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MAKING A LOW-LOSS CRYSTAL SET

Amateur Wireless

And Electrics

Vol. VI. No. 141.

SATURDAY, FEBRUARY 14, 1925

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CRYSTAL

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A RECEIVER FOR
SHORT WAVE-
LENGTHS

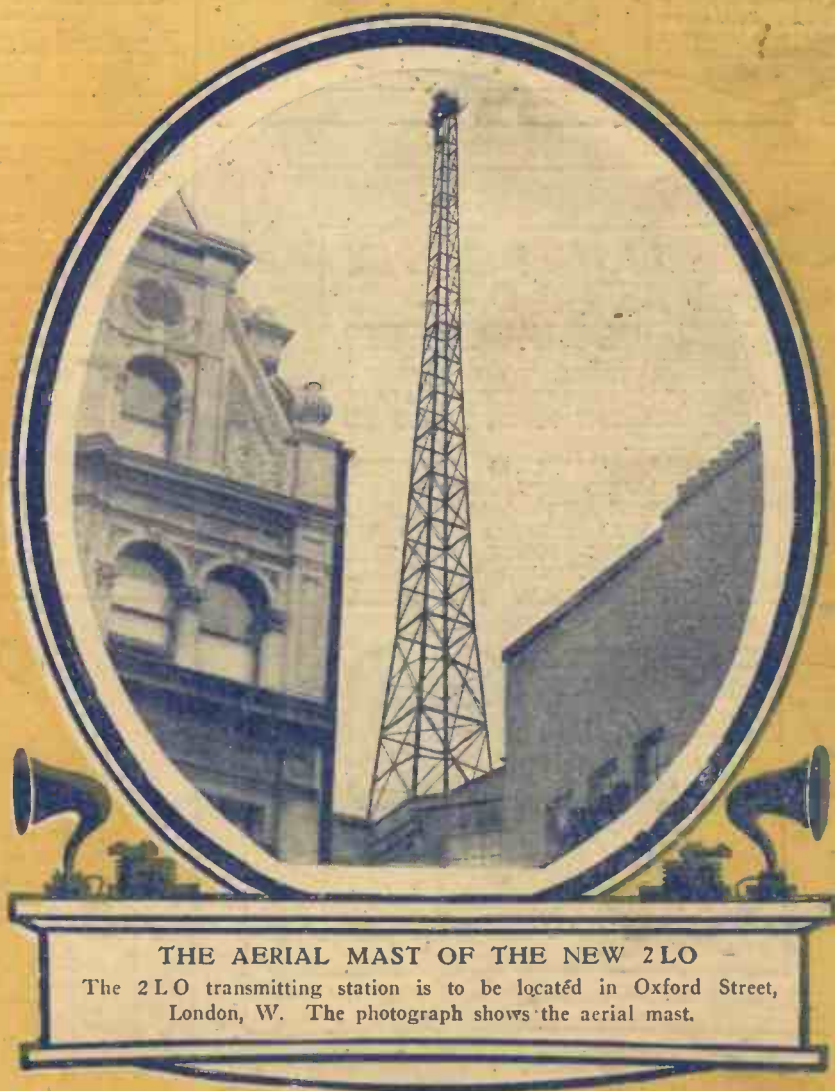
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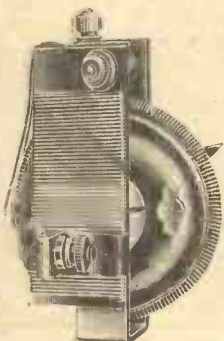
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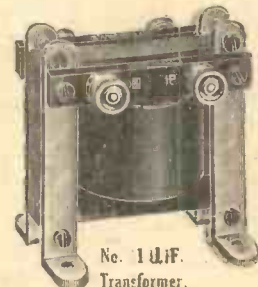
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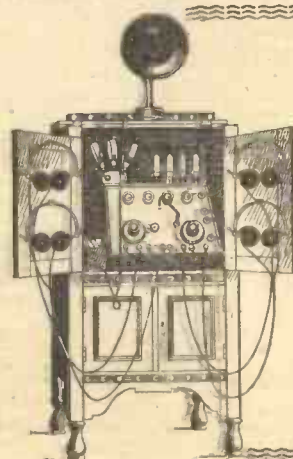
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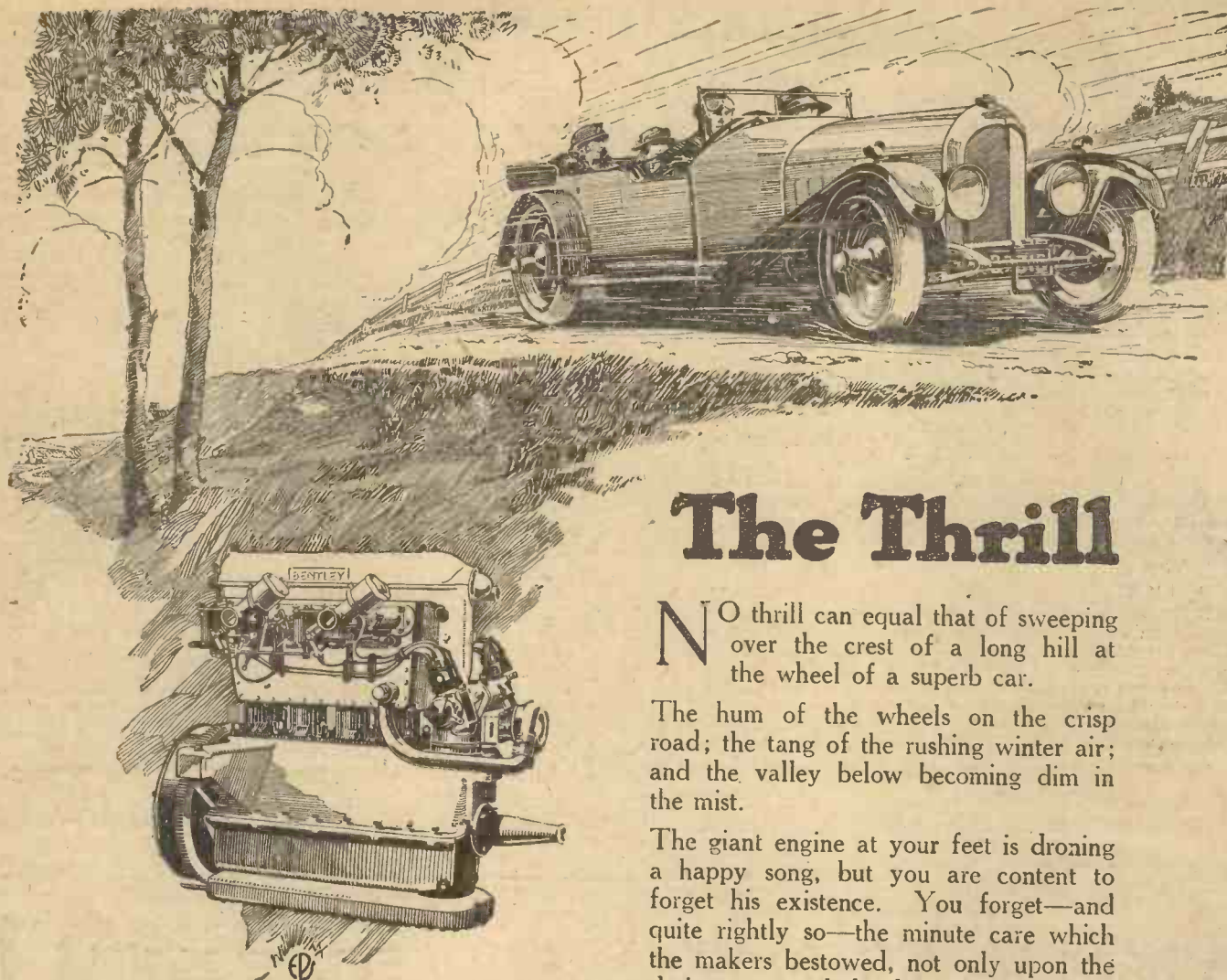
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5 S C, Glasgow, 359 miles.
2 B D, Aberdeen, 390 miles.
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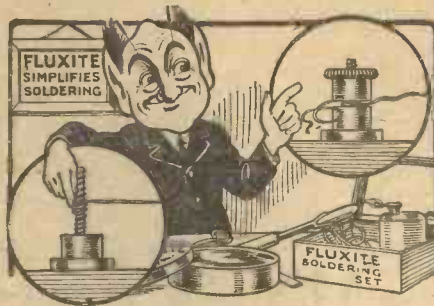
Radio Paris, 220 miles.
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Amateur Wireless

and Electrics

Vol. VI. No. 141

February 14, 1925

THE MYSTERIOUS CRYSTAL

THE humble crystal presents some remarkable problems, not only for the wireless amateur but for the chemist and the physicist also. The familiar combination of a fragment of galena with a wire catwhisker is still an unplumbed depth of mystery; the amateur knows that it is capable of rectifying alternating currents, but by what property or quality it accomplishes this work even our foremost scientists cannot accurately determine when an alternating current—mine for us. Perhaps the best explanation yet put forth of the rectifying properties of crystals is the thermo-electric theory which regards the crystal-wire combination as a thermo-couple.

The Thermo-electric Theory

This theory depends on the fact that one or both substances (in the case of two crystal detectors) has a large and dissimilar temperature variation of resistance. Thus, when an alternating current—such as the radio-frequency current received by the aerial—is applied, two distinct actions occur: when the current is flowing in one direction the temperature of the junction between crystal and catwhisker will rise, resulting in a reduction of the resistance and the passage of a large current. It is known that as the temperature increases, the resistance decreases, so that any increase of current will increase the heat production and the conductivity of the junction.

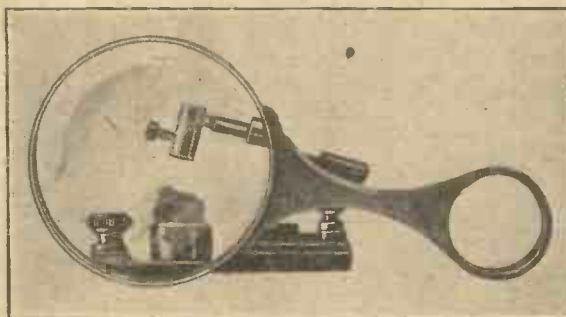
During the second half of the cycle, when the voltage is reversed, the conditions are altered. The junction temperature, owing to what is technically known as the Peltier effect, will then be cooling instead of heating, and this cooling is in direct ratio to the energy supplied—the greater the current the greater the cooling. The resistance now, instead of being reduced, is materially increased, with the result that the currents flow freely in one direction but only weakly in the other.

Other Theories

Various other theories have been offered, many of them too technical and involved to be of interest to readers of a journal whose prime appeal is to the amateur, but the one explained above appears to

be the most plausible and to have gained the largest number of adherents. In this respect, then, it suffices to remark that the true significance of the crystal as a rectifier has not yet been accurately determined.

The behaviour of crystals under heat opens up another interesting field for investigation. Most amateurs are aware of the fact that by slightly warming the



crystal better results are often obtained, yet this phenomenon is in direct contrast to the directions generally printed on the container, which claim that the sensitivity of the crystal is materially impaired, or even dispelled, by the application of any heat.

The Crystal and Heat

Recent investigations have proved that many minerals, especially those belonging to the pyrites group, undergo a physical change when heated. Those readers who still remember their school chemistry will be aware of the difference of molecular structure exhibited by yellow and red phosphorus, an outstanding example of physical change brought about by the application of heat. Here we have two substances entirely dissimilar in appearance and behaviour, yet identical in their chemical composition.

Similarly the galena crystal, which is a natural form of lead sulphide, as used in crystal detectors, has marked rectifying properties, while its constituents, if prepared in the laboratory, exhibit no similar characteristics. Many scientists believe this to be due to the peculiar crystalline structure of the native mineral—a structure which it is difficult to imitate in the synthetic forms which are now generally

included in the “ites” class. Artificial forms of galena are obtainable which possess remarkable rectifying qualities, but in the writer’s experience a good specimen of the real mineral excels them all.

It is this minutely crystalline structure—a crystal within a crystal, so to speak—which suffers derangement by the application of heat. Even then, by applying the heat gradually and allowing the crystal to cool slowly, this arrangement of the crystal is apparently unaffected, since its sensitivity remains unimpaired; indeed, I have found it possible occasionally to rejuvenate an old crystal by this method. I say “apparently” advisedly because it is possible that the crystal may undergo a structural alteration with an ultimate return to the old arrangement at the end of the slow cooling process.

Effect of Light

Another crystal phenomenon consists in the fact that strong light, especially sunlight, alters the behaviour of crystal detectors whenever the light is focused on the surface of the crystal during the reception of signals, a phenomenon which has already been discussed in these pages. Under some conditions the electrical conductivity of a crystal is altered whenever a strong light falls upon it, and further investigations into this peculiarity have brought to light another mystery for crystal theorists to puzzle over.

In the *American Physical Review* for November, 1923, and under the rather overwhelming title of “Spectro-photo-electrical Effects in Argentite,” is described a record of experimental work with crystals of the mineral argentite, which is an ore of silver analogous to galena in that both are metallic sulphides having many common characteristics. Just as the galena was affected by light, so, it was found, was argentite affected.

But something entirely new and unexpected was discovered. This was the production, inside the illuminated crystal, of an actual electromotive force. In some manner the crystal, or some constituent of it, acted to convert a part of the energy of the light into electricity,

(Continued at bottom of next page)

USING A SOFT VALVE IN A REFLEX SET

MANY users of reflex circuits fail to get good results because they employ valves which are far too soft for the purpose. Apart from the fact that such valves never give good amplification, it is exceedingly easy to arrive at a situation in which the valve is rectifying, at one of the bends

the transformer is loose-coupled, the three coils—airial, aperiodic anode and tuned secondary—being all intercoupled in a three-coil holder.

Valve Rectification

If now a soft valve is put into the Fig. 1 circuit and the catwhisker lifted, we have the effective circuit shown in Fig. 2. It might be thought that the secondary, $L_3 C_2$, would be out of action, but this is not so. The coupling of the coils still enables it to tune the anode as before and the whole tuning of the circuit is unchanged. In order to get good results, however, the valve must be adjusted to work on the proper part of the characteristic curve.

Adjusting the Valve

This may be brought about by varying the H.T. voltage, the effect of which is to move the characteristic curve bodily across the grid-volts base-line (see Fig. 3). Signals may sometimes be improved by shifting the connection to I.S. of the L.F. transformer to the filament side of the rheostat, as shown by the dotted line in Fig. 2, or even to L.T. +. This puts positive bias on the grid.

Double Rectifying Effect

Do not short-circuit or remove the L.F. transformer, as the secondary coil, with

trol than the ordinary tuned-anode, and the inclusion of the L.F. transformer (which is not, of course, a new device) is very satisfactory.

H. W. S.

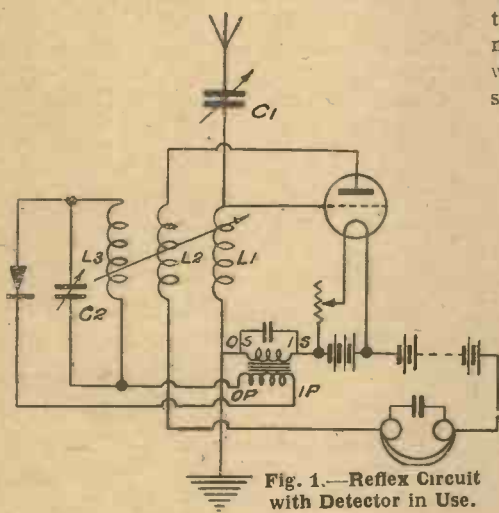


Fig. 1.—Reflex Circuit with Detector in Use.

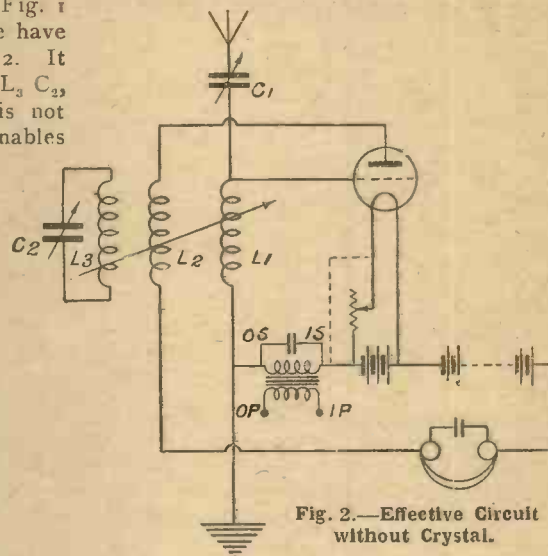


Fig. 2.—Effective Circuit without Crystal.

in its characteristic curve, while the crystal becomes simply a "passenger."

The existence of this state of things is readily detected by simply raising the catwhisker, when signals should become very much fainter or disappear entirely. If they retain or, as they often will, increase their strength, the valve is rectifying and steps should be taken (by means of grid bias, etc.) to alter its operating position on to the straight portion of the characteristic. If a soft valve is being employed this will not improbably spoil the reception altogether. The accepted remedy, of course, is to substitute a harder valve.

When Your Valve Burns Out

But if, as recently happened to the writer, your only hard valve has suddenly become *hors de combat* owing to excessively "close coupling" between the H.T. battery and the filament, and you have only an old stager whose blackened bulb betrays the softening due to age, excellent results can be obtained by frankly cutting out the crystal and using the set as a single-valve detector.

Fig. 1 shows one of the best and most commonly employed of the reflex circuits. Sometimes the primary instead of the secondary of the H.F. transformer (either tight- or loose-coupled) is tuned and it seems to make little difference which arrangement is adopted. In the writer's set it is the secondary which is tuned and

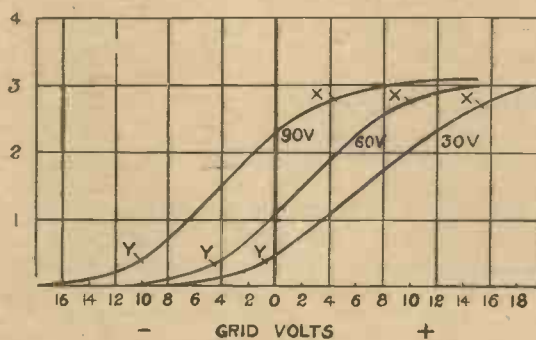


Fig. 3.—Curves showing Effect of Varying the H.T. Voltage.

the condenser across it, acts in some measure like a grid leak and, even though your object is to work at the upper bend in the characteristic, this gives an increased rectifying effect.

This circuit, though primarily evolved as a makeshift to enable a soft detecting valve to be used in a reflex set, is in itself a very good single-valve regenerative arrangement. In the writer's experience the method of tuning the anode by the separate secondary circuit gives finer con-

"THE MYSTERIOUS CRYSTAL," (continued from preceding page)

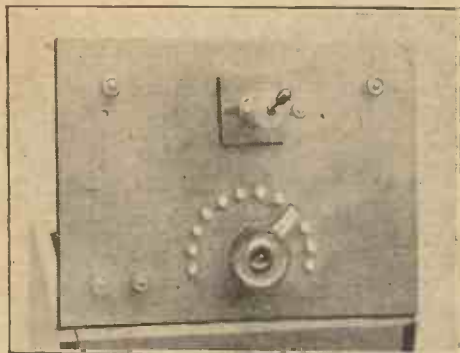
just as a dynamo converts mechanical power into electricity. It was even possible to measure the amount of this energy, a light of 600 candle-power at a distance of one metre from the crystal producing an electro-motive power of as much as .013 volt.

It is improbable, of course, that an effect so small as this (in volts) can ever be employed for the useful conversion of light energy into electrical energy. The real significance of the discovery does not rest upon that factor. The promise of importance lies in the chance of a better insight into what electrical processes really take place inside the crystal.

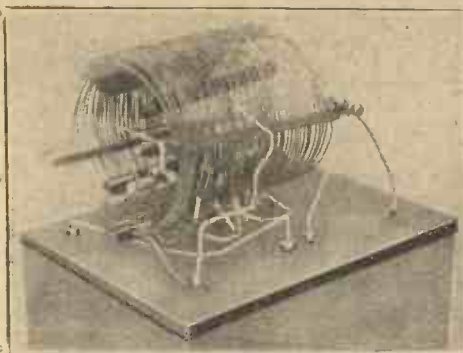
There is very little doubt that all these electrical and photo-electrical phenomena are related to the properties of the electrons in the crystal; that if we could know more about these properties we should be enlightened on many other points—the light-detecting property of selenium, the emission of electrons when light falls upon a metallic surface, the pressure effects which are responsible for the "talking crystals" and last, but not least, the familiar but mysterious behaviour of the crystal as a wireless detector.

Indeed, when one considers all, there is probably no other field of research in the whole of physics which offers a greater promise of important discoveries, both in theory and in commercial practice, than does the study of the crystal. A. J. B.

MAKING A LOW-LOSS CRYSTAL SET



Front of Panel.



Back of Panel.

THE following is a description of a low-loss crystal set with a bare-wire loose-coupled tuning inductance. Since the construction of the coils presents the greatest difficulty, the writer will describe in detail the method employed (see Figs. 1 and 2), which is very simple and straightforward. Fig. 1 shows a half section of a cardboard former tube (view of tube cut in halves lengthways). Assuming we are winding the outer coil first ($\frac{1}{4}$ in. in diameter), take a piece of $\frac{1}{8}$ -in. ebonite and cut four strips $\frac{1}{2}$ in. wide and 6 in. long. Trim these up so that they are exactly the same shape, and clamp all four strips together in the vice so that they appear as a solid piece of ebonite $\frac{3}{4}$ in. by $\frac{1}{2}$ in. by 6 in. (see Fig. 3).

Coil Formers

Using a square as shown in Fig. 3, mark off forty divisions pitched $\frac{1}{8}$ in. apart. On each of the two outer faces of the strips scribe a line $\frac{1}{8}$ in. from the top throughout their length. This is to guide the depth of the saw in cutting the teeth. The first tooth may be cut about $\frac{3}{8}$ in. from the end.

Having cut the forty teeth to the depth of $\frac{1}{8}$ in. to the lines, and whilst still in the

The next thing to prepare is the cardboard former. This may be as shown, 8 in. long and 4 in. in diameter (Fig. 1). Cut four slots 5 in. long by $\frac{1}{8}$ in. wide $\frac{1}{2}$ in. from one end of the former and equidistant around its circumference. This may be done on the domestic rolling-pin with a sharp knife. The four strips of

The coil can then be wound on the former, taking the turns between the ebonite teeth in the ordinary way. It should, of course, be fastened at the beginning and the end through holes in the former. After this is done a little shellac should be carefully dropped between each tooth, taking care that none drops on the cardboard former. The coil should then be allowed to stand for a few hours to allow the shellac to set. All that remains to be done now is to cut down through the former to each end of the four slots—that is, from the ends of the tube. The four pieces of former can then be gently broken away from the ebonite strips, leaving the finished coil. This method obviates the tedious drilling and threading of wire. The inner coil is wound in exactly the same manner.

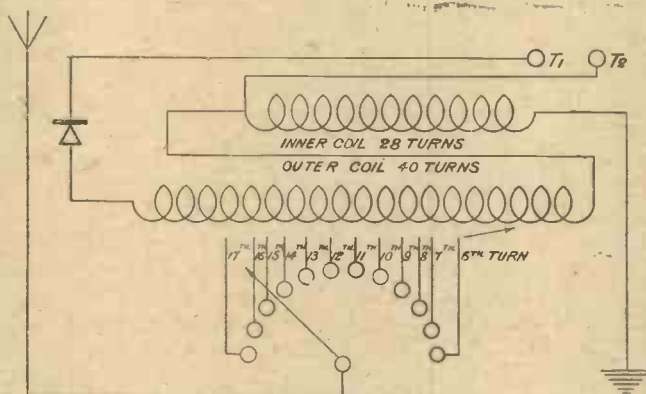


Fig. 4.—Circuit Diagram.

ebonite may now be fitted into these slots as shown in Fig. 1, taking care to keep the marked ends of the strips at one end. Pack the inside of the former with rolls of paper to keep the strips pressed home, and the coil is ready for winding. Anneal the wire by heating to redness and cooling in

Circuit

The wiring diagram is shown by Fig. 4 and is self-explanatory. The outer coil is tapped at single turns from the sixth turn from the end indicated by the arrow at twelve points. It will be noticed in the photograph that there is a direct lead from the aerial terminal to the fifteenth turn.

