the reverse of these may obtain.

Short-wave Phenomena

The short waves themselves are responsible for a great number of strange phenomena. Not long ago, when Senatore Marconi was conducting short-wave experiments between this country and South America, he found that the maximum range and the greatest signal strength were obtainable with a particular wavelength not, as you might expect, at night time but when the greatest portion of the route taken by the waves was bathed in sunlight. Short waves are also liable to peculiar distortion and fading effects of their own, but one of their most curious properties is that of "skipping" large areas altogether. It has been found that when certain short wavelengths are in use it is sometimes impossible to receive anything within a range of 100 miles or more of the transmitting station. Outside this area signals are strong, and they may be heard at distances of several thousand miles.

Why is it that on one night the receiving set seems to be full of "life," bringing in station after station as the controls are moved, whilst on the next one may be able to hear nothing but the local station? Investigations have show that as a rule receiving conditions are at their best for the broadcast waveband upon dark nights when the barometer is high; yet one often finds that on just such a night as this one's set is unable to reach out.

Puzzles in DX Work

During the past winter reception of American stations, despite the great improvements that have recently been made in wireless sets, was a complete failure. A year ago and in the two previous winters it was comparatively easy to tune in several whose rating was only about one kilowatt; the feat was in fact frequently accomplished with single-valve sets. Now not even Bound Brook, with its enormously powerful transmitter, can get across to this country. The failure has been put down to sun spots and a variety of other causes; but how is it that the short-wave transmissions of KDKA and WGY are unaffected and come in as well as ever?

Have you ever investigated the queer things that may be done with a crystal set? Try reversing the aerial and earth leads. In most cases you will not find

(Concluded at foot of next page)

GRID BIAS FOR THE DETECTOR

A NOVEL SUGGESTION

IN the most popular form of rectification, the leak and condenser (see Fig. 1), very few of us are aware that the efficiency of such an arrangement chiefly depends upon the grid-current effect of the valve functioning as the detector. In order to obtain the benefits of rectification by this method, the valve must necessarily function upon that part of its curve where grid current is present, and the grid potential will have to be somewhere between zero or near the commencement of the grid current and some value positive to the negative end of the filament. It will therefore be seen that this function is in direct contrast to the biasing of low-frequency amplifiers, where every endeavour is made to get away from grid current by using higher H.T. and a negative potential on the grids of the valves.

Leak and Condenser Method

As most of us know, when using the grid leak and condenser method of rectification it is usual to join the lower end of the grid leak to the positive side of the filament, and this automatically gives a positive bias to the grid through the leak, and causes the valve to function with a positive grid and a grid current passing from the filament to the grid.

Upon this principle the process of rectification takes place. The effect of this one-way current causes the grid condenser to become charged every time the received signal swings the grid negatively (and when positively is neutralised, as it were, by the grid current), the increasing charge in the condenser causes the H.T. current to drop accordingly.

One must not forget that the positive and negative swings upon the grid are at radio frequency, upon which is superimposed the audio frequency—or speech and music—with the result that the H.T. current rises and falls in accordance with the audio frequency of the wave received. The grid leak, of course, is of such a value as enables the charge to leak away from

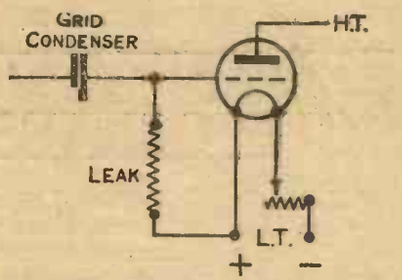


Fig. 1.—Usual Condenser and Leak Circuit.

the condenser, so that the grid is again ready for the next signal or low-frequency impulse.

From this it will be seen that not only does the value of the condenser, the resistance of the leak and the characteristic of the valve determine the efficiency of rectification, but, perhaps the most important

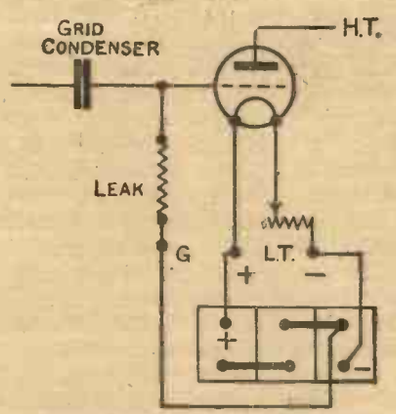


Fig. 2.—Method of Providing Bias.

of all, the value of the grid current available for this function.

It therefore becomes necessary for us to have some method whereby this current value may be varied to obtain the best results, and a variable positive bias to the grid of the valve is essential.

Providing Bias

To make this possible, instead of joining the lower end of the grid leak to the negative or positive side of the filament, connect this to a separate terminal on your set as shown in Fig. 2, and by means of an additional L.T. lead a tapping can be made at any point—2, 4 or 6 volts positive—on the L.T. battery. One can, by experiment, find the operating point on the detector valve to give the best rectification consistent with stability and selectivity of tuning. Generally speaking 2 or 4 volts positive will be found to give most excellent results on such Marconi valves as R5V, DE5B, DE5 and DE8, and in the case of dry-battery combinations using a 4½-volt dry battery and DE3, the 3-volt tapping may be found to be suitable for the purpose required.

The actual positive bias on the grid of the detector valve will also greatly depend upon the working value of the grid leak, and with a high-resistance leak the higher positive bias may produce the best results.

T. G. T.

There are now in the United States seven stations transmitting on short waves with a power of 20 kilowatts, namely: WBZ (Springfield), 50 metres; WQN (Rocky Point), 51.5 metres; KDKA (East Pittsburgh), 58.79 metres; WIR (New Brunswick), 74 metres; KIO (Kahuku), 90 metres; KEL (Bolinas), 95 metres; and WGH (Tuckerton), 103 metres.

"CURIOSITIES OF WIRELESS" (*continued from preceding page*)

the slightest difference in results. If the crystal cup is slightly tarnished you may be able after a little careful searching to find a sensitive spot, not upon the crystal itself but upon the rim of the cup. Should you care to make a few experiments with substitutes for the crystal itself you may obtain rectification with the help of a small piece of coke or of a lump of sugar instead of the crystal.

Any reader who lives within a few miles of a main station or of Daventry will probably be able to obtain quite good reception with nothing more elaborate than a pair of telephones and a detector. Wire the two in series, connecting the unoccupied terminal of the detector to the aerial and the second phone-tag to earth. Three or four people wearing rubber-soled shoes or standing upon a floor covering that is a good insulator make an excellent aerial if they stand holding hands at arms' length, whilst the one who is nearest the set places a wet finger on the aerial terminal. A similar human chain also makes quite a good telephone or loud-speaker lead.

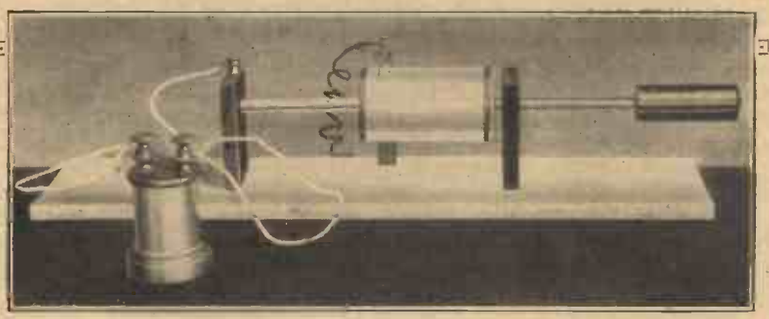
The Crystal Transmitter

Many crystal users have unwittingly become at times unlicensed transmitters! When two sets using neighbouring aerials are tuned to the same strong transmission it is often possible to conduct a conversation by alternately speaking into the headphones and using them for their proper purpose as receivers. In this case the receiver when spoken into plays the same part as it did in the old Bell telephone which was used before the microphone was invented. The carrier wave of the incoming signal is modulated by the vibrations of its diaphragm, and the owner of the set next door can hear all that is said. A similar effect is frequently observed by owners of valve sets who have crystal-using neighbours. Whenever the latter search with the catwhisker for a sensitive spot loud scratching noises are produced in the phones or loud-speaker of the valve set. Many amusing experiments may be conducted in this way.

J. H. R.

PRACTICAL HOME RADIO PICTURES

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



Photograph of Radio Picture Transmitter.

ALTHOUGH it is practically certain that the broadcasting of wireless pictures will take place sooner or later, there are many amateurs who are anxious to take part in this fascinating branch of wireless work without waiting for it to become general. The great help that the amateur has given in the development of wireless generally is well recognised, and it is in the hope that they may begin to take an equal share in the development of picture-telegraphy that this article is written.

There is no reason why with a little mechanical skill, and a little ingenuity, the average amateur cannot construct an instrument capable of sending or receiving a picture. To transmit a picture by wireless, a transmitting licence is, of course, necessary, but in the early stages of the experiments it will be found easier and almost equally interesting to connect the two instruments by an ordinary wire.

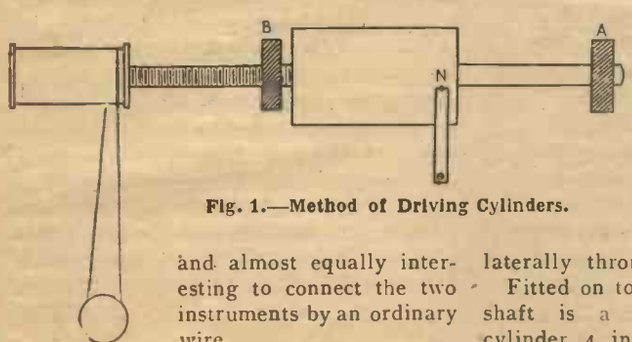


Fig. 1.—Method of Driving Cylinders.

The method about to be described will give perfectly good results using simple sketches, and has been specially designed to be driven by an ordinary gramophone. The cost of an instrument of this kind can be reduced to a few shillings, and can under suitable conditions be used for wireless transmission. The most important feature is the cylinder and shaft. This must revolve truly in order to achieve success. A convenient size of cylinder is 2 in. by 4 in., the diameter being 2 in. Brass tubing of this size can be easily obtained. After being cut and filed down to the correct length, each end should be turned true in the lathe and a flange sweated in each end. The flanges should first be carefully centred and drilled with a ⅜-in. hole.

If the length of the cylinder be 4 in., a silver-steel shaft 15 or 16 in. long should be obtained. Five or six inches of one end of the shaft should be cut with a thread of about 25 or 30 to the inch pitch. Needless to say, identical cylinders and shafts must be obtained for the sending and receiving instruments. The scheme of mounting is seen in Fig. 1. The cylinder is mounted on the shaft 5 in. from one end, while the threaded portion projects from the other end. Two bearings are required, one A, a plain bearing (a ball bearing for preference), through which the plain portion of the shaft is fitted. The other bearing B must be tapped with a thread of the same pitch as the shaft. It will thus be seen that as the cylinder and shaft turn, the cylinder will be carried from left to right so that the needle N will trace a spiral path over its surface. If the pitch of the thread is 25 to the inch, and the width of the cylinder is 4 in., a hundred revolutions will make the cylinder travel laterally through its own length.

Fitted on to the extreme left end of the shaft is a carefully turned boxwood cylinder 4 in. by 1 in. This must be carefully centred and drilled so that it runs dead true. The last thing to be mounted is the needle holder. This can be conveniently made of an L-shaped brass upright H (Fig. 2), to which is screwed (not soldered) a piece of thin spring brass ⅛ in. thick. It is a good plan to attach the spring with a washer and cheese-head screw, as the latter acts as a convenient terminal when wiring up. To the end of the spring is soldered an ordinary gramophone needle N at an angle of 45 degrees in the manner shown in the diagram, care being taken that the cylinder revolves in the direction of inclination of the needle. We have thus a simple instrument consisting of a metal cylinder, which, as it revolves, travels along its own length so that the spring needle traces a spiral path over its surface.

We have now to describe how two such instruments can be used for sending and receiving a picture by wireless.

If we look at the instrument in section as shown in Fig. 3 we see the needle N in contact with the cylinder C. Now if we place around the cylinder a thin sheet of tin- or copper-foil on which a sketch has been drawn in shellac ink, as the cylinder revolves the shellac lines composing the picture will come one by one underneath the needle N. Whenever the needle is in contact with the bare metal it will short-circuit the condenser, indicated by K, of a wireless transmitting circuit. When, however, one of the shellac lines of the sketch comes between the needle and the surface of the cylinder, this metallic circuit will be broken and the circuit K R L will be free to oscillate. Thus as the cylinder rotates and the different lines constituting the sketch come successively under the needle, the oscillating circuit is cut out for intervals of time corresponding to the width of the shellac lines.

An ink suitable for writing on the metal may be made by dissolving ½ oz. of best shellac in 2 oz. of methylated spirit; a little aniline violet or Gentian violet should be added to the mixture and well stirred in so as to make the ink easily visible. The surface of the metal foil should be thoroughly cleaned, either by rubbing it over with a clean rag dipped in benzol, or by polishing with french chalk. It is most important to have the surface perfectly clean, not only for the shellac ink to take well, but because dirt or grease is often quite sufficient to cause an interruption of the current when it comes beneath the needle. The pressure of the spring carrying the needle should be so adjusted that while the best possible contact is obtained between the needle and the cylinder, the point of the needle does not cut through the shellac lines. For this purpose, too, great care must be taken that the sketch or writing is thoroughly *dry* before it is mounted on the cylinder. Seccotine should be sufficient to attach it, but in the case of copper-foil, which is springy, it may be necessary to tie it on

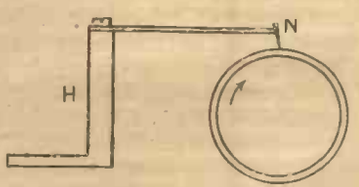


Fig. 2.—Arrangement of Stylus.

to the cylinder with three or four pieces of thin string until the glue has dried.

Before describing the method of reception, the driving of the sending and receiving apparatus must be explained. It is well known that one of the most accurate motors obtainable is the type used for driving a gramophone; regular speed is necessary because any variation in the speed of the motor would cause a change of pitch, and would entirely ruin the reproduction of music or the human voice. If two gramophones are placed side by

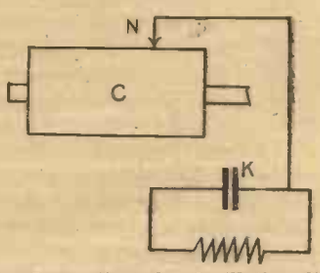


Fig. 3.—Connections for Oscillating Circuit.

side with the same record on each, and the motors of each are so adjusted that the two tunes played are in exactly the same key, it may be taken for granted that both instruments are running at identical speeds. If now the record is removed, and a small boxwood pulley wheel is glued to the centre of the turn-table, the gramophone can be used as a driving motor for the wireless-picture instrument, a thin elastic band being used as a belt as indicated in Fig. 1. The diameter of the pulley wheel should be about ¾ in.; this will mean that with the 1-in. diameter drum mounted on one end of the shaft of the transmitting or receiving instrument, and with the gramophone turn-table revolving at about eighty revolutions a minute, the brass cylinder will revolve roughly one revolution a second—a very suitable speed.

Receiving the Picture

To come now to the reception of the picture, a little weak starch paste should be made by grinding up half a teaspoonful of household starch in half a teacupful of water, and then pouring half a pint of boiling water upon it, stirring all the time with a spoon. A tablespoonful of glycerine is now added, and ¼ oz. of potassium iodide (which can be obtained from any chemist) dissolved in two tablespoonfuls of water is finally stirred in. A piece of good-quality blotting-paper is now cut of such a size that it just wraps round the cylinder with sufficient overlap to admit of its being attached with a little Seccotine. The paper, after attachment to the cylinder, is brushed over with the starch-paste solution as evenly as possible.

In the first instance it will be essential to tune up the two instruments by having them side by side on the table and connected with wire—the simplest case of an artificial telegraph line. We have then a straightforward circuit as represented in Fig. 4. C1 represents the drum of the transmitter, and C2 that of the receiving instrument. The needle N1 is connected to N2, and the cylinders or bearings are connected also, so that there is a metallic circuit through the two machines. In the line N1 N2 is interposed a battery of 4 volts, the negative going to the needle of the receiver. This needle, by the way, should preferably be of gold; a piece of gold wire about ¼ in. long and of No. 22 or 24 gauge should only cost a few pence, and can be soldered or riveted by a watchmaker on to the spring holder.

The joint in the paper should be brought under the needle in each machine, so that both cylinders start off in the same relative position. The gramophones are then started, and if they have been correctly tuned the two cylinders will keep in very fair synchronism during the length of the run.

Shunted on to the receiving instrument as shown in Fig. 4 is another 4-volt battery, the *positive* terminal of which goes to the needle. The *modus operandi* is then as follows: As long as the bare metal is in contact with the needle on the sending cylinder, the two batteries B1 and B2 balance each other and no current flows through the receiver. But when a shellac line of the sketch comes under the needle N1, the battery B1 is thrown out of action and the needle of the receiver becomes positive and leaves a deep violet ink mark on the sensitive paper.

