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The Wireless Magazine

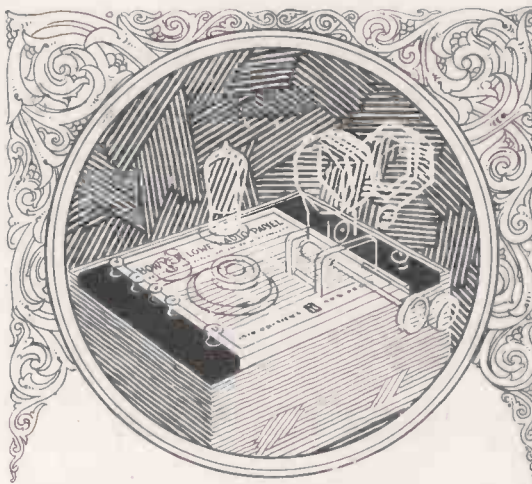
Edited by
Bernard E. Jones

VOL.1, NO.2.

March 1925
One Shilling Net



Guy Lippscombe



Buy Ebonite under Seal

If you could see your Radio Panel chosen, cut, marked, engraved and polished—if you could personally supervise every operation—still you would not be more thoroughly safeguarded than you are when you buy Bowyer-Lowe Panels in their sealed packages.

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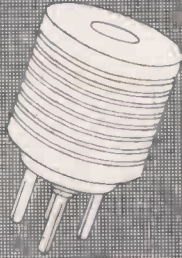
Bowyer-Lowe Panels of P.O. Grade "A" Ebonite are supplied in three forms: Semi matt, cut to any size at 3/4d. per square inch. Polished one side and all edges, 1d. per square inch. Drilled and engraved for any Radio Press Set (except OMNI Top). 1 1/4d. per square inch.

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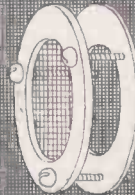
BOWYER-LOWE CO.,
Ltd.,
LETCHWORTH



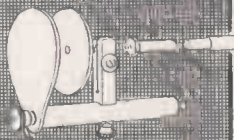
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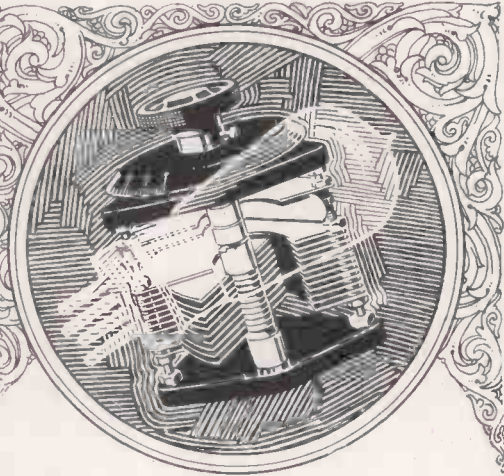
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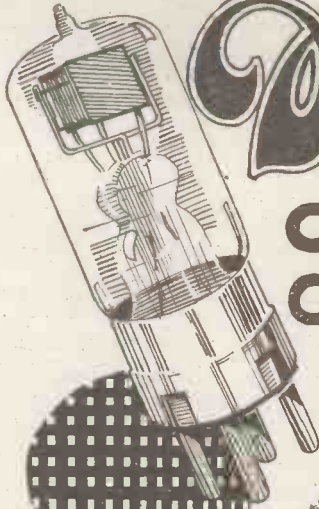
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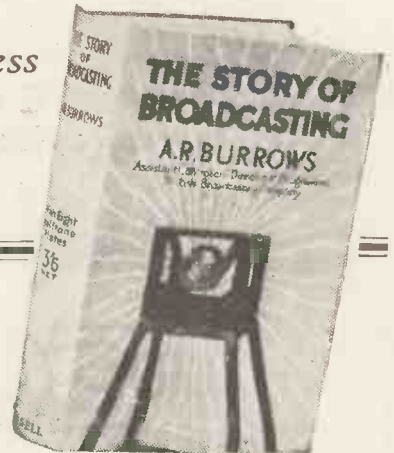
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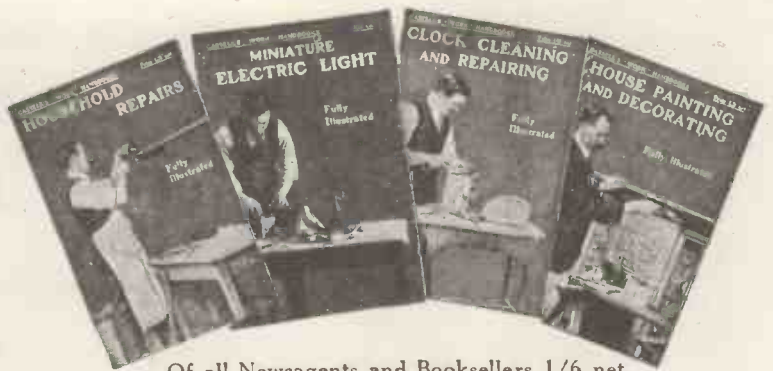


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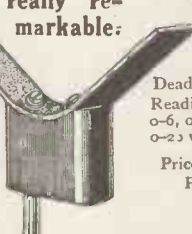


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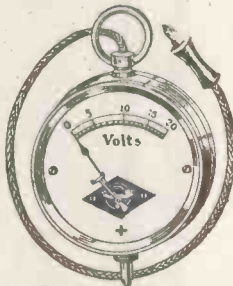
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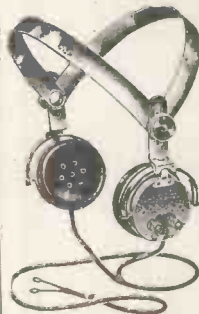


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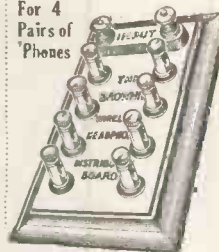
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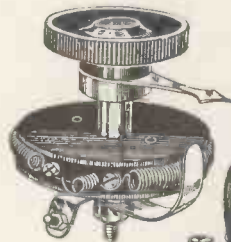
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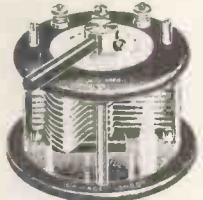
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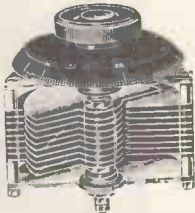
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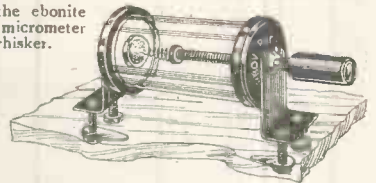
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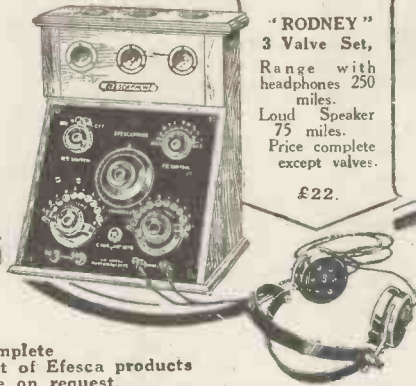
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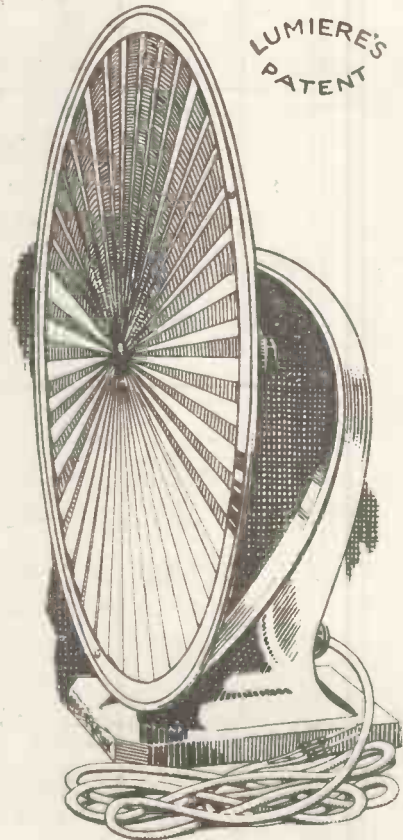
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APPLICABLE TO VALVES, TRANSFORMERS, Etc.