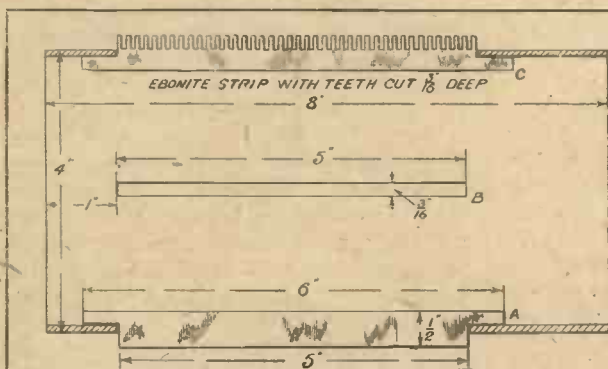


Fig. 1.—Section of Former Tube.

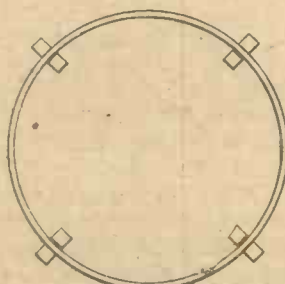


Fig. 2.—Cross Section of Former

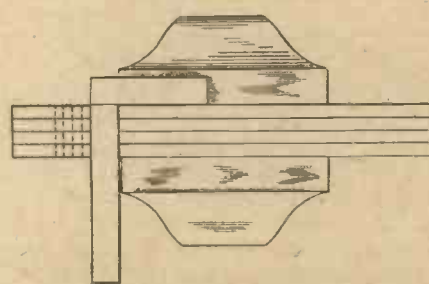


Fig. 3.—Method of Slotting Ebonite Formers.

vice, pieces are cut out of each end of the strips as shown at A and C (Fig. 1). The strips now present the appearance of c (Fig. 1). Before removing the strips from the vice, mark each at one end so that they will be in line when fitted.

water, and then stretch it from a post to take any kinks out by running emery-cloth between two pieces of wood along the wire. This serves two purposes: it straightens the wire and cleans off the oxide formed by annealing.

This is the writer's setting for Liverpool and need not be followed. The inner coil is set midway in the outer. For wavelengths longer than Liverpool another ten turns to both coils may be added.

(Concluded in first column of next page)

BOSPHOR PRONZ ON "SOME" APPARATUS

The Longcord Headphones

THERE has been sent to me for examination a pair of "Longcord" headphones. As their name implies, the feature of these phones is the long cord or cords which is or which are supplied with every pair. For the greater part of its length the cord of the Longcord headphones is a single cord. At the end of the cord away from the earflaps there are two distinct cords, each of which ends in a metal tag. These tags are of satisfactory shape and design for adult use, but should they find their way into the hands of children they would doubtless be considered too pointed.

At the other end of the cord, about a foot from the end, the Longcord cord divides again into two separate cords, each of which goes to an earpiece, thus making dual aural reception possible with these phones. On turning one of these earpieces over, it is at once noticeable that the cords again break up into two distinct cords. Thus the cord of the Longcord headphones is a single cord, a double cord or a quadruple cord according to the part of the cord you have under observation.

From earpiece to metal tag the cord of the Longcord headphones measures 12 ft.

"MAKING A LOW-LOSS CRYSTAL SET" (continued from preceding page)

Fig. 5 shows the layout of the panel. The set fits into a box just deep enough to allow the coil to rest on the bottom.

In comparison with a variometer set (using one of the expensive spherical variometers of a well-known make), the bare-wire set gave far greater volume. Compared with another variometer set (using a large-diameter variometer wound with No. 15 wire), the bare-wire set was about equal in volume, but speech and

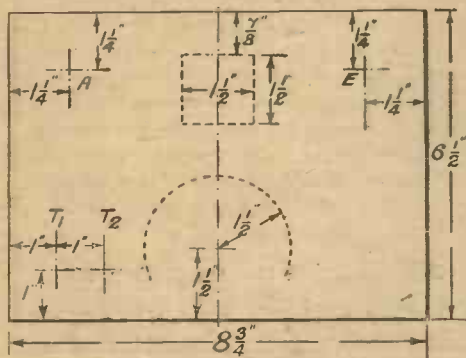


Fig. 5.—Layout of Panel.

music were far sharper. Again, compared with a tapped inductance set wound with No. 24 wire, the bare-wire set gave far greater volume.

W. G.

2.943 in. This excessive length can be easily reduced by the simple expedient of winding the cord into a coil of the slab-dab type, but the great feature of the Longcord headphones is that they make remote control possible. I find it an easy matter with these phones to tune in a crystal set placed directly under my aerial lead-in while seated in an armchair near the fire. Certainly it was a cold night when I carried out this test, and my assistant had every reason to complain of being made to stand by the window so long.

Since the bands of the Longcord headphones are covered with black morocco, I gather that these earphones are of Spanish origin. The earpieces fit fairly comfortably, but why cannot manufacturers of headphones make their earpieces of ample size? The pair sent me for test fitted over my own ears quite easily, but they were just half the size necessary to cover the ears of my assistant. Manufacturers should make their earpieces big enough for the biggest ears and not just big enough for the average ear. I shall be happy to send the dimensions of my assistant's ears to any manufacturer who is interested.

The Longcord phones are decidedly sensitive. Unfortunately in the pair supplied for examination the left earpiece was defective owing to the fact that the sensitive side of the diaphragm had been carelessly placed inwards instead of outwards. When the necessary change was made, the left phone was slightly better than the right phone. It is worth noting here that the sensitive side of the diaphragm can always be found by biting the diaphragm with the teeth. The sensitive side sticks to the teeth, the other side does not. This simple test, however, should not be made use of by anyone who has metal fillings in the front teeth. Such fillings have been known to take away the magnetism of a headphone diaphragm.

A New Leak

Messrs. Tiffy Taffy, of Knarvon, have sent me a presentation sample (other manufacturers, please copy) of their latest wireless accessory, the Daffodil leak. This ingenious little instrument is a vegetable product about 9 in. long consisting of a tuning knob in which are placed several dead end effects. Is is interesting to note that one-hole fixing is used in the development of these useful little gadgets. The appearance of the Daffodil leak is certainly a pleasing one, and its finish is of a consistently high odour.

For the reception of distant broadcasting stations the Daffodil leak is to be recommended strongly. It is particularly efficient in picking up Brussels, the new

American station POT 8 O and the French station Ka Barge.

The Leopard Crystal Detector

A long-distance wireless correspondent, who must remain nameless since he has not yet renewed his licence, has sent me a beautifully designed and constructed crystal detector. The first thing I noticed about this crystal detector was the glass barrel which holds the crystal. Since this barrel is made of the clearest glass, it is possible to keep the crystal under constant supervision and to make sure it is carrying out its rectifying duties properly. In addition to this, the glass barrel protects the crystal from dirt and dust and the greasy fingers of meddlesome wireless visitors. My long-distance friend, in the letter he sent with the crystal detector, expresses himself very strongly upon the subject of glass barrels. He is of the opinion that the world would be a better place if all barrels for crystals and other purposes were of glass so that one could always see what was in them.

As well as holding the crystal, the glass barrel supports the catwhisker controlling mechanism. This ingenious mechanism consists of a handle at the inner end of which is the catwhisker, this being inside the barrel as usual alongside the crystal. The other end of the catwhisker handle is outside the glass barrel, and it is this end of the handle which calls for special comment. Instead of being straight, as is so necessary for straight crystal circuits, this handle is shaped like the starting handle of a motor-car. The main portion of the handle—that is, the portion which has the catwhisker at the inner end—passes through a small musical box mounted in the end of the glass barrel and secured there by a couple of brass nuts. So ingeniously is the handle arranged that a mere turning of the handle in one direction causes the musical box to function, thus facilitating tuning to an unheard of extent.

It is, however, the crystal which gives the name to the Leopard crystal detector. This crystal is unique in that the sensitive spots show up as tiny but visible yellow patches, the rest of the crystal being of the usual nondescript colour. When examined carefully under a microscope having two stages of low-frequency amplification, it is seen that the sensitive streaks of the Leopard crystal go right through the whole crystal in much the same way as the inscriptive letters go through a bar of seaside rock. After testing the crystal so kindly sent me, I have no hesitation in saying that the Leopard crystal knocks spots off any other type of crystal it has been my privilege to receive and to receive with.

ADAPTING A PHONE FOR LOUD-SPEAKER



Parts of Reed-type Receiver.

THE receiver to be described was made for a pleated-paper loud-speaker, although it can be successfully used as a relay for the "Crystal" loud-speaker. The components required are: An ordinary single earphone; an ebonite knob; a piece of sheet brass, about 8 in. by $2\frac{1}{2}$ in. by $\frac{1}{8}$ in. thick; an ebonite sheet, 4 in. by $2\frac{1}{2}$ in. by $\frac{1}{8}$ in. thick; a quantity of 6 B.A. nuts and screws; and a length of 6 B.A. threaded rod.

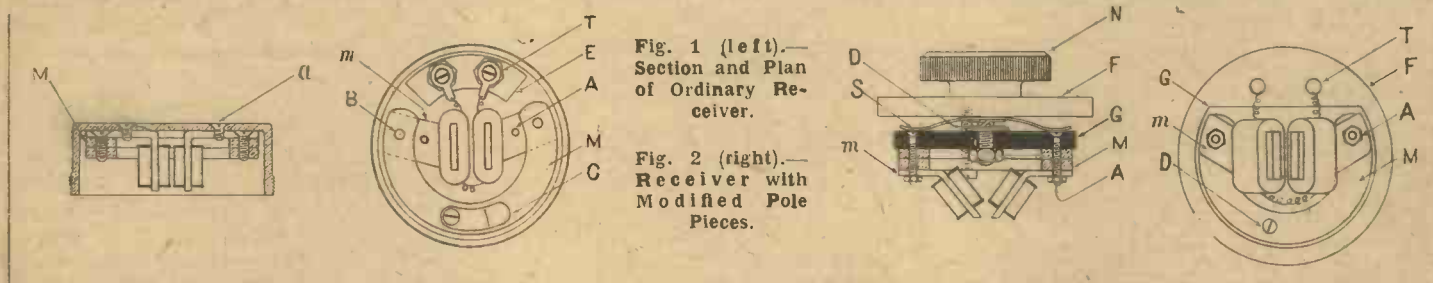
Before going into the actual details of the receiver it will be useful to explain the construction of an ordinary earphone. The one represented in Fig. 1 is a typical ex-Government receiver (2,000 ohms) that lends itself admirably for the purpose. It consists of a horse-shoe permanent magnet

held in position by a short clip C screwed to the permanent magnets. To make the reed receiver, the polepieces are unscrewed and the bends opened out so as to give them the shape shown in Fig. 2. It will be necessary to change the position of the bobbins to allow the soft-iron cores to project well beyond them. This can be accomplished by pressing the bobbins

facing the reed are carefully filed to present a flat surface.

The ebonite piece G, Fig. 2, is drilled in the centre, tapped 2 B.A., and a short length of 2 B.A. rod screwed into it and tightened by a nut. This part of the receiver is completed by a screw D screwed in the ebonite piece G, which passes through the hole in the magnets and projects about $\frac{1}{4}$ in. beyond the ebonite. This screw serves to keep the magnets in position and prevents them from moving as the knob is turned for adjustment. If the magnets are not provided with a hole for this screw the alternative plan is to screw it flush with the ebonite before mounting the magnets on the ebonite piece.

A circular piece of ebonite F, Figs. 2



M, at the ends of which are fixed the soft-iron polepieces *m* by the screws B. The whole arrangement is fixed into the aluminium case by the screws A, screwed in the tapped holes A in the polepieces *m*. The ends of the windings are soldered to two terminals T, which are screwed in an ebonite piece E. The phone leads, whose ends are connected to the terminals, are

down gently with a piece of wood. The permanent magnets with the polepieces are next fixed on an ebonite piece G of the shape shown in Fig. 2, the screws passing through the ebonite piece, permanent magnets and the tapped holes in the soft-iron pieces. The portions of the soft-iron pieces projecting beyond the magnets are filed off, also the ends of the polepieces

and 3, $2\frac{1}{4}$ in. in diameter and $\frac{1}{8}$ in. thick, is cut and carefully drilled in the centre to allow the 2 B.A. rod to pass through, also a second hole is drilled for the screw D (Fig. 3) so that the screw can move freely as the adjustment is made with the knob. On this circular piece is fixed the first ebonite piece G, on which are mounted the magnets, with a spring s and a spring



Three Photographs showing the Attachment of Reed-type Phone to Pleated diaphragm Loud-speaker

washer in between them as shown in Figs. 2 and 3. The spring S consists of a strip of hard brass $\frac{1}{2}$ in. wide and 2 in. long with a hole in the centre. If the knob N be now turned the magnets will move backwards and forwards, depending on the direction of rotation of the knob. The ends of the magnet windings are soldered to the terminals T screwed on the ebonite piece F.

issues of AMATEUR WIRELESS. Photographs of the loud-speaker are given to show the method of mounting the diaphragm and the receiver. The base of the loud-speaker, as will be seen from the photographs, consists of an ordinary wooden block 3 in. by 6 in., used in electrical installations, and the vertical wooden piece, which is $1\frac{1}{8}$ in. thick, is drilled along its length. Through this

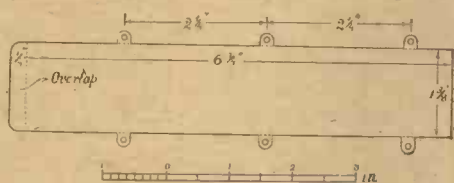


Fig. 4.—Metal for Outer Cover.

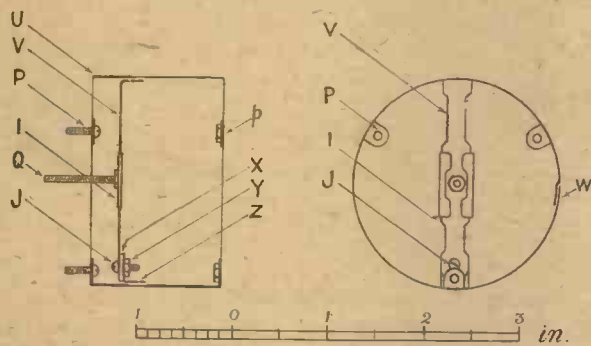


Fig. 5.—Details of Case.

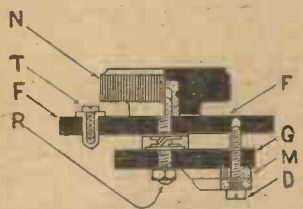


Fig. 3.—Adjusting Knob.

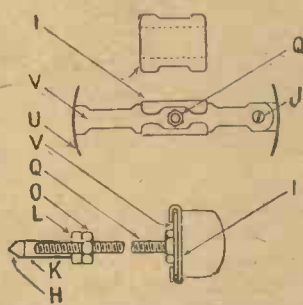


Fig. 6.—Details of Reed and Adjusting Device.

The outer cover can be made out of a strip of brass sheet cut according to the dimensions given in Fig. 4, which is rolled round and the joint W (Fig. 5) soldered. For fixing this to the receiver and the magnets, nuts are soldered on the inside of the three projections of one side, while small 6 B.A. screws P are soldered on the opposite three projections (see Fig. 5).

The Reed

The vibrating reed V (Figs. 5 and 6) is cut out of a piece of hard brass sheet, one end of which is bent at right angles and soldered to the inside of the cover U. The free end is screwed to the L-shaped piece Z and also soldered to the inside of the brass cylinder, with a rubber washer X in between. The difficulty of tapping the piece Z can be avoided by soldering a nut Y on its inside as shown in Fig. 5. The vibrating reed being of brass cannot be actuated by the magnets, and a piece of soft iron I (a diaphragm of the phone will serve for the purpose) of the shape shown in Fig. 6 is cut and fixed on the inside of the reed by turning its edges over. Finally, a length of 6 B.A. rod is soldered in the middle of the reed along with a nut to strengthen the soldered joint.

Further constructional details are provided by the photographs and diagrams.

The receiver described was made for a pleated-paper loud-speaker (12 in. in diameter), the construction of which has already been dealt with in the previous

hole pass the wires which connect the terminals on the board with the receiver.

Tension on Diaphragm

It was noticed that the tension on the paper diaphragm has a considerable effect on the tone and the quality of the music. This necessitated the use of an arrangement for altering the length of the rod pressing against the diaphragm. The arrangement consists of a small piece of brass tube K (Fig. 6) soldered to a nut L on one end, and the other end completely closed by soldering a short length of brass rod H pointed at the end. This tube is screwed on the end of the rod Q and can be kept in any position by a lock-nut O, thus regulating the length of the rod Q.

In conclusion, it might be added that this loud-speaker, though not quite as loud as the horn-type, gives a faithful reproduction free from all distortion.

M. J. C.

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A WANDERER RETURNS

I HAVE just resumed my interest in wireless after the lapse of over a year. My set, together with the inevitable assortment of spare coils, condensers, etc., had been reposing in a damp cellar, whence a fresh wave of enthusiasm has rescued them in a pitiable state of mouldiness and neglect. My accumulator, which is used for various other purposes, had not, fortunately, shared the general neglect, and having purchased a new set of H.T. batteries, I reassembled, in all their damp and mouldiness, the various components of my set. It was amazingly heartening to get an instantaneous response—not from Radio-Paris, for which I was trying, but from Chelmsford, a station that has come into being since my desertion from the science.

Then I slipped gently from all my old friends and, this journal beside me, sought for new stations.

I was at once made forcibly to realise the almost incredible advance that has been made in transmission, and, after the inspection and comparison of various receiving sets, I have been forced to the conclusion that transmission has made far greater strides than reception. Wireless enthusiasts, except those living under the shadow of a broadcasting station and using crystal sets, are still harassed by the bugbear of unreliable and unstable H.T. batteries. Valves, even the best and most expensive of them, are still fragile things. However, I derived enormous comfort from the fact that my own set, which employs a crystal detector and a reflex circuit, had treated the dampest of years in the dampest of places with the utmost contempt, and functioned as admirably as ever; nor do I find it in the least inferior to that of my neighbour, although his is a beautiful instrument of renowned make and almost irritating newness.

From all this I infer that, in general, our receiving sets have improved not of their or our volition, but almost inevitably by the astonishing progress that has been made in transmission. **WALTER MEADE.**

One rheostat may be used on a two-valve amplifier.

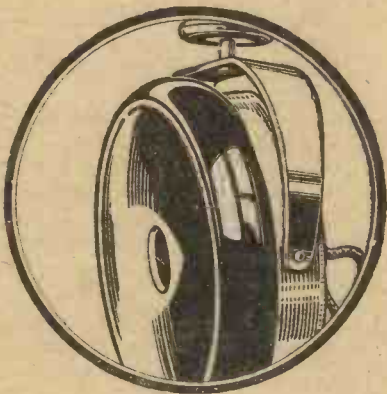
A long aerial is desirable, but good results are sometimes obtained on a short one.

Don't forget to clean off the flux after soldering.

If you use a loud-speaker that needs an accumulator, be sure and shut the current off when you have finished listening-in.



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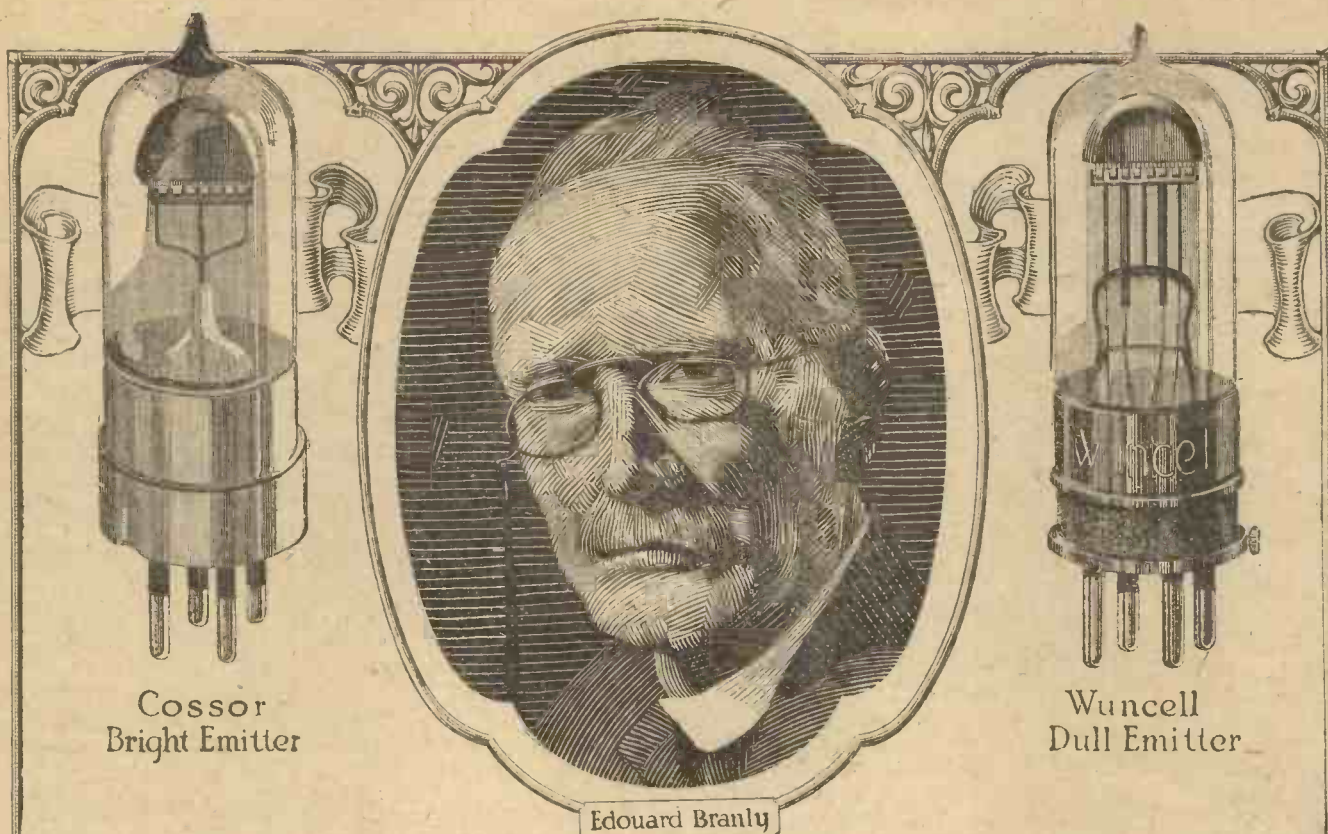
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A few years later, as we all know, signals were successfully transmitted—to the wonderment of the whole world—from Cornwall to Newfoundland—and received on the coherer. Surely one of the most remarkable uses for iron filings ever discovered.

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On Your Wave-length!

Why Bother with H.T. Batteries

I'M not going to describe in these columns a new circuit for the elimination of H.T. batteries. There are more ways of killing a cat than by drowning it, and similarly there are more ways of enticing electrons on to the plate of the valve than by buying expensive and troublesome dry batteries for the plate current supply. I suppose that for every reader who lives in a house without an electrical supply installation there are two or three who have such a service, and it is up to them to see that they avail themselves of the supply for their valve H.T. It's quite a simple matter to rig up the gear, and the first cost is only slightly in excess of the cost of a 60-volt unit. The Neon tube method, of which I speak, with its two attendant chokes and fixed condensers is also interesting from the experimenter's point of view, for the flashes of the tube when in operation on a multi-valve set perform amusing antics, as, for instance, when C.W. signals are being received they can literally be sight read by the flashes! If the amateur has any qualms about meddling with the mains, I think that he will find that his local electrical contractor will fit him up with the required gear at a very moderate sum.