Every time a shellac line comes under the needle of the transmitter a mark will

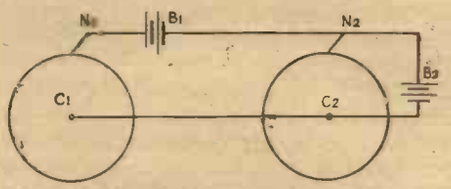


Fig. 4.—Diagram of Connections for Transmitting and Receiving Apparatus.

thus appear under the receiving needle, and by the time the two cylinders have run their course quite a good reproduction of the original should have been obtained. If a meaningless result be obtained at first, do not be discouraged; it is astonishing how as soon as the speed of the two cylinders is adjusted the picture becomes reproduced with remarkably good detail; on the other hand, a very little lack of adjustment in the timing will entirely obliterate the details.

Needless to say, it is advisable to get some first-class results with the two machines on the table or bench running side by side before making any attempt at anything in the nature of a wireless transmission. Some details of actual transmissions with the author's apparatus by wireless across London will be described in an early issue. T. T. B.

THE L.F. CUT-OUT SWITCH

A TWO-POLE or three-pole switch is often indicated in circuit diagrams for throwing in the last stage of L.F. amplification, the switch serving the dual purpose of transferring the loud-speaker to the anode circuit of the last valve and lighting the filament of that valve. This is normally a convenient arrangement, but when dull-emitter valves are used with dry batteries, or with an accumulator of small capacity, the L.T. current demand of an additional valve may be sufficient to affect the brightness of the valves already in use, and the strength of signals after throwing in the last valve may be no greater than before doing so.

To those who have learned the knack of tuning-in with the rheostat, this is annoying, and in such circumstances it is better to use an arrangement which allows one to tune in the wanted station on the earlier valves while the last valve is already lit, although not otherwise functioning.

In order to do this, a single-pole switch only is required. This connects the loud-speaker to the anode of the final valve, and filament control becomes the concern of the rheostat only. Apart from other considerations, the use of a single-pole switch has the merit of simplifying the wiring of the set. H. P.

THE EIFFEL TOWER TRANSMISSIONS

WITH the introduction of Summer time in France, the daily programme of the Eiffel Tower transmissions has been slightly altered. In telegraphy a weather forecast is given on 23 metres C.W. at 10.45 and 23.50 B.S.T.; time signal at 08.56 and 20.55 B.S.T. On 75 metres, C.W. weather forecasts are given at 05.20, 09.40, 17.00 and 23.50 B.S.T.; time signals at 08.56 and 20.55; tests at 21.10. On a wavelength of 2,650 metres, time signals are given at 08.56, 10.25, 20.55 and 23.44, also weather reports at intervals from 03.20 to 18.20 B.S.T. Meteorological bulletins are also given on 3,700 metres at 09.20, 10.45, and 17.20, 20.20 and 22.00 B.S.T.

As regards broadcast telephony, the Eiffel Tower is now using a wavelength of 2,650 metres, sending weather forecasts at 07.30, 09.40, 12.20, 20.00 and 23.20 B.S.T.; market reports at 11.30, 14.45, 15.50 and 17.15. Two concerts are given daily from respectively 19.30 to 20.35 and from 21.10 to 11.10 B.S.T. The use of the 2,740-metre wavelength for the late concert has been discontinued. GRIDDA.

EXPERIMENTING WITH TWO-GRID VALVES

TWO of the main advantages of the two-grid valve are (1) low filament-current consumption, and (2) the very low plate potential required. During reception on a frame aerial with a plate potential of 6 volts the filament current was found to

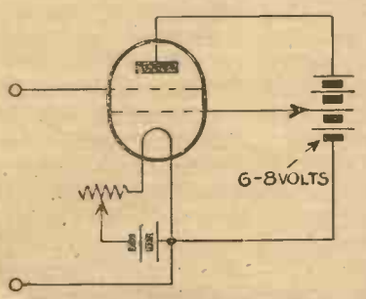


Fig. 1.—Position of Extra Grid.

be a trifle under .25 ampere. The usual consumption of the particular valve (French) with a 4-volt accumulator and no filament resistance is .35 ampere.

These two important advantages are due to the function of the extra grid, which is situated between the filament and the usual grid (Fig. 1). By raising this extra grid to a suitable positive potential with respect to the filament, the electrons emitted by the latter are helped on their way to the plate. This extra grid attracts and projects the electrons towards the plate, which they reach by passing through the large spirals of this grid. From this it will be seen that the plate potential and also the filament current can be greatly reduced and the same resultant flux still be obtained.

This is possible either by connecting the auxiliary grid to about the middle of the H.T. battery (Fig. 1), or still simpler by connecting it through a resistance to the H.T. battery as in Fig. 2.

Another important characteristic of the two-grid valve may be seen by examination of the characteristic curve of this valve. From the curve (Fig. 3) it will be seen that the valve in itself is a negative-resistance device, and therefore if placed in an oscillatory circuit will produce continuous oscillations.

The circuit Fig. 4 illustrates a stable and sensitive "one-lunger" employing a frame aerial. It would now be perhaps not out of place to describe the action of some of the constituent parts.

The frame aerial F.A. is tuned to the required wavelength by means of the variable condenser C1. This condenser should be of the vernier type and may have a value of .001 microfarad. C2 is the usual grid condenser, and R1 is the grid leak; the two-grid valve is rather sensitive as to this value, and it should be of the progressively variable carbon-pellet type. C2 may have a value of .0002 microfarad and R1 usually about 3 megohms.

The H.T. battery should, if possible, be variable in steps of 1½ volts, and may have a maximum of 10 volts. (For experimenting with various valves a battery of 20 volts is useful.) The filament rheostat R2 should be *very* progressive, as it is an important and critical control; the Lissenstat type is suitable. The resistance R3 prevents the set from oscillating at low frequency; it may have a value of 20,000 ohms, but is not always necessary. The telephones should not be shunted by a condenser, as it prevents the circuit from oscillating.

Care should also be taken when employing note magnification that the primary winding of the low-frequency transformer has not too high a self-capacity. The variable condenser C3 is used to start the circuit oscillating. It should have a low minimum capacity and a maximum of about .001 microfarad. If necessary, to obtain the above conditions a small variable condenser may be used, with the addition of fixed condensers in parallel, the number being varied by means of a switch. To receive a station, the switch CH is put in position II, thus disconnecting the condenser C3. Then with the frame tuned to the required wavelength and a plate potential of about 6 volts, turn on the filament current till a rustling sound of maximum intensity is heard. This does not necessarily correspond with maximum heating, as for every value of plate

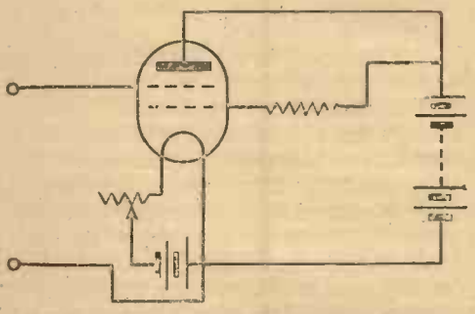


Fig. 2.—Connection through a Resistance.

potential there is a fairly critical value of filament current. Next start the circuit oscillating by touching with the finger the auxiliary grid and search for the carrier wave with the variable condenser C1. (If the station is a powerful one it is not necessary to make the circuit oscillate.) Having found the station, switch condenser C3 into circuit and adjust to the limit of oscillation; if necessary, adjust also grid leak R1 and find the best combination for plate voltage and filament current.

The circuit Fig. 4 will oscillate on any wavelength by touching the auxiliary grid with the finger or by earthing it through the condenser C3. If the set shows signs of spontaneously bursting into oscillation, this can be stopped by touching the plate, or controlled by shunting the telephones by a variable condenser.

The signal strength can be greatly increased by using an outside aerial, and Fig. 5 shows a suitable circuit. All the values remain unaltered except for the variable condenser C3 shunting the telephone; its action was described in the preceding paragraph. It is nearly always

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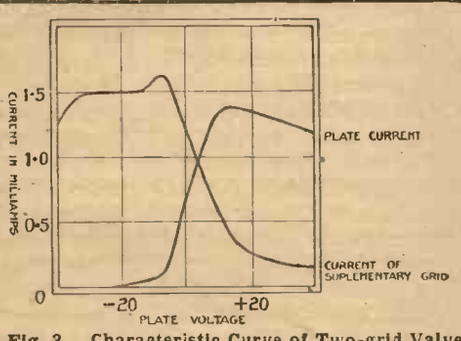

Fig. 3.—Characteristic Curve of Two-grid Valve.

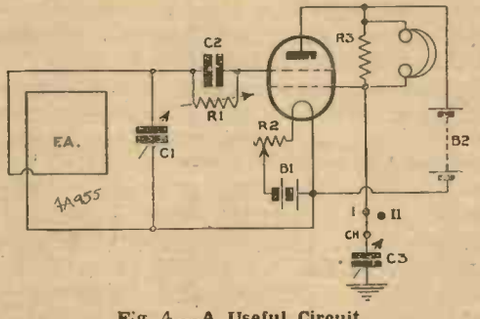

Fig. 4.—A Useful Circuit.

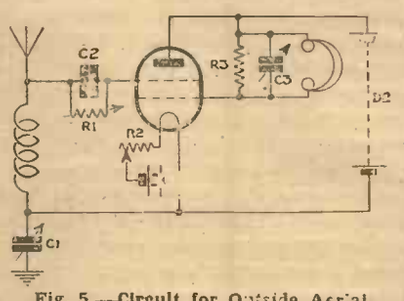

Fig. 5.—Circuit for Outside Aerial.

STRAIGHT-LINE CONDENSERS

A simple explanation of the tuning characteristics of three different types of condenser

PROGRESS in the design of variable condensers has been towards the production of an instrument in which the losses are negligible and the tuning simple and suitable for existing requirements of reception.

In the early days of broadcasting, the stations working were so few that their distribution over the allotted broadcast band of wavelengths was a simple matter and allowed of ample separation, so that there was little risk of two stations heterodyning each other. For such conditions, the old type of condenser, with semicircular plates, was quite satisfactory, but as the number of stations increased its disadvantages became very apparent.

"Straight-line Capacity"

The condenser with semicircular plates is a "straight-line-capacity" condenser; that is to say, the change in *capacity* is proportional to the movement of the vanes, and the rate of increase in wavelength in proportion to movement is much more rapid near the minimum end of the condenser scale. Under present conditions of reception this is most undesirable; not only is a plotted curve of little use for determining the positions of stations, but the majority of the broadcasting stations are crowded within a very small portion of the dial.

In order to improve tuning and to make calibration easier, the "square-law" or "straight-line wavelength" condenser was developed, and there are some very fine examples on the market. With such a condenser the change in *wavelength* is proportional to the movement of the dial. This helps to separate stations on the condenser dial, but as the majority of the B.B.C. stations work on wavelengths between 300 and 400 metres, tuning is still fairly crowded on the dial, although calibration is simplified considerably.

The overcrowding on the broadcast band of wavelengths, both in Europe and America, is becoming so acute that reallocation of wavelengths is becoming essential and a matter of considerable difficulty. It has been determined that, in order to avoid audible heterodyning, each station must be allotted a band of at least 10 kilocycles—note that this is terms of frequency and not wavelength.

Frequency and Wavelength

Frequency is obtained by dividing 300,000 by the wavelength in metres; thus the frequency of 2LO is 821 kilocycles. At first sight it might appear that there is no advantage in simply making a calculation which alters one figure to another; the advantage will, however, be apparent on comparing certain figures.

The wavelength of a station working at 3,000 kilocycles is 100 metres, and the wavelength corresponding to 3,010 kilocycles is 99.66 metres. The wavelength of a 500-kilocycle station is 600 metres and of a 510-kilocycle station it is 588.2 metres.

Thus it will be seen that although the frequency difference in each case is 10 kilocycles, the wavelength difference in one case is only .34 metre and in the other 11.8 metres. From these figures it will be seen that the lower the wavelength the smaller the wavelength difference necessary to avoid interference, and the use of kilocycles instead of metres becomes far more convenient for allocation purposes. The advantage for tuning will be apparent presently.

A straight-line frequency condenser, as the name indicates, alters the *frequency* in proportion to the movement of the dial, and as the lower the wavelength the greater the frequency difference, stations are more widely separated near the minimum position of the condenser.

As a comparison of the tuning characteristics of the three types of condenser, we will assume that we have one of each type of similar capacity, connected to similar inductances which will give a tuning range of 300 to 600 metres. We will also assume that each condenser is fitted with a dial divided into one hundred divisions.

With the semicircular-vane type of condenser the change in capacity for a movement over the first ten divisions of the dial will cause a wavelength change of approximately 40 metres.

With the square-law condenser the corresponding movement will give a wavelength change of about 30 metres, but with the straight-line frequency condenser the frequency change for the same movement of the dial corresponds approximately to a wavelength change of only about 15 metres.

Ten of the B.B.C. stations (not to mention Continental stations) are working on wavelengths between 300 and 340 metres. With the three condensers mentioned above, these ten stations would be tuned in on the first ten divisions of the straight-line capacity condenser. On the square-law condenser these stations would be spread over about fourteen divisions, but with the straight-line-frequency condenser they will be spread over about twenty-four divisions.

Easy Tuning

From these figures the greater ease of tuning with the straight-line frequency condenser (or, as it is often called, the S.L.F. condenser) will be apparent, whilst the tuning positions of other stations can be quite as easily determined as with the square-law condenser by converting the frequency to wavelength.

To compensate for the wider separation of stations near the minimum position of the square-law and S.L.F. condensers, they will be more crowded near the maximum position, and this is particularly so with the S.L.F. condenser. In actual practice this is no disadvantage; tuning is generally carried out on the lower range, and, more particularly, there are only six B.B.C. stations working on wavelengths between 400 and 500, as against fourteen between 300 and 400 metres. R. H. B.

"EXPERIMENTING WITH TWO-GRID VALVES"
(*continued from preceding page*)

necessary, as the circuit is liable to burst suddenly into oscillation.

Reaction may also be added as is depicted in Fig. 6, where Re is the reaction coil which is variably coupled to L, a small coil in series with the frame or, in case an outside aerial should be used, directly to the A.T.I.

In this circuit the telephones may conveniently be shunted by a fixed condenser. The resistance R3 is to prevent low-frequency oscillations, and its value varies with different types of phones. The best method of determining its value is to make a pencil line on the space between two terminals mounted on a small piece of ebonite and connect it in place of R3. The optimum value is then found by varying the amount of graphite present, stopping as soon as the howl ceases. Care should be taken to keep its value as high as possible.

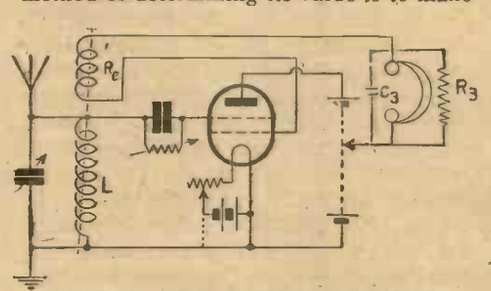

Fig. 6.—Two-grid Valve Circuit with Reaction.

In this circuit it was found that the condenser C3 and resistance R3 might sometimes be omitted. The reason for this will be explained later, when a few other two-grid valve circuits will be considered.

C. H.

(*To be concluded*)

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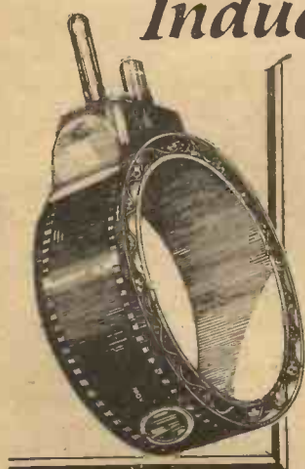

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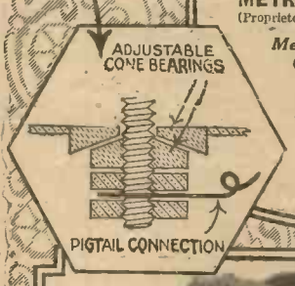

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If you get it right, you win £200!

Whatever your skill in counting capacities, however, the purchase of a Dubilicon will bring you one sure reward. The Dubilicon gives any capacity up to 0·011 mfd. simply by varying the connections of the eight unit capacities of which it is composed; so that by using the Dubilicon you will be able to select with unfailing certainty the best value of fixed capacity for any desired part of your circuit.

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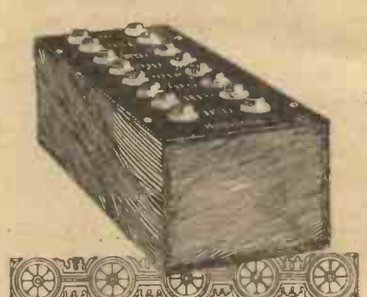
The uses and advantages of the Dubilicon, which we have summarised above, make it more than worth its low price of 30/-.