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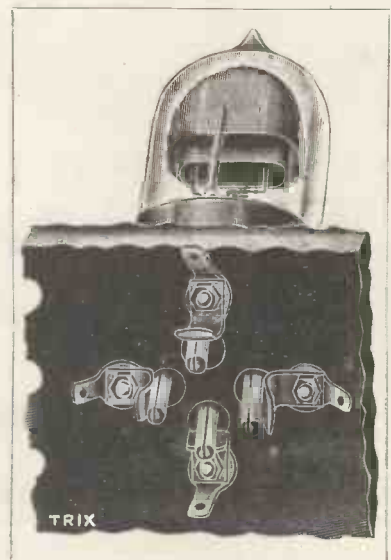
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8

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D. CONTAINING Gummed Template,
 4 Grips, 4 Screws,
 8 Nuts, 4 Soldering Tags
 AND INSTRUCTIONS.



The Wireless Magazine

March, 1925

THE WIRELESS MAGAZINE, edited by Bernard E. Jones, is published about the 25th day of the month and bears the date of the month following. Price One Shilling Net.

Contributions, whether MSS., drawings or photographs, are invited; they must have a wireless interest, and if accompanied by stamped addressed envelopes will be promptly considered. Every contribution to THE WIRELESS MAGAZINE will be paid for. All editorial communications should be addressed to The Editor, THE WIRELESS MAGAZINE, La Belle Sauvage, London, E.C.4.



CONTENTS

	PAGE		PAGE		PAGE
BROADCASTING — TO-DAY AND TO-MORROW. A Special Article by CAPT. P. P. ECKERSLEY	130	IN TUNE WITH THE PAST. A Story by A. E. MARTIN HARVEY	160	JOKING APART: TIPS FOR TYROS. By F. W. THOMAS	186
A CRYSTAL SET FOR MANY PHONES.	134	ABSOLUTELY FOR THE NOVICE. By COLIN BENNETT	162	THE LOUD-SPEAKER AS AN ORNAMENT.	189
UNDER MY AERIAL. The Chat of the Month	136	THE LISTENER AND THE LAW.	164	PRACTICAL COIL WINDING.	190
SHORT-WAVE PRACTICALITIES. By E. C. DAVIES	140	WIRELESS SLANG AT ITS WORST!	166	WHAT IS WRONG WITH GERMAN WIRELESS?	192
AT 2, SAVOY HILL, W.C.2. A page contributed by the B.B.C.	142	DO YOU CARE FOR GLASS PANELS?	167	THE WORLD'S BROADCASTING.	194
WHEN MARY LISTENS-IN. A Page Drawing by RENÉ BULL	143	HOW MANY VALVES?	168	WAVELETS.	196
A SPECIAL REINARTZ TWO-VALVER. Designed and Built by "THE WIRELESS MAGAZINE"	144	COMBINING THE GRAMOPHONE AND BROADCASTING. By Dr. ALFRED GRADENWITZ	169	QUESTIONS SIMPLY ANSWERED.	198
THE MYSTERY OF THE SILENT HOUSE.	147	WIRELESS PICTURES OF THE MONTH.	170	OUR CROSS-WORD THREE-VALVER.	200
KEEPING THE HOME FIRES BURNING. By E. V. KNOX ("EVOE" of "PUNCH")	148	A SELECTIVE ONE-VALVE SET.	172	LISTENING ON THE LONG WAVES.	206
WIRELESS FEMININITIES.	150	THAT METRONOME STUNT.	174	BELOW THE BROADCASTING BELT.	208
NEW COMPONENTS OF THE MONTH.	151	WHAT I THINK OF BROADCAST TALKS. By J. C. STOBART, Director of Education, B.B.C.	175	THE EVOLUTION OF THE CRYSTAL SET.	210
MAKING THE CRYSTAL OSCILLATE.	152	BRIGHT-EMITTER OR DULL-EMITTER, WHICH?	176	CONTINENTAL NOTES.	214
WHY I PREFER THE GRAMOPHONE.	153	SOME "REFLEX" MYSTERIES SOLVED.	178	FOR THE WIRELESS BOOK-SHELF.	220
SELENIUM: A KEY TO TELEVISION. By E. E. FOURNIER d'ALBE	154	BROADCAST MUSIC OF THE MONTH. With Eighteen Photographs	179	WIRELESS WEATHER WARNINGS!	222
"A SUNDAY ON THE CONTINENT"	157	GADGETS, HINTS AND TIPS.	182	PROGRAMME OF BROADCAST TALKS.	224
MY FIVE-VALVE RECEIVER. By a Boy of Fifteen	158	COUSIN CRYSTA'S CORNER. A Section for the Boys and Girls	184	JOTTINGS ON THE MONTH'S PROGRESS.	226
				WHAT THE READER THINKS.	228
				WHEN THE WIND BLOWS.	230
				THOUGHTS WHILE LISTENING.	235

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THE above title is somewhat alarming. The Editor thought of it, but I have to write about it; worse still, you have, perhaps, to read what I write.

The subject divides itself naturally into two heads: Transmitting and Receiving, and it will be easier to discuss each in turn.

Transmitters

The invention of the thermionic valve gave a tremendous impetus to wireless activity. At once we had the means of producing continuous waves at almost any frequency; of using the ordinary microphone of everyday use directly to control (thanks to amplification) almost any power; and lastly, the power to amplify feebly-received signals to almost any intensity.

The last quality is, perhaps, the least important; the problem still facing the wireless engineer is how to produce strong signals at the receiver—as amplification, unfortunately, magnifies interference and atmospherics equally with the signal.

The first applications of the wireless telephone transmitter were not concerned with broadcasting, but it is by the light of the experience gained with ordinary commercial transmitters that we later illumined

the more intricate difficulties that beset the path to distortionless transmission.