Every Amateur a Transmitter

If anything adds to one's interest in wireless it is the fact that one understands what is taking place at the transmitting end. In order to fully understand transmission every serious amateur should be the proud possessor of a transmitting licence, and there is no reason why he should not have one. Of course I'm not referring to the full open aerial licence which is used by the "pukkah" transoceanic enthusiast, but to the dummy or artificial aerial licence which carries with it a call sign and the Postmaster-General's authority to carry out laboratory experiments on transmitting gear. One feature of the licence which is particularly attractive is the fact that it costs nothing to obtain and is about the only thing in wireless which can be obtained free of charge. As regards limitations, your set must not radiate beyond your own premises and you must not call another station, but nevertheless it is a transmitting licence and your knowledge of things pertaining to wireless will be considerably enhanced.

Possibilities

Think of your own self-satisfaction when Brown, Smith, Green or any other of the "pukkah" transmitting fraternity are discoursing on the merits of oscillators and modulators with a superior air, and you

are able to follow their remarks intelligently and possibly trip them up if you feel so inclined. This perhaps sounds rather too optimistic, but transmission on a dummy aerial so nearly approaches to the real thing and under such convenient conditions that one can often learn far more with such an aerial than can many of the 10-watters who so regularly disturb the ether with their heart-breaking attempts at a little private broadcasting.

An Incentive to Learn

Another possibility is that when once you own such a licence it is an incentive to learn more and more about the science, and even that dry-as-dust requirement of the Postmaster-General's "inquisition form"—umpteen words of morse code per minute—can be tackled with a good heart. This all means that after a few months of dummy-aerial transmission you may easily qualify for the full licence if you wish to, and who knows but what you will in due course become one of the élite who has "been across" the Herring Pond.

Having said this much I expect that I shall now get into trouble with some of the "hams" of whom I have spoken with such gross irreverence. Possibly they do not now recollect the time when they first dabbled with an R transmitter valve and a doubtful 100-volt dry H.T. or, worse still, a 4-volt accumulator and a couple of brass bedstead knobs to form a spark gap. Of course they have their own aspect of "every amateur a transmitter" to consider, and they are none too keen on the ether being any more crowded than it already is. I appreciate their outlook, but a little fresh blood will do no harm. There is still plenty of room for research.

The Transmitting Movement

Furthermore, the transmitting movement requires strengthening; for every ten thousand broadcast listeners there is only one amateur transmitter, and until the strength of the amateur experimenter is felt in official quarters his lot is not likely to be an easy one. It is true that his fine work has caused those who would rather have treated him as a boy with a none too serious hobby to "sit up and take notice," but this of itself is not likely to induce the powers that be to deal leniently with the experimenter in any contemplated alteration to existing rules and regulations.

It is ridiculous, but a fact, that many scientifically qualified men have been debarred from experimenting on an open aerial solely because the P.M.G. was not satisfied that they had any useful experiments in view, or that their morse quali-

fications were in keeping with the official idea of a wireless telegraphy operator. At the other extreme is the spectacle of unqualified minors who, by reason of being in the position to do morse working and enumerate a sufficiently impressive programme, have managed to obtain a full licence.

Obtaining a full transmitting licence has become dependent on the applicant's ability to "tell the tale," coupled with his nimbleness of finger, for it must be admitted that most great inventions have been the result of accident. To think that an applicant can sit down and deliberately write that which he hopes to discover is asking a little too much, and before this state of affairs can be remedied the strength of the amateur must increase so that "pulling weight" might be felt in any future legislation affecting his interests.

Cheaper Valves

Writing in the New Year Number of AMATEUR WIRELESS I predicted that during the year we should see very substantial reductions in the prices of valves. Within the past few days announcements have appeared that prices have been lowered all round, and I am very glad to see that makers have taken this step. The valve is, of course, a much more difficult piece of apparatus to make than the electric-light bulb, but I think that on the whole valves have been too dear, and I am hoping that we shall see another substantial reduction before the year is out. When you come to think of it, those turned out by the French and the Dutch are not too bad—for rectification purposes there is nothing to beat a Dutchman—and their prices are very low. In the case of French valves, the smallness of their price is due probably to some extent to the fact that the franc stands now at only a fraction of its pre-war value; this argument cannot be urged in the case of Dutch valves, for the rate of exchange between Holland and this country has long been slightly against us.

One reason why I welcome the reduction in valve prices is that it brings the super-heterodyne set more within the range of the average wireless enthusiast. Bright-emitters can hardly be used owing to the enormous amount of current consumed by their filaments—ten standard bright-emitters would take about 7 amperes. With valves of the "o6" type we can bring the total current used down to .6 ampere, whilst 3 amperes will supply the needs of ten dull-emitters of the 2-volt type.

From Across the Herring Pond

Conditions for the reception of American stations have been much better of late.

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On Your Wavelength! (continued)

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This is put down in some quarters to improvements made at Northolt, but whether Northolt has anything to do with it or not I am not prepared to say. The other night, having adjusted my set to Bournemouth, I switched off at closing-down time and switched on again just before going to bed. There was WGY, as large as life, and WBZ was coming in so well that it was possible to find him with the set so far from the oscillating point that no trace of his carrier wave was to be heard as the condenser knobs were moved. In neither case was signal strength so great as I have known it on especially good nights, but there was almost a complete absence of atmospheric interference and items from programmes could be heard to perfection. Friends living in and around London tell me that they can generally get both of these stations just now whenever they try for them.

More About the Eclipse

It has been quite definitely established that KDKA's short-wave transmission during the eclipse was picked up in England by at least two listeners. Capt. West, of the B.B.C., whose Transatlantic work is well known to all "fans" was one of the two successful, though even he, apparently, found considerable difficulty in solving the carrier of this station. It is a curious question why, during the daytime, WGY on her normal wave-band should have been so much more easy to receive than KDKA on the short wave, the more especially when we consider the accepted theory that short-wave transmissions travel farther with given input than the longer waves do. But this is quite in keeping with recent experience, which has shown WGY and WBZ at much better volume than the short-wave station even during the normal broadcast hours.

It really does seem as though wireless has made up its mind to confound every theory immediately it is really established, for ever since we came to the conclusion that short-wave work gave better results over distance the reverse has been the case in fact.

A German station is to attempt the re-broadcast of KDKA. Whether the experiment will be a success cannot so far be gauged. Personally I am inclined to think that listeners in England will get better reception direct than via the intermediate transmitter at Stuttgart. Another Canadian station is trying to get over to England. Truly Transatlantic wireless is booming. This station, which is working on 313 metres, should be heard here, I think, unless, as sometimes does happen, a backwash harmonic of Northolt blots it out. However, 313 metres stands a much better chance of getting over than the

wavelength used by the Montreal station during the special tests conducted from there.

Whether this latter station has ever really been heard in England is a moot point, though I believe reports of its reception have come in at various times. Possibly when there is no interference from Northolt—which, by the way, has been the case more often lately than the average listener is used to—the Montreal station would be heard, though personally I have never been fortunate enough to strike during my testing a time when this fortunate state of affairs existed.

A SPLENDID BOOKLET

given Free

with Next Week's Issue of
"Amateur Wireless"

(Usual price, 3d.)

READERS by this time know the worth of our presentation booklets. They are the real thing—specially compiled, and skillfully compiled, to meet the exact needs of readers. The booklet we are giving free with next week's issue is entitled "Wireless Questions Simply Answered," and its purpose is, by the happy method of query and reply, to give the reader just the practical information he needs in a time of difficulty. All sorts of questions on all sorts of wireless subjects are asked and answered.

Will the regular reader do us a kindness by telling his wireless friends?

Will the casual reader extend to us the same courtesy, and will he in addition do just one thing—place a firm order for "Amateur Wireless," with his newsagent, so that he will not be disappointed of next week's and succeeding issues?

The booklet will be of 36 pages, will be simply packed with information, and will be amply illustrated. FREE next week.

FREE next week

To Super or Not to Super

I will deal with a question that I have been asked recently by dozens of wireless friends: Is the super-heterodyne really a good thing? I need hardly say that the answer to this question is the one which must be returned to the majority of wireless posers—yes and no. Let us deal with the "Yes" part first of all. If well built and properly handled the super-heterodyne will give you a degree of selectivity which is absolutely unobtainable with any other kind of set. That is a very strong point in its favour, especially if you live in a place where interference is particularly bad.

Next the range of the super-heterodyne is limited only by the amount of atmospheric interference that is encountered.

This means that you can pick up practically any signal that is going so long as its strength is great enough to enable it to be heard above the crackles and fizzes. But it must not be forgotten that if the range of the super-heterodyne is practically unlimited so far as signals are concerned, the same is equally true of atmospherics. Thus, except when conditions are phenomenally good, it cannot be operated in conjunction with the outdoor aerial. Another point in favour of the super is the fewness of its controls. A nine- or ten-valve set can be built upon whose panels appear only two condenser knobs, one for the aerial and one for the oscillator valve.

On the "No" side we have two very strong drawbacks. The first is that owing to its sensitiveness and to the fact that it brings in atmospherics which would be inaudible in the ordinary way the set is apt to be very noisy. I have never yet known anything like a background of silence with a super. The second is that unless it is very carefully handled it is liable to cause a good deal of interference.

The Power of the Plebiscite

"Vox populi vox aetherii" should really be the motto of the B.B.C., or, in other words, "Give the public what it asks for." Anyhow, Manchester is going to adopt this solution, for so many requests for favourite pieces have been received that one evening is going to be devoted entirely to the listeners' own choice of works, commencing to-night, and as the programme includes "by request" such works as the Finale from Mendelssohn's Italian Symphony, as well as the Overture to Balfe's *Bohemian Girl*, it looks as if the public knows its own business.

On the more serious side, 2 ZY starts to-morrow with that long-promised organ recital at the town hall by Dr. Kendrick Pyne. He is giving the programme postponed from December, and I note that it includes Widor's Organ Symphony in F minor. The outstanding feature of this is a Toccata, which when heard with the orchestra as well as organ gives the impression of mighty wheels going round; one could almost liken it to a musical version of a pyrotechnic display.

The English Element

Some of the best of the programmes recently, I am glad to note, have had a thoroughly native element, despite the symphony concert at the Opera House last night, when Bruno Walter was the conductor and Wilhelm Rode was announced as vocalist. Personally I fail to see why we should revel in German art while we have the Halle Orchestra conductor, Mr. Hamilton Harty, Goossens, Landon Ronald, Dr. Adrian Boult and others.

THERMION.

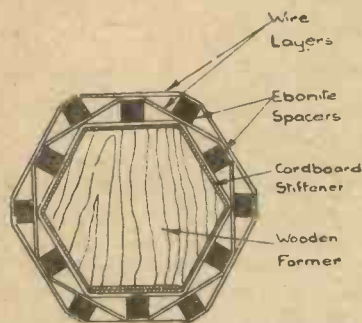


Fig. 1.—Method of Winding Former.

WINDING HEXAGONAL COILS

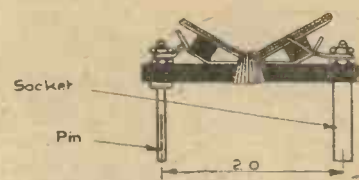


Fig. 2.—Method of Mounting Coil.

THE coil about to be described may be said to have some advantages over the duolateral coil. It is simpler to make, no elaborate former is necessary, and as no shellac or wax is used its self-capacity is a minimum.

A simple former is required. This consists of a hexagonal block 1 in. thick with 1 in. sides. This can be made from wood.

A strip of thin cardboard preferably of a fine hard texture $\frac{3}{4}$ in. wide and about $7\frac{1}{2}$ in. in length is bent round the former. It is overlapped the length of one side and Seccotined, with the end of the wire to be used between the overlap.

A layer of the wire is wound tightly on the cardboard. Six ebonite spacers are now required. These should each be $\frac{3}{4}$ in. long by $\frac{3}{4}$ in. square; they are held on the centre of the coil's sides by a rubber band. Another layer is now wound on over the spacers. After a sufficient number of turns to hold the spacers have been wound on, the rubber band can be removed. This process is continued until the required number of turns has been reached.

The following table shows the gauge of wire required for different wavelengths and the number of turns per layer.

No. of Turns	S.W.G.	Turns per Layer
12	18	6*
18	18	6*
25	18	6*
30	18	10
35	22	18
40	22	18
50	22	18
60	22	18
75	26	25
100	26	25

* Turns air-spaced.

The wire in all cases should be double-cotton-covered.

Care should be taken to see that the layers are all wound in the same direction.

When the finished coil is slipped from the former it will be found to be very rigid if care has been taken to wind the wire on tightly.

A slight modification must be made for coils for the higher frequencies. Six

equally-spaced grooves are filed on the corners of the cardboard stiffener and on one side of the spacers. The wire when wound into these grooves will have an air space of about one diameter between the turns.

Note should be made of the fact that when more than four layers are required the third and subsequent sets of spacers should be made with slightly increasing thicknesses.

The coils can be conveniently mounted on the standard plug and socket.

If the self-capacity is to be at a minimum, special mountings should be made.

The mountings can be made quite easily from a piece of ebonite $2\frac{1}{2}$ in. long by $\frac{3}{4}$ in. wide. An ordinary valve pin and socket tapped into the ebonite are used. The coil can be bound to the mounting by thread or empire tape, or attached by a strip of fibre passed over the coil and fixed to the pin and socket by nuts.

If the coil is of such a size that it fouls the pin and socket, a packing block of $\frac{1}{4}$ -in. ebonite $1\frac{1}{2}$ in. long by $\frac{3}{4}$ in. wide should be inserted between the coil and the mounting.

B. H.

WIRELESS FOR SHIPS' LIFEBOATS

TWO of the motor-driven lifeboats of the R.M.S. *Orbita*, which have been built by Messrs. Harland and Wolff, Ltd., of Liverpool, have been equipped with the latest type of Marconi wireless apparatus.

The photograph shows one of these lifeboats on her trials at Liverpool.

The installation comprises a transmitter and a receiver which embodies a direction finder. The transmitting range is, under normal conditions, at least sixty nautical miles when the receiving station is using a crystal detector; very much greater ranges can be obtained when a valve receiver is employed.

The transmitter, which is of the quenched spark type, is supplied with power by a generator driven by a petrol engine, which can be run continuously for nine hours.

The receiver, with which dull-emitter



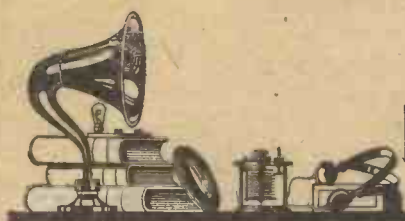
Marconi Installation on a Ship's Lifeboat.

valves are used, can be employed for "all-round" reception or, by a simple adjustment, for direction finding. For the latter important service the small rectangular frame aerial mounted near the bow of the boat is used in conjunction with the main aerial.

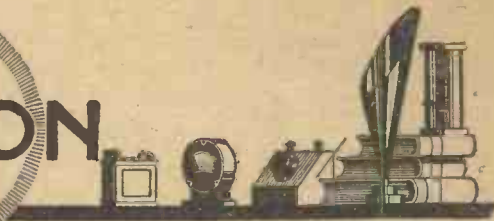
Station C N R, Moncton, Canada, transmitted a special programme for the benefit of British listeners on February 3.

On three recent occasions the broadcasting from 2 L O has been heard in British North Borneo, about 10,000 miles away.

An additional direct-wireless telegraph service to New York has been opened by the Marconi Wireless Co., and messages can now be sent at the rate of 200 words a minute.



OUR INFORMATION BUREAU

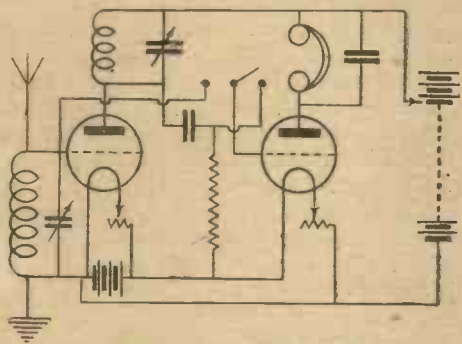


RULES.—Please write distinctly and keep to the point. We reply promptly by post. Please give all necessary details. Ask one question at a time to ensure a prompt reply, and please put sketches, lay-outs, diagrams, etc., on separate sheets containing your name and address. Always send stamped, addressed envelope and attach Coupon (p. 288).

Switching in H.F. Circuits

Q.—What is the simplest method of switching out the high-frequency stage in a set employing 1 H.F. and detector?—H. S. (S.W.17).

A.—We do not recommend switching in high-frequency amplifiers, but where it is



Switching Out the H.F. Valve.

essential to dispense with the high-frequency amplifier the connections shown in the accompanying diagram may be employed.—U.

Wireless Waves

Q.—How fast does a wireless wave travel?—L. C. (E.9).

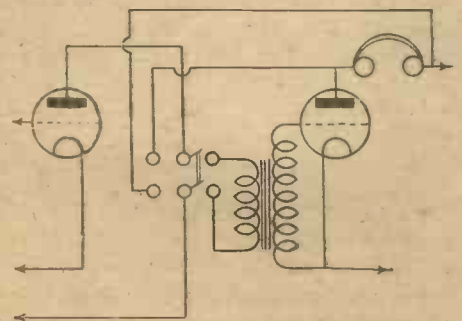
A.—186,000 miles a second. This speed never varies, and is identical with that of light and radiant heat.—U.

Switching Out the L.F. Stage

Q.—Please give a circuit diagram showing a method of switching out the last valve on a 3-valve set (H.F., D. and L.F.), using a double-pole double-throw switch.—A. W. (Rye).

A.—The connections are shown for a switch to cut out the low-frequency amplifier.

A double-pole double-throw switch is



L.F. Switching.

employed for switching, and there is no need to employ a special anti-capacity switch for the purpose.

When placed to the left the L.F. valve is cut out, and when placed to the right the amplifier is introduced.—U.

Weather and Wireless

Q.—Does weather affect wireless?—D. G. (Wimbledon).

A.—Not very much. Thundery weather may cause atmospherics, but fog, rain, frost or snow make no particular difference to wireless signalling.

Aerial insulators are apt to leak in damp weather and loss of signal strength is often noticed during wet periods for this reason.—U.

Capacity Effects

Q.—How can one avoid hand-capacity effect?—S. D. (Reading).

A.—We suggest you fit an extension handle to the tuning condenser. You will find that adjustments of filament current and anode potential are necessary before good results are obtainable.—U.

The Lightning Arrester

Q.—What is a lightning arrester?—H. O. Manchester.

A.—As applied to wireless, a lightning arrester is essentially a minute gap between the foot of the down-lead and the earth-lead.

The theory is that high-tension currents, such as those due to lightning discharges, or even the "return currents" from earth due to a near-by cloud inducing a charge in an aerial, will jump across the small gap rather than traverse the highly inductive winding of the receiving set which is connected to opposite sides of the gap.

The received currents, on the other hand, are too feeble to jump the gap and must of necessity traverse the receiving apparatus.—U.

Aerial Gauge and Signal Strength

Q.—Does the gauge of wire used for an aerial affect the strength of signals received?—A. F. (Birmingham).

A.—There is absolutely nothing to be gained by using wire thicker than No. 22 S.W.G., 0.028 in. in diameter. With a crystal set as the receiver no appreciable difference in signal strength will be noticed when No. 37 S.W.G. wire or silicon bronze aerial wire is used. Mechanical strength of the wire will, however, have to be remembered when erecting aereals.—K

Two Leads from One Aerial

Q.—Will the efficiency of an aerial be reduced if a lead-in is taken from each end?—T. C. (London).

A.—No attempt should be made to attach two receivers to the same aerial. The aerial may, however, be broken in the centre if desired, and a "lead-in" taken from each end.—U.

Impedance

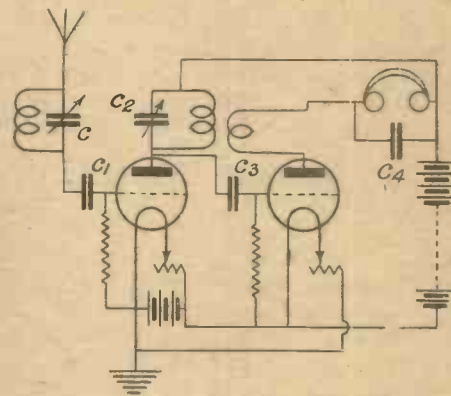
Q.—What exactly is meant by impedance?—W. P. (Barnet).

A.—The property which a wire possesses of offering apparent obstruction to the passage of an alternating current. Simply explained it may be stated thus: Inductance offers obstruction to the passage of a direct current, but is almost immediately overcome, and then the current flows.

With alternating current, changing direction at high speed, the obstruction is not overcome before the current changes its direction, and is again obstructed, the result being that it never gets through.—U.

Short Wave Sets

Q.—Please give a circuit, employing 1 H.F. and detector suitable for long-distance work on short wavelengths (in the range of 100 to 200 metres). Please give values of condensers.—H. M. (Hereford).

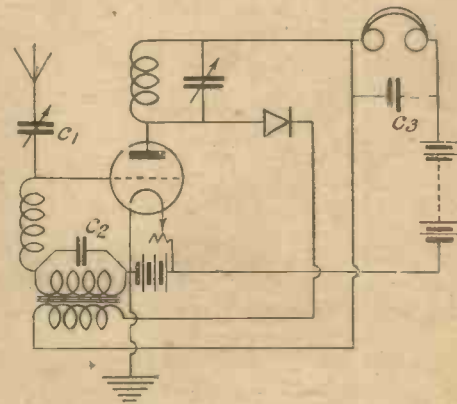


H.F. Amplifier.

A.—High-frequency amplification on these short wavelengths is exceedingly difficult, but the circuit shown in the accompanying figure may be used with every chance of success: C is the ordinary A.T.C. having a value of .0003 microfarad. C₁ and C₃ are grid condensers, value .0003 microfarad. C₂ the anode T.C. may have a value of .0002 microfarad. C₄ is the highly desirable phone condenser that enables high-frequency pulsations in the plate circuit to pass direct to earth. A suitable value is .001 microfarad.—U.

A Single Valve Dual Circuit

Q.—What are the connections for a single-valve dual set, employing a crystal detector and a low-frequency amplifier?—I. S. (Hammer-smith).



One-valve Reflex Circuit.

A.—The necessary connections for a single valve reflex receiver are shown in the accompanying figure. The condenser C₃ should have a value of about .0003 microfarad and is for the purpose of by-passing the aerial current direct to earth.—U.

THE TRUTH ABOUT AMPLIFICATION

ALTHOUGH to-day the general public is much more well informed on wireless matters than it was a couple of years ago, a great deal of uncertainty seems to exist in the minds of amateur constructors as to exactly how much actual amplification can reasonably be expected from a given combination of valves.

Vague Ideas

It is safe to say that until comparatively recently even experts had very vague ideas on this subject. Only the other day the writer picked up a book written a few years ago by a now famous author, who, referring to a set comprising two stages of high-frequency amplification, a valve detector and two low-frequency stages, assumed that as each valve could be expected to increase signal strength at least five times, a total amplification of 5^2 , or 3,125 times, would be given by the set. And the H.F. valves were coupled by aperiodic transformers!

Although nowadays few people are optimistic enough to expect such enormous amplification from any "straight" circuit, still most amateur constructors seem to have a very hazy idea as to what amount of amplification really is obtainable, and it is the purpose of this article to attempt to clear away some of this vague uncertainty on a very vital subject.