In addition, the purchase of a Dubilicon entitles you to enter for the £200 prize competition. All you have to do is to estimate the number of different capacities you can get by connecting up the first five units in various ways.

Ask your dealer about one to-day—and mind you enter for the £200 competition! He will tell you all about it!

The Dubilicon



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On Your Wavelength!

Testing Earth Systems

THE amateur is very often puzzled as to the best method of definitely ascertaining the merits of earthing systems available. There is one fairly inexpensive method of testing, however, which is available to every amateur who possesses an ordinary moving-coil voltmeter or a milliammeter with a range of from 3 to about 6 milliamperes. In order to carry out the measurement it will be necessary first of all to remove the reaction coil or short-circuit this with a piece of thick wire. The meter is next inserted in the plate or anode circuit of the detector valve, and when signals are being received from a local station the set is tuned as sharply as possible. It will be noted that the needle of the meter will dip towards zero when signals are passed over, and when tuning is as sharp as possible the needle will be at the maximum point of deflection from the previous reading at which signals are being received. It will now be found that attaching the various earths or combinations of them or a counterpoise will result in different readings in the meter. Care must be taken, however, that the set is retuned for each setting as each earthing system possesses sufficient capacity and inductance of its own to alter entirely the wavelength of the set from the setting used on the earler tests. Apart from other considerations, the test is of scientific interest, as it visibly indicates the effect of applying a positive potential to the grid of the valve. The reason for the meter indicating a drop in the current flowing in the plate circuit is because the grid becomes slightly positive, thus blocking the flow of current between the anode and cathode of the valve. The amount by which the needle dips is a measure of the high-frequency voltage received on the grid.

The Elimination of Static

With the advent of summer, as shown by the calendar, we are again faced with our old wireless bugbear, static disturbances. As is well known, these difficulties take the form of crackling and crashings in the telephones, and sometimes they are more prevalent on one wavelength than on another, but generally they can be heard over the whole tuning range of the ordinary broadcast receiver. The question as to how these may be avoided is bound to arise, and the usual answer has to be given once again, it cannot be done—yet. Nevertheless, those people with very low aerials will find that they are able to crow over their neighbour's 60-ft. mast double-wired, double oscillating aerial in this respect, for the ratio of static interference decreases with the reduction in the electrical height of the aerial. A high multi-wire aerial will collect far more static and other interference than will a low single wire, and also a single-wire high aerial will collect less static than a multi-wire aerial of similar height. Therefore should the inquirer live within reasonable range of a broadcasting station, he may reduce the height of his aerial in order to gain the desired effect.

One thing must be borne in mind when so doing, and this is that it is a mistake to add high-frequency amplification to any set when a minimum of static interference is desired. Also static interference may be overcome to a certain extent by reducing the high-tension voltage on the detector anode and by abandoning the use of reaction. I do not expect, however, that the last-mentioned alternative will be very popular. A frame aerial is beneficial in overcoming the difficulty, but since the efficiency of such an aerial is somewhat low when compared to an elevated collector, this again is hardly likely to be popular.

Volts versus Resistance

I found a would-be enthusiast very perplexed the other day over the problem of getting his new resistance-capacity-coupled amplifier to work as efficiently as his old transformer-coupled affair. He had a milliammeter in circuit with his plate current, and pointed a despairing forefinger at the very meagre reading of half a milliampere which he was drawing through his valve. It took me some time to convince him that his 100-volt high-tension unit would not under any circumstances drive any more current through the valve except by way of the filament circuit, which, of course, is rather an undesirable path for it to follow! The next time I met him he seemed somewhat elated, and explained that my theory was wholly incorrect, for his valve absorbed the proper current. He further explained that it was the valve which was faulty, for he could still get nothing through in the shape of signals. I examined the set, and found that he had carefully shorted the anode resistance in order to get the normal three milliamps of current to which he was accustomed. I gazed, said nothing, and have left him to continue his argument with the valve manufacturers. My sympathy would have been wasted on him.

Is It a Good Transformer?

Too often we hear an amateur discoursing on the merits or demerits of particular transformers without fully understanding the principles involved, with the result that a very good transformer is sometimes ruthlessly condemned on very flimsy grounds. It cannot be too clearly emphasised that the average amateur has not got the technical equipment necessary for the passing of judgment upon these articles, for there are so many factors which control the results obtained with a given instrument that it is wellnigh impossible to gauge their performance unless they are used under the exact conditions laid down by the manufacturers. Even then the electrical as well as the mechanical construction of the loud-speaker and the impedance of the valve in connection with which the transformer is used may be such as to give the user an altogether erroneous impression of the results obtainable by its use. It is therefore hardly fair for anybody not properly equipped both in apparatus and in knowledge and skill to condemn a particular transformer because it does not give to them the results which they desire. Such judgment can only be given by a skilled radio experimenter who has had an extensive experience of transformer practice. It may be taken, however that almost any modern transformer will give excellent results if used under proper working conditions, but, needless to say, some will appear to be better than others. The position is therefore that all transformers of modern design will give good service but that some will be better than others.

Broadcasting the News

Although, fortunately, the great strike is now a thing of the past, an account of my peeps into 2 L O during the strike will probably interest my readers. Outside the entrance I was met by two "Metropolitans," but my acquaintance with the commissionaire during normal times proved sufficient to allow of my entry.

Inside one felt the abnormal atmosphere, for the activities of the B.B.C. being acutely topical, its members were given to speculation as to their best line of immediate action. My friends the announcers had left their quarters, and into their offices and several others furniture was being carried. There were telephone engineers putting in extra telephones and fitting them with the familiar headphones, for at such a time the ordinary means of telephoning were out of the question.

No sooner had a floor of offices been converted into a temporary news-agency than the telephones were blocked with inquiries from all over the country. The newspapers had ceased to publish, and immediately the mind of the public swung to the B.B.C. All and sundry rung up

On Your Wavelength! (continued)

the company, asking every conceivable kind of question, personal and otherwise. Members of business concerns desired to make announcements, promoters of impending functions required notices to be sent out to their patrons, tipsters wished to keep in touch with their clients and others feared for the safety of their relatives; thousands wanted to volunteer and demanded information.

During all this time, while relays of people waited patiently for their "call" to be dealt with, lines were being installed direct to the Admiralty. News was to be controlled by that department.

Routine Uninterrupted

In addition to this news centre there was the dependence of provincial stations upon London for the supply of bands and artistes. How was the normal programme to proceed? The absence of printed matter complicated the control of the intricate system of simultaneous broadcast, which owing to the extended news bulletins was completely dislocated.

As the strike proceeded it was but natural that the Government's "mouthpiece" should be protected. My next visit to the B.B.C. was made through a posse of business-like "specials," complete with blue uniforms, and on proceeding inside I found that every danger spot had its quota. The telephone exchange was blocked by a very bored special "Robert," the control room had both "Metropolitans" and "specials," while various exits had emergency "Roberts," who sometimes must have wondered why they were there.

Listeners may have noticed that during the strike they frequently heard some lusty applause. Such appreciation came from the band of "specials," who were provided with entertainment from the "echo" room. Their applause went back to the "control" via a special microphone.

News Service

Readers can picture the emergency news service offices at Savoy Hill when it is mentioned that thousands felt it their mission to keep the B.B.C. informed of happenings all over the country. In addition, there were representatives of the established news agencies and typewriters hammering out reports straight from the telephone. These operators wore headphones and were oblivious to noise. One wandered down the passages and by careful "peeps" discovered that all the daintily decorated waiting rooms had become bedrooms, while many artistes had to wait from morning to midnight, dependent on the transport organised by the company and supplied by volunteers.

I ventured into a room downstairs and discovered a quiet individual poring over a map of London. From this room the volunteer transport was directed. Staff and artistes were collected from morning to night, and then came the homeward trek. Few persons after the first disorganisation were seriously inconvenienced by lack of transport. The last to leave the building were the "leather-lunged" announcers.

Owing to the simultaneous system of broadcasting and the knowledge artistes have of this system, cross-country engagements were kept by artistes in different parts of the country. They simply wandered into the nearest station of the company. An artiste who should have been at Glasgow at 9 o'clock was, perhaps, at Birmingham. What matter? London told Birmingham to put him in a spare studio and at 9 o'clock the listener at Glasgow heard the artiste.

Public Opinion

In the street have been heard comments on the B.B.C. but no criticism. Yet it is difficult to say whether the charge, that there was too ruthless a pruning of all sensationalism by the censor, is correct. The bare facts were all that serious people required, and the vast majority felt that they could trust the B.B.C. in its policy of public service. Now all is over—a hectic, worrying and painful period in the B.B.C. history has passed, one hopes for ever.

First Rate

I have been very much struck recently by the number of really good variable condensers at most reasonable prices which are now available for amateur use. There is a great deal more in condenser design than the average person thinks, though probably the importance of the low-loss idea has been greatly exaggerated. What one really does want in a condenser is that it should be up to its stated maximum capacity, that its minimum capacity should be very low indeed, and that there should be no wobble about the moving parts. I have used recently a number of different types priced at from five shillings to fifteen shillings, and in most cases I have found that they are a very vast improvement upon the cheaper makes available a year or so ago. Another good thing is the introduction at a moderate price of the so-called "vernier" dial, a geared arrangement which can be fitted to existing variable condensers. If these are well made and well designed they help one enormously in tuning, since tiny variations in capacity may be made with their help. But one word of warning: if you buy a vernier dial, see that there is no backlash in its gears. Should this be present you will find the dial anything but a blessing.

Valve Holders

Another component which has been improved almost out of recognition is the valve holder. Until quite recently almost the only type available at anything like a low price was that which consisted of four stout brass legs embedded in a solid chunk of what was sometimes ebonite—and sometimes was not. Though it is not always realised, the valve holder may considerably affect the stability of a receiving set. Most of us know that the capacity between the grid and the plate of a valve within the bulb allows reaction effects to take place, even though no reaction coil is used, especially upon the shorter waves. Reduce this capacity and you decrease the reaction effects, thus making the set less liable to oscillate. Now with a solid valve holder there may be a not inconsiderable amount of capacity, not between the plate and grid, but between the plate and grid sockets. The thicker the sockets and the more ebonite there is, the greater will its capacity be. Several modern types of valve holder have air-spaced sockets and the extra capacity that they introduce is very small indeed. If you have solid valve holders and find your set hard to control, try the effect of substituting those which contain very little ebonite.

Wet Cells for H.T.B.s?

From time to time I have told you of the gloom and despondency into which I am plunged by trying unsuccessfully to find a solution of the great high-tension battery problem. I cannot install an accumulator because of the difficulty of getting such a battery recharged satisfactorily in my particular locality. Dry-cell batteries, even if I purchase those of the largest size, refuse to stand up to the work for long—and there you are, or, rather, there I am not! A correspondent tells me that he is obtaining excellent results with a battery made up of small wet cells of the Leclanché type. He does not, however, give details either of the average life of his battery on one charge, or of its annual upkeep costs. Nor does he state whether his battery requires a great deal of attention to keep it in proper condition.

The cost of installing such a battery is rather high in the first instance, for cells of suitable size seem to run to about a shilling apiece. Still, if the battery lasts well and gives little or no trouble, it will be economical in the long run. One of the worst features of the ordinary wet Leclanché cell is the way in which solid matter from the electrolyte "creeps" over the jar; I am told, though, that this can be prevented by topping each cell with a little oil.

THERMION.

A TWO-STATION SPADE-TUNED CRYSTAL SET

The Complete Receiver.

THE method of tuning employed in the crystal set described below is the well-known one of varying the inductance by adjusting a metal plate in relation to the coil. This is such a simple method that it is surprising to find it so little employed.

The set is so made that it can be tuned to the local station and to 5XX at will. Two coils are used, one of a special character contained inside the box and the other an ordinary 5XX coil of 200-300 turns, which is set in a coil holder on the panel when required. Otherwise the coil plug is shorted by means of an ordinary

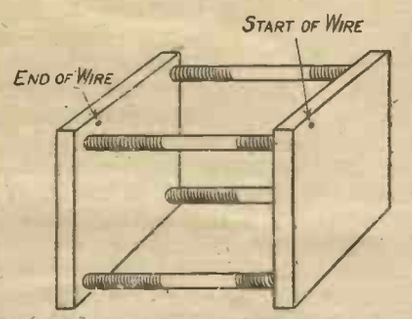


Fig. 1.—Former for Low-wavelength Coil.

short-circuiting link, which may be seen in the photographs.

The large coil is tuned by the zinc spade behind it. This is of the same diameter as the coil, and is mounted on a wooden bar, which is pivoted on a screw attached to the back of the case. There is no connection between the spade and the coil; the tuning is done by passing the spade behind the coil. The zinc should not touch the coil, but be fitted to move as close to it as possible.

Low-wavelength Coil

The other coil (for the lower wavelengths) is built on a simple low-loss former, and ordinary bare tinned wire is used. The former (Fig. 1) is built of two pieces of wood 4 in. square. Joining these together are four rods, which may be of wood, bone, ebonite or other material. These four rods are nicked throughout their length, with the exception of a space of about ½ in. in the middle, which is left clear. In the original set they are 3 in. long and carry thirty grooves, but they may be longer if necessary; in fact, the former itself can be built so that the two wooden sides form the actual sides of the cabinet itself, in which case they should be 4 in. by 5½ in. (Fig. 2), so that the top panel may be screwed down on the top, leaving sufficient space between the ends of the terminals, etc., and the upper surface of the wire.

The wire, No. 17 or 18 S.W.G., is wound by first passing one end through a hole in the wood (or, if there is plenty of room, it is better to pass it through a hole in the end of one of the rods), leaving a few inches free for connecting purposes. It is wound in the grooves round the outside of the former. Having completed the fifteenth turn, it passes across the ungrooved space and goes on to the remainder of the grooves, finally passing through another hole in the opposite piece of wood or end of the rod.

The Spade Tuner

The spade with which this coil is tuned consists of a rectangular piece of zinc, just large enough to go inside the coil through the space left in the middle of the turns. It is attached to a wooden spindle, at the upper end of which a knob is finally fixed as a handle. The upper end of the spindle passes through the panel and the lower end into the bottom of the case. The spade must be just large enough to revolve inside the coil without touching the wire.

It will be found that 30 turns of wire are sufficient to tune 2LO in and out, but for higher wavelengths a few more turns will be needed.

It is scarcely necessary to point out that in putting the set together, if the former does not form part of the case, it should be secured to the under side of the panel by

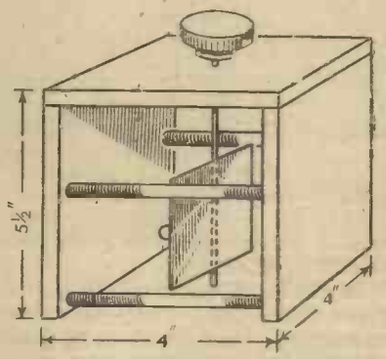


Fig. 2.—Arrangement of Spade Tuner for Low-wavelength Coil.

means of ordinary wood screws; then the spade can be inserted and the knob fixed to the upper end of the spindle last of all.

In the particular set shown by the photographs the crystal is underneath the panel, but this is a matter of convenience. The aerial and earth terminals are on one side of the panel, and the phone terminals on the other, and the very simple wiring may be followed easily from the diagram Fig. 3. When using the inner coil the

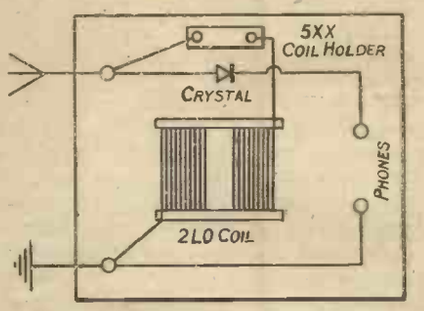


Fig. 3.—Diagram of Connections.

5XX coil should be removed, of course, and its sockets short-circuited by the link. For tuning purposes the smaller spade may be left alone and the 5XX spade used by itself.

As to the 5XX coil, if two ordinary commercial basket coils (such as those sold by any dealer at eightpence each) are obtained, and the inner end of one joined to the outer end of the other, and the pair mounted back to back with a piece of cardboard between them; such a "twin coil" will serve admirably, and 5XX can be readily tuned in and out by the spade.

S. M. S.

SHORT AERIALS

MANY amateurs seem to have the mistaken impression that a long aerial is a necessity for loud signals and long-distance reception. This, however, is by no means correct. For receiving on wavelengths of the order of 50 to 100 metres, a long aerial is of no advantage over a short one, and often a short wire will give better results. Freedom from atmospherics is obtained by the use of a small aerial of low electrical height and, on the short waves at least, there does not seem to be a great difference in sensitivity between the long aerial and the short one.

P.

DO YOU UNDERSTAND THE TROPADYNE?

Some interesting facts of a development of the super-het

WHILE it is possible with an efficient aerial and earth installation to tune in most of the British and Continental, and a few American, stations on a good night on a single valve, yet such results are not consistent and as a rule are of such inferior quality that any attempt to amplify the speech or music with low-frequency valves only produces horrible distortion. Apart from the unsatisfactory results, such a procedure cannot be too severely condemned owing to the great amount of interference caused to other listeners.