In the commercial wireless telephone the problem was how, with certain combinations of valves, transformers and the ordinary commercial microphones of everyday line telephone use, to get intelligible communication over a guaranteed distance. There was no question of super-intelligibility, nor did there arise the necessity of producing sufficiently good quality music to do justice to symphony orchestras, ballad singers, pianoforte solos, and the like.

Usual Form of Transmitter

It may be interesting to draw the diagram of the standard wireless telephone transmitter, and to discuss in some detail its method of working, indicating its evolution from the intelligible speech transmitter to the broadcast telephone of today. It is shown in Fig. 1 in absolute essence.

The microphone *M* produces, by virtue of its associated transformer, variations of current through the valve *Vc*. These, having their source in the power supply, necessarily produce variations in voltage at the point *P*, owing to the intro-

duction of a large-value iron-core choke *C*. Enclosed in the dotted line is the ordinary oscillation generator. Obviously, since the voltage at the point *P* is being varied sympathetically with the voice, so the power to the oscillation generator is sympathetically varied.

It is a gratifying fact, proved by experiment, that, provided the reaction circuit of the ordinary valve oscillation generator is correctly adjusted, the aerial output is proportional to the power input.

It should be realised, therefore, that we may draw the right-hand part of the diagram as a pure D.C. resistance; the equivalent value being given by the volts divided by the oscillating feed.

Drawing, then, the right-hand side of Fig. 1 as a resistance, the essential diagram of the so-called choke-control system becomes one of stark simplicity (Fig. 2).

It will be realised that, since we are to vary the power to the resistance *R_o* sympathetically with the microphone input, the power supplied to the "control" valve *Vc* must equal the power supplied to the oscillating circuit or its equivalent resistance.

We may look upon the system in another way by drawing the

circuit as in Fig. 3. The control valve is replaced by a variable resistance and the voice, so to speak, moves the slider up and down. The current from the power supply is constant, a limited amount of power only being available. The system may thus be con-

but will agree that, while it is intelligible, it leaves much to be desired in smoothness of reproduction.

The introduction of broadcasting gave rise to a further study of the subject, and at Writtle, the first broadcast station to work regularly in England, a transmitter was devised which conformed to more modern practice. The author, with a few members of his staff, made a fairly complete study of the broadcast telephone, and particulars of the final set are given here to indicate the advances made.

The control valve, or, as it was, valves (there being four in parallel), were of far wider grid mesh than hitherto employed. The voltage of the set was lower than standard, and an equal power was expended when the set was quiescent (that is, before the microphone was energised), in both control and oscillating systems.

It will be realised, if attention is concentrated entirely upon the control system, that we have an alternating potential at P (Fig. 3). Redraw, therefore, Fig. 3 and replace the valve by an alternator (Fig. 4). (This is not strictly fair, but it will serve to illustrate the following point). It will be seen that,

considering the power supply to be of infinite conductance to the alternator (no impedance), we have three paths to earth for the constant current generated by the alternator; one via the choke, another via the resistance, and a third via the blocking condenser (C of Fig. 1).

Now we want all our current to flow into the resistance, or in other words, the oscillator.

Fig. 4 (below).—Valve replaced by Alternator.

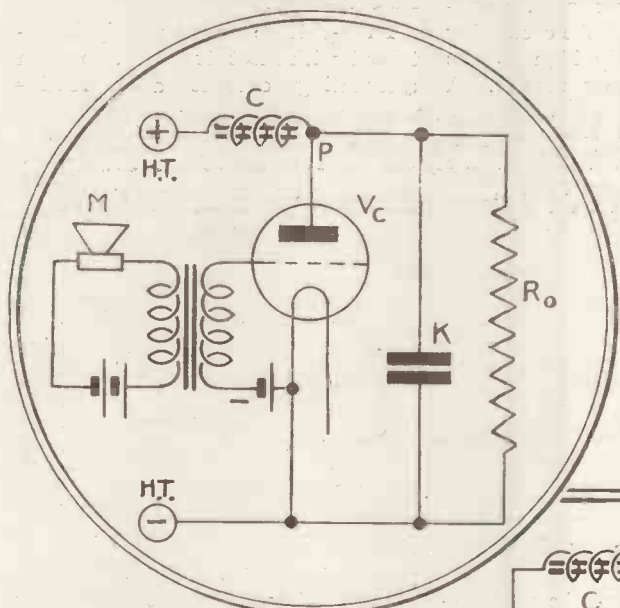


Fig. 2.—Choke Control System.

sidered a constant-current system. With the control resistance shorted no power flows into the "oscillating" resistance; with the control resistance in mid-position a power (P) flows into the oscillating resistance; with the control resistance open-circuited a power 2P is available for the oscillator resistance.

Thus, theoretically, we can, by swinging the grid voltage on the control valve between infinite limits and presupposing a "perfect" valve, double the normal power in the aerial or reduce it to zero. It is a constant-current system of control.

These facts were, perhaps, not fully understood at first. The author was associated with a school of designers who believed in the high-impedance valve working at relatively high voltages. Such valves are far more efficient as oscillation generators.

No valves were available for "control" valves in the early days except such high-impedance valves, and it was therefore necessary, if full control was to be obtained, to work these valves along non-linear parts of their characteristics; and the ideal of equal power in each system was only obtainable at the expense of rectification in the control system, besides the non-uniform loading of the transformer due to grid current.

As a commercial telephone the method was successful, and anyone who may happen to listen to the Croydon ground station which communicates with aircraft will be able to judge the quality of the station,

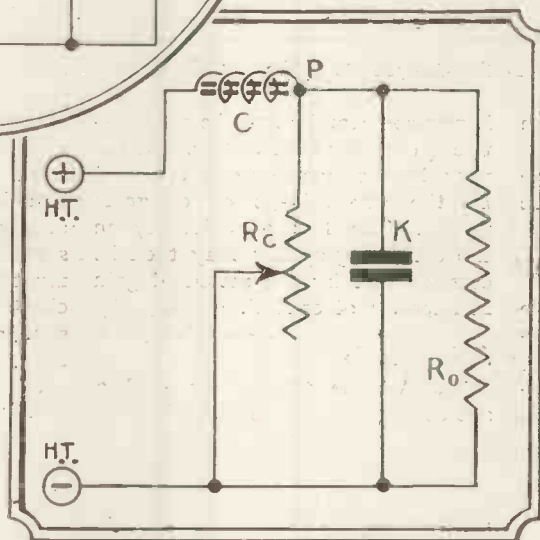
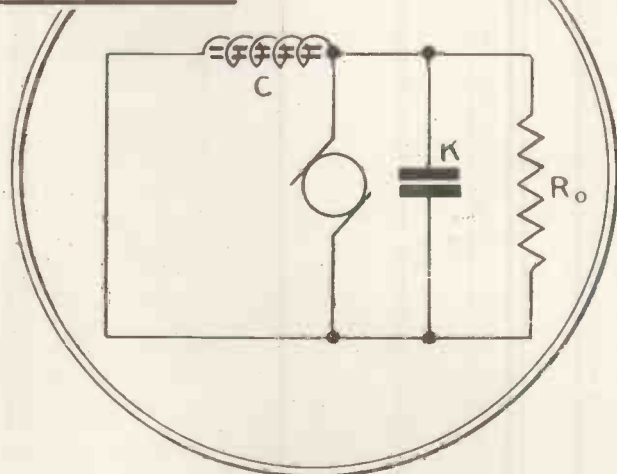


Fig. 3.—Diagram to explain Choke Control.