Most of those who have had experience with multi-valve sets will have found that

much louder signals can be obtained by using low-frequency amplification than by using the same number of stages before the rectifier. It is now generally agreed that high-frequency amplification, by present-day methods, is of no use at all on short wavelengths (below about 200 metres), while several authorities have expressed a doubt as to whether it is of any real use even on the broadcast band, and one or two have even gone a step further and stated definitely that it is not.

Exaggerated Statements

These latter, in the writer's opinion, have gone too far, and their conclusions do not agree with his own experience. It can be confidently stated that on the broadcast wavelengths, using one stage of H.F. amplification before the rectifier, in a set very carefully designed to reduce capacity losses to a minimum, a voltage amplification of twice is possible, but is seldom obtained by the home constructor. The amplification given by a second H.F. stage may be as high as 1.5, but not more, while it is practically impossible to obtain any useful amplification at all from a third H.F. stage.

In view of its low efficiency, H.F. amplification may be considered to be of doubtful utility on the broadcast wavelengths (except in certain special cases) and not worth the extra tuning complications, the L.T. and H.T. consumed, and the cost of

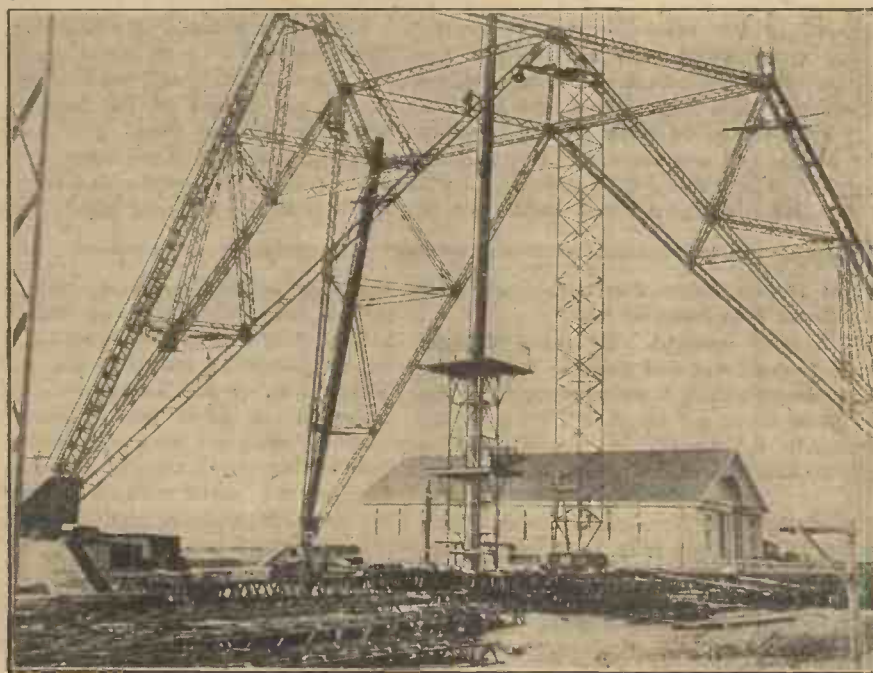
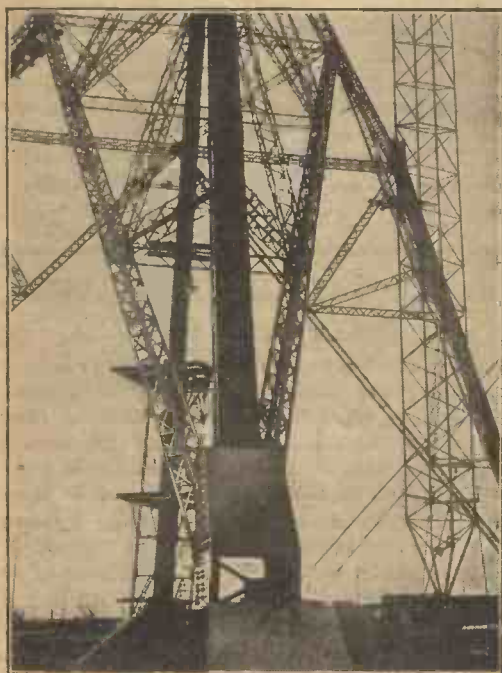
the extra valves. However, it should be pointed out in this connection that, owing to the peculiar shape of the rectification curve, the efficiency of the detector increases with an increase in the amplitude of the H.F. oscillations applied to it, and thus the slight increase of signal strength due to the use of one or two high-frequency stages may be of more use than is at first sight apparent.

L.F. Amplification

Coming now to the question of low-frequency amplification, we find that the operating conditions are vastly different from those obtaining on the other side of the rectifier. We are now able to make use of step-up transformers to increase the voltages applied to the grids of the valves (which was not practicable when dealing with H.F. currents owing to the necessity of tuning both the plate and grid circuits to approximately the same wavelength as the incoming signals); also the existence of capacity between leads and components is of much less importance when dealing with low-frequency currents.

The amount of "step-up" that can be obtained by the use of transformers is, however, strictly limited, as in order to obtain good reproduction it is necessary to make the impedance of each transformer winding approximately equal to the impedance of the rest of the circuit in

(Concluded in first column of next page)



BUILDING THE LARGEST WIRELESS STATION IN THE WORLD

At Königswusterhausen, Germany, the largest wireless station in the world is now being erected. The photographs show the base of the great tower, which is to be 225 metres high, in course of erection and one of the transmitting houses.

AN EXTENSIBLE UNIT SET.—VI

THE REACTION UNIT

THE constructor, if he is a comparative beginner, will by now have gained enough practical experience in working the set to enable him to employ reaction. Properly-used reaction can considerably increase the sensitiveness, which is the distance-range of a receiver. Abused, it will cause interference with the reception of broadcast by sets in the neighbourhood.

The parts for the reaction unit are shown in Fig. 28a (p. 225). They are: Two 9-in. lengths of rubber-covered flex; one condenser extension handle; one



Fig. 39.—View of Set showing Connections on Panel.

the bar which has hitherto joined these terminals) reaction may be applied to the aerial circuit or, particularly for broadcast, to the H.F. circuit. The adjustment of the reaction coil with relation to the other is quite smooth, and to change the reaction from one circuit to the other is only a matter of a moment. To test the unit it should be tried on each coil, and should it in either case produce no increase in signal strength as one coil is made to approach the other the leads of the fixed coil must be reversed. If



Fig. 37.—Reactance Unit Complete.

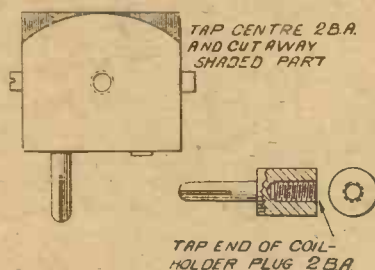


Fig. 36.—Details of Reaction Coil Mount.



Fig. 38.—Top View of Set showing Reactance Unit.

coil holder; one coil-holder plug; $1\frac{1}{2}$ -in. 4 B.A. screwed rod.

Fig. 36 shows each part with the necessary machining and drilling indicated. To assemble the unit the screwed rod is secured in the extension handle by the fixing screw which is incorporated in the latter. It is important to ascertain when purchasing this handle that the junction has a set-screw, as some are tapped only for 2 B.A. rod and are secured by a binding nut, which will not be suitable in this case. Next screw the coil holder on to

the rod until it binds rigidly against the extension handle collar; finally screw the coil-holder plug on tightly. In Fig. 37 this is made clear and the unit is shown completed.

There now remains only to drill a 2 B.A. clearance hole between the plug and socket of the aerial-tuning coil holder and another in the coil holder of the high-frequency unit. By inserting the plug of the reaction unit into either of these holes and attaching the flex leads to the two terminals at the top of the detector panel (discarding

reaction phenomena is absent in both cases, reversing the reaction coil leads will put matters right.

Fig. 38 is a photograph of the top of the set with reaction applied to the tuning coil of the aerial circuit. The socket in the H.F. coil can be seen.

Fig. 39 is a photograph of the complete set as so far described and including the reaction unit. The next unit which will be described is a simple and effective "wave trap."

DAVID GREY.

(To be continued)

"THE TRUTH ABOUT AMPLIFICATION" (continued from preceding page)

which it is inserted. By using a high-ratio transformer and suitable valves it is possible to obtain a voltage amplification of 30 or more per stage without affecting seriously the quality of reproduction; a more usual figure, however, is 15.

Resistance-capacity Amplification

So far we have only considered transformer-coupled L.F. amplifiers. When we make use of resistances and condensers or chokes and condensers between the valves we are, as when dealing with H.F. currents, unable to obtain any step-up in voltage between one valve and the next. However, as losses due to capacity and other causes are much less serious here

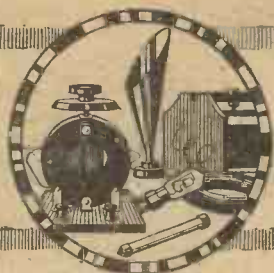
than on the high-frequency side, we can obtain an actual voltage amplification more nearly approximating to the theoretical amplification factor of the valve. A common figure for the latter is 10 or 12, although at least one modern valve, specially designed for use in these circuits, has a theoretical amplification factor as high as 20! Thus with choke-capacity or resistance-capacity coupled L.F. amplifiers, using general-purpose valves, an actual voltage amplification of 8 to 10 times per stage may be expected. J. F. JOHNSTON.

The French Government is seriously considering a proposal to convert the Bordeaux, Lyons and Tours high-power stations for the purposes of wireless telephonic transmissions.

BROADCASTING AND DEEP-SEA FISHING

IN Sweden reports are regularly broadcast by the Gothenburg (S A S B) wireless station on 700 metres, as well as from other coast transmitters, for the benefit of the smacks at sea. Information is given relative to the positions at which large shoals of fish have been located. Weather forecasts are also broadcast at regular intervals in order that the trawlers may be duly warned of approaching storms and movements of icebergs. J. G. A.

Unable to applaud wireless items they enjoy, American listeners-in send printed cards which carry their views at postcard rate.



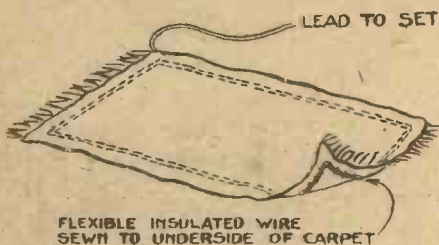
PRACTICAL ODDS AND ENDS

A Novel Indoor Aerial

THE illustration shows a convenient method of constructing an unobtrusive indoor aerial for use in the top rooms of a house situated near a broadcasting station.

The receiving set used should preferably contain at least one stage of H.F. amplification, particularly if the carpet to which the aerial wire is sewn is small.

An earth lead to some near-by water-



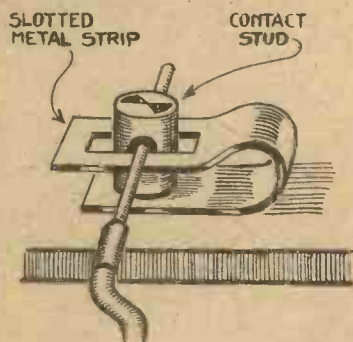
Wires Sown under Carpet.

pipe must, of course, be employed in conjunction with the "carpet" aerial.

R. N. W.

A Spring Terminal

THE following may be used in any position or for any purpose when quick detachability is required. The materials required are few, being single contact stud, nut and washer, and a short piece of springy sheet brass. Ordinary soft sheet may be brought to this condition by



Details of Terminal.

judicious hammering along its length. The sketch should be self-explanatory.

C. W.

Lead-in Wires

SERIOUS losses of aerial energy are liable to occur at the point where the leads of a multi-wire aerial meet owing to imperfect contact between the wires.

A good way of connecting them is to

take a short length of annealed copper tube, hammer one end flat, and solder the aerial into the other end. The flat end can be drilled and held under a terminal on the end of the lead-in tube. K.

Soldering Aluminium

THERE are occasions when the constructor is up-against the problem of soldering aluminium.

The job is not difficult when set about in the correct way and using one of the many specially prepared solders for that metal. The procedure is slightly different to that of soldering brass or copper in that no flux is used. Use a perfectly clean iron, and heat a little above the usual temperature. Make a little brush from a few pieces of thin brass wire.

After cleaning the parts, melt off the stick a "blob" of solder on to the place to be tinned with the iron. (Do not attempt to pick up the solder with the iron in the usual way.) Keep the iron on the outer edge of the blob and with the wire brush scratch the metal underneath *through* the blob of molten solder. This will break up the filter of oxide which will have formed between the solder and the metal and preventing them from uniting. "Humouring" the solder with the iron at the same time will result in the solder adhering and a job being made.

A fine nickel bit makes things easier, but with care and a little patience success can be obtained with a copper bit if the hints above are followed. C. W.

Indoor Earths

FREQUENTLY amateurs who are unable to erect outdoor aerials find it equally difficult to get a satisfactory earth connection.

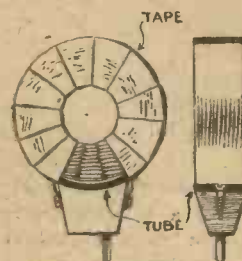
Perhaps the simplest thing to use is an iron bedstead as a counterpoise earth. A large piece of copper or iron netting placed under the floor covering can also be used. U.

Honeycomb Coil Mounting

HONEYCOMB coils, unless rendered less efficient by impregnation with shellac, are liable to be crushed with constant use if the coil plugs fit at all tightly.

A novel method of mounting which will stand up to any ordinary wear and tear is shown in the diagram. A length of $\frac{1}{8}$ -in. ebonite tube is required of 3 in. or $3\frac{1}{2}$ in. diameter. This is cut into rings of the thickness of the coils to be mounted. The rings are secured to the coil mounts

by a screw, as shown in section. The coils can be held in position by binding with empire cloth or insulating tape. By varying the number of pins counted in winding, the gauge of wire and thickness of coils, an efficient set can be made all approximating to the same diameter. A hole only slightly less than the diameter of the fixing screw must be drilled in the ebonite mount before assembling is attempted.

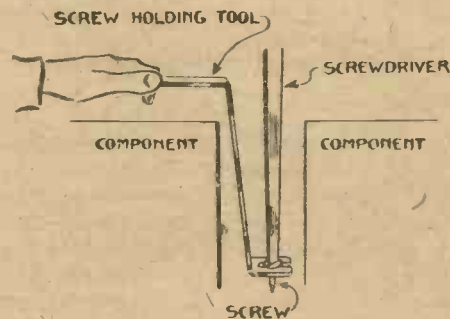


Method of Mounting Coil.

When cotton-covered wire is used it is advisable to bind with empire cloth first unless the coil is lightly impregnated with wax or shellac. When wax is used any surplus should be removed by rotating the coil about 9 in. above a gas-ring before removing the pins. S. E. N.

Screws in Awkward Places

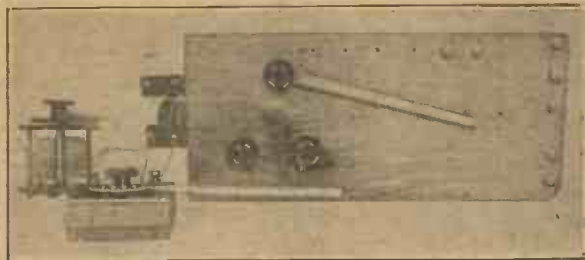
HOLDING a screw in an inaccessible position while the screwdriver is manipulated often proves somewhat of a problem. By constructing a simple tool



Method of Supporting Screws.

from a piece of strip brass or steel as shown in the illustration the screw may be held quite easily while the first few threads are engaged.

In making the holder it should be noted that a slot is cut in one end of a width great enough to pass the shank of the screw but not the head. In some cases a strip of cardboard or thick paper will serve the same purpose. N. W.



Front of Panel.

NOW that so much transmission takes place on 50 to 120 metres, many amateurs wish they had a receiver which would work efficiently on that range. It is true that certain precautions must be taken when working on so low a wavelength, but, providing no grossly careless mistakes are made, there should be no real difficulty for anyone who has had some experience of valve sets in general.

The writer wished to build a receiver which would bring in American amateur and short-wave broadcasting stations as regularly and reliably as possible. The use of high-frequency amplification is not to be recommended to anyone who wishes to build a short-wave receiver with the minimum trouble and expense. It was decided, therefore, that for general purposes a detector and single L.F. amplifier should be used.

On nights when conditions are good it is possible to use a further stage of note magnification, but as a rule atmospherics are sufficiently bad to render the use of another amplifier objectionable.

The Detector Circuit

There being no radio-frequency amplification, it is obvious that the detector valve must work at its utmost efficiency. It is in the detector circuits that special precaution must be taken. Wiring up with No. 26 S.W.G. wire in systoflex may be all right in a note magnifier, but it is not suitable for very high-frequency circuits; the spacing of the wiring must be kept reasonably large.

The tuning coil requires careful designing. It is possible to receive signals with coils wound in the ordinary way on cardboard formers or in honeycomb form, but the results are very disappointing. The coil must be rigid and have a very low self-capacity and H.F. resistance.

Then there is the question of reaction. It will be found difficult to make the circuit oscillate nicely with the use of the ordinary feed-back coil. If it is at all periodic, fairly tight coupling will be required, and the change in wavelength of the circuit will be very large for small changes in coupling, making it difficult to tune in weak telephony. If a tuned-reaction coil is used the set will be found to burst into oscillation suddenly, and smooth control will be very difficult to

obtain. A single-coil circuit was therefore tried. The finished receiver uses the Hartley circuit, such as is common in transmitters.

It will be seen from the circuit diagram that the plate is joined through a small condenser to one end of the coil and the grid condenser to the other. A lead is taken from the centre of the coil to the filament. The small variable condenser in the plate lead controls the oscillation of the valve, giving a fine adjustment of reaction with very little wavelength change for corresponding changes in reaction. The tuning condenser is put across the whole coil. It was originally intended to use an entirely aperiodic aerial coil, but after a certain amount of experiment it was discovered that a semi-tuned aerial circuit increased the signal strength in some cases by 100 per cent.

It will generally be found impossible to tune the aerial circuit exactly with the secondary because the detector valve stops oscillating unless a very high plate potential is applied. This is exceedingly bad practice, as the set virtually becomes a low-power transmitter and will cause interference for a considerable distance around. But it will be found that quite a large increase in signal strength will be gained by tuning the aerial circuit somewhere near that of the received signal.

The set was built with a view to reliability and efficiency, and hence little has been done to make it look attractive, as will be seen from the two photographs which give a general view of the receiver.

The front panel is of mahogany which had been used previously for other apparatus. If desired, an ebonite panel may of course be used.

The panel is roughly 20 in. by 8 in. by $\frac{3}{8}$ in., and is screwed to the edge of the baseboard, which is of varnished teak size 12 in. by 14 in. by $\frac{3}{8}$ in.

Inductance Coils

The coils next merit attention. In the first place all insulation on the wire is dispensed with and bare tinned-copper wire is used. The gauge is also important. If this is too small the resistance will be too large. It must be remembered that at very high frequencies only the outside surface of the wire carries the current.

A RECEIVER FOR SH

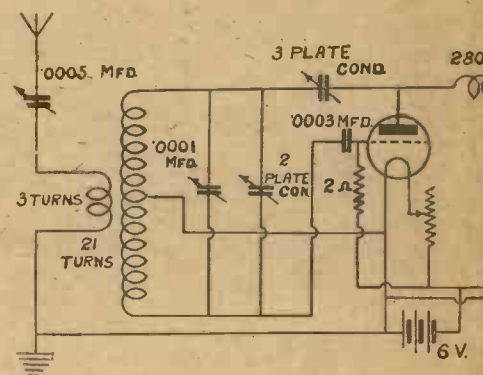
CONSTRUCTIONAL NOTES ON A SIMP



View of Receiver

The wire must therefore be of large cross-section. If, on the other hand, the wire is made very large, very wide spacing would be necessary to reduce the capacity of the coil. It has been found, after a lot of experiment, that No. 16 round tinned copper wire is the best for the purpose.

The next item which claims attention is the former. If any solid support is used



it will increase the capacity of the coil. An ultra efficient coil would be self-supporting. This has the disadvantage of being very sensitive to vibration, etc. Four thin strips of dry wood were used to support the turns. Here again ebonite could be used, but it would increase the capacity of the coil, the specific inductive capacity of ebonite being considerably larger than that of wood. Twenty-one holes, $\frac{1}{16}$



Back of

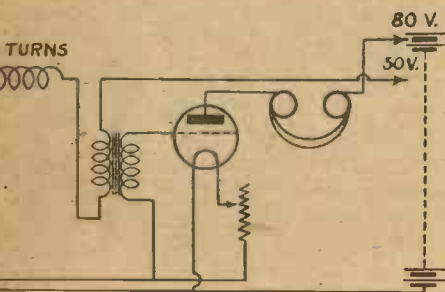
SHORT WAVELENGTHS

THE SET FOR AMERICAN BROADCAST



from above.

ing one end in the vice and twisting the other end round a tool handle and pulling hard. When the wire is quite straight, take a stout cardboard or wooden former, about 3 in. in diameter and about 6 in. long, and attach one



Circuit Diagram.

end of the wire to it. Now wind on some twenty-four turns as tightly as possible and cut off the surplus wire. On releasing the wire the coil will spring out to a diameter of about 4 in. About half the first turn is now cut off and the four pieces of wood threaded on one after the other.

When the wire has been put through the first hole it is threaded through the next until all the 24 turns are through.

Panel.

A piece of wire is now soldered to the middle of the middle turn. This is important if the set is to work properly. A length of the same wire is then wound to form the aerial coil, which has three turns. The construction will be obvious from the third photograph. The size of this coil is made so that it just fits into the larger coil.

Condensers

The condenser which is connected in series with the aerial is of .0005 microfarad capacity and need not necessarily have an anti-capacity handle. This condenser can be seen in the photograph on the left. The other condenser in the box is of .0001 microfarad fitted with a long (10 in.) extension handle. It will be seen that this condenser is connected to a pair of terminals on a strip of ebonite on the left of the panel. These terminals are wired across the whole of the coil. The pair of terminals above are wired in parallel and are for the use of a two-plate vernier condenser.

The anode stopping condenser has two moving plates and one fixed plate between them. It is mounted on the panel, and the extension handle can be seen in the photograph.

The valve holder used for the detector valve is also an important point. An ordinary A-type valve holder has far too large a capacity for use on short wavelengths.

Four extra short valve sockets are screwed on to a piece of $\frac{1}{8}$ in. ebonite. A small hole is drilled lengthwise in the shank of the socket and the wire soldered in. As much metal as possible is filed away from between the legs to still further reduce the capacity.

A hole is drilled in each corner of the ebonite and four screws hold it down, sufficient condenser spacing washers being placed between the wood and the ebonite to prevent the wires touching the baseboard.

The grid condenser is of good quality with a capacity of .0003 microfarad. A grid leak is connected between grid and negative L.T. Clips are dispensed with, and the wires are soldered directly on to the brass ends of the leak to ensure reliable connection. A leak of 2 megohms is satisfactory, but it must be of good quality

or silent working will be absolutely impossible.

On referring to the circuit diagram it will be seen that an H.F. choke coil is connected in series with the primary of the L.F. transformer. This is essential in order that the H.F. oscillations may not by-pass through the H.T. circuit. The self-capacity of these coils must be low. In this case two are put in series. One has 160 and the other 120 turns. They are mounted on blocks of ebonite and well spaced.

The L.F. transformer can be of any good make. The whole L.F. amplifier is built on ordinary lines and contains no special features. It will be noticed that separate terminals are provided for positive H.T. for detector and amplifier.

Two Cossor P1 valves are used ordinarily and have given every satisfaction. About 50 volts are ample for the detector, while 80 volts may be used on the amplifier. The bottom end of the secondary of the transformer should be connected to the negative L.T. terminal, thus providing a potential difference across the filament rheostat for a slight grid bias.

Results

It will be seen from the diagram that the centre tapping of the coil is also joined to earth. This is not essential, but by being so any hand-capacity troubles are avoided when adjusting the filament current.