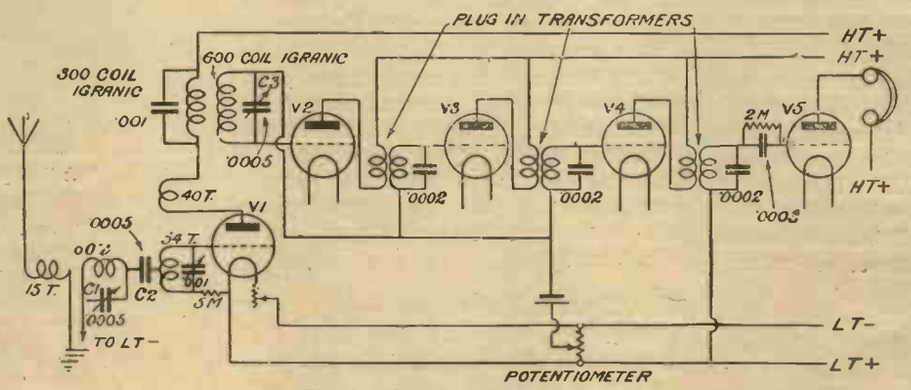


Fig. 1—The Tropadyne Circuit.

The supersonic heterodyne receiver is undoubtedly the best receiver for weak signals on the medium and short band of wavelengths, but the principal objections to this class of receiver have been the cost of valves and the heavy drain on the batteries, and the fact that if used with an outdoor aerial they radiate badly.

The principle of the supersonic heterodyne receiver, briefly, is to alter the wavelength of the incoming signal to a predetermined figure—say 6,900 metres—and then to amplify this altered wavelength at high frequency before finally rectifying the signals. The object of increasing the wavelength is, of course, that high-frequency amplification can be carried out far more efficiently at high wavelengths than at low. Moreover, in the process of increasing the wavelength we obtain a selectivity with a minimum of controls unknown in any other type of receiver.

Wavelength Changes

The usual method of obtaining this change in wavelength is to employ a separate oscillating valve tuned to a different frequency to the incoming signals, and which is superimposed on the incoming frequency, producing a frequency equal to the difference between the two.

Efforts have been made in America—the home of the super-heterodyne—to dispense with this separate oscillator valve, and two methods have been evolved; the first of these methods is known as the second harmonic method, with which, however, we are not dealing in this article, and the other method, which is due to Mr. Clyde Fetch, is known as the Tropadyne circuit.

This latter method, apart from saving a valve, produces a receiver which is simple to build, is extremely selective, and which does not radiate when used with an outdoor aerial.

On reference to the theoretical circuit, shown by Fig. 1, it will be seen that an aperiodic aerial circuit induces oscillation into a tuned secondary circuit, the output of which goes through a .0005 fixed condenser to the centre point of another circuit which is generating oscillations at a different frequency.

These two circuits can be tuned to different frequencies without interaction between them. The incoming frequency blending with the locally-produced frequency produces the required lower frequency, which is then amplified by three H.F. valves and finally rectified by the detector valve.

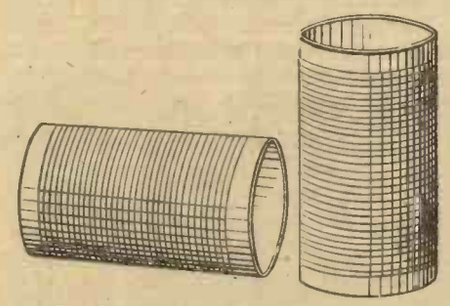


Fig. 2.—Relative Positions of Coils.

As to results, all stations in this country and practically every Continental station between 250 to 530 metres can be received loudly and clearly, subject to morse and heterodyne interference, on an outdoor aerial, and on a good night the majority of these stations can be heard clearly without either aerial or earth connected to the set, sufficient energy being picked up from the aerial lead-in hanging 2 ft. away.

Some Constructional Hints

Now as to the construction of the set, it is recommended that the American system of placing all the valves, coils, etc., behind the panel be adopted.

First wind 15 turns of 18 d.c.c. wire on a 3½-in. cardboard or ebonite former, and half an inch away wind 60 turns of the same wire. On a similar former wind 54 turns of No. 18 or 20 d.c.c. wire—making a tapping at the centre turn — and half an inch away wind 40 turns of 22 d.c.c. wire —all windings in the same direction. These coils should be mounted on the baseboard by means of small brackets made of bent strip brass, and placed in non-inductive relation to one another as shown in Fig. 2.

In the plate circuit of the first valve there is a 300-turn duolateral coil, with a fixed .001 condenser in parallel, and the 40 turns of the coil already described. This 300 coil is closely coupled to a similar coil of 600 turns which is tuned by a .0005 variable condenser. The mica type, such as the Polar, may safely be used here, but good quality air dielectric condensers of .0005 and .001 microfarad (with vernier) should be used in the other positions as indicated in the diagram.

Now we come to an important point, on which the success of the set will depend, and that is that all the H.F. stages must be tuned to the same frequency. The writer obtained three matched 2,500-7,000 metre transformers from Messrs. McMichael, Strand, W.C., and three matched .0002 fixed condensers from Messrs. Dubilier. The condensers were placed across the secondaries of the transformers, and the resulting wavelength is about 5,500 metres.

A variable grid leak, with a minimum of not more than ½ megohm, is connected on the filament side of the grid circuit of the first valve, and the usual .0003 condenser and 2-megohm grid leak is placed in the grid circuit of the last valve.

As to valves, a Wecovalve functions excellently in the first position V1; V2, V3 and V4 are Edison .06 valves, and V5 should be for preference a valve capable of detecting loud signals; one of the DE6 or B.T.H. B6 type works well here.

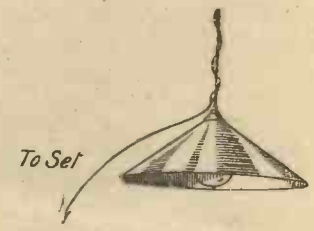
The filament ends of the grid circuits of the three H.F. valves are joined together and connected to the negative side of a small 1½-volt dry cell, the positive

(*Continued on page 766*)

PRACTICAL ODDS AND ENDS

Electric-light Aerial

WHEN reception from the local station only is desired there is really no need to erect an elaborate outdoor aerial, as quite good results and loud

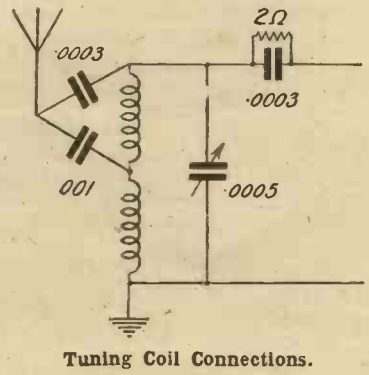


Electric-light Aerial.

signal strength are obtained on improvised indoor aerials. The electric-lighting system can be used as a collector of energy without interfering in any way with the wiring. Simply twist a length of about 2 ft. of rubber-covered wire around the flex lead to one of the lamps, connect one end to the aerial terminal of the set and leave the other disconnected. The lighting main supply forms quite an efficient aerial and the signals are by-passed (through the capacity of the twisted wires) to the receiver. L. S.

Novel Aerial Coupling

A NOVEL method of coupling the aerial to the tuning inductance is shown in the accompanying diagram. The tuner consists of two coils coupled in series and the aerial lead is split. One part is con-



Tuning Coil Connections.

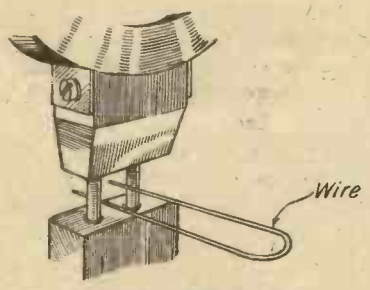
nected, through a .0003-microfarad fixed condenser, to the aerial terminal and the other, through a .001-microfarad fixed condenser, to the joint of the two coils.

The result is a form of auto-coupling which, especially in use with a poor aerial, will give sharper tuning and possibly a slight increase in signal strength. F. K.

Short-circuiting Device

A SHORT-CIRCUITING device for loading coils which does not necessitate the removal of the coil from the coil holder is shown in the accompanying diagram. A **U**-shaped piece of springy brass or copper wire is used for shorting the coil sockets and the limbs of the wire being spaced a little larger than the distance between the two sockets so that the shorting-piece can hold itself in position.

The device is of great use in connection with crystal sets, as it enables the loading coil to be placed in or out of circuit with the minimum of trouble, but in valve sets care must be taken that the capacity of the coil (when out of circuit) does not influence near-by components. P. P.



Short-circuiting Device.

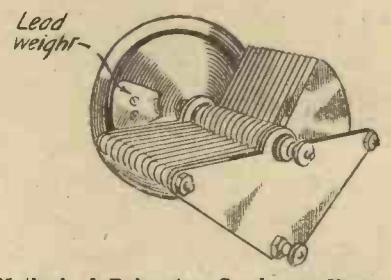
The Earth Connection

IF an outdoor earth is used it is important to give it a little attention from time to time in hot weather. A great many of the troubles complained of in summer-time are due to the fact that the earth contact becomes very poor owing to the drying up of the soil in which it is situated, with the result that a high resistance is set up.

A good tip is to place an old piece of stove-piping upright upon the earth plate, the length of the pipe being sufficient to allow a few inches to protrude above the surface of the ground when the hole has been filled in. A number of holes should be drilled or punched near the lower end of the pipe. In dry weather a bucketful of water poured into the pipe will make a great difference in results. P.

Balanced Condensers

THE bearings of variable condensers, when new, are usually stiff enough to prevent undue movement of the vanes, but it is sometimes found when the condenser has been in use a short time that the vanes do not stay in the correct position and are apt to fall (by reason of their weight), so that the capacity is altered. The trouble can be quite simply cured in the following manner. Cut a piece of thick sheet lead

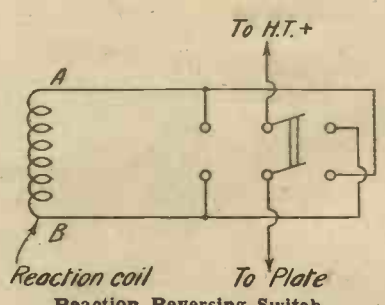


Method of Balancing Condenser Vanes.

to make a weight to fit the recess usually to be found at the back of large ebonite dials and screw it into the position where it balances the moving vanes of the condenser. It will then be found that the condenser can be set to any desired position and the vanes will not cause any accidental alteration of this value. B. I.

Reversing Reaction

WHEN a valve set is under construction it is necessary to discover the correct way of connecting up the reaction coil, since otherwise the receiver will not function properly. The best method of doing this is to make use of a double-pole change-over switch wired as shown in the diagram. It will be seen that if the switch is turned over to the left current from the plate enters the coil at the end marked B and leaves it at A. When the switch is



Reaction Reversing Switch.

turned over to the right, the direction of the flow is reversed, current entering at A and leaving at B. By means of the switch one can discover in a matter of moments which way round the coil should be wired up and there is no possibility of making a mistake. J. H. R.

Fig. 6.—Choke Coil.

THE longer one uses a wireless set, the more evident it becomes that batteries —especially the H.T. battery—are the source of more annoyance than any other component. The life of the usual H.T. dry-cell battery is a variable quantity; it has a duration of from two or three weeks to six or seven months. Even during its short span of life the H.T. battery makes its presence felt by frequent spasms of crackling, causing the owner to suspect innocent and far more trustworthy apparatus, such as transformers, coils and valves. Accumulator H.T. batteries are more reliable in this latter respect, but even they wear out in time.

Using the Lighting Mains

We must therefore consider the house-lighting supply as, so far, the most dependable and practical means of obtaining the necessary current and voltage for the operation of the valve, and it is intended to give a short description with practical constructional details of the most successful of the several methods of harnessing the house-lighting supply to the wireless set. Unfortunately we have in England a most amazing assortment of house-lighting systems, the voltages and frequencies of which vary from 50 to 250 volts and 25 to 100 cycles. If we had a uniform supply the problem with which we are confronted would be easily solved, for then it would only be necessary to give particulars of one "battery eliminator." As it is, nearly every house-lighting supply requires an eliminator specially designed for the purpose, having chokes and condensers suitable for the particular supply.

Alternating current has been used with success to heat the filaments of valves without rectification. The method of doing this is shown in Figs. 1 and 2. In order that the voltage of the mains may be reduced to a suitable value for the rated filament voltage of the valve, a step-down transformer is inserted in the circuit between the mains and the valve filaments. The secondary of the transformer consists of few turns of wire in comparison with the number of primary turns, and possesses a centre-tap to which the grid returns of the valves are connected. The centre-tap helps to neutralise the A.C. hum, which, without the centre-tap, would interfere seriously with reception. Such a method is eminently suitable for transmitting purposes, but the reader is cautioned that with a valve receiver using the system shown in Fig. 1 there will always be a slight hum in evidence.

For absolutely smooth reception the A.C. must first be rectified and then filtered. Now as A.C. consists of a positive half-cycle followed by a negative half-cycle, it is possible to suppress, say, the negative half-cycle and allow the positive half-cycle to pass, thus obtaining a series of D.C. impulses. A more efficient method is to employ what is known as full-wave rectification, in which both positive and negative half-cycles are rectified, producing a comparatively smooth D.C. In this case the rectifier may conveniently consist of four large chemical rectifying cells, known as Nodon valves. Fig. 3

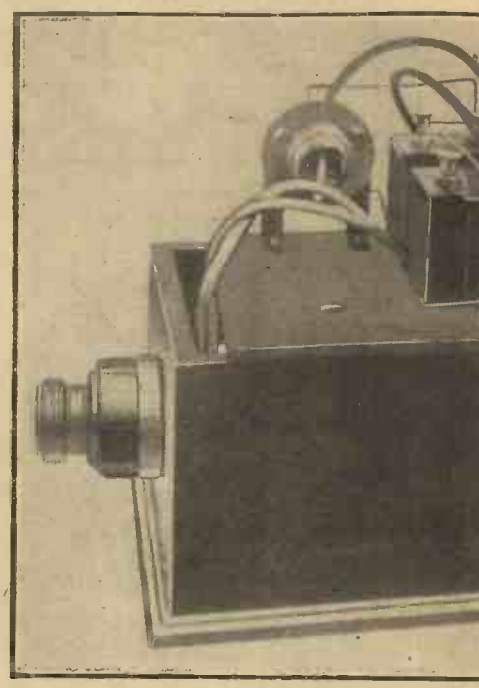


Fig. 12.—Under-panel View of

BANISH YOUR BAT

Constructional Details of Systems of C
Direct-current and Alterna

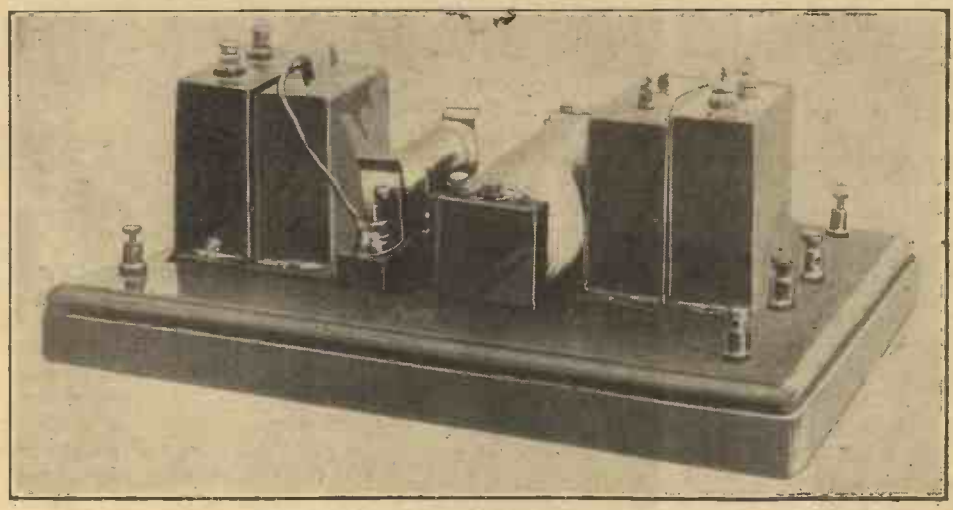


Fig. 7.—Smoothing Chokes and Condensers.