If the impedance of the choke is low compared with the resistance and condenser in parallel, then much will be lost; if the impedance of the condenser is low, the high-frequency will be lost. Considering the system as a whole, it will be seen that the resistance should be

low compared with choke or condenser in parallel.

This is not always easy to arrange, because it must be realised that, theoretically, at any rate, we must get an equal power from our constant current alternator at any frequency from 30 to 10,000 (the practical range of audible fre-

quencies), and the invention of the super-microphone, which in itself can give such performance, make it imperative that this should be done.

Choke and Condenser Values

happy compromise may be made between the very high-voltage and the very low-voltage systems favoured by the two schools of designers to-day. The loss of efficiency in the oscillating system may then be compensated by the increased gain in linearity of control.

Sub-controls

The Writtle transmitter used a sub-control system to magnify the

In this article Capt. P. P. Eckersley deals only with the purely technical side of broadcasting. Other phases of development, specially written by the B.B.C., are dealt with on page 142.

applied disturbances to the value required for full control. This may produce reactions in the control system, and although these can be eliminated easily enough by careful design, the point requires consideration. On the Writtle transmitter the sub-control system was worked from an entirely different supply—a 1,500-volt rotary converter in this case—but it is not thought that development will necessarily lie along these paths, as reactions can certainly be eliminated.

Resistance-capacity connection between sub-control and main is

desirable, but the sudden load produced by grid current may show up "blasting" more than with properly-designed transformers.

Power Supply

High-voltage power supply is obtained with most transmitters from alternating current after rectifi-

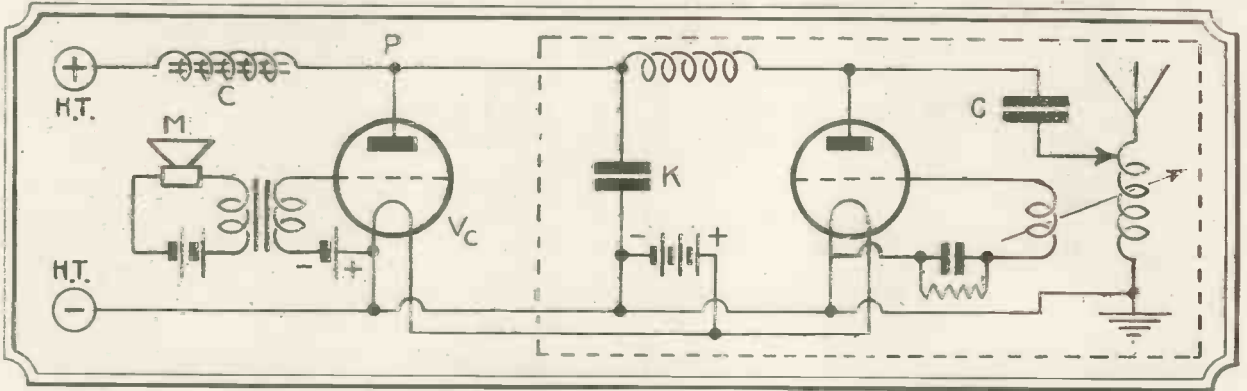


Fig. 1.—Essential Components of Standard Telephony Transmitter.

The writer pointed this out to Capt. Round in 1922 when describing the Writtle transmitter, and showed that up to 6,000 or 7,000 frequency with an oscillating impedance of about 20,000 ohms, a blocking condenser capacity of 0.0001 microfarad and a choke value of 600 henries, it was possible to obtain a fairly linear characteristic. Capt. Round raised the point again and has made some further experiments at 2 L.O.

The problems with higher-power transmitters are more acute owing to large valve capacities, and it is thought that improvements must be sought in existing broadcast transmitters either to decrease the

Smoothing systems for D.C. supply must, however, be almost as elaborate as for A.C. if all commutator ripple is to be eliminated. If progress moves towards still lower voltages, D.C. supply will probably be universal for broadcast transmitters, eliminating, as it does, the maintenance charges for rectifying valves.

In broadcast transmission we have always to study above all things the quality of emission; we cannot in any case go beyond distortionless limits, nor run into grid current. The strength of a signal from any broadcast transmitter can, however, be almost doubled by allowing "blasting," or running into rectification, and grid current in the control system. It is my opinion that in this case we allow the peaks of the disturbance so greatly to overshoot the limits that the aerial system constantly stops oscillating, producing an overall control much greater than that normally achieved.

Speech and music from echoless rooms has an average or R.M.S. value far less than that of a pure alternating current; it is peaky

in wave-form. As control has to be limited to the peaks, the overall control suffers.

It is interesting in proof of this to notice that the more echo that is introduced to the original source of sound, the greater the apparent loudness of signal; transmissions conveyed over great distances by land-line also are louder. In both cases the peaks of the disturbance delivered to the transmitter are smoothed off—in one case acoustically, in the other electrically.

It will probably be impossible, with the improvements in the relations of the various quantities in the broadcast transmitter, to go beyond a certain degree of control, which could undoubtedly be increased did we allow "blasting." It will be realised, of course, that any departure from strict relationship between input and output impulse will limit overall control.

Wave Constancy

The independent drive or master oscillator has been introduced in many broadcast transmitters. The original designers required an absolute constancy in the oscillating characteristics of the high-frequency generator, and the usual reaction circuit was abandoned in favour of a more stable arrangement, where an absolutely independent oscillator induced fluctuations to the grid of the main oscillator valve exactly in tune with the natural period of the aerial.

By this means the feeblest of voltage applications to the aerial oscillating system will produce a correspondingly feeble oscillating current; there is no fear of instability.

Captain Round in some investigations confirmed by experiment that the independent drive, by maintaining an absolute wave constancy, largely overcame the distortion incident to long-distance reception at night. He showed that at 100 or more miles from 2LO, reception was almost unintelligible without the use of independent drive due to "night effect" distortion.

This point is interesting in connection with the short-wave transmissions from KDKA which, while

of good signal strength, are liable to serious night distortion. Readers may be interested to know that an independent drive is to be fitted at Pittsburg. We eagerly await the results of further tests with America, because if night distortion can be eliminated, we should not be far off a fairly reliable transoceanic link. Too great reliance, however, should not be placed on the results of the experiment.

Microphone Developments

The development of the microphone during the past two years has been remarkable. Both the American and British engineers have produced instruments that, *per se*, are little short of perfection. A standard has been adopted on which to base performance. A microphone, to be perfect, must give to its associated amplifying system equal electrical impulse for equal audibility.

There is little doubt that the actual instrument for converting sound impulses into electrical impulses approaches this ideal more

long distances. This presupposes the use of transformers. While transformer design has undergone remarkable changes, it cannot be said that the ordinary iron-cored device, even the most perfect of its kind, gives equal efficiency over the full range of required frequency; it is probable that there is a serious falling off at frequencies below 100 and above 5,000. This introduces a bar to absolute perfection and the elimination or the production of a more perfect transformer should indicate the needs of the future.