No condenser is necessary across the transformer or H.T. as there should be no H.F. current passing in this circuit.

The set has been in use for some little time on a temporary aerial consisting of 60 ft. of ordinary 7/22's bare wire with a 10-ft. lead-in. The aerial is about 25 ft. high at the lead-in end and 12 ft. high at the free end. The aerial is far from efficient, but KDKA can be heard any night at 11.20 p.m. and by midnight it is sufficiently strong to work a small loud-speaker directly off the set.

An improvement will probably be found in the use of a counterpoise. This should consist of four or five wires spaced about 2 ft. or 2 ft. 6 in. apart and fixed about 6 ft. above the ground parallel to the aerial. They should be perfectly insulated and as much care taken over them as the aerial itself.

H. A. C.



The Inductance Coil.

THE NEW 2LO TRANSMITTER

A PREVIOUS announcement of 2LO's forthcoming move from its present position at Marconi House has already been made, and details of the new transmitter are now available.

Two aerial masts of the lattice-steel type are being erected on the roof of a West End store, and will be about 125 ft. high. The building itself is about 100 ft. high, so it will be seen that an effective height of 225 ft. will be obtained.

The aerial itself is of the inverted L-cage type, only some 70 ft. long. The lead-in is, however, 220 ft. long. The aerial consists of two "sausages," spaced by a 15-ft. spreader, each "sausage" having five wires on 3-ft. 6-in. diameter hoops.

The transmitter will be housed in a hut which is being constructed on the roof of the building directly in line with the masts. This hut will contain the actual wireless transmitter. A second hut near the base of one of the masts contains the alternators and dynamos.

The input power of the transmitter will be 3 kilowatts to the anodes of the oscillators—that is, twice the power at present employed at London and other main stations. The set has been specially built, and it is in effect equivalent to two main station transmitters run in parallel.

The fact that the power of the London station is being doubled will, of course, not mean that its range will be doubled. It will, as a matter of fact, be increased by less than one and a half times, and its effective crystal range will probably be in the neighbourhood of 25 miles, assuming that it is at present 17 to 18 miles.

REDUCTION IN THE PRICE OF VALVES

The following are the reductions in the prices of wireless valves which came into operation on Monday, February 2, 1925.

Name	Type	Present Prices	Reduced Prices
B.T.H.	R.	12/6	11/-
Cossor	P.1. & P.2.	12/6	11/-
Ediswan	A.R. & R.	12/6	11/-
Marconi Osram	R. R.5V.	12/6	11/-
Mullard	Ora. R. H.F. & L.F.	12/6	11/-
"	Ora B.	13/-	11/6
B.T.H.	B.3.	21/-	18/-
Cossor	" Wuncell " W.1. & 2.	21/-	18/-
"	" W.R.1. & 2.	23/6	20/-
Ediswan	A.R.D.E.	21/-	18/-
Marconi Osram	D.E.R.	21/-	18/-
Mullard	L.F. Ora D.3. L.F.		
"	D.3. H.F.	21/-	18/-
B.T.H.	B.5.	25/-	21/-
Cossor	" Wuncell " W.3.	25/-	22/6
"	" W.R.3.	27/6	25/-
Ediswan	A.R.06	25/-	21/-
Marconi Osram	D.E.3.	25/-	21/-
"	" D.E.6.	25/-	22/6

Name	Type	Present Prices	Reduced Prices
Mullard	D.F. Ora. D.06 L.F. & H.F. Weco.	25/-	21/-
Western Electric	Wecovalve	25/-	21/-
B.T.H.	B.4. B.6.	35/-	30/-
Ediswan	P.V.5.D.E.	35/-	30/-
Marconi Osram	D.E.4.	30/-	26/-
"	D.E.5. D.E.5.B.	35/-	30/-
Mullard	D.F.A.2. D.F.A.O.	30/-	26/-
"	D.F.A.1. D.F.A.4.	35/-	30/-
B.T.H.	B.7.	37/6	32/-
Marconi Osram	L.S.5.	55/-	50/-
Mullard	D.F.A.3.	37/6	32/-

St. David's Day this year will be the occasion of an interesting innovation. The B.B.C. have now decided to broadcast the service which will be held at the King's Cross Tabernacle, London, on the evening of March 1 (St. David's Day).

The broadcasting of the Nottingham Council debates is the subject of a report by the General Purposes Committee which will be considered at the meeting of the Council to be held shortly.

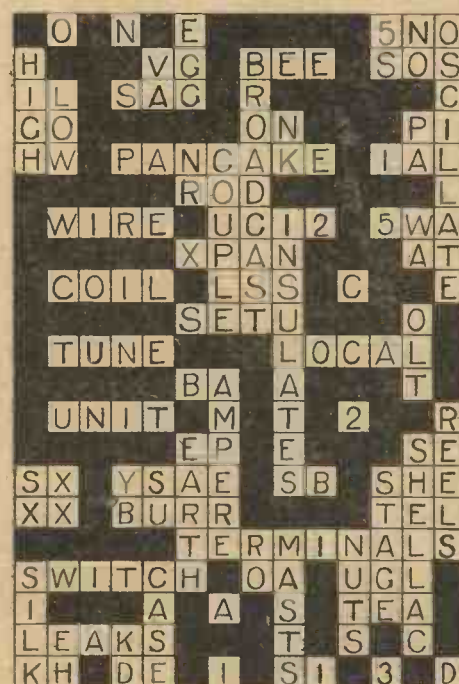
Radio-Paris has attempted successfully the relaying of programmes broadcast from 5XX at Chelmsford, England. These relayed concerts are of great interest to French amateurs who have not been able to pick up England directly.

Great success has attended the efforts of M. Robert Goldschmidt to establish wireless communication with the Belgian colony in the Congo.

Recent broadcasting from KDKA has been clearly heard at Sydney (about 8,000 miles away).

THE SOLUTION OF THE "A.W." CROSS-WORD CIRCUIT

(The puzzle was published in our last issue.)



RADIO PARIS AND 5XX

THE following is a copy of a letter which we have received from Capt. Eckersley, chief engineer of the B.B.C., on the subject of a paragraph which appeared in "On Your Wavelength" in No. 136.

SIR,—In a recent issue of AMATEUR WIRELESS the remark was made: "The man in the Wireless Street has never succeeded in bringing in Radio-Paris while 5XX is working. Now we know where we fail—the B.B.C. cannot do it either." A remark was made in the *Radio Times* to say that with a really selective set it was possible to tune out Chelmsford in London and get Paris. In another issue of the *Radio Times* the great difficulty of eliminating the one in favour of the other was commented upon. The two statements do not contradict one another. There is a great deal between the man in the Wireless Street and the expert operating a really selective set.

Certain of our member firms market sets which we are sure will comply with the desired performance. I was present at a test in which 5XX was tuned out and Paris brought in. In this particular case a good aerial was used with reaction, a really satisfactorily arranged coupled circuit, and a well-designed tuned anode.

Possibly the above may tend to clear up any misconception, and illustrates the difference between a really selective set and the one used by the man in the Wireless Street. This is not meant to disparage the man in the Wireless Street, who for general purposes does not require a very selective arrangement.

May I take this opportunity of recommending your readers to experiment with good aerials and carefully-screened coupled circuits if they wish to listen to Paris while Chelmsford is working? The reason why we made the statement over the broadcast that the *Daily Express* concert would be heard better in England, owing to the interference from 5XX, was that we knew that the majority of listeners do not happen to possess very selective apparatus.

The Argentine Republic, with a number of receiving stations estimated at nearly 200,000, is making fast progress in wireless.

The Postes, Telegraphes et Telephones department in France has announced that wireless messages may be transmitted between France and Russia at the same rates as were usual before the war.

The earth connection arranged for the new station at Daventry is an elaborate one. The station will have an earth system of wires measuring 200 ft. across.

AROUND THE SHOWROOMS

Cheaper Valves—

EVERYBODY is glad of the reduction in valve prices, which, although not great, is certainly very welcome to amateurs—especially to those multi-valve enthusiasts who are unlucky in the matter of burn-outs.

As the market for valves becomes steadier and as manufacturers learn more about mass production methods, we may expect the prices of valves to be still further reduced.

That manufacturers are seriously applying their energies to the production of better valves is proved by Cossors. In future all Cossor valves are to be fitted with a special anti-capacity base. This is of particular interest in these days of short-wave work.

—and More Valves

THOSE who are interested in wireless development can carry out for themselves some experiments with some of the earliest valves—I refer to the Marconi-Round valves—at small cost.

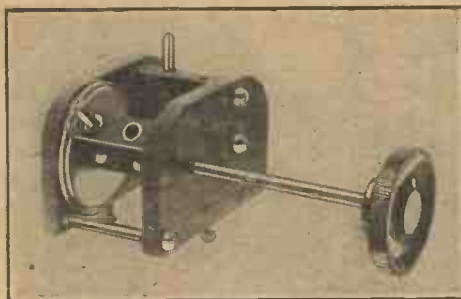
These valves, I notice, are being offered at 3s. each by T. W. Thompson and Co., of 39-43 London Street, Greenwich, S.E.10.

Direction-finding stations erected in France early during the war had to make use of Round valves. To get the best results the "pip" at the top, which contains a piece of asbestos, has to be heated, and I have heard many glowing tales of D.F. huts having floors with a carpet of matchsticks over an inch thick!

Geared Coil Holder

THE necessity for using a coil holder capable of fine adjustments was brought home to me last week when I was using a reflex set that incorporated reaction in the ordinary way.

During the testing-out stage reaction was very difficult to control, oscillation being



Lotus Coil Holder.

very sudden and fierce with the coil holder I was using. For fine adjustments it is essential to use a geared holder, such as the Lotus shown by the photograph.

Behind the metal disc on the left is a system of gear wheels that gives an 8-1 reduction.

This means that eight revolutions of the control knob are necessary to move the coil through one revolution. Of course in practice it does not go right round.

Another important point about this coil holder is that, no matter in what position it is fitted, the moving coil cannot fall.

The makers of Lotus coil holders are Garnett, Whiteley and Co., Ltd., of Broadgreen Road, Liverpool.

Dual Filament Resistance

NOWADAYS almost every valve user wants to be able to change over directly from bright-emitters to dull-emitters, that is, without having to connect extra resistance in circuit.

Most resistances that are suitable for use with either type of valve are of the carbon variety. I see, however, that L. McMichael, Ltd., of 179, Strand, W.C.2, are making a dual rheostat that has a wire resistance element.

The wire is wound on a circular former in the ordinary way, one-half being for bright-emitters and the other half for dull-emitters. The dial is engraved red on the bright-emitter segment and white on the dull-emitter segment.

Loading-coil Socket

WHERE a loading coil is provided for in a set it is necessary to short-circuit the socket when the coil is not in use.

To save this trouble a neat little socket has been made that automatically completes the circuit when there is no coil.

The switching is done by the plug, which springs up when not held down by a coil. This device is well made and can be fixed to any panel of $\frac{1}{4}$ in. in thickness.

Will Day, Ltd., of 19, Lisle Street, Leicester Square, W.C.2, are the manufacturers. VANGUARD.

PROGRESS AND INVENTION

Plug Connectors

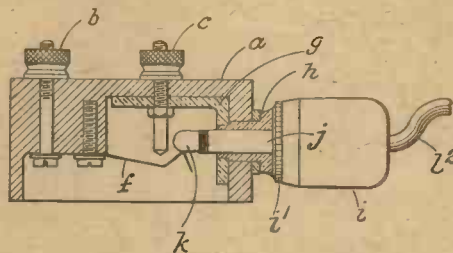
VARIOUS types of aerial-earthing plug have been constructed, but most of them are lacking in compactness and neatness. Many of these, also, are not of the anti-capacity type, and since the contacts form the two plates of a condenser by-passing the aerial currents, efficiency is often low.

Quite a neat type of plug connector and earthing switch is described in Patent No. 225,276/23 (F. W. Pleasance, Glengall Road, Peckham, London).

It will be seen from the diagram that although good contact is made when the plug is withdrawn, the contacts themselves present only a small area one to another, and the self-capacity of such a switch is therefore small.

The plug itself may be insulated, or may be connected either to the aerial or earth terminal of the set.

This type of plug should also prove useful for switching in high-frequency circuits where a good-contact low-capacity switch is necessary.



Plug Connector (225,276/23).

If necessary, two fixed contacts could be employed on either side of the spring, and the plug would then be insulated from the circuit.

Portable Loud-speakers

NOW that spring is coming and many amateurs will be taking their sets out into the open, portable sets and loud-speakers will be greatly in demand.

The average loud-speaker is awkward to use in the open air, for the horn is usually fixed in one position relative to the base, and it is impossible to direct the sound where it is needed.

Patent No. 226,585/23 (Edward Alfred Graham, St. Andrew's Works, Crofton Park, Brockley) describes a method of rendering the loud-speaker more suitable for outdoor use.

According to this invention, the horn is pivoted at the base so that it may be turned in the direction in which maximum volume is desired. If necessary it may even be tilted in a vertical position, and this position will probably be found very effective under certain conditions.

EXPERIMENTAL TRANSMISSION.—IX

STILL MORE CIRCUITS DISCUSSED

ANOTHER excellent arrangement is also shown in Fig. 33, which may be adapted to any circuit where a combination of earth and counterpoise systems is to be employed.

The direct earth is tapped to the exact centre of the inductance, and aerial and counterpoise tapplings are then moved simultaneously until aerial and counterpoise (not counterpoise and earth) are in tune, when maximum results will be obtained. Either of the two previous systems mentioned for combined earth and counterpoise may, of course, be used instead, and this is certainly worthy of consideration.

Fig. 34 illustrates a scheme whereby the radio choke in the plate circuit may be omitted and a high-tension + tapping be taken on to the tuner.

In Fig. 35 a high-tension negative tapping is taken to the tuner, but the feature worthy of note is the method of tuning the counterpoise by means of a separate inductance coil with tapplings. The operation of bringing earth and counterpoise in tune may thus be simplified, as the position of the tapplings to counterpoise will have no effect on oscillation.

Fig. 36 is essentially the same as the preceding one, but it will be noticed that an extra tapping, in series with a blocking condenser C , has been included on the tuning inductance. Control of oscillation and wavelength will by this means be slightly simplified, and no matter what may occur in theory, it is a practical dodge well worth trying. The capacity of this condenser is not critical, something approximating .002 microfarad having been found suitable.

Fig. 36a illustrates a typical transmitting circuit, capacity coupled, such as is employed in many Dutch amateur stations.

Figs. 37 and 38 illustrate two methods by which the correct negative potential may be maintained on the grid, the use

of extra cells shunted by a large-capacity condenser, and (Fig. 38) the use of a valve as a high-resistance leak.

The internal resistance of the valve is controlled by the emission of electrons, that is, by filament current; a receiving valve with about 4 volts on the filament would prove most satisfactory.

The choke Ch may often be omitted.

The Master Oscillator System

Although the master oscillator system is rather difficult to work and as it requires an extra valve, it cannot give the same overall efficiency as a set of the normal type, yet it is really the key to most difficulties in short-wave transmission, and as such is considered worthy of a special note.

In the master oscillator system the power valve is excited from an oscillator which is capable of generating enough power to meet the losses in the grid circuit of the power valve.

The general principle is shown in Fig. 39. The grid of the power valve is connected to an oscillator tuned to the required frequency, and so the plate output wavelength is quite independent of the aerial tuning, which results in a perfectly constant wavelength however much the aerial may swing.

A very suitable circuit is shown in Fig. 40, but, of course, any one of the preceding oscillators described may be used as a driver, and the power-valve circuit may take different forms.

The plate-grid coupling is not in any way critical, and is not necessary in many cases, a fact conducive to easy wave changing.

A hard receiving valve may be used to control the power valve provided that powers not greater than 10 watts are dealt with, but it will be very hard pressed. Operations will be greatly simplified if a

(Continued on page 274)

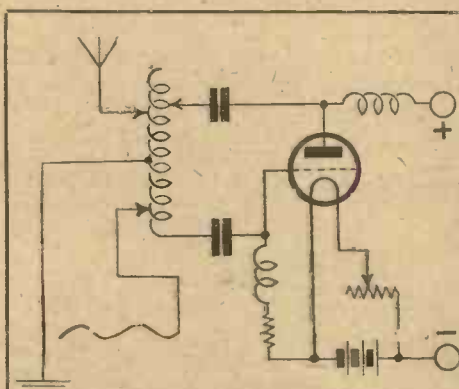


Fig. 33.—An Arrangement of Counterpoise

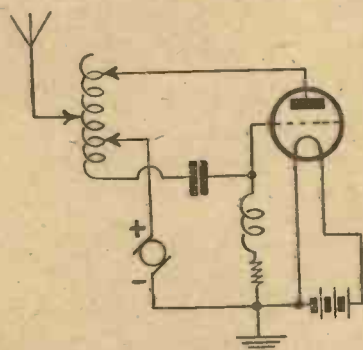


Fig. 34.—Dispensing with the Radio Choke.

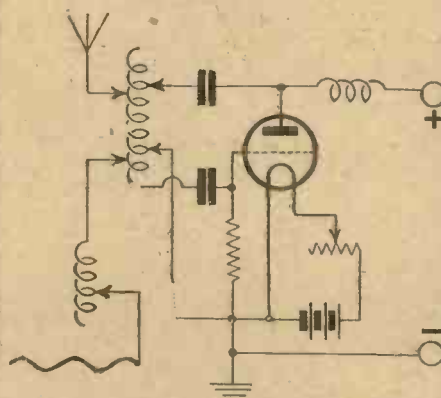


Fig. 35.—Tuning the Counterpoise.

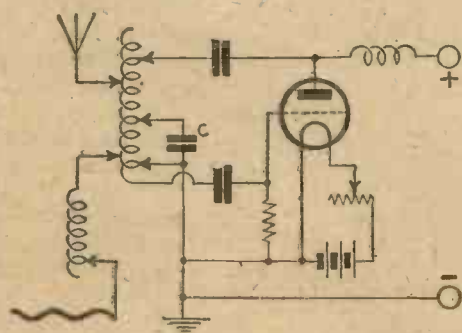


Fig. 36.—A Method of Fine Tuning.

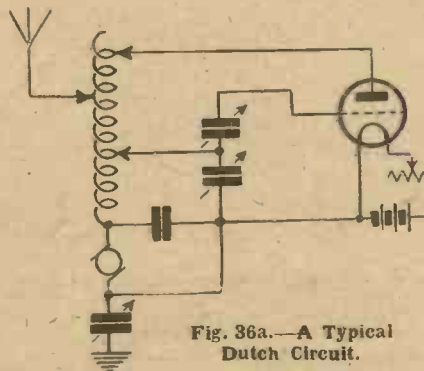


Fig. 36a.—A Typical Dutch Circuit.

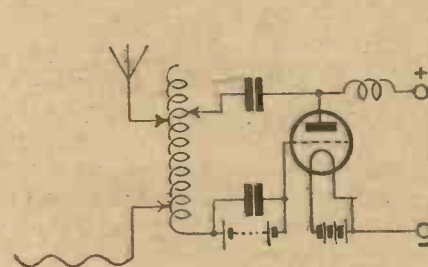


Fig. 37.—Obtaining Correct Grid Potential.



*Now fades the glimmering landscape on the sight
And all the air a solemn stillness holds.*

GRAYS ELEGY

NOW that the Sterling "Primax" Loud Speaker has taken its place as the true master of radio reproduction, how great the wonder and delight radio evenings hold! For the "Primax" is truly supreme. It reproduces music, song and speech with a purity and volume so perfect that the keenest critics of music praise its powers. The pleated diaphragm gives even distribution of sound. The simplicity and perfection of the electro-magnetic mechanism ensures the complete absence of any harshness. The "Primax" is an ornament to any room—a joy to all musicians.

Radio dealers will willingly demonstrate its distinctive qualities before purchase, and any test is cordially welcomed.

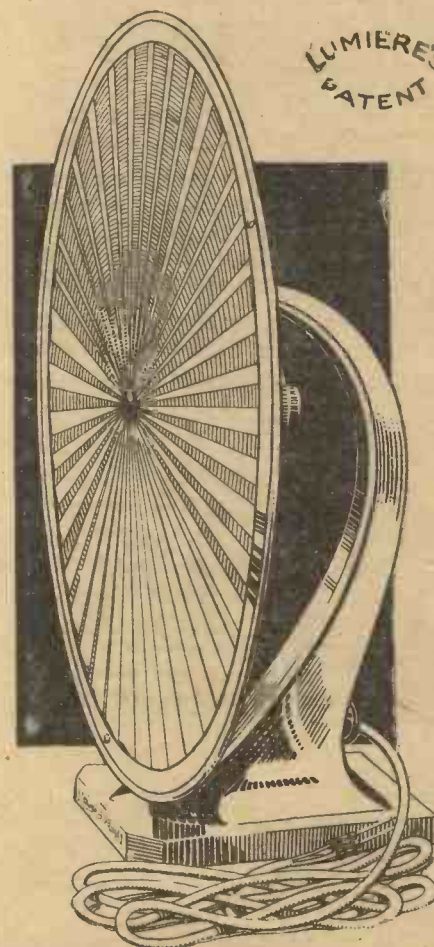
The Sterling "Primax" Hornless Loud Speaker has a pleated diaphragm mounted in a frame and supported on a graceful stand. The whole instrument is bronzed finish. It is connected to the receiver in exactly the same way as an ordinary loud speaker. Complete with 12 ft. of flexible cord. (2,000 ohms resistance.)

PRICE **£7:15:0**

STERLING PRIMAX

Hornless Loud Speaker (Bronzed Finish)

At your Radio dealers



LUMIERE'S
PATENT

Advt. of **STERLING TELEPHONE AND ELECTRIC CO., LTD.**

Manufacturers of Telephones and Radio Apparatus, etc.
210-212, TOTTENHAM COURT ROAD, LONDON, W.1

Works: DAGENHAM, ESSEX.

Sole Manufacturers and Licensees of the "Primax" Loud Speaker



It has been decided to broadcast a service from York Minster. In all probability it will either be the Easter Sunday service of the Military Sunday service on May 3.

Following similar tests in France, German scientists claim to have succeeded in producing ultra-short waves having a frequency of more than 300,000,000 per second, which corresponds with a wavelength of less than one metre.

A symphony concert will be relayed from the Covent Garden Opera House on February 12 at 8 p.m.

A miscellaneous programme to be broadcast on February 13 includes songs by Roderick Ackroyd and pianoforte solos by Chilton Griffin.

The broadcasting station at Rome has increased its daily service from two hours to three. Now the station gives a programme in the afternoon from 3 to 4 and at night from 8.30 to 10.30.

It has been decided to fit the seats in the Italian Senate with plugs for wireless sets.

The French station at Agen has made several trials at broadcasting on a wavelength of 340 metres, but their transmissions are constantly jammed by those of the German stations across the border.

Before the opening of the relay station at Hamburg there were only 400 people

who listened-in, but only three months afterwards they numbered 50,000.

The Capetown station has broadcast a novel relay throughout the South African Union, giving a band performance from the Swedish cruiser *Fylgia*, which was at the time of the performance about 250 miles out at sea.

The "Roosters" concert party will broadcast a "mixed grill" on the evening of February 16.

The S.B. programme to be given on February 17 includes musical comedy excerpts given by the J. H. Squire Celeste Octet.

A new valve has been invented which requires 110 volts to operate it! Its great advantage is that it can be plugged direct to the house electric lighting supply, whether A.C. or D.C., and thus eliminates the accumulator entirely.

The Westinghouse station at Pittsburg, KDKA, has sent out a message which was clearly heard at Sydney, Melbourne, and at Rabaul, in the Bismarck Archipelago, north of New Guinea, a distance of over 9,000 miles.

The official wireless telephony tests between Australia and America have been quite successful, many musical items and speeches having been distinctly heard in different parts of Australia. The strength

of signals from America was quite as powerful as from the Sydney broadcasting station.

"From the Mystic East" is the title of the programme to be given on February 18. Louis Hertel will provide humour appropriate to the scheme of the evening.