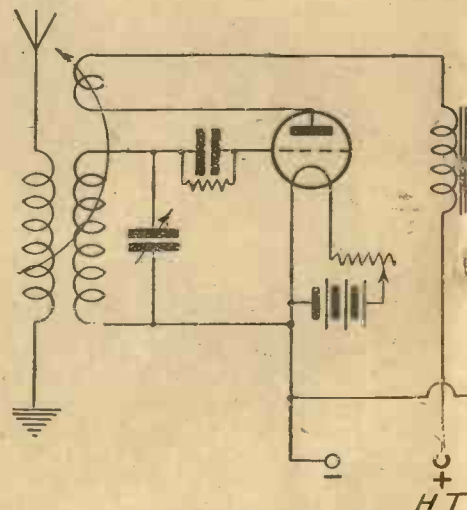
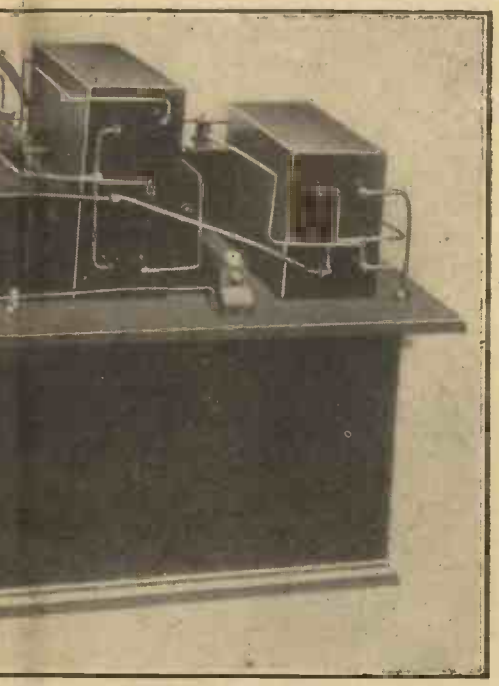


Fig. 1.—Circuit Diagram for Fi



Fuller H.T. Battery Eliminator.

TTERY TROUBLES!

Obtaining H.T. and L.T. Supplies from ating-current Lighting Mains

(page 760) shows the circuit diagram of the whole arrangement.

The Nodon valve (Fig. 4) consists of a 2-lb. earthenware jam-pot lined round the sides with pure lead sheet $\frac{3}{16}$ in. thick. A space of 1½ in. is left between the bottom of the jar and the bottom of the lead sheet, and the latter is so cut that a strip of lead ½ in. wide projects from the top of the jam-pot. To the projecting lead strip a terminal is attached. The jam-pot is then filled to within 2 in. from the top with a normal saturated solution of ammonium phosphate, which may be obtained ready for use from a chemist. It is important to note that the solution must be saturated and not acid. A centre electrode of pure aluminium rod ¼ in. in diameter is suspended from a paraffined wooden strip resting on the top of the jam-pot. A second terminal is attached to the top of the aluminium rod. It may be found advantageous to cover the aluminium rod with some black chemical rubber tubing, covering the entire length of the immersed portion of the rod with the exception of about ½ in. from the bottom. This, however, is a matter for experiment.

Four cells or jars are required joined up as shown in Fig. 3; the aluminium rods are shown as small black circles and the lead electrodes as the major arcs of circles having a much larger diameter. These connections should be carefully noted, for it is important that the polarity of the wires connected to the L.T. terminals of the set should be correct.

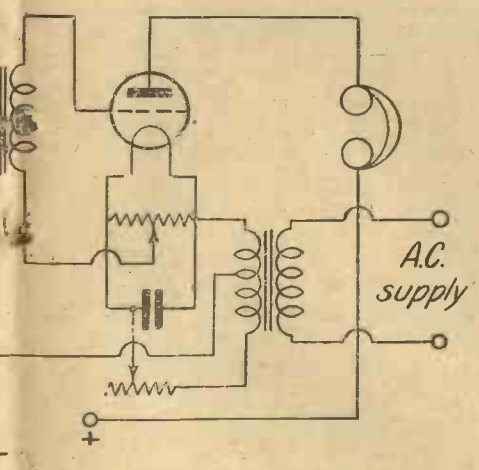
So much for the L.T. battery eliminator. We have now to consider the H.T. problem. In this case the current obtained must be quite smooth, the slightest ripple having a disastrous effect on reception and, indeed, it will entirely annihilate any weak signal. As in the case of the L.T. problem, a transformer is practically essential, but, happily, the same transformer may be used for both purposes. Details of suitable transformers will be given further on in this article. For the plates of the valves a much higher voltage is required than that necessary for the filaments. Moreover, the voltage must be sufficiently high to overcome the voltage drop caused by the rectifier and smoothing system. The current required is small.

Fig. 4.—The Nodon Valve.

H.T. and L.T. from A.C. Mains

A circuit diagram of the system used to supply H.T. and L.T. from A.C. mains is shown in Fig. 5. Two separate rectifiers are used, but that for the H.T. supply consists of two thermionic valves giving full-wave rectification, while that for the L.T. supply is the chemical rectifier previously described. A transformer with three secondaries is required, one for the H.T. supply, one for the valve filament supply to the set, and the third for the filament supply to the two thermionic rectifying valves. In the H.T. supply output from the rectifier a smoothing system is inserted consisting of chokes and condensers. Fig. 6 is a photograph of such a smoother.

If several H.T. tappings are required it is easy to insert a fairly high resistance in series with the existing H.T. positive



lament Supply from A.C. Mains.

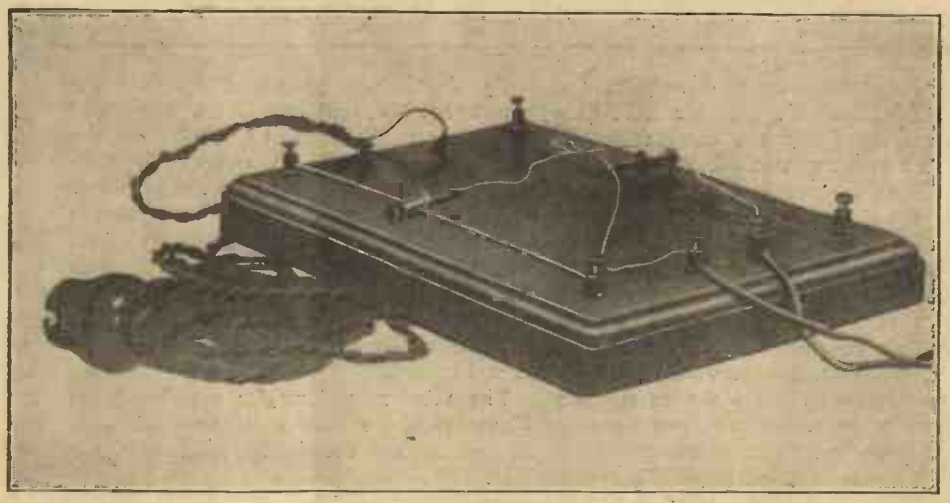


Fig. 10.—Resistance for Direct-current System.

tapping, bringing the free side of the resistance out to a separate terminal, as shown in Fig. 5. Another alteration that will tend to eliminate A.C. hum is to be made in the set itself. Anode rectification, although not quite so sensitive as grid rectification, is still very efficient provided the right type of valve is used. A.C. hum, moreover, is considerably reduced by employing anode rectification. There is no reason, of course, why grid rectification should not be used if a separate L T. battery is employed for the detector valve alone. This latter method is shown in circuit diagram form in Fig. 1.

With regard to the choke, as shown in Figs. 6 and 7, the latter should be wound on an iron core having a diameter of ¾ in. and 5 in. in length, on which two ebonite or wood cheeks are mounted at each end. The winding consists of 32,000 turns of No. 36 S.W.G. s.s.c. copper wire wound on in layers. If desired, two chokes may be wound on the same iron core, one winding on top of the other. The core may consist of soft iron wires cut off in 5-in. lengths.

Unfortunately the transformer is not so easy to specify, for the windings depend on the voltage and frequency of the supply and also on the type of thermionic rectifying valves used. Assuming that ordinary 6-volt power valves, having a high total emission, are used for this purpose, the voltage output of the secondary supplying the filaments of these valves would be 12 volts, as both filaments are connected in series. In order to adjust the filament current to a nicety, a 10-ohm rheostat should be connected in series.

For the H.T. supply a total voltage of about 400 is required from the next secondary winding. With full-wave rectification only half of this voltage is applied to each valve during the complete cycle and a further decrease due to the smoothing system will bring the total voltage applied to the H.T. terminals on the set to about 120 volts. With a 30,000-ohm resistance in series a 60-volt tapping will be obtained. Both secondaries are centre-tapped.

The third secondary for supplying the filaments of the valves in the set is connected to the chemical rectifier in the manner shown. The output of this secondary should be about 30 volts 3 amperes, allowing for a voltage drop of about 25 volts across the rectifier. A list of transformer specifications is given in a table which covers most of the common A.C. supplies of this country. The cross-sectional area of the iron core of the transformer should be 2 sq. in. in all cases. Other dimensions of the core are given in Fig. 8. Both primary and secondary coils should be wound on the same limb of the iron core and the latter should be built of Stalloy laminations .014 in. thick. In all cases the frequency is to be taken as 50 cycles.

Now we come to D.C. mains. With D.C. mains the whole matter is much simpler, and Fig. 9 shows the complete arrangement for H.T. and L.T. supplies. For the filament supply quite a neat arrangement, which is very satisfactory, can be made from two long pieces of pencil lead mounted as in Fig. 10. A variation of resistance is obtained by moving the metal contacts (these can be pin terminals) along the pencil leads. The smoothing system, as before, consists of 10-henry chokes and fixed condensers of large capacity. When using this system a fixed condenser of .5 microfarad should be inserted in the earth lead of the set or

(Concluded on page 770)

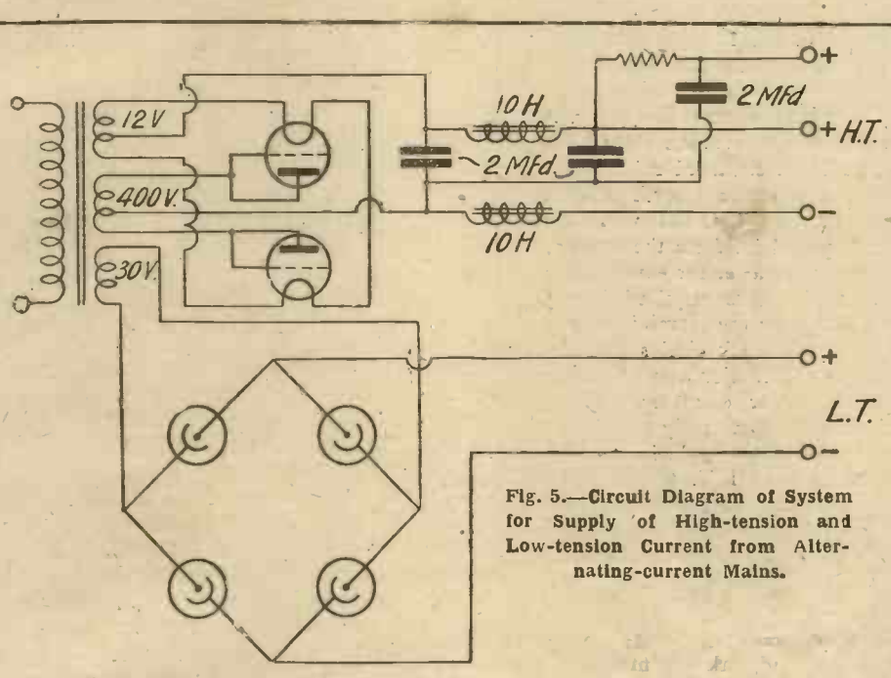


Fig. 5.—Circuit Diagram of System for Supply of High-tension and Low-tension Current from Alternating-current Mains.

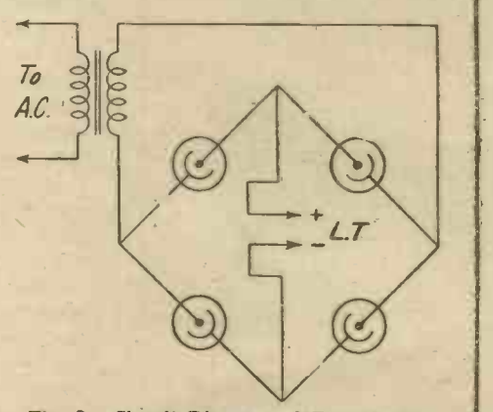


Fig. 3.—Circuit Diagram of Transformer and Rectifier.

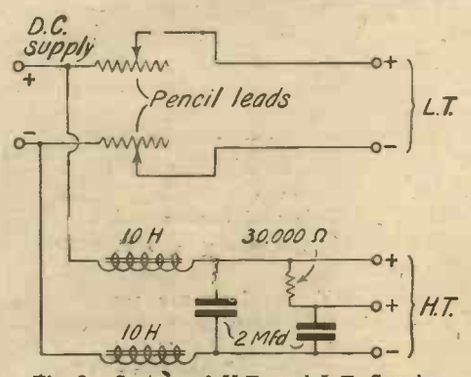


Fig. 9.—System of H.T. and L.T. Supply from Direct-current Mains.

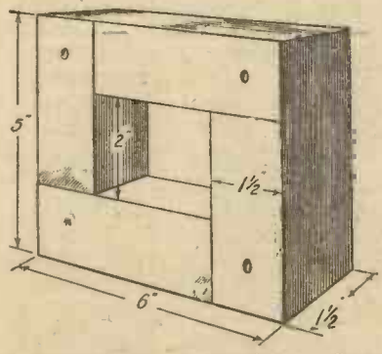


Fig. 8.—Details of Transformer Core.

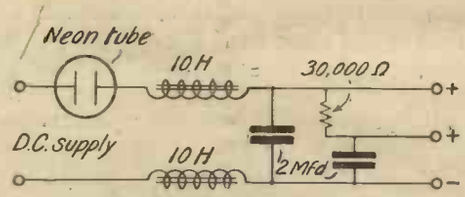


Fig. 11.—Direct-current System with Neon Tube.

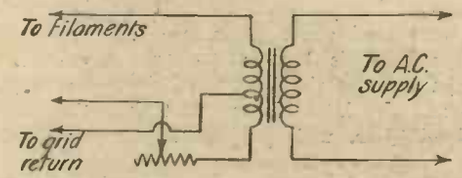


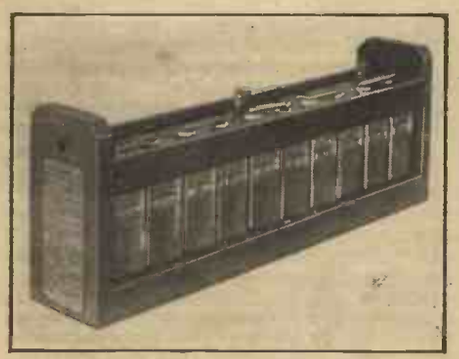
Fig. 2.—Details of A.C. Filament Supply.

"A.W." TESTS OF APPARATUS

Conducted in the "Amateur Wireless" Research and Test Department

Exide H.T. Accumulator

NOW that amateurs are realising the necessity for accumulator H.T. batteries where a large number of valves are used, there will doubtless be a demand for really well-made batteries of this type. The example illustrated in the photograph is made by The Chloride Electrical Storage Co., Ltd., of Clifton Junction, nr. Manchester. It is a 20-volt unit with a terminal in the centre giving a ten-volt tapping. The H.T. unit is very sturdy in construction and compact. The varnished wooden case containing the cells is 14 in. long, while its width is under 2¾ in. The space taken up by four such units (giving 60 volts) would not be unduly great. The top of the case is covered with a black insulating compound, in which are embedded the ten porcelain vent-holes of the cells. A point which saves time when charging is the grouping of the vent-plugs in pairs in the form of rubber plugs joined by rubber strips. The sturdily-built glass containers all have the acid level clearly marked on the sides. The plates are well separated from each other and from the bottom of the container. Judging from the actual ampere-hour capacity—2,500 milliamps.—we should say that in conjunction with other similar units it should be able to deal with heavy current outputs.



Exide H.T. Accumulator.

Mullard PM2 Valve

A USEFUL addition to the series of PM valves is the new PM2, recently submitted to us for test by the Mullard Wireless Service Co. From the accompanying table of constants it will be seen that this valve is very economical in filament current consumption; it is also particularly suitable for use in portable receivers, as there is an entire absence of microphonic noises. It will also be seen from the table that the impedance of the valve is low, and on that account is suitable for L.F. power amplification. In this it certainly lives up to the maker's claims, and for a two-volt valve is one of the best power amplifiers we have tested. It is important, however, to follow closely the maker's instructions as to grid bias, H.T. and L.T. voltages, etc., as if this is done the life of the valve will be much longer.

Mullard PM2 Valve.

As a detector the PM2 gives good results if a grid leak of 3 megohms is connected to the positive L.T. terminal of the accumulator.

Characteristic		*Values*
Overall length		4⅛ in.
Overall diameter		1¾ in.
Filament voltage		1.4 to 1.8 volts
Filament current		.14 ampere
Anode voltage		50 to 100 volts
Total Electron Emission		20 m.A.
Impedance	At 75 anode volts and zero grid volts	8750
Amplication factor		5·4
Mutual conductance		.62 m.A/volt

The address of The Mullard Wireless Service Co. is Nightingale Lane, Balham, S.W.12.