Resistance-capacity amplification can be used with success, and theoretically with no distortion over any practical range of frequencies, but the system cannot be applied as between two systems of amplification far removed in actual distance. The link from studio microphone to first amplifier usually requires a transformer; from first amplifier to control room two more; from control room to transmitter a further two—five in all. Each introduces an added departure from strict linearity—a necessary evil, but one that may sooner or later have to be faced.

Simultaneous Broadcasting

The introduction of long-line linking as between one broadcast centre and another introduces, perhaps, the most serious distortion incident to the present transmitting system. Further transformer distortion is a minor difficulty as compared with the variable attenuation and cut-off introduced by even overhead land-lines. The cure is to concentrate further on transformer design to improve the present methods of line correction which can *theoretically* overcome nearly *all* distortion, and lastly to introduce more repeater points in long lines. Smaller corrections and larger amplification will give us, then, the double advantages of purer reproduction and less spurious induction noises.

The reader may by this time be wondering why he hears anything at all, as so many disabilities seem to bar the possibility of proper reproduction. He will, however, forgive me if I point out that ears are wonderful things; imagination supplies a heap

(Continued on page 212)



Captain Eckersley: A Typical Portrait.

nearly than either the wireless transmitter or more notably the wireless receiver.

Unfortunately, for practical performance we require amplification and transference of impulses over

A Crystal Set for Many Phones



MOST owners of crystal sets have experienced the annoying reduction of signal strength consequent upon the connecting, either in series or parallel, of additional pairs of phones.

With the novel crystal set here described, the possibility of such an eventuality is entirely reduced and many pairs of phones may be used without any appreciable reduction in signal strength taking place.

The Circuit

Referring to the circuit diagram, Fig. 1, it will be noticed that each pair of phones is in series with a crystal-detector, whilst tuning is accomplished by means of a .0005 microfarad variable condenser and plug-in coils. This enables the set to be quickly tuned to either high or low wave lengths.

Components

In order to facilitate an estimate of the cost of the complete set, a list of the parts required is given below:

- 1 ebonite panel 9 in. by 7 in.
- 1 wood box 9 in. by 7 in. by 4 in. deep inside.
- 1 .0005 mfd. variable condenser of the one-hole fixing type.
- 6 perikon (zincite-bornite) crystal detectors of the type shown in Fig. 2.
- 1 plug-in coil to suit wavelength of station required to be tuned-in.
- 1 plug-in coil holder.
- 14 terminals.
- 3 yards tinned copper wire (No. 18 or 20 s.w.g.)
- 4 No. 4 counter-

sunk-head wood screws for fixing panel to box.

Complete drilling dimensions of the panel are given in Fig. 3. If the panel is of the non-guaranteed type; both surfaces should be thoroughly rubbed with fine emery cloth in order to

Perhaps the greatest disadvantage of the ordinary crystal set is that only two or three pairs of phones, at the most, can be used without a serious falling-off in strength.

In this article, however, is described a set that will give as good volume with six pairs of phones as with one pair, and what is more, no batteries are required.

remove any traces of tinfoil or other conducting substance adhering to the surface.

By far the best plan, however, is to purchase guaranteed ebonite, thus obviating the necessity of

preparing the surface after drilling.

Wiring Diagram

Fig. 4 shows the positions of the components and wiring on the back of the panel. For the benefit of those conversant with the ordinary type of circuit diagram, a theoretical circuit diagram is given in Fig. 1.

Care should be taken to connect the fixed plates of the condenser and the zincite crystals to the aerial side of the circuit.

Using the Set

When using the set it should be noted that phones of widely varying resistances may be connected in without detracting from the signal strength of any of the phones which may be in use.

A further point of interest is that phone terminals not actually in use may be short-circuited with a piece of thick wire, without appreciably affecting the signal strength in the remaining phones being used.

As regards the plug-in coil, the exact size will depend on the wavelength of the particular station to be received.

Ordinary broadcast reception with a full-size outdoor aerial will necessitate the use of a No. 35 coil for wavelengths of 400 metres or under. A No. 50 coil should be used for receiving on wave lengths between 400 and 500 metres.

For Chelmsford

For reception of the Chelmsford high-power station (1,600 metres), a



The Set in Use With Many Phones.

No. 150 coil should be plugged in.

The use of a small indoor aerial will entail the use of coils having more turns than those specified, the exact number of turns being determined by experiment.

By plugging in larger coils than those specified for low wavelengths and connecting a .0003 microfarad fixed condenser in series with the aerial, that is, between the lead-in wire and the aerial terminal of the set, an appreciable increase in signal strength may be obtained if a full-size outdoor aerial is used.

The design of this set is based on the principle outlined by Mr. J. W. Miller in "Amateur Wireless," No. 124. Mr. Miller is believed to be the originator of this principle.

It should be fully realised that phones of any resistances can be used. For instance, if phones of 60, 120, 1,000, 4,000, 8,000 and 12,000 ohms resistance are used on the same set, signals of equal volume will be heard in each pair, providing all the phones are of the same efficiency.

An important point to notice is that high-resistance crystal detectors

must be used, preferably of the zincite-bornite type, as recommended.

With detectors of the ordinary catwhisker-contact type there is the likelihood of a falling-off in strength.

Therefore the apparent impossibility of using phones of different

resistances on the same set at the same time, and retaining the same strength of signals as would be the case if the phones were in use alone, has been achieved.

If desired, the extra crystal detectors can, of course, be added externally, as shown by the circuit diagram. R. T. J.

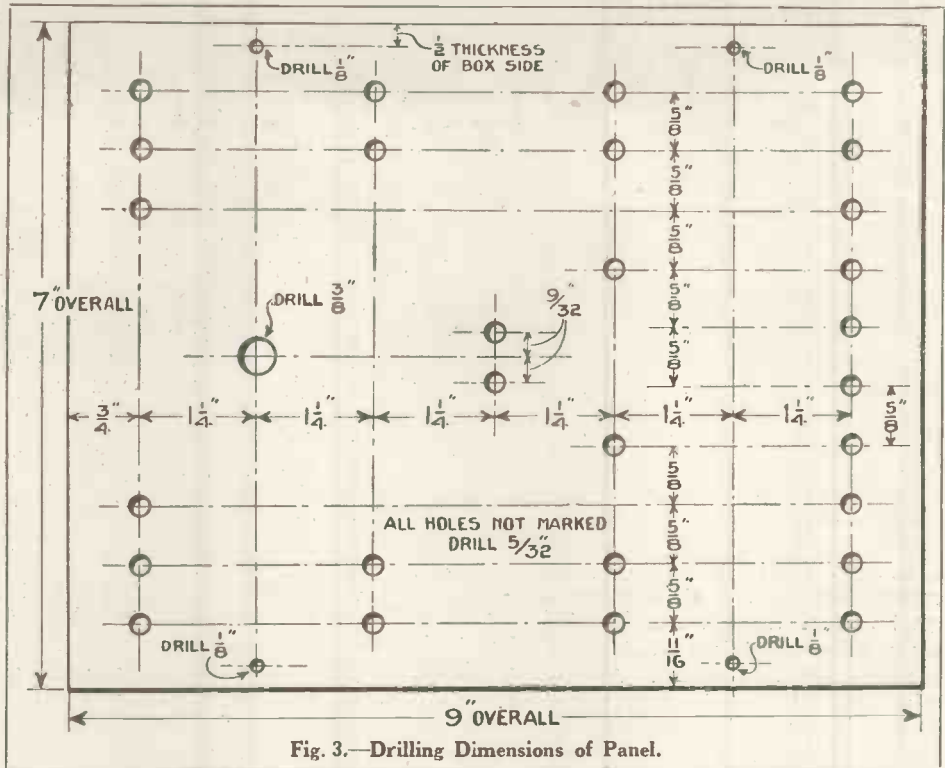


Fig. 3.—Drilling Dimensions of Panel.