A programme of chamber music of great interest will be broadcast on February 19.

"Quips" will give another of his talks on "the World in Anecdote" at 8.30 p.m. on February 20.

A popular programme will be broadcast on February 21, which will include items by the Band of H.M. Scots Guards.

The wavelength of the Edinburgh station has now been definitely fixed at 465 metres.

A new installation, tried for the first time recently by the municipal broadcasting station W N F C, of New York, is expected to prove a valuable adjunct to the work of the police.

Experiments carried out by experts in wireless telephony go to show that the eclipse on Saturday, January 24, undoubtedly did have an effect on the reception of wireless signals.

A new broadcasting station is to be erected at Finkenwalde, near Stettin, with two towers each 130 ft. high.

Amateur wireless users in Bulawayo have heard Pittsburg, in the United States, more than 7,000 miles away, on two-valve sets.

The popular programme to be broadcast on February 14 includes songs by Bryn Gwyn and musical entertainment by Foden Williams.

A "Star Ballad" concert will be broadcast on February 15, in which all the artistes are of the highest standing in the London musical world. De Groot and the Piccadilly Orchestra will provide the evening programme.

A Swedish magazine, the *Radio-Bladet*, has organised a test between Swedish and American amateurs for the purpose of encouraging amateur transmissions in Sweden.

The café habit is rapidly being discarded in France as a result of the introduction of wireless. Frenchmen and their families now hear concerts by wireless from Paris, London and Brussels instead.

Using wireless apparatus, with the human body instead of an aerial, a German physiologist, Dr. Lillenstein, has succeeded in hearing the action of the muscles.

A wireless club has been organised at Poznan (Poland) for the purpose of popularising wireless in that country and developing the wireless industry.

A temporary agreement was reached between the British Broadcasting Company and representatives of the entertainment industry at their last meeting in London.

EXPERIMENTAL TRANSMISSION" (continued from page 272)

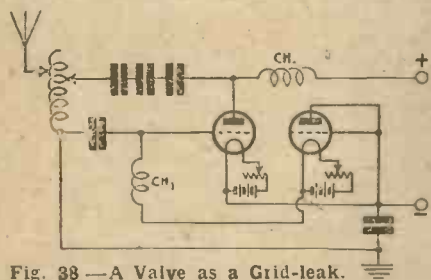


Fig. 38—A Valve as a Grid-leak.

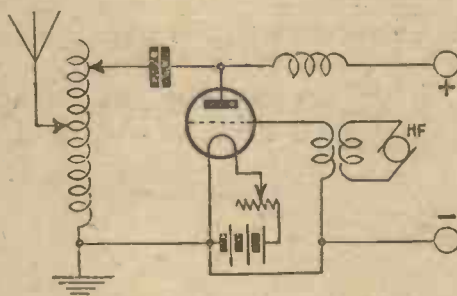


Fig. 37—The Principle of the Master-oscillator.

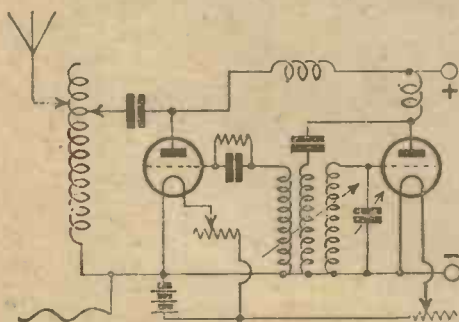
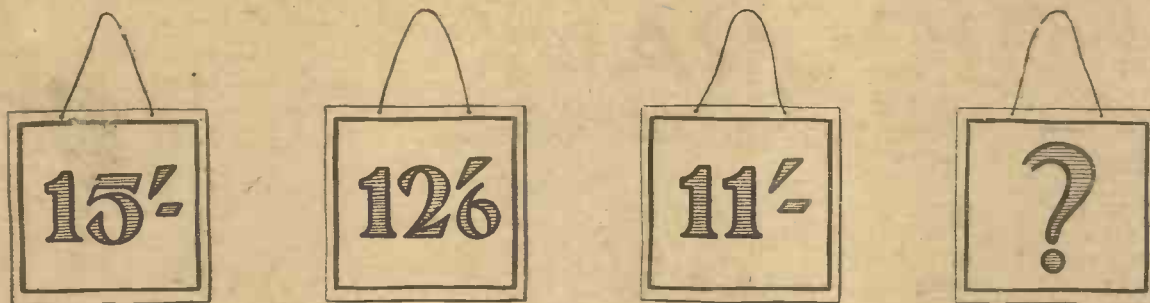


Fig. 40.—A Typical Master-oscillator.

small-power valve is employed. If a receiving valve is used it will probably not work efficiently on the high plate voltage supplied to the transmitter. To obviate this difficulty the radio choke may be wound with resistance wire or a separate plate supply may be employed.

KENNETH ULLYETT.

(To be continued)



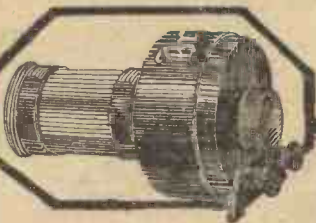
Months ago we decided that a first-class bright filament valve could be manufactured to sell at 10/- and yet contain the very best materials and workmanship. We still find this true to-day. The price of the Silver Clear Louden remains at 10/-.

LOUDEN 10/- VALVES



Louden Valves - Silver Clear

Advert. of the Fellows Magneto Co., Ltd., Park Royal, London, N.W.10.



Have you a Gramophone

—then why not use it as a Loud Speaker?

MANY wireless enthusiasts have overlooked the fact that any good Gramophone can be readily converted into a first-class Loud Speaker by the attachment of a BROWN Gramophone Wireless Adaptor (in either of its two types).

No alterations are necessary, merely remove the Sound box and fit the Adaptor. A rubber connection ensures that it will fit practically every type of Gramophone.

You will be surprised at the volume of mellow tone that either of these Adaptors can produce—with a good Gramophone the results should be practically indistinguishable from a standard BROWN Loud Speaker.

Prices

SOLD IN TWO TYPES:

Type H1.

120 ohms £4 : 7 : 6

2000 ohms £4 : 10 : 0

4000 ohms £4 : 12 : 0

H2. (as illustrated)

120 ohms £2 : 0 : 0

2000 ohms £2 : 2 : 0

4000 ohms £2 : 4 : 0

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15 MOORFIELDS, LIVERPOOL
67 HIGH ST., SOUTH AMPTON

Brown
Wireless Apparatus

Gilbert Ad. 2221



Correspondence

H.F. Couplings

SIR,—Specialising as we do on H.F. couplings and reaction units to work in conjunction with them, we were interested in the article on page 134 of No. 138. We would like your readers to know that the method suggested of marking the pins of transformers has been adopted by us for more than two years on all the apparatus of this class which we make. The photograph shows one of our transformers,



Radlax H.F. Transformer.

from which you will see that the pins are marked.

The same method is adopted in the case of our anode coils, which are made up in the same style; the top or L.T. pin is a dummy; the plate and grid pins are connected together so as to automatically make the plate-to-grid connection when the anode coil is plugged in, thus enabling transformer or tuned-anode coupling to be used in the same sockets. Anode reaction can be used on any of these instruments by means of our various reaction units.—RADLAX, LTD. (London, W.1).

"Seeing Music"

SIR,—From the remarks of "Thermion" in No. 139 under the heading "Seeing Music," in which he describes how the needle of a milliammeter fluctuates in unison with the music or speech received, it is obvious that his set must be yielding very distorted reception. As his remarks are likely to prove most misleading, may I be allowed to make the following correction.

If the needle of a milliammeter placed in the H.T. lead of an L.F. amplifier fluctuates, it is quite obvious that some or all the valves are being operated beyond their linear limits. A dip of 5 milliamps that "Thermion" mentions indicates appalling overloading of the valves and that they are partially rectifying the L.F. impulses.

In every amplifier attached to a B.B.C. station a milliammeter is permanently inserted in the H.T. lead, and it is one of the primary duties of the control engineer to see that the needle *never* fluctuates. I mention this as a practical proof of what is really an elementary theoretical consideration in efficient L.F. amplification.—C. E. W. (Parkstone).

"What Your Condensers Do"

SIR,—In reply to the letter of A. F. W. (Kingston) in No. 138, I should like to point out what appears to be an error. There are three well-defined classes of electrical movement constituting three different kinds of electric current, namely: (a) conduction currents formed by movements of electrons from one atom to another in a conductor or closed circuit when an E.M.F. is applied to that circuit; (b) displacement current obtained by impressing a fluctuating or oscillating E.M.F. across an insulator or dielectric (the current that flows is not an electron flow or complete transference of electrons from one atom to another, but is a combined movement of electrons in the neutral atoms themselves that causes a momentary movement of electrons known as a displacement current); the third (c) is known as a convection current—that is, a current due to the movement of electrons or negative and positive ions through the acid or electrolyte of a cell, across a spark gap or arc or between the filament and anode of a valve—in fact in all cases where an ionising action occurs. I do not agree that the statement referred to is inaccurate, as displacement current does momentarily flow and continues to flow whilst an E.M.F. of varying amplitude is applied and maintained.—L. A. C. (London).

Other Correspondence Summarised

G. B. (Swansea), E. K. (Edmonton) and A. H. P. (Shepherd's Bush), referring to the letter of W. B. S. (Dornoch, N.B.) in No. 139, state that the church service which he received at 1 a.m. on January 12 was transmitted by WGY.

E. T. G. (Henley-on-Thames) states that his crystal reception has greatly improved since he installed a "Vertex" aerial.

H. S. (Longsight) would like to draw attention to the fair treatment he received when he returned a faulty Eureka transformer to the makers. Although it had been in use for several months, they immediately sent a new one.



REDUCED
PRICE

25/-

Carriage Paid, ready
for mounting.

Clearer Speech and Music

with the



**TWIN-COIL L.F.
INTER VALVE
TRANSFORMER**

ONE amateur enthusiast writes: "Your transformers are definitely superior in quality of production of speech and music." Another says: "The greatly improved reception since fitting these transformers is indeed amazing."

These opinions, arriving daily, confirm our own tests. With the M-L transformer you get both speech and music clearer. There is a complete absence of distortion, greater amplification and a longer range.

Stoutly built and well finished, it is dust and damp proof. The coils are completely enclosed. Insulation has received special attention, and there is no danger of burning out. Primary to secondary ratio, 1—4.

To get the best from your set use an M-L transformer.



The



**ANODE
CONVERTER**

A PERMANENT substitute for the high-tension battery. Ideal for power amplifier work. Worked from the ordinary 6-volt accumulator, the consumption is low—1.15 amperes. Perfectly smooth reception. Continuous adjustment of H.T. voltage and not by steps.

Supplied in
the following
standard voltage
ranges:

Type B 6-120 volts } For two
£11 5 0 } stage
Type C 12-300 volts } power
£13 10 0 } amplification

Type D 12-500 volts } For low power
£18 0 0 } transmission work.

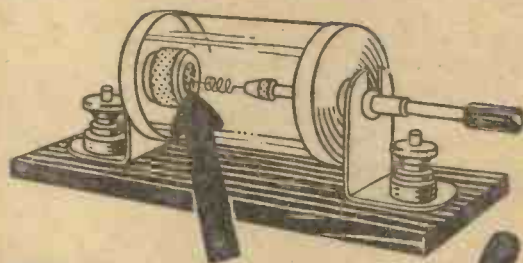
We invite applications
from traders for terms.

Write for details.

The M-L Magneto Synd., Ltd.,
Wireless Dept.,
Victoria Works, Coventry.



for distance



Neutron

The consistent high sensitivity of Neutron Crystal is proved by the rapidly accumulating records of "long-distance" reception — and you can obtain the same results, with care in your choice and arrangement of apparatus; particularly in your choice of Crystal — at the same time the most important item and the least expensive. Be sure it is Neutron.

Manchester from Bakewell

"A. C.," Bakewell, receives Manchester on a Neutron plain Crystal Circuit.

38
miles

Birmingham from London

"L. V. C.," of Chiswick, receives Birmingham regularly on a Neutron without amplifiers.

125
miles

Chelmsford from York

"E. C. D.," York, receives the high-power station on a single slider set, with Neutron.

160
miles

Brussels from Chiswick

"L. V. C.," of Chiswick, receives Brussels on a Neutron, without amplifiers.

200
miles

Madrid from Chippenham

"R. A. H.," Chippenham, regularly receives Madrid on a plain Crystal circuit, with Neutron.

800
miles

And with 2 stages of L.F. only, W B Z from Chippenham

3,000
miles

"R. A. H.," of Chippenham, also reports reception of W B Z (Springfield, Mass.) on a Crystal set, using Neutron, with 2 low-frequency valves acting as note magnifiers only.



Concert Tested & Guaranteed Radio Crystal

Stocked by the Best Radio Dealers. Packed in tin with silver catwhisker. Insist on Neutron in the Black and Yellow Tin—

1/6

Produced by NEUTRON, LTD., Sicilian House, London, W.C.1. Phone: Museum 2677. Sole distributors:

V. Zeilin & Sons,

144, Theobald's Road, London, W.C.1.

Phones: Museum 3795 & 6841.



TRADE NOTES AND CATALOGUES

WE are informed by Fuller's United Electric Works, Ltd., Woodland Works, Chadwell Heath, that they are in a position to supply standard-size ebonite panels ready for use in sealed envelopes.

Mr. Herbert G. White, who has been associated for the past fourteen years with Messrs. Gent and Co., Ltd., has relinquished his post as London manager with this firm to take up the appointment of chief engineer of the wireless department of Messrs. C. A. Vandervell and Co., Ltd., Acton, London, W.3.

From the British Thomson-Houston Co., Ltd., Crown House, Aldwych, W.C.2, we have received an illustrated leaflet of table-lamp loud-speakers.

Two large show-cards illustrating the "Dragonfly" loud-speaker have been sent us by Alfred Graham and Co., St. Andrew's Works, Crofton Park, S.E.4.

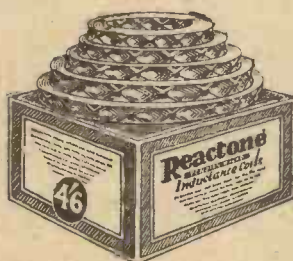
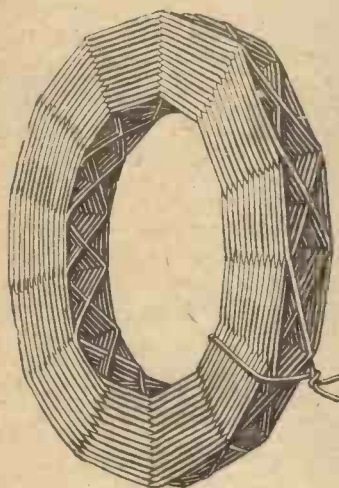
A catalogue of C.A.C. wireless sets and accessories has been sent us by the City Accumulator Co., 10, Rangoon Street, E.C.3.

A window card illustrating the R.I. low-frequency transformer has been received from Radio Instruments, Ltd., 12, Hyde Street, New Oxford Street, W.C.1.

From the Radi-Arc Electrical Co., Ltd., Bennett Street, Chiswick, W.4, we have received a sample of the Liberty safety wander plug, which will not allow sufficient current to pass to injure valves.

HAVE YOU SEEN THE "WIRELESS MAGAZINE"?

It is acknowledged as—
the MOST ORIGINAL
the MOST ENTERTAINING
and the MOST PRACTICAL
—of its kind
1/- net Monthly



Reactone Coils are now supplied in Cartons hermetically sealed with Cellophane wrappers.

Tension-winding means Efficiency

Reactone Coils are tension-wound because that gives them greater rigidity, complete uniformity, and their structure (better for coupling). They are the *only* correctly tension-wound, former-less Coils.

Reactone Inductance Coils are wound on patented machines which apply a constant tension to the wire throughout the winding—the same at the periphery as at the beginning: the machines automatically compensate for the greater *speed* at periphery, and thus avoid *stretching* of the wire and consequent lack of uniformity.

Uniformity means definite calibration;

Set of 5—Nos. 25, 35, 50, 75 and 100. New Price ... 3/-

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you can depend on each Reactone Coil tuning to the wave-length specified.

With tension-winding we are able to dispense with all ebonite, empire tape, or other substances which introduce additional self-capacity; and at the same time secure a unique low-capacity formation that makes TUNING SHARPER, SIGNALS STRONGER, and REACTION READIER.

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Ask your Wireless Dealer. In case of difficulty, send P.O. for 3/3 (or 2/- for the Chelmsford), with your Dealer's name and address, to the Manufacturers:—

LEWIS HARFORTH & CO., 88-90, Chancery Lane, LONDON, W.C.2.

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Can also be obtained wholesale from V. ZEITLIN & SONS, 144, Theobald's Road, LONDON, W.C.1.

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THE GIL RAY RADIO CO.,
Stoilian House, London, W.C.1.
Stocked by best factors and V. Zeitlin & Sons, 144, Theobald's Rd., W.C.1.

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The Crystal that misses nothing

If you would have complete satisfaction from your set, not now and then, but *every time and all time*, you must instal the famous Talite Crystal which is all over active, extremely sensitive and thoroughly tested and guaranteed before being sold to the public. Refuse all others and buy Talite (sold in tubes at 1/9) or H.H.F. Hertzite (sold in tubes at 1/6). From all dealers or send Postal order for large trial piece to the Premier Crystal House.

"ALL LIVE SPOTS"
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HARDING, HOLLAND & FRY, LTD.
52 QUEEN VICTORIA STREET, LONDON, E.C.4.

FALLON SQUARE LAW CONDENSERS

Features include :
One hole fixing, tag
connections, heavy
aluminium top and
bottom plates.
Metal to metal adjust-
able bearings, stout,
well-cut aluminium
vanes. Complete as
illustration.



The New Fallon Square Law Condenser is absolutely the last word in perfect condenser construction.

Extremely handsome appearance, all parts being heavily plated; .068 spacing (the closest possible). In the new model the overall length of the .001 condenser is only 4 1/2 in. as against 5 1/2 in. in the old model, and by a new idea in spacing washers, rigidity of construction, never before achieved in any make of condenser, has been obtained.

SQUARE LAW TYPE (As illustrated.)			
Price		Price	
.001 ... 9/6	.00025 ... 6/9		
.0005 ... 8/6	.0002 ... 6/-		
.0003 ... 7/-	Vernier, 3 or 5, 4/6		

STANDARD TYPE With Ordinary Vanes			
Price		Price	
.001 ... 8/9	.00025 ... 6/-		
.0005 ... 7/-	.0002 ... 5/6		
.0003 ... 6/6	Vernier, 3 or 5, 4/-		

FALLON FIXED CONDENSERS

—improve results
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Made of the highest quality mica and copper foil; each one tested and guaranteed. FALLON Fixed Condensers are right up to FALLON standard. Fitted with soldering tags and nuts for making clean connections. **British Reputation.**—Your Condensers are not FALLON'S unless the name FALLON appears on same.



FALLON Fixed Condensers
Capacities up to .001,
1/3 each.
Capacities up to .004,
2/- each.

Fixed Condenser and Grid
Leak COMBINED.
(As Illustrated.)
2 or 3 megohms,
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FALLON'S The Premier VARIOMETER

Inside winding, suitable for broadcast reception on any P.M.G. Aerial, extraordinary close coupling ensuring large tuning range. Inductance, the highest possible—9.5 to 1. Metal feet can be adjusted to four different positions. As used in the Single Valve receiver for all wavelengths, described and illustrated in "Modern Wireless," July issue.

Postage 6d. **PRICE 10/-**

All Post Orders, Correspondence and Applications for Trade Terms to :

FALLON CONDENSER Co., Ltd.

White Ribbon Works, Broad Lane, Tottenham, N.15.

BRANCHES : 3, Kings' Street West, Deansgate, Manchester ;
120, Wellington Street, Glasgow.



Music-Masters both!



80%

THE "Revo" Loudspeaker is as near perfection in reproduction as a loudspeaker can be. We didn't put it on the market till we had explored every avenue of research, and now we have a loudspeaker that reproduces melody that's rich and pure, exquisite in its fidelity.

By the peculiar construction of the throat and bell, distortion is kept at zero point and "muffling" is entirely absent.

The diaphragm adjustment is most flexible in its control.

THE "REVO" SENIOR

Specification : 22 in. high ;
Aluminium Trumpet 14 in.
diam. ; Finished Black.
Price, 80/-.

The "Revo" "Senior" Loudspeaker has two small brothers the Junior and Baby, worthy followers, finished black, price 48/- and 30/- each respectively.

At all dealers. If
unable to obtain
locally write
direct :

The CABLE ACCESSORIES Co., Ltd.,
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21/-
EACH

We produced the "Revo" Lightweight Headphone to meet the demand for a light, comfortable and ultra-sensitive phone. No pressure, no hair-tearing, no discomfort, no projections. 21/-.

Guaranteed for 12 months.

"Revo"
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The Name for Perfect Radio



The Living Artiste

HEAR the song as the singer intended you to hear it.

Close your eyes and let your Loud Speaker reflect the real personality of the artiste. It should be easy if your Set is free from distortion. The corner stone upon which the whole structure of sound reproduction rests is the L.F. Transformer. Such responsibility is shared by no other component. And what is this Transformer? Text Books will tell you that it consists of an iron core surrounded by two separate windings of fine wire wound one over the other.

They will even give the inquiring reader all the constructional details he needs. But there is very much more in the design of a good L.F. Transformer than that.

In two Models:
Concert Grand 30/-
Eureka No. 2 22/6
(For second stage)

Take the Eureka Concert Grand for example. This unconventional design broke away from tradition and left the accepted theories of low frequency amplification. Its low ratio gives immense amplification—a paradox that must be tried out to be fully appreciated. Its hermetically sealed contents can be exposed to the elements indefinitely without harm. Its coppered steel case definitely eliminates interaction under all conditions. But above all its tone is a revelation to all who are music-sensitive. How much longer will you put up with the inferior Loud Speaker reproduction when for 30/- you can get the finest Transformer money can buy?

One that carries a full and unconditional guarantee.

Supreme **EUREKA** for Tone

Advertisement of Portable Utilities Co., Ltd., Fisher St., London, W.C.1.



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 Greenwich Mean Time.

London (2LO), 365 m. 1-2 p.m., con.; 3.15-3.45 p.m., lec.; 4-5 p.m., con.; 5.30-6.15 p.m., children; 6.40 p.m. talk; 7-7.30 p.m., time sig., news, talk; 7.30-9.30 p.m., music; 9.30-10.0 p.m., time sig., news, talk; 10.0-10.30 p.m., music. Mon. and Wed. the Savoy Bands are relayed until 11.0 p.m., and on Sat. until midnight. Sat. only, 4-5.30 p.m., con.

Aberdeen (2BD), 495 m. **Belfast** (2BE), 435 m. **Birmingham** (5IT), 475 m. **Bournemouth** (6BM), 385 m. **Cardiff** (5WA), 351 m. **Glasgow** (5SC), 420 m. **Manchester** (2ZY), 375 m. **Newcastle** (5NO), 400 m. Much the same as London times.

Bradford (2LS), 310 m. **Dundee** (2DE), 331 m. **Edinburgh** (2EH), 328 m. **Hull** (6KH), 335 m. **Leeds** (2LS), 346 m. **Liverpool** (6LV), 315 m. **Nottingham** (5NG), 322 m. **Plymouth** (5PY), 335 m. **Sheffield** (6FL), 301 m. **Stoke-on-Trent** (6ST), 306 m. **Swansea** (5SX), 481 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. (G.M.T.).

AUSTRIA.

Vienna (Ravag), 530 m. (1 kw.). 08.00, markets; 10.00, con.; 12.05, time sig.; 12.20, weather; 14.30, Stock Ex.; 15.00, news, con.; 15.10, children (Wed.); 17.10, lec. (Tues., Fri., Sat.), children (Tues.); 17.30, lec. (Wed.); 18.30, news, weather; 19.00, time sig., con., news; 21.00, dance (Wed., Sat.).