Unica Cabinets

NOW that wireless reception has ceased to be a novelty, constructors are turning their attention to more artistic cabinets in which to house their latest sets. It is to meet this demand for a cabinet which is a presentable piece of furniture that the Unica series of cabinets has been designed. These range from the simple cabinets to take upright panels with sliding baseboards to the most ornate pieces of furniture of various periods and in various woods. Then there are several excellent designs of cabinets for enclosing loud-speakers and rendering them artistic and pleasing in appearance. Included in the series are cabinets for portable receivers, one of which contains a loud-speaker and detachable frame aerial. We have used many of the models, and can confidently recommend them to our readers. The makers of the Unica series are The Unica Cabinet Co., of 73, Camden Street, London, N.W.1.

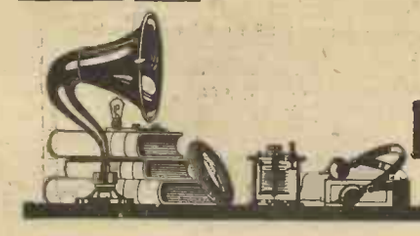
Lotus Coil Holders

WE have received from Garnett, Whiteley and Co., Ltd., of Lotus Works, Broadgreen Road, Liverpool, samples of their range of slow-motion coil holders, including two-way and three-way models. These components are extremely well made and are fitted with control arms of various lengths, thus enabling the coil holder to be mounted on a panel or at the back of a baseboard. Both end-plates consist of well-shaped bakelite mouldings, the insulating properties of which are very high. In action the slow-motion mechanism, which is entirely concealed, affords a very smooth and fine control of the coupling between the coils.

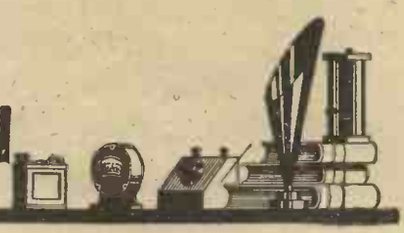
Empire Transformer

THE small transformer illustrated has been sent us for test by The H.T.C. Electrical Co., Ltd., of 2, Boundaries Road, Balham, S.W.12. The construction of this component is very neat. Four terminals are mounted on a small ebonite panel on the top of the transformer, and clamped under the terminal heads are soldering lugs of a commendably large size. The panel is clearly engraved to indicate the terminal connections. The insulation between windings was tested at 500 volts and found to be satisfactory. Tested in conjunction with a two-valve receiver using a low-impedance detector valve and low-impedance amplifying valve, it gave fair results as regards quality, although the volume was not great. The ratio is 4 to 1, a suitable value for general purposes. In comparison with similar transformers its performance was found to be quite satisfactory.

Empire L.F. Transformer.



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. Always send stamped, addressed envelope and attach Coupon (p. 772).

H.T. Accumulators

Q.—*Can you tell me where it is possible to obtain the lead and aluminium rods for the A.C. rectifier described in the recent article on "The Maintenance of the H.T. Accumulator"? How long does the ammonium phosphate solution last? Does it have to be fresh for each charge or can it be revived by any means, and how can I tell when it is becoming weak?—E. M. (Watford).*

A.—The lead sheet and aluminium rod can be obtained from Stantion and Co., of Shoe Lane, E.C., although most metal dealers can usually supply both metals. As the amount of current passing through the rectifier cells when charging high-tension batteries is so small that there are no appreciable heating effects, the solution will be found to last well, provided that the aluminium and ammonium phosphate are chemically pure. Failure of the rectifying action is indicated by an increase in the time needed to get the battery fully charged, and by the complete or partial disappearance of flicker from the resistance lamp. Rectification may be tested for by connecting two lead wires in series with the battery and valves, dipping the ends of the two leads into a small jar of water while the charging current is switched on. One of the wires will rapidly assume a brown colour, and the other will remain grey if rectification is taking place satisfactorily.—M. M.

Effect of Grid Bias

Q.—*What is the effect of applying grid bias to an L.F. amplifying valve.—L. S. (Middlesex).*

A.—In order that perfect amplification may be given by an L.F. valve it is necessary that the valve be worked under certain conditions. It is, for instance, necessary that the characteristic curve shall have a long straight portion and that the normal operating point shall be situated somewhere near the centre of this straight part of the curve. It is also undesirable that the operating point shall become positive, as this might lead to a flow of grid current which would cause unequal damping of the signals and so result in the reproduction being distorted. As the whole of the straight part of the characteristic curve may be required for the amplification of powerful signals it follows that the whole of this should lie on the negative side of the zero grid-volts line. This can be accomplished by raising the H.T. voltage to a sufficiently high value, but then the centre of the straight portion (where it is desired that the mean operating point shall be) will lie considerably to the left of the above-mentioned line. In order to make the mean potential of the grid sufficiently negative to satisfy the above condition, it is necessary to apply a suitable bias voltage to the grid of the valve and hence the need for the grid-bias battery. While it should not be expected that the application of grid bias will, in every case, result in an increase of signal strength, signals are often stronger after the H.T. voltage has been raised and the grid bias suitably adjusted owing to a steepening of the characteristic curve. An increase in the value of the grid-bias voltage alone will not cause an increase in signal strength.—B.

Windings for Transformers

Q.—*Please give me core dimensions and a winding specification for four static transformers as particulars stated below?—B. W. F. (Forest Gate).*

OUR WEEKLY NOTE

ACCUMULATORS

The feature which makes an accumulator such a desirable source of L.T. supply for all types of valves is that its voltage remains practically constant until the charge is approaching total exhaustion. When this occurs, however, the voltage falls rapidly, though the battery will recuperate considerably if switched off for a few minutes.

An accumulator should never be worked further when once its voltage has started to fall; neither should it be left uncharged for a moment longer than is necessary. When bright-emitters were the only valves available and the accumulator failed during an interesting programme, there was a great temptation to overrun the battery by switching it off and on at frequent intervals. In this manner snatches of the programme could still be received though the battery was being seriously overrun.

In these days of dull-emitter valves, however, the temptation to use an accumulator long after it should have gone to the charging station is more than ever put before the amateur. Any such temptation should be strongly resisted. To use a four- or six-volt accumulator until it can no longer light the filaments of valves requiring only three volts may easily result in sulphated plates, and then the battery will be permanently injured. THE BUREAU.

A.—The various ratings asked for are: (1) 30-watts capacity, with alternative windings to suit 100 volts 50 cycles or 400 volts 50 cycles primary, and in each case an output of 1,000 volts, 0.03 ampere on the secondary; (2) 18 watts capacity, with alternative windings for 100 volts 50 cycles or 200 volts 50 cycles primary, and in both cases 6 volts 3 amperes secondary output. The core for No. 1 will be built from Stalloy strips 1½ in. wide by 0.018 in. thick to the following overall dimensions: 6 in. wide by 4½ in. high by 1½ in. deep. This will leave a central opening 3 in. long and 1½ in. deep for the windings, a considerable space being necessary owing to the high voltage of the secondary and consequent unusual amount of insulation. The turns-per-volt constant for a core of these dimensions (working on a 50-cycle circuit) will be 2.6, so that the required number of turns for any of the specified voltages is arrived at by multiplying volts by constant. 100 volt primary = 100 × 2.6 = 260 turns; 200 volt primary = 200 × 2.6 = 520 turns; 1,000 volt secondary = 1,000 × 2.6 = 2,600 turns. The gauges of wire are settled by the current carried in the respective windings, which again is found by dividing the watts by the volts generated in each coil. Thus: 30 watts ÷ 100 volts = 0.3 amps. = No. 26 S.W.G. 30 watts ÷ 400 volts = 0.15 amps. = No. 30 S.W.G. 30 watts ÷ 1,000 volts = 0.03 amps. = No. 40 S.W.G. The primaries may be wound with d.s.c. wire. After insulating with Ohmaline varnish and baking out, they are taped all round with two layers of cotton tape and replaced on the former to have the secondary wound over them. Before starting this put on 2 layers of 10-mil. Empire cloth and do not wind to the extreme edge of the flanges but stop the layers ⅛ in. from each end. At every second layer interleave with a double layer of 5-mil Empire silk and repeat this until the full number of turns are on. The finish of the secondary should be taken out at the opposite side of the coil to the start, and both be protected with varnished silk sleeving. Over the last layer of the secondary wrap three more thicknesses of 10-mil Empire cloth and again tape round to finish off. A final impregnation in Ohmaline and a good baking out is essential before assembling on the iron core, since 1,000 volts is a pressure that requires very careful treatment. If any terminals are used on the metal frame see that they are insulated with porcelain bushes of liberal dimensions. The 18-watt. transformers in specification No. 2 are a much simpler proposition, being relatively of a low voltage. The core dimensions for these can be reduced to an overall size of 5 in. wide by 3¼ in. high by 1 in. deep, the internal wire space being 3 in. by 1¼ in. The core is built up of Stalloy strips 0.018 in. thick and 1 in. wide. The turns-per-volt constant is in this case 8, therefore the winding specification will work out: 100 volts primary = 100 × 8 = 800 turns; 200 volts primary = 200 × 8 = 1,600 turns; 6 volt secondary = 6 × 8 = 48 turns. The respective currents will be found as before, by dividing watts by volts: 18 watts ÷ 100 volts = 0.18 amps. = No. 30 S.W.G.; 18 watts ÷ 200 volts = 0.09 amps. = No. 34 S.W.G.; 18 watts ÷ 6 volts = 3 amps. = No. 17 S.W.G.; d.c.c. wire can be used throughout for these windings, no special interleaving of layers being necessary, beyond 20 mils of Empire cloth to separate the primary coil from the secondary. Impregnate with Ohmaline varnish and bake out as before.—A. H. A.

EARTH CONTACT!

NEXT WEEK AT 2LO

By THE LISTENER

ON Sunday afternoon, May 30, we are promised a relay from Hyde Park by the Royal Parks Band. Studio interludes will also be given, the soloists being Edward Isaacs, the famous Manchester pianist; Harry Solloway, the new violinist; Herbert Cave, tenor; and Helen Henschel.

A carillon recital will be broadcast from Loughborough at 8 p.m., followed by an organ recital by J. Edgar Humphreys relayed from St. Mary-le-Bow. The late evening programme consists of a light symphony concert, conducted by Geoffrey Toye.

The week's pianist for the special recitals is Mrs. Norman O'Neill, who will give excerpts from Mozart's compositions.

Francesco Ticciati.

On Monday chamber music will be given in the evening by the well-known Æolian Players (Constance Izard, Rebecca Clarke, Gordon Bryan and Joseph Slater), and Anne Thursfield as vocalist. A variety programme is promised at 8 o'clock, the artistes announced being the Two Bobs, C. W. Thwaite, Will Hay the Schoolmaster Comedian, Carlton, Lawrence Bascomb, Ann Stephens and Alan Macbeth, and the Fayre Sisters in a concertina quartet.

Vladimir Vladimoff.

On Tuesday Emilio Colombo's orchestra will be heard again with Signor Colombo himself, just recently returned from Italy. Later will follow Act II of *Othello* (Verdi), relayed from Covent Garden. At 10 p.m. will follow the first part of the new mystery competition play entitled *Wolf, Wolf!* written by Ernest Hope.

A lighter atmosphere is to prevail on Wednesday, when, in addition to the orchestras of Camille Couturier, the New Gallery and the Rialto during the day, at 8 p.m. John Henry's concert party programme will be relayed from Ramsgate. As this date also marks the birthday of Thomas Hardy, a special feature programme will be given at 10 p.m.

Listeners will be glad to hear once more the J. H. Squire Celeste Octet on Thursday, with Gaby Valle as vocalist. At 10 p.m. follows part two of the mystery serial *Wolf, Wolf!*

Some popular artistes will appear on Friday. Episode V of *That Child* includes, in addition to Lorna Hubbard, the child in question, Mabel Constanduros, Michael Hogan and Ena Grossmith.

Interludes will be provided by Ronald Gourlay, and later a short programme by the Wireless Symphony Orchestra.

Friday, June 4, being the anniversary of Weber's death, a programme will be given of some of his works, with Rachel Morton, soprano, and Francesco Ticciati, the Italian pianist,

Anne Thursfield.

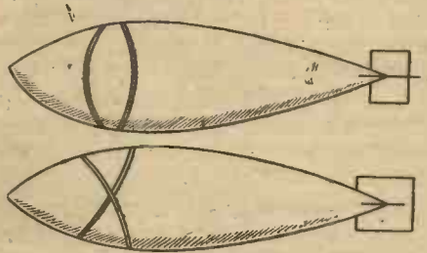
On Saturday Trooping the Colours will be given at 11 a.m. At 7.40 there will be a performance by Vladimir Vladimoff and his famous Balalaika Orchestra. The singer is Mdme. Oksarova, soprano.

THE WIRELESS EQUIPMENT OF THE *NORGE*

WIRELESS played an extremely important part in the latest expedition under Amundsen to the North Pole. The rigid airship *Norge* was very thoroughly equipped with wireless apparatus and in addition to the normal plant there is a direction-finder. The installation was undertaken by the Marconi Co.

The generating plant for power supply to the transmitter is a machine giving 133 milliamperes at 3,000 volts for H.T. and 14 amperes at 14 volts for L.T. This generator is driven by an air screw which develops 3 h.p., and arrangements are made for regulating the speed of this screw, while in addition to the air-screw drive, a 2¾-h.p. petrol engine is installed in case of breakdown. Power is taken from the generator and fed into a Marconi-type-U transmitter of .5-kilowatt input. Type T250 valves are employed, and the set is suitable for C.W. or tonic train, the latter being produced by a rotary interrupter. The wavelength range is from 559 to 1,500 metres.

For reception the ship is equipped with



Plan and Elevation showing Arrangement of Aerial.

a Marconi short-wave receiver which has a wavelength range of 10 to 100 metres. The purpose of this instrument was for communication with Point Barrow, where a short-wave transmitter is in operation. The standard receiver is arranged so as to be suitable for direction-finding or ordinary reception. For direction-finding a radiogionometer is used.

Low-tension current for the receivers is provided by an accumulator "floating" across the L.T. side of the generator. When the generator is running the accumulator is charging, so a constant source of L.T. is always ready for service. The main aerial of the *Norge* is 300 ft. long, but the most interesting aerials are the direction-finding loops. It must be borne in mind that the compass, when actually at the Pole, is useless, since all bearings are due south, so the direction-finding equipment is really one of the most important pieces of apparatus on board. The loops are forward and are wrapped round the envelope diagonally. The drawing will make the arrangement obvious. Each loop has two turns 9 in. apart.

D. B.

TWO further broadcasts of opera from Covent Garden have been fixed. An act of *Jewels of the Madonna* will be given on June 18, and another from *Manon* on June 25.

The efficiency of radio communication between Mexico and the rest of the world will be greatly increased by the installation of the new 500-watt equipment for trans-oceanic service. The station is located in Chapultepec Park, Mexico City.

The Australian "beam" wireless station will probably be ready for a trial service with Great Britain about September, and will be opened for traffic during the year.

The final lecture of the series which have been given from the London School of Economics is announced. On June 1 the subject chosen is, "Is the House of Commons of Any Use?" and the speakers will be Mr. J. H. Thomas and Mr. G. K. Chesterton. Mr. Lloyd George will be in the chair.

Bootle Education Committee have decided not to allow schools to use their wireless installations during school hours without special permission.

Experimental transmissions on a wavelength of 395.8 metres are being made by the Prague station.

The Breslau broadcasting station is now transmitting nightly with a power of 4 kilowatts. A wavelength of 418 metres is employed.

The Czecho-Slovakian Ministry of Railways has installed loud-speakers in the Wilson railway station at Prague in order to inform passengers of the arrival and departure of trains.

It is stated that wireless amateurs in Cairo are proposing to erect a transmitting aerial on the top of the Pyramid of Chephren, a height of 472 ft. The transmitter itself would be installed in the Rameses Tomb.

The Ravag Broadcasting Co. of Vienna proposes to install a microphone in St. Stephen's Cathedral to relay all organ recitals and for the transmission of midnight chimes of the Grosse Pummerin carillon.

Two new wavelengths have been suggested for the Vienna station, namely, for the high-power transmitter at Rosenhuegel, 517.2 metres, and for the old plant at the Stubenring 588.2 metres. When the change is made the Graz station will broadcast on 363.8 metres.

In deference to the wishes of listeners, the Prague station has ceased to broadcast advertisements.

The Chicago Federation of Labour has obtained permission to erect a broadcasting station at the Municipal Pier, which was formerly used as a wireless station by the American navy. The Labour movement will finance and control the station, which is intended to transmit messages to labour centres in the United States of America and abroad.

Loud-speakers have been erected in St. Peter's Cathedral at Rome. For many centuries sermons could only be heard by a comparatively small circle of listeners in the immediate vicinity of the minister. Reports from Rome now confirm that by means of an amplifying unit and loud-speakers, every word of the sermon is clear in all parts of the cathedral.

Radio-Toulouse regularly relays operatic and other performances from the Capitol Theatre and others in that city.