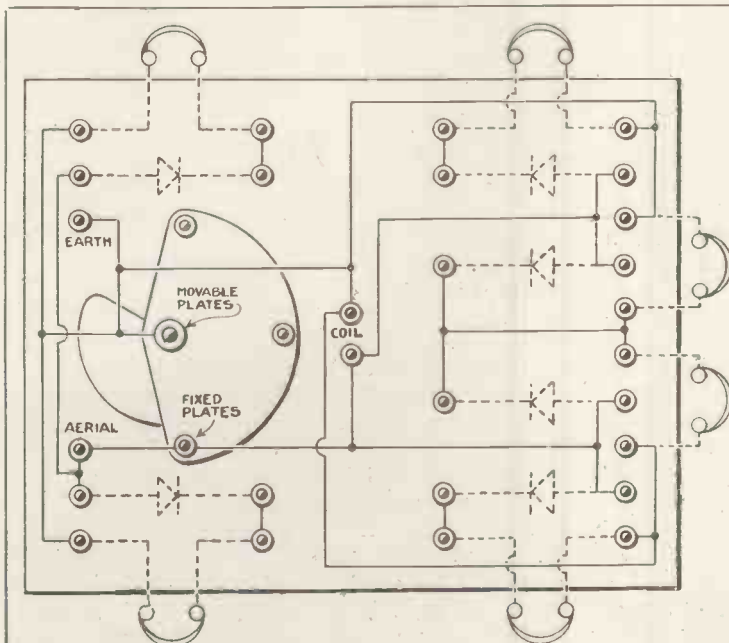


Fig. 4.—Positions of Components and Wiring.

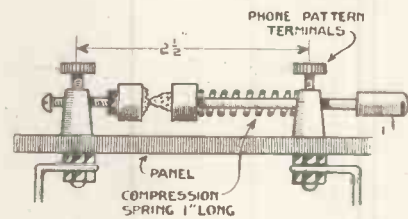


Fig. 2.—Details of Detector.

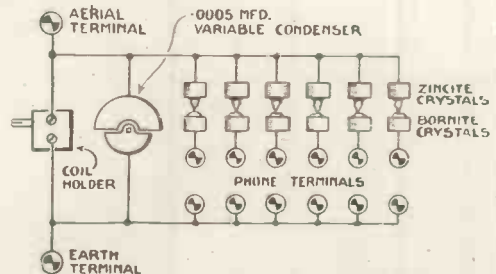
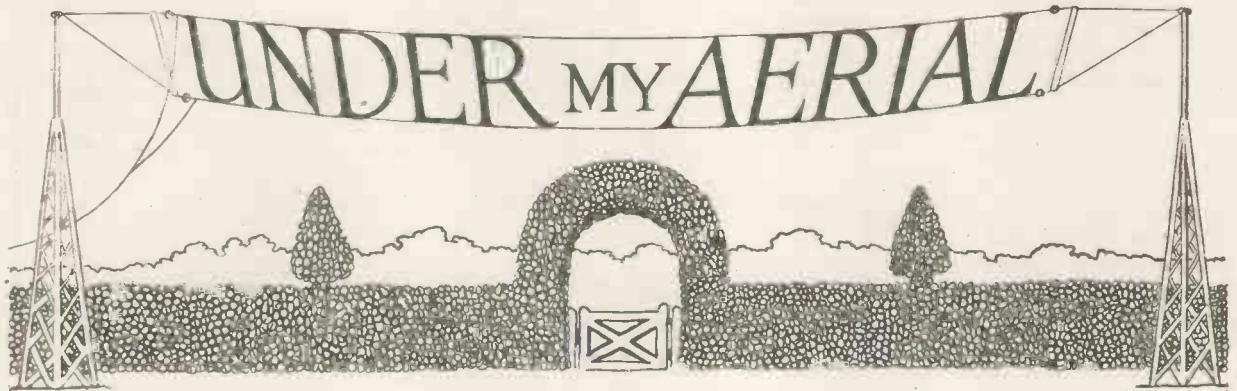


Fig. 1.—Circuit Diagram.



Natural Wireless Crystals

THESE is an old superstition that whatever you do on New Year's Day you will do much of during the year.

If there is any truth in the old superstition, then I shall spend a good deal of time in 1925 looking for wireless crystals in the neighbourhood of lead mines. An old scientific friend of mine who is now at the N.P.L. (National Physical Laboratory), where wireless components are tested and certificated, used to give the lie to this old superstition in the following manner.

New Year's Day always saw him at his home in Nottinghamshire. In the afternoon of that day he made a point of reading a Shakespearean play, and he never read another line of Shakespeare during the rest of the year. Most probably I shall never engage in a hunt for natural wireless crystals again in 1925.

I had a good time with the crystals I picked up in the vicinity of an old

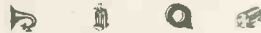


"Smash them up with a hammer"

lead mine on New Year's Day. I am no mineralogist. All I can tell you is that the crystals I found were ordinary samples of lead-ore. The pieces I took home with me were large, and I had to smash them up with a hammer before I could try a sample in a crystal set. To my very great astonishment, the first piece I tried gave me as good signal strength as any crystal I ever bought, despite the fact that there were only a few sensitive spots.

I am not, however, going to make a fortune out of my lead-ore crystals,

for they only retain their sensitivity for a few days. Still, it was an interesting little experience.



The Speed of Broadcast

On New Year's Eve I happened to be staying in the country with a wireless friend who possesses a really good three-valve set. As the hour of midnight approached, my friend tuned in 5 X X and placed his loud-speaker near a French window lead-out into the garden. In order to let the New Year in properly we both went just outside the French window where we could hear the local church bells in addition to the loud-speaker.

"The church clock here is usually a couple of minutes slow compared with Big Ben," said my friend. "I wonder how it will compare with Big Ben to-night."

We heard the quarter chimes from Big Ben through the loud-speaker, but the church clock remained silent. However, immediately the first of the twelve hour strokes from Big Ben came through the loud-speaker, the local church bells broke out into the joyous peal with which the new year is always ushered in.

"At any rate, the church clock has started the New Year well as regards time," remarked my host. "I hope they will keep it up."