Graz (relay), 700 m. Testing.

Innsbruck (relay station). Under construction.

BELGIUM.

Brussels (SBR), 265 m. (1½ kw.). 17.00, orch., children (Wed. and Thurs.); dance (Tues. and Sat.); 18.00, news; 20.15, lec., con., news (opera, Mon. and Wed.).

Haeren (BAV), 1,100 m. 13.00, 14.00, 16.50, 18.50, weather.

CZECHO-SLOVAKIA.

Kbely (OKP), 1,160 m. (1 kw.). Weekdays: 09.00, 10.30, 12.30, 16.00 and 17.00, con. (Wed. and Sat.); 18.30, lec., news, weather, con. (time sig., 19.00), daily; 10.00, con. (Sun.).

Komarov (OKB), 1,800 m. (1 kw.). Weekdays: 13.00, Stock Ex., weather, news; 17.30, con. (Thurs.); 09.00, con. (Sun.).

Strasnice (430 m.). Testing shortly.

DENMARK.

Copenhagen (Kjobenhavns Radiofonistation), 470 m. 19.00, con. (Sun., Wed., Thurs.); also tests on 750/800 m. 20.00 almost daily.

Lyngby (OXE), 2,400 m. Weekdays: 18.20, news and Stock Ex.; 20.00 and 21.00, news, weather and time sig.

Ryvang, 1,025 m. 18.30, Eng. lesson (Wed.); 19.00, con. (Tues. and Fri.).

FRANCE.

Eiffel Tower, 2,600 m. (6 kw.). 06.40, weather (exc. Sun.); 11.00, markets (exc. Sun. and Mon.); 11.15, time sig., weather; 14.45, 15.35, 16.30, Stock Ex. (exc. Sun. and Mon.); 18.00, con. (not daily); 18.45, Paris fashions (in English)—temp.—(Wed. and Sat.); 19.00, weather; 20.30, con. relayed from PTT (Fri.); 22.10, weather (exc. Sun.).

* On 1st and 15th of each month at 16.45.

Radio-Paris (SFR), 1,780 m. (2 kw.). Sundays: 12.45, orch.; 13.45, news; 16.45, con.;

(Continued on page 282)

G.A.
2226

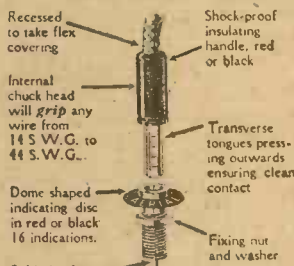
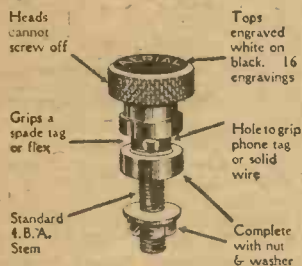
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Extremely sensitive, weigh only 12 oz. with cords.



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PURPLE, or NATURAL BRONZE

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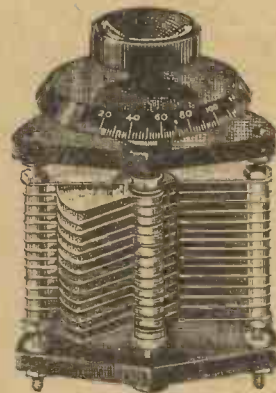
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0.003	5/6	0.0002	4/6	0.0001	4/-
3-plate Vernier, 3/9					

"K" Square-Law Range

The plates in this model are exceptionally thick, and all metal parts are plated.

0.001	10/-	0.0005	8/3	0.0003	7/9
0.0002	7/3	0.0001	6/6		

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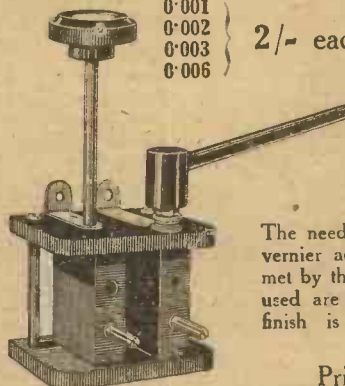
0.001	13/6	0.0005	12/6	0.0003	11/6
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"K" New Pattern Fixed Condensers



The "K" Fixed Condenser is an entirely new Wates' production and it is confidently anticipated that, due to its unique qualities the old model, consisting of layers of plates, liable to expansion and changes in capacity, will soon be a thing of the past. Reports from users are enthusiastic and repeat orders are commonplace with the "K" Tubular Fixed Condensers. Apart from their accuracy in capacity they have the added advantage of great ease in fixing, being either fixed directly to the wiring-in panel or supported by the brackets supplied free with each condenser.

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0.002		0.0002	
0.003		0.0003	
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"BROADCAST TELEPHONY" (cont. from page 280)
20.30, news, &c.; 21.00, dance music. Week-days: 12.30, orch., Stock Ex., news; 16.30, markets, Stock Ex., con.; 17.45, Stock Ex., news, women; 20.30, lec., news, con.; 21.00, dance (Thurs.). Frequent relays of 5 XX after 22.00. *Le Matin*, Paris, provides a special con. every 2nd and 4th Saturday in the month at 21.00 or 22.00 G.M.T.

L'Ecole Sup. des Postes et Télégraphes (PTT), Paris, 458 m. (400 w.). 14.00, lec. relayed from Sorbonne University (Thurs.); 15.00, outside relay (Sat., irr.); 15.45 and 17.00, lec. relayed from Sorbonne (Wed.); 16.00, outside relay (irr.); 20.00, Eng. talk (Tues.); 20.30, lec. or con., almost daily, con. relayed by F. L. (Fri.); 20.45, lec. (Sun.), organ recital 3rd Sun. each month; 21.30, con. (Sun.).

"Le Petit Parisien", 345 m. (500 w.). 21.30, con. (Sun., Tues., Thurs.), dance (Sat.). **Lyons-la-Doua**, 530 m., 10.30, gramophone con.; news, etc. (irr.).

Radio-Lyon, 287 m. (2 kw.). 12.00, 17.15, 20.30, news; con. (irr.).

Toulouse Aerodrome (MKD), 1,525 m. 09.42, 19.42, weather.

Station du Pic du Midi, 350 m. (300 w.). Testing.

GERMANY.

Berlin (2), 503 m. (1½ kw.). 08.00, sacred con. (Sun.); 09.00, markets, news, weather; 10.00, factory con. and tests; 10.30, educat. hour (Sun.); 11.15, Stock Ex.; 12.00, time sig., news, weather; 13.15, Stock Ex.; 14.00, lec. (Sun.), markets; 14.30, children (Sun., Wed.); 15.00, Esperanto (Sat.); 15.30, orch., French (Tues.); 17.30, lec., women; 18.00, French (Mon.), lec. (Tues.); 18.30, lec., Engl. (Thurs.), theatre news (Tues.); 19.30, con., weather, news, time sig.; 21.30, chess (Mon.), dance until 23.00 (Thurs., Sat., Sun.). * If opera relayed, at 18.30.

Berlin (Telefunken Co.), 290 m. Tests. **Eberswalde**, 3,130 m.: Telegraphen Union, 06.45-18.45, news, con. (Fri., irr.).

Königswusterhausen (LP), 2,450 m. (5 kw.). Wolff's Buro. Press Service: 06.00, 20.00, 2.800 m. (5 kw.): 10.30, con. (Sun.), Esperanto lec. 4,000 m. (10 kw.): Express News Service, 06.00-20.00 (daily); lec. (Tues. and Fri., time irr.).

Bremen, 330 m. (1 kw.). Relay from Hamburg.

Breslau, 418 m. (1½ kw.). 10.15, Stock Ex., weather; 11.00, factory con. (weekdays), sacred con. (Sun.); 11.55 (Sun.), time sig., weather, Stock Ex.; 14.00, news (weekdays); 15.00, children (Sun.); 16.00, orch., children (Fri.); 16.45, con. (Sat.); 17.00, shorthand (Sat.), Mah Jongg (Wed.); 18.00, Esperanto (Mon.), Engl. (Thurs.), lec. (other days); 19.00, con., weather, time sig., news; 20.30, dance (Sun.); 21.15 (Mon.).

Cassel, 292 m. (1½ kw.). Relay from Frankfurt.

Dresden, 280 m. (1½ kw.). Relay from Leipzig.

Frankfurt-on-Main, 470 m. (1½ kw.). 07.30, sacred con. (Sun.); 10.10, Stock Ex.; 10.55, time sig., news; 15.00, children (Sun.), Stock Ex. (weekdays); 15.30, con., women; 16.00, con. (Sun.); 17.00, markets, lec., children (Wed.); 18.00, lec. (daily), shorthand (Wed.), Esperanto (Fri.); 18.30, educat. hour; 19.00, lec., Engl. (Mon.); 19.30, con. (daily), jazz band (Fri.); 20.30, time sig., weather, news; 21.00, dance or late con. (not daily).

Gleitwitz (relay station). Under construction.

Hamburg, 395 m. (1½ kw.). Sunday: 07.55, time sig., weather, news, lec., women; 10.00, sacred con., chess; 12.00, con., lec.; 16.00, children; 17.00, con.; 18.00, Engl. conv.; 19.00, sport, weather, news, con. or opera; 21.00 onwards, as weekdays. Weekdays: 06.25, time sig., news; 07.30, theatre news; 11.55, time sig.; 12.20, Engl. (Wed.); 14.00, political news, markets; 15.00, women; 15.30, lec., Esperanto; 16.05, orch., 17.00, con., lec.; 18.25, lec., Engl. conv. (Tues. and Fri.), Spanish (Mon. and Thur.); 19.00, weather, con. or opera;

21.00, weather, markets, news; 21.50, news (in English), dance (not daily).

Hanover, 296 m. (1½ kw.). Relay from Hamburg.

Königsberg, 463 m. (1½ kw.). 08.00, sacred con. (Sun.); 10.15, markets; 11.55, time sig., weather; 13.15 and 15.00, markets; 15.30, children (Tues., Wed., Sat.), orch.; 18.30, lec., Esperanto (Thurs., Sat.); 19.00, con. or opera; 20.00, orch., lec., weather, news, dance (Thurs., Sun.).

Leipzig, 454 m. (1½ kw.). 07.30, sacred con. (Sun.); 10.00, educat. hour (Sun.); 11.00, markets, orch., time sig.; 15.00, markets; 15.30, orch., children (Wed.); 16.30, lec. (Tues.); 17.30, lec. (Tues.), experimenters (Wed. and Sat.); 18.00, lec.; 19.00, lec. (irr.); 19.15, con. or opera, weather, news; 21.00, con. (not daily). Will shortly be increased to 5 kw.

Münich, 485 m. (1½ kw.). 10.30, lec., con.; 13.00, news, weather, time sig., snow forecast; 14.00, con., lec. (Sun.); 15.30, orch. (16.00 Sun.), children (Wed.); 17.00, agric. talk (Mon.), con.; 18.00, lec., Engl. (Mon. and Fri.), Italian (Tues.), Russian (Sat.), Esperanto (Thurs.); 19.30, con.; 20.30, news, weather, time sig.; 21.00, late con. (Sun.), lec. (Tues.), dance (Sat.).

Munster, 410 m. (1½ kw.). 11.00, sacred con., news (Sun.); 11.30, news (other days); 11.55, time sig.; 14.30, markets; 15.30, children (Sun.), lec. (weekdays); 18.40, weather, lec., time sig.; 19.20, women, con. or opera, news, dance (Sat.); 21.00, English, Spanish or Esperanto, news, dance (Sat.).

Nuremberg, 340 m. Relay from Munich.

Stuttgart, 443 m. (1½ kw.). 06.30, time sig., weather (weekdays); 10.30, con. (Sun.); 15.00, time sig., con., news (Sun), children (Sat.); 16.45, children (Wed.); 18.30, lec. (weekdays); 19.00, con. (daily); 20.15, time sig.; 22.00, weather, news, dance (Sun.).

HOLLAND.

Amsterdam (PCFF), 2,000 m. Daily: 07.55-16.10 (exc. Mon. and Sat., when 10.10-11.10), news, Stock Ex., time sig., 09.55 and 16.10. (PX), 1,050 m.: con., 20.40, con. or organ recital (Mon.).

Hilversum (HDO), 1,050 m. (1½ kw.). 17.40, children (Mon.); 19.40, lec. and con. (Wed. and Fri., irr.); 19.40, con. (Sun.), relay of Mendelberg orch. (Thurs.); con. (Sun.); 21.40, lec. (Sun.).

Vossegat (Dé), 1,050 m. 12.10 and 19.40, weather.

Soesterberg, 1,050 m. 19.26, weather. **Bloemendaal**, about 200 m. 09.40 and 16.40, sacred service (Sun.).

HUNGARY.

Buda-Pesth (MTI), 950 m. Half-hourly from 06.45, news, Stock Ex., 10.00, con.; 11.30 news (daily).

ITALY.

Rome (IRO), 425 m. (2 kw.). 16.00, orch. 19.35, news, con.; 20.15, lec., con.; 21.00, dance (irr.).

(Radioaraldo), 624 m. (500 w.). 10.30, news; 11.00, time sig., con.; 14.20, Stock Ex.; 19.00, con.

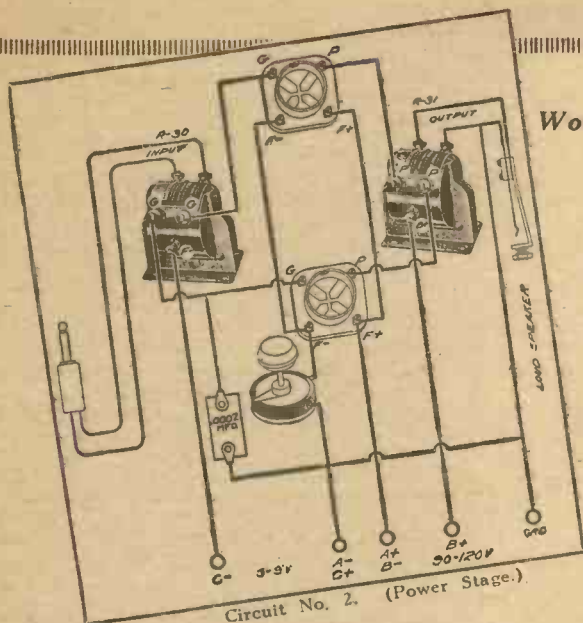
(Concluded on page 284)

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Dublin: W. A. Doyle Kelly and Co., Pearse Street.
Bournemouth: L. Bass, 23, Louther Road

"BROADCAST TELEPHONY" (cont. from page 282)

Centocelle (ICD), 1,800 m. (6 kw.). 15.00 and 19.30, news, con.

JUGO-SLAVIA.

Belgrade, 1,650 m. (2 kw.). 17.30, con., news, weather (Tues., Thurs., Sat.), weather, news only (Mon., Wed., Fri.).

NORWAY.

Christiania, 340 m. (500 w.). Testing, daily, about 19.30.

PORTUGAL.

Lisbon (Aero-Lisboa), 375-410 m. 20.30, tests, music, speech (irr.).

Monsanto (CTV), 2,450 m. (15 kw.). Tests, music (irr.); 13.00 and 23.00, weather.

RUSSIA.

Moscow, 1,500 m. (temp. W.L.). Weekdays: 14.00, markets; 16.30, news and/or con. Sundays: 13.45, lec.; 16.30, news; 17.15, con. Times are not strictly adhered to, as broadcasting programme is not yet fully organised.

SPAIN.

Madrid (Radio-Iberica), 392 m. 21.00, weather, Stock Ex., time sig., con., news; 22.00, *La Libertad* con. (Tue. and Fri.). Sunday: 16.30, con.

Barcelona (EAJI), 325 m. 17.30 or 18.00, lec., Stock Ex. markets, con. or relay of opera; 20.30, news and con.

Seville (EAJ5), 350 m. 18.30, lec., con., news.

SWEDEN.

Stockholm (SASA), 430 m. (500 w.). Sundays: 09.55, sacred service; 16.00, children; 17.00, sacred service; 19.00, con.; 20.30, news, weather. Weekdays: 11.30, weather, Stock Ex., time sig. (11.55); 18.00, lec. (irr.); 19.00, con., lec., news, weather.

Gothenburg (SASB), 290 m. (500 w.). also 700 m. 10.00, fishery reports (700 m.); 11.55, time sig.; 19.00,* programme s.b. from Stockholm.

Malmö (SASC), 270 m. 11.00, weather; 19.00,* programme s.b. from Stockholm.

Boden (SASE), 2,500 m. 18.00, con. (Tues., Fri., Sun.)—temp

* Local programmes are also broadcast at times.

Sundsvall (SASD), 680 m. (500 w.). To open about March.

Falun (SMZK). Tests. Occasional relay of 5XX.

SWITZERLAND.

Geneva (HB1), 1,100 m. (500 w.). 13.15, lec. No Sun. transmissions.

Lausanne (HB2), 780 m. (500 w.). 07.05, weather; 12.30, weather, markets, time sig., news; 16.00, children (Wed.); 17.55, weather, news; 20.15, con. (exc. Wed.), dance (Thurs. and Sat.).

Zürich (Höngg), 515 or 650 m. (W.L. not definitely fixed) (500 w.). 11.00, weather; 11.55, time sig., weather, news, Stock Ex.; 15.00, con.; 17.15, children (Mon., Wed., Fri.); 18.00, weather, news; 19.15, lec., con., dance (Fri.); 21.00, news. Sundays: 15.00 and 19.15, con., news, weather.



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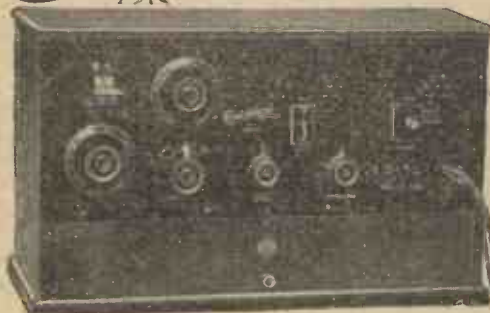
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160 International Buildings, Kingsway, London, W.C.2.



No. 7 Set

The Set you can be proud of



4-VALVE Set COMPLETE

No Extras Whatever.

£26:11:9

Carriage Paid.

Also made in two and three valve models at equally keen prices.

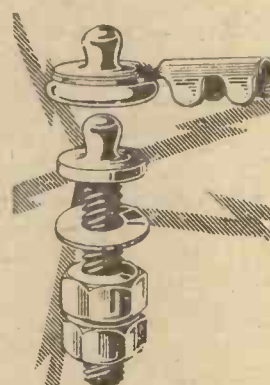
Ask your Wireless Dealer for a Free Demonstration.

Full particulars free on request.

The EAGLE Engineering Co., Ltd., WARWICK.

London Depot: 8, GREAT RUSSELL STREET, W.C.1.

No cum 284



Take the WORRY out of Wireless

WHEN you build up your set—or re-wire it with Newey Snap Terminals—you straight away take all the small worries out of wireless. With a slight pressure of the finger perfect contact is made and any number of headphones can be coupled together, one above the other, on the same connection.

Experimental sets can be easily built up and changed time after time with Newey Snap Terminals, obviating as they do the mess and uncertainty of wiring not perfectly soldered.

Contents of Complete Set

- 8 Terminal Studs,
- 6 Multi Connectors,
- 4 Coloured Connectors,
- 8 Discs (Black, Red and Blue).
- Phones +
- High Tension +
- Low Tension +
- Earth
- Phones -
- High Tension -
- Low Tension -
- Aerial

COMPLETE with Instructions, Price - 2/-



MADE IN - PATENT NO. 14130/24 ENGLAND

VALVES REPAIRED

Please Send us your Burnt Out Valves. We Undertake to Return them

AS GOOD AS NEW

Bright Valves, from 5/6

Dull Emitter, " 9/-

All valves thoroughly tested before being sent back.

H. SLOOG, 45 Gt. Marlborough St. London, W.1

HULLO EVERYBODY!!

POST FREE COLUMN REVOLUTION IN VARIABLE CONDENSERS

Sorbo earcaps.....pair	1/8
Ebonite coil stands, 2-way.....	3/6
Ditto, with extension handles(nickel)	3/11
Ebonite 2-way Cam Vernier.....	5/-
Ditto, 2-way Geared.....	5/11
Shipton 2-way Vernier.....	4/6
Ebonite 3-way plain.....	4/6
Ditto, extension handles, nickel...	5/6
Shipton 3-way Vernier.....	7/6
Aerial 100 feet heavy 7/22 (with six insulators).....	3/6
Ebonite Basket Holders.....	1/6
Murray Valve Holders.....	1/6
Solid Rod Valve Holders.....	1/3
Bretwood anti-cap.....	1/9
Legless anti-cap Holders.....	1/3
Ditto (Goswell).....	1/6
Flex, twin min silk.....12 yards	2/6
Flex, lighting.....12 yards	2/-
Flex, red and black twin.....12 yards	2/6
C & W Battery Links.....doz.	1/3
DCC Coil, Chelmsford, use with '0005	2/3
DCC Coil, Chelmsford, use with variometer.....	1/9
72-in. Phone Cords (best).....	1/11
Valve Legs, Goswell Insulated.....	4 1/3
1 lb. DCC 16 Wire.....	3/6
Simplex lead-in.....	1/9
Neutrodyne Vernier Colvern.....	3/6
Independent Vernier (both Colvern)	2/6
Valve Templates.....6d.	
Valve Windows.....2 for	1/4
H.F. McMichael's Barrel Type.....	10/-
B.B.C. 300/600, 5 XX 1100 3000, Energo	
250/700, 3/11; 450/1200, 4/3; 900/	
2000, 4/6; 1600 3000, 4/11; Raymond	
B.B.C., 3/-; 5 XX, 3/6	
3/16 Ebonite, 6 x 6 and 7 x 5 each 1/8;	
8 x 6 and 9 x 6 each 2/6; 10 x 8, 3/6;	
12 x 9, 5/-; 12 x 12, 6/-	
Diamond Weave Coils (5), 3/6 (equal	
25, 35, 50, 75, 100 Honeycomb).....	1/6
Neutron Crystal and Whisker.....	13/11
Radio Micro .06 Valve.....	13/11
French Metal .06 Valve.....	21/-
Myers DE Valve.....	12/6
Myers Universal.....	12/6
(Valves posted at buyer's risk)	
T.C.B. 6, 13, 30 ohms.....each	4/-
T.C.B. 300 ohms Potentiometer.....	5/-
Copper Tape Aerial, 100 feet.....	3/3
Mic-Met Detector.....	6/3
Burned Detector.....	5/6
Micrometer Enclosed Detector.....	2/9
1/16 square Bus Bar Hank.....	1/-
2 v 40 amp. Hart Accumulator.....	15/-
Allen Variable Grid Leak.....	1/9
P.D.T. Panel Switches.....	1/9
S.P.D.T. Panel Switches.....	1/5
Bretwood Variable Grid Leak.....	3/-
Watmel Variable Grid Leak.....	2/6
Bretwood Anode Resistance.....	3/-
Watmel Anode Resistance.....	3/6
McMichael's 2 Meg Grid Leak.....	2/6
McMichael's 100,000 ohm Resistance	2/6
Tools, seven Twist Drills.....	2/6
Taps 0, 2, 4, 6 BA set.....	2/11
4 Taps and Wrench.....	3/6
Soldering Iron and Solder.....	2/9
Mansbridge 2 mfd.....	3/11
1 mfd, 3/6; .25, 3/6; .01, 2/6	

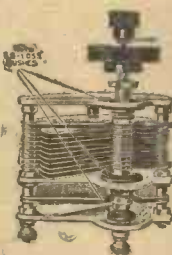
L.F. TRANSFORMERS	
Ferranti.....	17/6
granic.....	21/-
R.L.....	25/-
Ormond.....	14/-
Eureka Concert Grand.....	30/-
2nd stage.....	22/6
G.R.C.....	15/-
Super Success (Black).....	21/-
Standard Success.....	16/-
Brunet Shrouded.....	13/6

IMPORTANT NOTICE
TRADE COUNTER OPEN
will oblige you with any lines in stock,
less 20% on Proprietary articles only.
NO POST ORDERS TRADE

Bretwood Anti-cap Switch.....	5/-
Finstone Condensers.....	1/3 to 2/-
Ormond Neutrodyne Condenser.....	2/3

SQUARE LAW LOW-LOSS

(Square-Lo-Loss) WITH VERNIER
The only Condenser with the LOW-LOSS BUSHES
ELECTRICAL LOSSES REDUCED to a minimum. Full
capacity as rated.
EXCEPTIONAL LOW CAPACITY
"THE" Condenser for SHORT WAVELENGTHS
Why buy a Condenser without vernier when you can buy these?
SQUARE LAW .001 ... 8/9
(with vernier) .0005 ... 7/9
including Knob and dial (Ebonite ends 1/- extra)
.0003 ... 7/-
Trade supplied Post 6d. set



"DE LUXE" Model

AS SHOWN, WITH DIAL, KNOB AND BUSH.