By means of the new system of photo-transmission by wireless, a portrait of Mr. Baldwin has been sent to New York in one hour 45 minutes.

The Radio Club de Liége is running a small telephony transmitter, and concerts are broadcast on Mondays, Wednesdays and Fridays at 9.30 p.m. B.S.T. A wavelength of 185 metres is employed.

The Egyptian Government has granted Marconi's Wireless Telegraph Co., Ltd., a thirty years' concession for wireless purposes.

Radio Belgique (Brussels) is making experimental transmissions on a wavelength of about 550 metres.

Norway will shortly bring into operation a further three small relay stations, namely: Rjukan (100 watts), Porsgrund (700 watts), and Notodden (50 watts).

Time signals, emanating from the Neuchâtel Observatory are daily broadcast by the Berne station at 13.00, 16.00 and 20.00 B.S.T.

The power of the new Radio-Zoologie broadcasting station at Antwerp is only 100 watts; it takes the bulk of its programmes by land-line relay from Radio Belgique, Brussels.

During the last few months the wireless telegraphy station established at Theodosia, a port on the South-eastern coast of Crimea (Russia) has daily transmitted a weather forecast and time signal at 12.29 B.S.T. on a wavelength of 600 metres. The call-sign of the station is REK. A further forecast, including storm warnings, is sent out at 11.40 a.m. on 1,800 metres, and at 23.00 B.S.T. on a 600-metre wavelength.

A new broadcasting station has been erected at Agram (Zagreb), in Hungary. For the present it will be operated by the local wireless association, who will be solely responsible for the general programmes. The concerts are broadcast on a wavelength of 350 metres with a power of 350 to 500 watts.

The new Salamanca (Spain) broadcasting station EAJ 22 has now resumed transmissions on a wavelength of 405 metres. Concerts are given from 17.00 to 18.00 and 21.00 to 23.00 B.S.T. daily.

Since April 1, the cost of wireless receiving licences in Czecho-Slovakia has been reduced from fifteen to ten kroner, or roughly 1s. 2d. per annum.

In Jugo-Slavia a high-power broadcasting station is being erected by the State in the neighbourhood of Agram (Groatia). Broadcasting in Jugo-Slavia is still in its infancy, and it is stated there are only about 700 wireless receivers in Belgrade.

It is intended to install a microphone on the tower of Glasgow University so that the chimes may be broadcast.

Sheffield listeners are complaining bitterly that their local relay station is being badly heterodyned. It is practically impossible to follow the station's transmission and it is generally thought that more than one station is heterodyning 6 F.L.'s programme. Repeated requests have been made for the station to lower its wavelength.

The use of wavelength-governing crystals is being seriously considered by German broadcasting authorities, and tests are to be carried out extensively next month to determine whether it is possible by their use to reduce the number of wavelengths in Germany from the present twenty to some nine or ten.

Early works of great composers are the basis of a programme from Glasgow, to be relayed to Daventry, Edinburgh and Dundee, on June 10. The principal vocalists are Mavis Bennett, Herbert Thorpe and Joseph Farrington, while the station orchestra and choir will contribute the major portion of the programme.

Band music is very popular with Scottish listeners, and interest is being shown in the northern visit of the Marsden Colliery Band, which will broadcast from Glasgow on June 8.

Under the title of *Whiffs*, a series of revues is to be given from the Glasgow station, commencing June 7. In addition to the usual musical interludes and topical sketches, a novel competition is to be run.

The Air Ministry is erecting a number of short-wave stations in the British Empire for communication with aircraft.

Condenser Faults

SIR,—At the present time one hears and reads a good deal regarding variable condenser efficiency and faults, and in this respect perhaps some of my own experiences would be of assistance to other readers.

Of course, any slight fault or point of inefficiency is very much more pronounced on the higher frequencies, and the condenser I am going to mention was perfect in operation on the broadcasting band.

I built a short-wave receiver with a range of from 10 to 100 metres, and took great care in selecting good components. On completion the set functioned fairly satisfactorily, but there was one great drawback which made tuning of weak signals difficult. This fault was that, as the condenser was rotated, a continuous rustling sound was heard. At first this was thought to be due to dust between the plates, but inspection disproved this. The contact to the moving spindle was secured by a pigtail of four turns. As these turns were of bare copper and since they touched as the condenser plates were turned, it was thought that this might be partly the cause of the trouble. Two of these turns were removed so that those remaining could not touch, and although this improved matters slightly, there was still the rustling sound. Careful scrutiny showed that the pigtail was fastened to the spindle by fitting into a cut in the latter, the joint being covered with solder. On testing this connection, however, the real cause of the trouble was found; the pigtail was in the groove all right, but the soldering had not been properly done, with the consequence that the connection was *slightly* loose. This appears to be a rather obscure fault, but a similar thing might cause annoyance to many others. On soldering the connection carefully the receiver worked quite silently and is now giving splendid results.—F. P. (Keighley).

The Wavelengths Problem

SIR,—I read with interest your article in No. 204 regarding the probable rearrangement of the wavelengths of the broadcasting stations in Great Britain. The new wavelengths suggested appear to be a considerable advance on those at present in use, and should certainly improve conditions in our own country, where wavelength problems of a domestic nature have been rather overlooked of late owing to the greater attention given to the general European situation.

At the present time it is something to boast about if one can cut out a near-by station in favour of another B.B.C. transmission. In allocating the existing wavelengths, the separation of stations serving adjacent areas was not, in my opinion, given due consideration. Until recently the large and enthusiastic wireless population of Fife spent many weary nights in trying to separate Dundee on 331 metres from Edinburgh on 324 metres. These wavelengths have now, fortunately, been altered so as to allow a greater margin. Another case is provided by the difficulty experienced by Glasgow listeners in receiving Belfast when the local station is working. On well-separated wavelengths these stations would be useful in providing alternative programmes for listeners in their respective areas, but with only 18 metres between them I find that intelligible reception is easier from Königswusterhausen than from Belfast during Glasgow's transmissions! This crowding of our own stations also gives rise to interference by oscillation, as by the use of excessive reaction (in endeavouring to obtain greater selectivity in order to receive a transmission on a wavelength not far removed from that of the local station) the operator of a valve set may cause howls which interfere with the neighbouring receivers tuned to the local station. Under such conditions the one- or two-valve man is tied to the local station during broadcasting hours.

The "two programmes for everyone" slogan appears to have been abandoned, and though the advent of Daventry was hailed as the forerunner of a new era in which every listener would be able to choose his programme, nothing farther has been done, and though English listeners who are centrally situated are now well catered for, crystal and single-valve operators in Scotland still have to rely on one programme. It appears to me that the only satisfactory solution of the alternative programmes and wavelengths problems is the erection of stations outside the city areas, transmitting on two widely separated wavelengths and with greatly increased power. A smaller number of stations would then suffice to cover the whole of Great Britain; each area would have at least two programmes, and the jamming of city dwellers' sets would be avoided. Oscillation caused by station-searchers would be greatly reduced, and the only people who would be worse off would be the very small minority who would then be situated under the shadow of the stations, which, being located in country districts, would not affect a large number by the blotting-out of other transmissions.—G. S. (Glasgow).

Other Correspondence Summarised

W. R. Lough (27, Norfolk Road, S.W.19) has numerous copies of the early issues of "A.W.," and will be pleased to forward them to any reader.

"DO YOU UNDERSTAND THE TROPADYNE?"

(*continued from page* 756)

side being connected to the moving arm of the potentiometer shunted across the main low-tension accumulator.

Although it is not absolutely necessary, the writer has made metal covers of zinc to fit over the two duolateral coils and the three H.F. transformers and connected the covers to L.T. negative. This helps to prevent the set from picking up long-wave Morse and also to avoid stray capacity coupling between the transformers.

The three H.F. valves should be brought near to oscillation point by means of the filament rheostat and potentiometer for maximum sensitivity.

The set is easy to build and simpler to operate than the conventional tuned-anode set, and the results are a revelation.

About 25 volts to the Wecovalve and about 50 volts to the .06 valves are suitable H.T. values, and about 50 volts to the last valve if a DE6 or B.T.H. B6 is used.

Operation

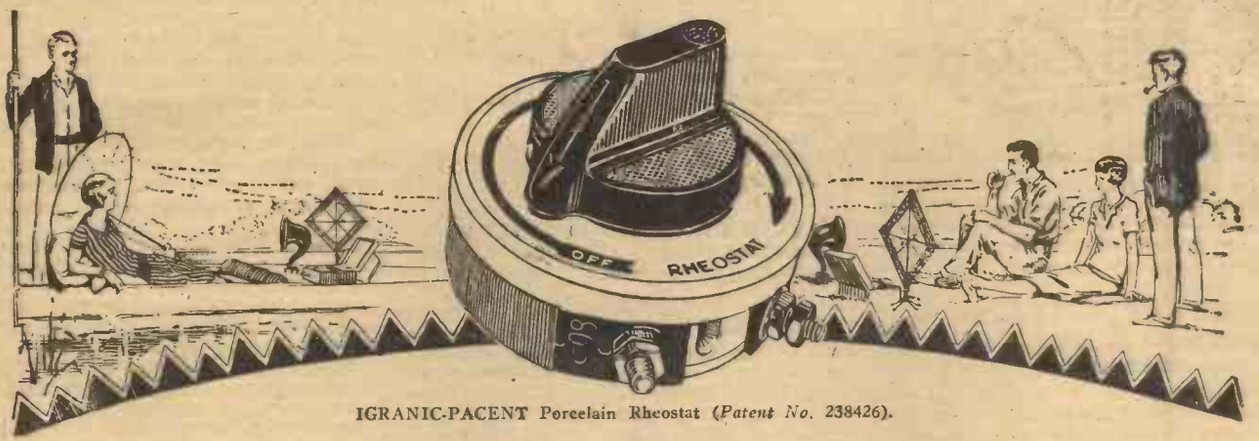
To operate the set, tune in the local station by adjusting the condensers across the wound formers, C1 and C2, and then vary the condenser, C3, across the 600 coil until signals are at a maximum, then tune in a distant station and make a final adjustment of the condenser, C3. This need not be touched again, and all tuning is now done on condensers, C1 and C2. The tuning of C2 is very sharp, and a vernier is essential, but it is not necessary to use a vernier in conjunction with C1.

Once a station is logged it will always come in at the same settings of the condensers, and if the wavelength of one station is close to another, only the vernier of C2 may need altering to go from the one station to the other.

No L.F. valves need be incorporated in the set, as every wise amateur should make up an efficient low-frequency amplifier which can be used with any type of receiver.

If a frame is used, the first former will not be required, and the connections go direct to the position occupied by the 60 turns of the former in the diagram.

F. G. S.



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Smoothness of control and quiet operation are additional advantages appreciated by users of all types of sets, portable or otherwise. The highly finished Bakelite knob and the attractive dial improve the appearance of any receiver.

Rheostats of 6, 10, 20, 30 and 50 ohms. or a Potentiometer of 400 ohms. are obtainable, and the price is the same for each—half-a-crown.

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NOTE.—*In the following list of transmissions these abbreviations are observed: con. for concert; lec. for lecture; orch. for orchestral concert; irr. for irregular; m. for metres; and sig. for signal.*

GREAT BRITAIN

The times given are according to British Summer Time.

London (2LO), 364 m. 1-2 p.m., con. (Tues., Thurs, Fri.); 3.15-3.45, transmission to schools; 3.30-5.30, con. (Sun.); 4-5 p.m., con.; 5.15-5.55, children; 6 p.m., light music; 7-8 p.m., time sig., news, music, talk; 8.10-10 p.m., music; 9.0, news (Sun.); 9.30 p.m., time sig., news, talk; 10 p.m., special feature (Mon., Wed., Fri.). Tues. and Thurs. the Savoy Bands are relayed until 11.30 p.m., and on Sat. until midnight.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 440 m. **Birmingham** (5IT), 479 m. **Bournemouth** (6BM), 386 m. **Cardiff** (5WA), 353 m. **Glasgow** (5SC), 422 m. **Manchester** (2ZY), 378 m. **Newcastle** (5NO), 404 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 315 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 321.5 m. **Liverpool** (6LV), 331 m. **Nottingham** (5NG), 326 m. **Plymouth** (5PY), 338 m. **Sheffield** (6FL), 301 m. **Stoke-on-Trent** (6ST), 306 m. **Swansea** (5SX), 482 m. **Daventry** (25 kw.), high-power station, 1,600 m. Special weather report 10.30 a.m. and 10.25 p.m. (weekdays), 9.10 p.m. (Sun.); 11.0 a.m., light music (exc. Sat. and Sun.); relays 2LO from 4 p.m. onwards, own con. on Mon. Dance music daily (exc. Sun.) till midnight; on first Friday in each month until 2 a.m.

IRISH FREE STATE.

Dublin (2RN), 397 m. Daily, 7.30 p.m. Sundays, 8.30 p.m. until 10.30 p.m.

CONTINENT

The Times are according to the Continental system; for example, 16.30 *is* 4.30 *p.m., and* 08.00 *is* 8 *a.m. B.S.T.*

AUSTRIA.

Vienna (Radio Wien), 582.5 m. and 531 m. (temp.) (10 kw.). 11.00, con. (almost daily); 15.30, con.; 19.25, news, weather, time sig.; con., lec., news; 20.00, con.; 22.00, dance (Wed., Sat.).

Graz, 402 m. (1 kw.). Relay from Vienna. Also own con. (Tues., Wed., Fri.), 20.10.

BELGIUM.

Antwerp, 265 m. (100 w.). Relays Brussels.

Brussels, 482 m. (1½ kw.). 17.00, orch. (Tues., Thurs., Sat. only), news; 20.00, lec., con., news (opera, Mon. and Wed.).

CZECHO-SLOVAKIA.

Prague, 368 m. (5 kw.). Con., 20.00-23.00, daily. Also tests on 398.5 m.

Brunn (OKB), 521 m. (2.4 kw.). 10.00, con., news (Sun.); 19.00, lec., con. or dance (daily).

DENMARK.

Copenhagen (Radioraadet), 347.5 m. (2 kw.). Sundays: 15.30, lec.; 17.30, children; 20.00, play; 21.15, news, con.; 21.15, news, Esperanto (Mon.), silent night. Weekdays (Tues., Fri., Sat.); 20.00, lec., con., news, con.; 21.30, dance (Sat.).

Ryvang, 1,150 m. (1 kw.). Sundays: 09.00, sacred service.

Odense, 810 m. Relays Copenhagen.

Sorö,* 1,150 m. (1½ kw.). Relays Copenhagen. Also broadcasts at times on 1,500 m.

FINLAND.

Helsingfors (Skyddskar), 504 m. (500 w.). Temporarily closed down.

Helsingfors, 440 m. Con., 18.00 (Tues., Thurs., Sat., Sun.).

***Tamafors**, 368 m.

***Jyvaskyla**, 561 m. (200 w.).

***Uleaborg**, 233 m. (200 w.).

* Relay Helsingfors.

GRAND DUCHY OF LUXEMBURG.

Radio Luxemburg (LOAA), 1,200 m. Con.: 14.00 (Sun.), 21.00 (Thurs.).

FRANCE.

Eiffel Tower, 2,650 m. (5 kw.). 06.40, weather (exc. Sun.); 11.00, markets (exc. Sun. and Mon.); 11.20, time sig., weather; 15.00, 16.45, Stock Ex. (exc. Sun. and Mon.); 18.00, talk, con., news; 19.00 and 23.10, weather; 21.00, con. (daily).

Radio-Paris (CFR), 1,750 m. (about 3 kw.). Sundays: 12.45, con., news; 16.30, Stock Ex., con.; 20.15, news, con. or dance. Weekdays: 10.40, news; 12.30, con., markets, weather, news; 16.30, markets, con.; 20.15, news, con. or dance.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (800 w.). 07.00, physical exercises; 14.00 or 15,00, studio con. or outside relay; 20.30, lec. (almost daily); 21.00, con. (daily).

Le Petit Parisien, 333 m. (temp.) (1 kw.). 21.15, con. (Tues., Thurs., Sat., Sun.).

Radio L.L. (Paris), 350 m. (250 w.). Con. (Mon., Wed., Thurs.), 20.30.

Radio-Toulouse, 430 m. (2 kw.). 12.30, con., time sig. (daily); 17.30, news (exc. Sun.); 20.45, con.; 21.25, dance (daily). Also operatic relays on 500 m., occasionally.

Radio-Lyon, 280 m. (2 kw.). 20.20, con. (daily).

Radio Agen, 318 m. (250 w.). 12.40, weather, Stock Ex.; 20.00, weather, Stock Ex.; 20.30, con. (Tues., Fri.).

***Lyon-la-Doua**, 488 m. Own con., 20.00 (Mon., Wed., Sat.).

***Marseilles**, 351 m. (500 w.).

***Toulouse**, 280 m. (2 kw.).

***Bordeaux**, 411 m.

* Relays of PTT Paris.

Montpelier, 220 m. (1 kw.). Relays Radio Toulouse.