For a few minutes we stood out in that garden, listening to the bells at the local church as well as to the bells of St. Martin's through the loud-speaker. Talking things over before the warmth of a cosy fire afterwards, we wondered how many listeners-in heard Big Ben tell the beginning of another year. We also wondered if those listeners-in really appreciated the marvellous speed of broadcast waves.

From my friend's house to the church is a distance of 300 yards or

thereabouts, and the sound of the church bell takes nearly a second to travel from the church tower. It seems an amazing thing to think that it takes less time for the sound of Big Ben to travel from 2 L O to my friend's loud-speaker, a distance of over a hundred miles.

I have repeatedly read that, in some districts of London, Big Ben can be heard by wireless before the actual sound of the clock itself. This is possible, as we all know, because of the comparatively slow rate of travel of sound waves through the air.

The actual rate of travel of a sound wave is, I believe, $12\frac{1}{2}$ miles per minute. Broadcast waves, however, travel at the prodigious rate of 186,000 miles per second. I once heard a speaker at a wireless club lecture say that the difference between the rate of travel of wireless waves through the ether and the rate of travel of sound waves through the air could be realised to some extent when it was stated that it



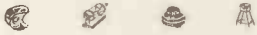
"The speed of broadcast"

would take a sound wave over ten days to travel as far as a wireless wave travels in a second.

Have you ever thought of the confusion that would arise if we tried to take our time from hearing the striking of a super Big Ben in London?

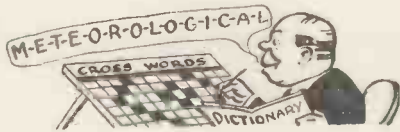
A clock at Chelmsford would be nearly three minutes slow if set by hearing the actual sound of this super clock; and Bournemouth would be eight minutes behind London were it to rely on the hearing of this super Big Ben. The clock

errors in the other broadcasting centres would be greater, the worst error being that for Aberdeen, over half an hour.



Some Pressure!

So many aerial masts were blown down during the heavy gales of late December and early January that I thought it would be a matter of interest to find out what pressure a gale of wind exerted on an aerial mast when the mast was fully exposed to the force of the gale. Accordingly I sought out a meteorological friend. (What an awful word that word meteorological is. I always have to get out my dictionary to make sure that I have the spelling right. I



"Bound to use the word"

am bound to use the word, for nothing insults a meteorological expert more than to call him a weather man.)

Without a word of warning I put my question to my meteorological friend in this way:

"Can you tell me what pressure a gale of wind exerts on an aerial mast?"

"Before or after?" he counter-queried.

"Before or after? What do you mean?" (I never could remember the difference between relative terms except positive and negative in wireless.)

"I simply meant before or after it was blown down."

"Before, of course. You're only being silly to gain time, you know. I can hear you working it out."

"Not a bit of it. It makes a good deal of difference whether the aerial mast takes it standing up or lying down."

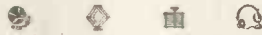
"In the case under question, it takes it standing up. You're hedging like you weather folk always do. Even when you are asked a straightforward question, you can't help hedging. I did not ask you for a weather forecast."

"Listen-in, then. When at its worst last night, the wind was blowing with such force as to exert a pressure of—er—about five pounds per square foot. On a thirty-foot

mast, I suppose that that would mean a pressure of over fifty pounds altogether, or say half a cute."

"Half a what?"

"Sorry. That's what my little son calls it; c—w—t, you know. He pronounces it cute. Hundred-weight is the correct pronunciation, I think. Rather cute of the little fellow, don't you think?"



Interesting American Figures

The Government Department of Commerce in the United States has given some most interesting figures showing the way in which Uncle Sam spent his money on wireless during the year 1923. The total amount spent on wireless apparatus that year reached the amazing figure of nine and a half million pounds. Possibly the most interesting feature of the figures disclosed is that ten times as much was spent on loud-speakers as on phones. Even if we assume that a loud-speaker costs as much as five pairs of phones, these figures show that two loud-speakers were purchased to every pair of phones. Surely there could be no better testimony to the popularity of the loud-speaker on the other side of the Pond.

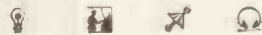
A second interesting feature of the American wireless trade figures for 1923 is that about £100,000 was spent on crystal sets, whereas the amount spent on "toob" sets was close on two and a half million pounds. This is, perhaps, what would be expected in a country of so vast an area that a comparatively large



"Interesting American figures"

proportion of listeners-in must be outside the range of crystal reception.

I wonder if corresponding figures are available for our own country.



Fault-Finding

Last week I was engaged in fault-locating in wireless sets which refused to function properly. The first bit of trouble I ran up against was in a two-valve set made by an old friend of mine who had suddenly taken up wireless. The set was well

made, the only obvious fault being an excess of solder on the joints and terminals, a frequent fault with beginners in constructional work.

I examined the set most carefully. The wiring was correct, and I could see nothing wrong, yet not a sound could be got out of it. I went over the aerial and earth systems. Both were satisfactory. I again examined the set, checked the wiring once more, and sounded all the connections in my most impressive manner. Everything seemed perfect.

I began to get worried and to reach that stage when you wish you could make a speedy exit, and when you make quiet resolutions to give up wireless and take to something simpler, like meccano or plasticine modelling. Then I suddenly saw



"I had to rouse myself"

the cause of all the trouble. A small piece of solder had somehow or other fastened itself on the reaction condenser in such a way as to short the plates.

The second bit of trouble I ran up against last week was soon located and put right. The worst feature of it was that I had to rouse myself from my usual Sunday afternoon reverie, put on a pair of boots and a mackintosh, and trudge a mile and a half in the pouring rain to the house from which the SOS came. The fault was in a double-pole throw-over switch. One minute's work with a screwdriver put matters right, and I had walked one and a half miles through rain such as never was before. Fault-finding in wireless sets is sometimes a mug's game. I often wonder why I do it.



Weather and Wireless

It seems a very natural thing to do to try to connect weather with reception in wireless. I have often found myself endeavouring to seek an explanation of an occasion of noticeably good or bad reception in terms of the weather on that occasion. If I happen to run across any kind of article on the subject of wireless and weather I read it with great interest, for it is a fascinating subject.

What brought this subject to my mind recently was the extraordinary good reception I obtained from British and Continental broadcasting stations for several nights in succession at the beginning of December. There were, I think, two separate series of "good" nights, and as



"Eat more bananas"

both series came immediately after a violent gale I found myself wondering if a strong gale had the power to sweep the air clean for wireless reception.

Of course, if you talk to the weather expert on the subject of weather and wireless he will not be very enthusiastic. He will tell you that the atmosphere is divided into two distinct layers. In the lower of these layers, he will inform you, temperature falls as you travel upwards, while in the higher layer temperature ceases to fall. He will also tell you that all our weather occurs in the lower layer of the atmosphere, and that the Heavyside layer is in the upper part of the atmosphere, high above the turbulent atmospheric changes which cause our weather. You will see what he is driving at. He means to point out that, if you assume the existence of the Heavyside layer, you can hardly expect weather to have an effect on wireless waves as they travel through the atmosphere.