.001 ...	6/11
.0005 ...	5/6
.0003 ...	5/-
.0002 ...	4/9

POST 6d. SET.

UNSURPASSED FOR FINE TUNING

JACKSON BROS.

SQUARE LAW.	STANDARD.
.001.....9/6	Variable Condensers, with Knob and Dial.
.00075.....9/-	
.0005.....8/-	.001.....8/6
.0003.....6/9	.0005.....7/-
.00025.....6/9	.0003.....5/9
.0002.....5/6	.0002.....5/-

Post 4d. Set.

EDISON BELL

.0001 to .0005 Fixed.....	1/3
.002 to .006.....	2/-
.001.....	1/3
.003 with Grid Leak.....	10/6
Variometer.....	10/6
Twin Detector.....	5/6

LOUD SPEAKERS

Sterling Dinkie.....	30/-
Dragon Fly.....	25/-
Junior Amplifier.....	27/6
Dr. Nesper.....	21/-
Sterling "Baby".....	55/-
C.A.V. Tomtit.....	30/-

POLAR CONDENSERS

.001, .0005, .0003 each 10/6	
2-way CV(Junior) stand 6/-	
2-way Universal.....	11/-
Others not Obtainable.	

STERLING SQUARE LAW

(With Vernier).	
.001.....	30/-
.0005.....	25/6
.00025.....	23/-

DR. NESPER HEADPHONES

Adjustable diaphragm, detachable receivers, double leather - covered headsprings, long flexible cords, nickel plated parts. Very comfortable fitting to the head.

SEE TRADE MARK.
4000 ohms.....13/3
Post 6d. pair.

NEW MODEL

With Knob and Dial. WITH VERNIER.

.001 ...	8/9
.0005 ...	6/11
.0003 ...	6/9

With EBONITE DIAL and Two Knobs. Post 6d. Set.

TWIN Condenser SQUARE LAW

EBONITE ENDS.

.00025 ...	12/6
.0003 ...	12/6
.0005 ...	18/11

TWIN (Ordinary).

Equal units of .00025 or .0003. Complete with Knob and Dial. 9/-

ALL VALVES ON POST SENT AT PURCHASER'S RISK.

BRIGHT EMITTER

11/-
B.T.H., Ediswan, Marconi, Mullard, Cossor, Myers, Green and Red Ring, etc.

.06, DER, ARDE, etc.

Myers, Cossor, Mullard, Ediswan, Marconi, etc. Valves sent by post (purchaser's Risk)

GOSWELL ENGINEERING

2-way Cam Vernier ...	9/-
3-way "....."	12/6
3-way Ordinary.....	7/6
2-way Panel.....	3/-
3-way Panel.....	5/-

HEADPHONES

4000 ohms	
Sterling.....	25/-
B.T.H.....	25/-
Byrands Matched.....	25/-
Brown's Featherweight.....	25/-
G.R.C.....	20/-
Brunet, New Model 16/11	
Telefunken.....	17/11

SPECIAL. To callers only. To customers purchasing 20 - worth of our own goods at full prices, we supply a first-class pair of 4,000 ohm phones for 5/- as an advertisement only.

REACTONE COILS

For Chelmsford ... 2/6
For Broadcasting ... 4/6

CALLERS' COLUMN

NO POST ORDERS FROM SAME

See Name RAYMOND

on windows

EBONITE 3/16	ACCUMULATORS
stock sizes	2 v. 40 amps... 9/6
3 in. also stocked	4 v. 40 amps... 16/6
6 x 6 1/4 10 x 8 3/4	4 v. 60 amps... 18/6
7 x 5 1/4 12 x 6 3/4	4 v. 80 amps... 23/6
8 x 6 1/4 12 x 9 3/4	6 v. 60 amps... 27/6
9 x 6 2 1/2 12 x 12 5/8	6 v. 80 amps... 33/6
14 x 10 5/6	6 v. 105 amps. 38/6
Cut to size	Hart's Stocked.
1 d. sq. inch	All High Quality.
VALVES	
.06 Radio Micro 12/6	RAYMOND FIXED CONDENSERS
.06 Genuine	.001, .0001 to
"Metal".....11/6	.0005.....10d.
French R.....6/2	.002, .003, .004 1/-
Phillips R.....6/11	Dutch "D".....1/9
Dutch "D".....4/9	.006, 1/3; .01, 1/9;
Dutch "R".....4/9	.02, 1/9.

D.C.C. WIRE	Switches, Panel
per lb.	D.P.D.T. 1/-
13 g. 9d.	S.P.D.T. 10 1/2 d.
22 g. 10d.	D.P.D.T. China
26 g. 1/1	Base 1/4
30 g. 1/6	S.P.D.T., China
20 g. 9d	Base 10d.
24 g. 1/-	Rheostats, Ormond
28 g. 1/3	1/8, C & S 1/-
Etc., etc.	Raymond ... 1/3
	Do. & Dial 1/6, 1/11
	Dual ... 2/2, 4/6
	Twin Flex, 2-colour,
	6 yds. 10d.
	Lighting 12 yds. 1/6
	Empire Tape
	12 yds. 6d.
	Fibre Strip
	36" x 1" 2d.
	60 B.B.C. 8/11
	Switch Arms 7d.
	30 B.B.C. 5/6
	Studs, 2 a 1d.
	9 v. B.B.C. 2/6
	Lead in, 10 yds. 1/-
	15 (D.E.) ... 1/9
	Belt Wire 10ft. 5d.

ENGLISH 4000 ohm Phones, 10/- pr.

Terminals	1d.	Transfers, 32
11d., 2d.		Titles..... 2d.
Pillar W.O. phone		Nugraving..... 6d.
Nickel 2d. each		Copper Foil ft. 2d.
Coil Stands, 2-way		Ins. hooks 2 for 1d.
1/9, 2/-, 2/3		Knobs 2BA ... 2d
3-way, 3/6, 4/-, 4/3		Ins. Egg 1d.
Cam Vernier		V. Windows 4d.
Shipton 2-way 4/-		BBC, HFT 2/6
" 3-way 7/6		5XX HFT 2/9
Various from 3/11		Ad. Tape 2d.
Detectors, Micro-		Valve Pins 2 a 1d.
meter, 1/6; En-		Do. sockets ... 1d.
closed, 9d., 1/-, 1/6		Wander plugs 1d
Phone Cords 72" 1/-		Staples 5 a 1d.
Extra quality 1/6		Spade Tags 6 a 1d.
Valve holders 10d.		Spade Screws
No junk stocked.		2 for 1d.
Shorting Plugs 3d.		Box and Lid 2/3, 2/11
Coil Plugs 4d., 5d.		Nuts 6 a 1d.
1/9, 2/-		Whiskers, 1d. to 6d.
With fibre 7d.		Variometers 1/3, 1/6,
Shaped, 7d., 8d.		1/9, 2/-
Edison Bell ... 11d.		Battery links
Shellac 5d.		3 for 2d.
EB Bushes 1d.		Sets of DCC Coils
Basket Coils		BBC (5) ... 1/3
DCC 5 XX 1/-		7 Drills 1/2
Extra large ... 1/9		1/16 sq. Bus Bar 6d.
Holders 7d. 8d.		Panel Sockets 1d.
7 Drills 1/2		Woods Metal 2d.
1/16 sq. Bus Bar 6d.		Sq. Law, .0005 5/-
Aerial 7/22 100		Sq. Law, .0003 4/8
feet..... 1/11		Frame Aerial, etc.,
Frame Aerial, etc.,		Sq. Law, .0003 5/-
PB, 110 feet, 3/6		Dials 8d. extra

EVERYTHING YOU WANT AT CHEAP PRICES
Crystal Sets 4/9, 5/11, 6/9, 7/11, 9/11 up

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GALLERY DOOR

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HOURS
OF BUSINESS:
DAILY - 5 to 7.45
SUNDAYS - 10 to 1

CHIEF EVENTS OF THE WEEK

SUNDAY, February 15.

London and 5 X X	3.0	Star Ballad Concert.
London and 5 X X	9.0	De Groot and Piccadilly Orchestra
Bournemouth	3.0	Russian Symphony Concert.
Manchester	3.0	Sonata Recital—Solos and Songs.
Newcastle and 5 X X	8.30	Byrd's Great Service by the Newcastle Bach Choir. Address by the Very Rev. the Dean of Durham.
Glasgow	9.0	Recital of 16th Century Church Music.
Liverpool	9.0	Operatic Evening by the British National Opera Company.

MONDAY

Bournemouth	8.0	Winter Gardens Night.
Newcastle	7.30	A Scene from <i>The School for Scandal</i>
Glasgow	7.30	Choral and Orchestral Evening.

TUESDAY

5 X X	7.30	Operatic Programme.
London	7.30	Musical Comedy Excerpts.
Belfast	8.0	Belfast Postmen's 13th Concert.

WEDNESDAY

London and 5 X X	7.30	From the Mystic East.
Birmingham	7.30	The Band of 2nd Batt. The East Yorkshire Regiment.
Cardiff	7.30	The Music of Edward German.
Manchester	7.30	Operatic.
Newcastle	7.30	Light Opera.
Newcastle	8.30	Violin and Pianoforte Recital.
Aberdeen	7.30	Choral and Orchestral Evening.
Belfast	7.30	Symphony Concert.
Nottingham	7.30	The Nottingham City Orchestra.

THURSDAY

London	7.35	Chamber Music Evening.
Bournemouth	7.35	Musical Appreciation
Manchester	7.35	Vocal and Instrumental Hour.
Glasgow	7.35	Spanish Scenes.

FRIDAY

London and 5 X X	8.25 (approx.)	Speeches at the Civil Service Dinner, relayed from the Connaught Rooms.
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Birmingham	8.15	Speech by the Rt. Hon. The Earl of Birkenhead, K.C., relayed from the Chamber of Commerce Banquet.
Bournemouth	7.30	Musical Appreciation, Second Night
Cardiff	7.30	The Charm of Variety.
Manchester	7.30	Concert in Aid of the Lord Mayor's Unemployment Fund.
Newcastle	7.30	From the Cotton Fields.

SATURDAY

London	7.30	Band of H.M. Scots Guards.
Birmingham and 5 X X	7.30	A Nigger Minstrel Programme.
Manchester	7.30	Pantomime, <i>Cinderella</i> .
Aberdeen	7.55	Violin and Pianoforte Recital
Aberdeen	8.35	A One Act Farce, <i>The Cure</i> .



Inland Revenue Radio Society

Hon. Sec.—MR. J. O. CLANTON, 570, Salisbury House, London Wall, E.C.2.

MEETINGS are held at 2, South Place, E.C.2, on first and third Fridays in each month during the winter months and the first Friday in each month during official summer time. Membership is open to permanent, temporary and retired members of the Inland Revenue Department.

The first regular meeting was held on Jan. 16, when Mr. Crewe gave a talk on the working and running of a wireless society. This was followed by a description of an efficient short-wave receiver. Mr. M. C. Butler also spoke on the subject of "The Use of Esperanto in International Radio Communication."

Coventry and District Co-operative Radio Society

Hon. Sec.—MR. A. CURTIS, West Orchard, Coventry. The meeting held on January 28 was devoted to practical work, when a loud-speaker of the plated paper type made by a member was tested on the society's three-valve receiver and gave excellent results.

"Practical Notes in Electric-light Wiring" is the title of an illustrated article appearing in the current issue of "The Amateur Mechanic and Work" (3d.), and will be of use to all those who contemplate installing the necessary wires and apparatus for lighting up their own homes. Other articles and features appearing in the same number are: "Mending Broken Glass and China," "A Hall Stand for a Restricted Space," "Our Small Car Page," "Adding a Valve to a Wireless Set," "A Catwhisker Clutch," "Notes by the Way," "Practical Photography: Snow and Hoar-frost Landscapes," "Repairing a Broken Vice," "A Tobacco-pipe Cleaner," "Designs for Model Steam Traction Engines," "Motor Cycle Practicalities," "Fitting Shelves in Recesses," "Cycling Chat: Winter Equipment."

ANNOUNCEMENTS

"Amateur Wireless and Electrics." Edited by Bernard E. Jones. Price Threepence. Published on Thursdays and bearing the date of Saturday immediately following. It will be sent 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 & 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.

LOUD SPEAKERS

STANDARD	2000 ohms	£5 0 0
"	4000 "	£5 10 0
"	120 "	£4 15 0
JUNIOR	2000 "	£2 15 0

Black Crystalline or Black Satin Enamel.

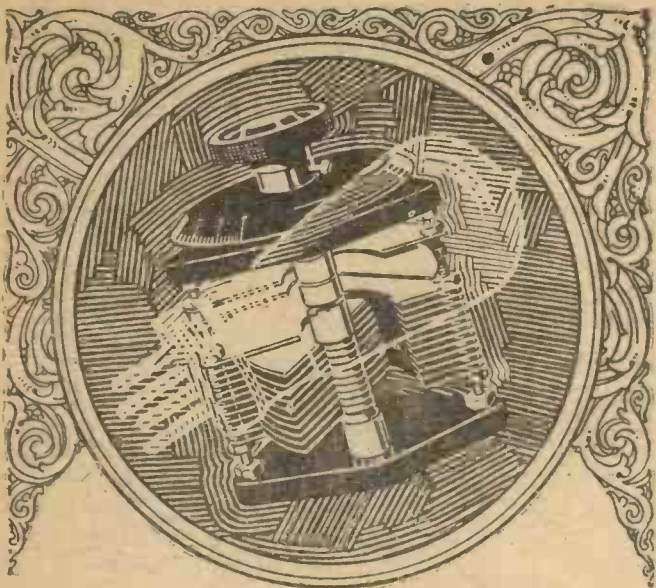
TOM-TIT 2000 ohms
Black Crystalline or Bright Stove Enamel

30!

C.A. Vandervell & Co., Ltd.
 ACTON VALE, LONDON, W. 3.
Members of the N.A.R.M.A.T.

IMMEDIATE DELIVERY

OVER THIRTY YEARS' ELECTRICAL EXPERIENCE



Equal to an extra Valve

IF, instead of adding a Valve Panel to your set, you could obtain the extra power by substituting Bowyer-Lowe Square Law Condensers for those you are using, you would be satisfied that the new condensers were out of the ordinary. Can it be done? Read what these customers say. Their experience is very definite evidence that only Bowyer-Lowe Condensers give the square law effect PLUS reduced losses and greatly increased capacity ratio.

MITCHAM. "The improvement your Square Law Condensers have effected in my Three-Valve All Concert Receiver has practically given me another valve."

GRAYS. "I have fitted the Condenser in my All Concert Receiver to replace one of a cheaper make. I can get all stations on Loud Speaker whereas I could only get London on phones before."

These results are unusual under any circumstances, but they prove conclusively that, especially when used in conjunction with Bowyer-Lowe MATCHED H.F. Transformers, Bowyer-Lowe Square Law Condensers yield signals that are unexcelled in purity and volume.

Fit these condensers in all your sets. Substitution is easy because they are NO larger than ordinary condensers. Good dealers stock them at prices from 11/6.

Bowyer-Lowe Tested Square Law Condensers

Send 11d. stamp for Pocket Price List of all Bowyer-Lowe Apparatus. 36 pp. of information with blanks for your own notes.

BOWYER-LOWE CO., Ltd., LETCHWORTH

Safety first



BEFORE you build your Set make sure that your panel is free from leakage. Safety First should be your watchword. A low-grade panel will nullify all your efforts and cause you endless trouble. Red Triangle Ebonite is fully guaranteed to be entirely free from leakage and to conform to the highest electrical standards. Its beautiful surface of velvet smoothness needs no tedious sandpapering before use.

Every Red Triangle Panel is supplied in a sealed wrapper bearing its distinctive label. Be sure you get Red Triangle Ebonite and accept no substitute. All ebonite appears alike and the only way you can tell the good from the bad is to look for the Red Triangle on every package. If your Dealer cannot supply order direct from us.

12 Stock Sizes :

6 x 8	3/-	7 x 10	4/3	8 x 12	6/-	12 x 14	10/6
6 x 18	8/-	8 x 6	3/-	10 x 12	7/6	12 x 16	12/-
7 x 5	2/3	8 x 10	5/-	10 x 24	15/-	12 x 18	13/6

All 1/4-in. Thick.

Special Sizes :

All Concert-de-Luxe, 16 x 8 x 1/4	8/-	Resistoflex, 12 x 8 x 1/4	6/-
Transatlantic V., 22 x 11 x 1/4	15/-	Anglo-American, 36 x 9 x 1/4	20/-
All Britain, 16 x 9 x 1/4	9/-	Neutrodyne Receiver, 12 x 10 x 1/4	7/6
S.T. 100, 12 1/2 x 9 1/2 x 1/4	7/-	Neutrodyne Tuner, 12 x 10 x 1/4	7/6
Puriflex, 14 x 10 1/2 x 1/4	9/2	3-Valve Dual, 24 x 10 x 1/4	15/-
Transatlantic IV., 16 x 8 x 1/4	8/-	Harris Crystal Set, 9 x 5 1/2 x 1/4	4/4

Any Special Size Cut per return at 1d. per Square inch.

TO THE TRADE: Red Triangle Ebonite is being extensively advertised and in spite of its superior quality can be sold to you at prices no higher than that which you are paying for ordinary unbranded ebonite. Write to us to-day for details of our selling plans.



PETO-SCOTT Co., Ltd.,

Registered Offices, Mail Order and Showroom,
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LIVERPOOL:—4, Manchester Street.
CARDIFF:—94, Queen Street.
WALTHAMSTOW:—230, Wood Street.

Red Triangle Ebonite

P.S. 2235

Harlie

FOOL-PROOF
DETECTOR

Provisional Patent 26791/24

Continuous reception in any position at all times, owing to the special design of both crystal and catwhisker, is the keynote of this excellent detector.

SOME NOVEL FEATURES:—

1. Nickel-plated detachable dust proof cover.
2. Special "Harlie" super-sensitive crystal.
3. Ebonite wheel for rotating crystal.
4. Catwhisker on slide for covering whole surface of crystal.
5. Nickel-plated sockets for panel mounting.

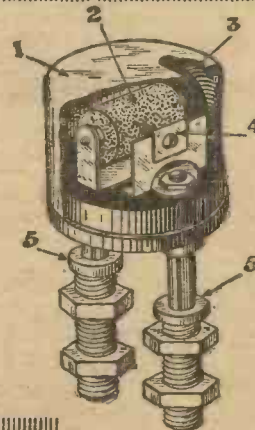
Obtainable from all dealers or direct from Patentees and Manufacturers.

PRICE COMPLETE 5/6

Generous Trade Terms.

Telephone: Clissold 293.

**HARLIE BROS., 183, Dalston Lane,
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Barelay's 709.

FINSTON ONE-HOLE FIXED CONDENSERS

Another big step forward in radio. Amateurs, experimenters, and other enthusiasts have long needed a model with the easiest fixing possible, viz., the one-hole method. Like our other components the Finston One-hole Fixed Condenser will give the utmost satisfaction and is immune from trouble in the most exacting and protracted use.

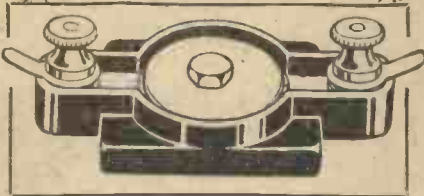
Guaranteed within 5 per cent of stated capacity, this accuracy has never before been obtainable by the public. The only one-hole fixing condenser on the market. Buy one. Test one. It will prove our statements and thoroughly satisfy you.

FEATURES:
Reliability of Capacity.
Finest grade Mica Dielectric Highest possible quality. Copper. Frod. Adapted for Terminal soldered connections.

CAPACITIES:
.0001 to .002,
price 2/- each.
.003 to .006,
price 2/6 each.

If your dealer cannot supply Finston Components, send your order to us together with his name and address, please!

LIGHTING SUPPLIES CO.,
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Barclays 714

PARIS AND OTHER STATIONS

Clearly heard on Loud Speaker Nr. London, using the "MIRACLE" MASTER Valve Set £3 12 6 plus Royalties. 1, 2, 3, & 4 Valves. Trade supplied. Send stamp for particulars. **WORLD'S WIRELESS STORES, WALLINGTON**

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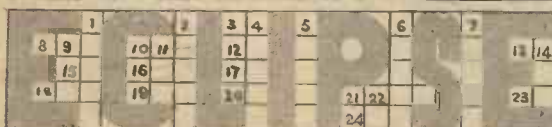
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LISSENIUM TUNING CHART. Note the Intermediate Coils 30, 40, and 60.

TABLE I. Wave-length range when used as Primary Coils with Standard P.M.G. Aerial and .001 mfd. condenser in parallel.			TABLE II. Wave-length range when used as Secondary Coils with .001 mfd. condenser in parallel.		
No. of Coil.	Minimum Wave- length.	Maximum Wave- length.	Minimum Wave- length.	Maximum Wave- length.	PRICE.
23	185	350	100	325	4/10
30	235	447	130	425	4/10
35	285	530	160	490	4/10
40	360	675	200	635	4/10
50	480	850	250	800	5/-
60	500	950	295	900	5/4
75	600	1,300	360	1,100	5/4
100	820	1,700	500	1,550	6/9
150	965	2,300	700	2,150	7/7
200	1,845	3,200	925	3,000	8/5
250	2,300	3,800	1,100	3,600	8/9
300	2,500	4,600	1,400	4,300	9/2



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WANT COILS
WHICH INTEN-
SIFY TUNING
—USE LISSENI-
AGON COILS.

SIGNALS ARE ALWAYS STRONGER—

when capacity is low and inductance is high. If, where, say, a No. 35 coil is ordinarily used with added capacity to tune it to a given wave-length, a No. 60 coil can be used, AND WITHOUT ADDED CAPACITY, other things being equal, it follows that signals would be stronger.

In the new LISSENIUM CRYSTAL SET a form of tuning has been introduced which permits of a No. 60 LISSENIUM (pronounced LISSENI-AGON) coil being used, and dispenses with the need of added capacity to tune it. A big signal voltage is built up. But, apart from its high inductance efficiency, too, there are other considerations which place this receiver far above all other crystal sets, NO MATTER WHAT THE PRICE.

THERE IS AN UNDISTURBED ELECTRICAL CIRCUIT, for instance. The only moving part is the metal plate, and although this is entirely unconnected with the electrical circuit, its influence on the inductance is effectively applied through the medium of the magnetic field created.

In conjunction with the principle of EDDY CURRENT TUNING employed in this new LISSENIUM CRYSTAL SET, LISSENIUM COILS ARE PECULIARLY EFFICIENT. No other coils give the same results.

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NOTE.—One LISSENIUM coil must be ordered with each set—the receiver will not be sold without a LISSENIUM coil because the use of these coils ensures very high efficiency.

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No. 60 LISSENIUM coil (covers 350 to 400 metres on this receiver)	5/4
No. 75 LISSENIUM coil (covers 400 to 500 metres on this receiver)	5/4
No. 250 LISSENIUM coil for Chelmsford	8/9

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