Angers (Radio Anjou), 300 m. (500 w.). Daily: 20.30, news, lec., con.

Bordeaux (Radio Sud-Ouest), 330 m Con., 22.00 (Mon., Fri.).

Mont de Marsan, 390 m. (300 w.). Con. (weekdays only), 20.30.

GERMANY.

Berlin, on both 504 and 571.5 m. (4 kw.). 06.30, con. (Sun.); 09.00, sacred con. (Sun.); 11.00, con. and tests; 12.55, time sig., news, weather; 15.00, educ. hour (Sun.), markets, time sig.; 17.30, orch.; 20.30, con., weather, news, time sig., dance music until 24.00 (exc. Tues. and Fri.). Relayed on 1,300 m. by Königswusterhausen and Stettin (241 m.).

Königswusterhausen (LP), 1,300 m. (8 kw.). 11.30-12.50, relays Berlin (Sun.); 15.00, lec. (daily); 18.30, relay of Berlin (Vox Haus) con. (daily). 2,525 m. (5 kw.), Wolff's Buro Press Service: 06.45-20.10. 2,880 m., Telegraphen Union: 08.30-19.45, news. 4,000 m. (10 kw.), 07.00-21.00, news.

Breslau, 418 m. (4 kw.). 12.00, con. (daily), Divine service (Sun.); 12.55, time sig. (Sun.), weather, Stock Ex., news; 16.00, children (Sun.); 17.00, con.; 19.00, lec.; 20.30, con., weather, time sig., news, dance (relays Berlin). Relay: Gleiwitz, 251 m.

Frankfort-on-Main, 470 m. (1½ kw.). 08.00, sacred con. (Sun.); 11.55, time sig., news; 12.55, Nauen time sig.; 16.00, con. (Sun.); 16.30, con.; 18.00, markets, lec.; 20.00, lec., con., weather. Dance: relays Berlin. Relay: Cassel, 273.5 m.

Hamburg, 392 m. (4 kw.). Relayed by Bremen (279 m.), Hanover (294 m.), Kiel (233 m.) Sundays: 07.25, time sig., weather, news, lec.; 09.15, sacred con.; 13.15, con.; 18.00, con.; 19.15, sports, weather, con. or opera, dance. Weekdays: 05.45, time sig., weather; 07.00 and 07.30, news, weather; 12.55, Nauen time sig., news; 14.00, weather, con.; 16.15 and 18.00, con.; 19.00, lec.; 19.55, weather and con.; 22.00, dance (daily, exc. Tues.).

Königsberg, 462 m. (1 kw.). 09.00, sacred con. (Sun.); 12.55, time sig., weather, news; 16.30, con.; 17.00, con. (Sun.); 19.30, lec.; 20.00, con. or opera, weather, news, dance (irr.).

Leipzig, 452 m. (700 w.). Relayed by Dresden (294 m.). 08.30, sacred con. (Sun.); 11.00, educ. hour (Sun.); 12.00, con. (daily); 12.55, Nauen time sig., news; 16.30, con., children (Wed.); 20.15, con. or opera, weather, news, cabaret or dance (not daily).

Munich, 487.5 m. (3 kw.). Relayed by Nuremberg (340 m.). 11.30, lec., con. (Sun.); 14.00, time sig., news, weather; 16.00, orch. (Sun.); 16.30, con. (weekdays); 18.30, con. (weekdays); 19.15, lec.; 19.30, con. (Sun.).

Munster, 412 m. (1 kw.). Relayed by Elberfeld (259 m.), Dortmund (283 m.). 11.45, radio talk, Divine service; 12.00, news (Sun.); 12.30, news (weekdays); 12.55, Nauen time sig.; 15.30, news, time sig.; 16.00, con.; 17.00, children (Sat.); 19.40, news, weather, time sig., lec., con.

Norddeich (KAV), 1,800 m. 24.00 and 04.00, weather and news.

Stuttgart, 447 m. (1½ kw.). 11.30, con. (Sun.); 16.30, con. (weekdays); 17.00, con. (Sun.); 18.30, time sig., news, lec., con. (daily); 21.15, time sig., late con. or cabaret.

HOLLAND.

Amsterdam (PCFF), 1,955 m. (1 kw.). Daily: 06.35-15.30 (exc. Mon. and Sat., when 12.30-13.30), news, Stock Ex.

Hilversum (HDO), 1,050 m. (2½ kw.). 09.00, sacred service (Sun.); 19.10, con.; 21.00, news, etc. Testing on 25 kw.

HUNGARY.

Buda-Pesth (Csepel), 560 m. (2 kw.). 09.00, news; 12.00 and 15.00, weather, news; 17.00, dance music; 20.00, con. or opera, dance.

Kosice, 2,020 m. (2½ kw.). 19.00, con.

ICELAND.

Reykjavik, 327 m. (700 w.). Tests: 22.30, 24.30.

ITALY.

Rome (1RO), 425 m. (3 kw.). 10.30, sacred con.; 13.15, official communique; 17.00, children; 17.30, relay of orch from Hotel di Russia; 17.55, news, Stock Ex., jazz band; 20.30, news, weather, con.; 22.15, late news.

Milan, 320 m. (2 kw.). 20.00-01.00, con., jazz band. Testing on 425 to 430 m.

JUGO-SLAVIA.

Belgrade (Rakovitza) (HFF), 1,650 m. (2 kw.). 17.00, news (daily), con. (Tues., Thurs., Sat.).

Agram (Zagreb), 350 m. (500 w.).

LETTLAND.

Riga, 488 m. (2 kw.). Con. daily, 21.00-22.00.

NORWAY.

Oslo, 382 m. (1.2 kw.). 11.00, Divine service (Sun.), Stock Ex. (weekdays); 13.15, markets; 19.15, news, time, lec., con.; 22.00, time, weather, news, dance relayed from Hotel Bristol, Oslo (not daily).

Bergen, 358 m. (1½ kw.). 19.30, news, con., etc.

POLAND.

Warsaw, 480 m. (6 kw.). Daily: con., 11.00-13.00; 15.00-23.00, daily.

RUSSIA.

Moscow (RDW), 1,450 m. (12 kw.). Weekdays: 12.30 and 17.55, news and con.; 23.00, chimes from Kremlin.

(Popoff Station), 1,010 m. (2 kw.). 10.00, 11.00, lec.; 13.00, 19.00, con. (Tues., Thurs., Fri.).

Radio Peredacha, 410 m. (6 kw.).

(*Concluded on page* 770)

"BROADCAST TELEPHONY" (*cont. from page 768*)

Trades Union Council Station, 450 m. (2 kw.). 18.00, con. (Mon., Wed.).

Leningrad, 940 m. (2 kw.). Weekdays: 16.00.

Nijni Novgorod, 1,400 m. (1.2 kw.). 21.30, con.

SPAIN.

Madrid (EAJ6), 392 m. (1½ kw.). Daily: con. (times vary daily). Closes at 24.00 on Sun., Wed., Sat.

Madrid (EAJ7), 373 m. (4½ kw.). 17.30-24.00, con. (almost daily).

Madrid (EAJ4), 340 m. (3 kw.). 16.00, con.

Barcelona (EAJ1), 324 m. (3 kw.). 17.00-21.00, news, lec., con. (Sun.); 18.00-23.00 (daily).

Barcelona (Radio Catalana) (EAJ13), 462 m. (4½ kw.). 19.00-24,00, con., weather, news.

Bilbao (EAJ9), 415 m. (1 kw.). 19.00, news, weather, con. Close down 22.00.

Bilbao (Radio Vizcaya) (EAJ11), 418 m. (2 kw.). 22.00-24.00, con. (daily).

Cadiz (EAJ3), 357 m. (550 w.). 19.00-21.00, con., news. Tests daily (Mon., Tues., Wed., Sat.), 24.00.

Cartagena (EAJ15), 335 m. 19.00-22.00, con. (daily).

Seville (EAJ5), 357 m. (1½ w.). 21.00, con., news, weather. Close down 23.00.

Seville (EAJ17), 300 m. 19.00-22.00, con. (daily).

San Sebastian (EAJ8), 343 m. (500 w.). 17.00-19.00, 21.00-23.00 (daily).

Salamanca (EAJ22), 405 m. (1 kw.). 17.00 and 21.00, con. (daily).

Saragossa, about 325 m. Testing.

SWEDEN.

Stockholm (SASA), 430 m. (1 kw.). 11.00, sacred service (Sun.); 12.30, weather; 14.00, con. (Sun.); 17.00, children (Sun.); 18.00, sacred service; 19.00, lec.; 21.15, news, con., weather. Dance (Wed., Sat.).

Relays.—Boden (SASE), 1,200 m.; Eskilstuna, 250 m.; Falun (SMZK), 370 m.; Gothenburg (SASB), 288 m.; Gefle, 325 m.; Helsingborg, 235 m.; Joenkoeping (SMZD), 265 m.; Kalmar, 253 m.; Karlsborg, 1,250 m.; Karl-Sundsvall (SASD), 545 m.; Trollhattan scrona (SMSM3), 196 m.; Kristinehamm (SMTY), 202 m.; Karlstadt (SMXC), 221 m.; Linkoeping, 467 m.; Malmo (SASC), 270 m.; Norrkoeping (SMVV), 260 m.; Orebro, 218 m.; Ostersund, 720 m.; Säffle (SMTS), 245 m.; (SMXQ), 322 m.; Umea, 215 m.; Varborg, 340 m.

SWITZERLAND.

Lausanne (HB2), 850 m. (1½ kw.) (temp.). 20.00, lec., con. (daily).

Zurich (Hongg), 513 m. (temp.) (500 w.). 11.00, con. (Sun.); 12.00, weather; 12.55, Nauen time sig., weather, news, Stock Ex.; 13.30, piano solo; 17.00, con. (exc. Sun.); 18.15, children, women; 19.00, news, weather; 20.15, lec., con., dance (Fri.).

Geneva (HB1), 760 m. (2 kw.). 20.15, con. (daily).

Berne, 434 m. 10.30, organ music (exc. Sat.); 16.00, 20.30, con.

Basle. Testing.

CHIEF EVENTS OF THE WEEK

SUNDAY, MAY 30

London	Shakespeare's Heroines.
Cardiff	*Outpost* (A. G. Prys-Jones).

MONDAY

London	Burns' Songs and Poetry.
Aberdeen	"Jutland." A Sound Effect Cameo.
Birmingham	*The Wizard of Wireless.*
Newcastle	A Northumbrian Concert.

TUESDAY

London	*Wolf I. Wolf I* A Mystery Competition Play.
Belfast	Manx Music.

WEDNESDAY

London	John Henry's Concert Party.
Hull	Treasure Trove—From Past and Present.
Liverpool	Chamber Music.
Newcastle	The Wallsend Male Voice Quartet.
Nottingham	The St. Hilda Colliery Band.
Plymouth	A Joyous June Jumble.

THURSDAY

London	*Wolf I Wolf I* (Part 2).
Bournemouth	The King's Birthday—British Programme.

FRIDAY

London	Weber Centenary.
Cardiff	G.W.R. Staff Concert.
Manchester	*The Last.*

SATURDAY

Aberdeen	Aberdeen Musical Festival—Prizewinners Concert.
Cardiff	"Wit of the West."
Glasgow	"Round the Camp Fire."
Manchester	Masters of Opera—Verdi.

TRADE NOTES

We have received from the General Electric Co., Ltd., of Magnet House, Kingsway, the April issue of the *Osram Bulletin,* a monthly magazine of great interest to wireless dealers and traders.

A useful valve chart, showing the characteristics of Burndept, Mullard, B.T.H., Marconi and Osram, Cosmos, Cossor and Ediswan valves, has been issued by Burndept Wireless, Ltd., of Bedford Street, Strand, W.C.2.

An interesting relay, to take place on June 19, will be that from the Crystal Palace of the National Union of School Orchestras, numbering some 4,000 juvenile performers.

It is proposed to broadcast on June 20 the service held at Lincoln Cathedral, which will include an address by Archdeacon Blackie, Chaplain to the King.

"BANISH YOUR BATTERY TROUBLES!" (*continued from page 760*)

else a short-circuit of the mains may occur.

By inserting a Neon tube in the positive lead of the H.T. supply the ripple of D.C. mains will be still further reduced. This method, which is to be recommended, is shown diagrammatically in Fig. 11. With this smoothing system all hum is practically eliminated. The complete smoother may be mounted in a box, as has been done with the well-known commercial smoother seen in one of the photographs (Fig. 12) and which employs a Neon tube.

A. L. P.

Mains Voltage	*Primary Winding*		*Secondary Windings*		
	No. of Turns	*Gauge*	*12-volt Secondary*	*400-volt Secondary*	*30-volt Secondary*
100	400	20	48 turns of No. 20 d.c.c. wire tapped at the 24th turn.	1600 turns of No 36 d.s.c. wire tapped at the 800th turn.	120 turns of No. 18 d.c.c. wire.
110	440	22			
200	800	23			
210	840	23			
220	880	24			
230	920	24			
240	960	24			
250	1000	24			
260	1040	24			

SUGGESTED NEW WAVELENGTHS

FOR EUROPEAN BROADCASTING STATIONS

AT the International Conference of European broadcasters, which was held at Geneva in March with the object of devising a scheme to avoid interference, the following table of altered wavelengths for the more important stations, based on tests made at various times, was put forward for consideration:

	Metres
Toulouse (P T T)	245.9
Brussels	265.5
Barcelona (E A J 1)	280.4
Dortmund	283
Birmingham	288.5
Münster	303
Bournemouth	306.1
Newcastle	312.5
Milan	315.8
Leipzig	322.6
Belfast	326.1
Prague	348.9
Breslau	357.1
London	361.4
Graz	363.8
Oslo	370.4
Stuttgart	379.7
Manchester	384.6
Radio-Toulouse	389.6
Frankfort	394.7
Glasgow	405.4
Berne	411
Stockholm	416.7
Rome	422.6
Hamburg	428.6
Brunn	441.2
Paris (P T T)	447.8
Lyons	476.2
Berlin (Witzleben)	483.9
Aberdeen	491.8
Zurich	500
Vienna (Rosenhuegel)	517.2
Munich	535.7
Buda-Pesth	555.6
Berlin (Magdeburgerplatz)	566
Madrid (E A J 6)	577
Vienna	588.2

Apart from the smaller relay stations to which a series of common wavelengths may be allotted, it would appear that but very slight alterations will be effected in the wavelengths of those stations not mentioned in this list. Of course, before these new wavelengths can be brought into operation, authority from the respective governments must be obtained. J. G. A.

SPARK INTERFERENCE

MUCH of the interference experienced by broadcast listeners situated near the coast-line arises from the increasing use of wireless direction-finding installations. The calls are morsed on a wavelength of 450 metres, which with spark transmission means an overlap up to 100 metres on each side. To make matters worse, coastal and sea-going vessels are also allotted wavelengths of 300 and 600 metres, either of which can be used at will.

Between the three wavelengths none of the short-wave B.B.C. stations are free from interference. The only effective remedy is to load up the set to receive Daventry, as ordinary selective tuning, or the use of wave-traps, seems quite unable to cope with this form of nuisance.

M. A. L.

"A Dovecote for the Garden" is the title of an article appearing in the current issue of "The Amateur Mechanic and Work" (3d.), and describes the construction of a house where birds may come and go at pleasure and live an unrestricted natural life. Other articles appearing in the same number are: "The War Against Rust," "Making a Lady's Work-table," "Accumulators: Their Action, Care and Maintenance," "In the Metalworker's Shop: Accurate Drilling," "Choosing a Speedometer for Motor-cycle," "A Convertible Wireless Three-valve Set," "Building a Poultry House," "A Beautiful Ship Model in Nickel," "The Reflecting Telescope and How to Use It," "Pendulums for Electric Clocks: A Convenient Suspension Bracket and Spring," etc.

ADVERTISEMENT INSTRUCTIONS for "Amateur Wireless" are accepted up to first post on Thursday morning for following week's issue, providing space is available.

PREPAID ADVERTISEMENTS.

Advertisements under this head are charged FOURPENCE PER WORD, minimum charge FOUR SHILLINGS.

DEPOSIT SYSTEM.

As the Publishers cannot accept responsibility for the bona fides of Advertisers in this publication they have introduced a system of deposit which it is recommended should be adopted by readers when dealing with persons with whom they are unacquainted. It is here explained.

Intending purchasers should forward to the Publishers the amount of the purchase money of the article advertised. This will be acknowledged to both the Depositor and the Vendor, whose names and addresses must necessarily be given. The Deposit is retained until advice is received of the completion of the purchase, or of the article having been returned to and accepted by the Vendor. In addition to the amount of the Deposit, a Fee of 6d. for sums of £1 and under, and 1s. for amounts in excess of £1, to cover postage, etc., must be remitted at the same time. In cases of persons not resident within the United Kingdom, double fees are charged.

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Printed and Published in England by Cassell & Company, Limited, Ludgate Hill, London, E.C.4. Sole Agent for South Africa, Central News Agency Limited. Saturday, May 29, 1926.