The most modern theory on the travel of wireless waves is that such waves can be classified in two distinct groups, those groups being sufficiently well described by the names "ground waves" and "atmosphere waves." Ground waves, which travel more or less on the surface of the earth, have their paths through that part of the atmosphere where weather changes are continually taking place.

Atmosphere waves are those waves which travel upwards and are bent back to earth again. They are supposed to travel along paths of which the greater part is in the higher regions of the atmosphere, the regions where weather does not exist as we know it at the surface of the earth.

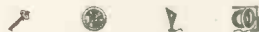
Now, if the weather really had an effect on the travel of wireless waves,

it would be expected that that effect would be the greatest on ground waves. But with ground waves there are only the slightest of variations. It is the atmosphere wave which plays pranks with our reception and causes such curious things as "fading."

I am as superstitious as anybody as to the effect of weather on wireless reception, but I am afraid that when I come to reason the thing out properly, what I have read about wireless and weather is somewhat akin to the following illustration of fallacious reasoning given by a university lecturer to his students some years ago:—

"During the past five years the rate of importation of bananas to the British Isles has increased steadily. During the same five years the disease known as 'barber's rash' has almost died out. Eat more bananas, and so ensure that you will not suffer from this dread complaint."

After the laughter and applause had faded away the good man remarked that he always did manage to "razor" laugh with that particular illustration.



More Weather Observations

Some remarks of mine on the possibility of gales bringing about good atmospheric conditions for long-distance wireless reception have brought me some interesting observations from a wireless friend who is now living in Lancashire.

"Never before," writes my friend, "have I had such wonderful long-distance reception as I had at the beginning of January when that unusually large number of gales swept the country one after the other in rapid succession. All the B.B.C. stations came in at loud-speaker



"More weather observations"

strength on a three-valve set, and I got two new Continental stations which I could not identify at the time.

"Probably I should have done even better in long-distance reception had not my aerial been blown down like many more in this district.

"I do not know whether atmospheric conditions were responsible or not for my success with an indoor aerial while my outside aerial was down," the letter went on, "but I got both Chelmsford and Manchester on the loud-speaker using the three valves, the aerial being an indoor one



"Talking to a Scotch experimenter"

of about fifty feet of electric lighting flex slung across a room, out through the door and then down a long corridor. The fact that I left a good fifty feet of the flex coiled up behind a picture at the end of the corridor may have helped."

It would be a most interesting thing to collect from listeners-in throughout the country their opinions as to what type of weather they think brings the best conditions for long-distance reception. I remember talking to a Scotch experimenter in the summer of 1923 on the subject of the effect of rain on wireless and I remember how emphatic my Scotch friend was that rain worked wonders with long-distance reception. He was quite convinced that the best time for picking up 2 L O in Scotland was after heavy rain had fallen over the British Isles.

Of course, this was eighteen months ago. Things have changed since then. It is highly probable that increased transmitting power has made wireless telephony less dependent on atmospheric conditions than in the early days of broadcasting.



Tuning with Toffee Tins

I have just carried out a most entertaining series of experiments on tuning a wireless circuit by bringing up a large toffee tin to the inductance coil in that circuit. The inductance coil used in the experiments was a basket coil wound on stiff cardboard. This inductance coil was mounted in an old broken photograph frame. It was possible to place the frame with the coil in it so that the coil was very nearly in a vertical plane as it stood on the table near to the valve receiving set.

Using a photograph frame as a coil holder is a good example of the

way in which household "junk" can be utilised in carrying out unusual wireless experiments. Personally I never like to see anything of a likely nature find its way to the "local receiving station" for discarded rubbish. I would far rather keep a thing by me for years in case it should be wanted.

Now, it is well known that if a short-circuited coil of low resistance is brought nearer and nearer to a tuning coil the inductance of that tuning coil is lowered. It is equally well known that the same effect can be produced by bringing a sheet of metal nearer and nearer to a tuning-coil. This effect may be made use of in tuning a wireless circuit. In fact, this method of tuning is made use of in one of the best known types of commercially-made valve receivers.

In the simple experiments which amused me for a good many hours recently I used a large toffee tin instead of a sheet of metal. This toffee tin would, of course, stand on the table by itself, and it was a very simple matter to push the tin gradually up to the coil.

The first thing I found out was that the tin had to be within four inches of the photograph frame and the coil in it to have any appreciable effect.

Placing the toffee tin a foot or more away from the tuning coil, I tuned-in 2 L.O. Then I moved the tin slowly up to the coil. As the tin got nearer and nearer 2 L.O got weaker and weaker, until nothing could be heard of that station. To bring back 2 L.O to its usual signal strength I had to move the tuning condenser of '0005 microfarad capacity through 20 degrees.

Cardiff was another station I tuned-in. With the toffee tin out of harm's way, Cardiff came in at 18 degrees on the tuning condenser.



"Household 'junk' can be utilised"

When the toffee tin had been pushed right up to the coil the tuning-condenser had to be moved to 40 degrees or so in order to bring Cardiff in again. By setting the condenser anywhere between 18 and 40 degrees I could tune in Cardiff by moving the toffee tin nearer to or further away from the tuning coil.

The last experiment I tried was to get at the effect of two toffee tins. Tuning-in London with both tins off the table, the best setting for the variable condenser was 30 degrees. I then took out the coil from the photograph frame and placed it between the two toffee tins, these being as close as possible, with the coil supported between them. The tuning condenser had to be moved to 85 degrees to restore the signal strength of 2 L.O.

The above is just one example of what can be done with a wireless set. There is an immense amount of pleasure in carrying out experiments of this kind. I do not see how anybody could ever be tired of wireless.

Birds on the Aerial

I see that societies which have the preservation of bird life as their objective have appealed to the Postmaster-General for legislation to make it compulsory for every aerial



"The dare-devil"

wire to have large corks placed on it at intervals of two yards. Naturalists belonging to these societies say that birds cannot see an aerial wire until they get quite close to it, and that often enough they see the wire too late to avoid flying into it. The corks, these naturalists say, would make it easy for a flying bird to see and avoid collision with the wire.

I wonder how many wireless amateurs have known birds to be killed by flying into their aerial wires. Although I have had years of experience in wireless reception, I do not remember a single case in which a bird has met death by flying into a wireless aerial.

A length of bare copper wire is probably very much more easily seen by a bird than a length of black-enamelled wire. I remember once placing a counterpoise earth of black-enamelled wire down my garden. At the house end of the counterpoise the wire was fastened to a nail driven into the woodwork of a window. Very frequently a sparrow would bang into the counterpoise with a resultant ping easily audible in the house. I never saw a sparrow get

hurt on this black wire. The height of the wire above the ground was eight feet.

Probably the birds could not hurt themselves because they could not get up a good flying speed in the restricted area of the garden.

With regard to birds and aeri-als, have you ever noticed that birds seldom perch on a single-wire aerial, but that they seem to have a decided preference for the spreaders of a twin-wire aerial?



Losing Selectivity

Have you ever known a valve set to lose steadily in selectivity? I have had such an experience during the last few weeks, and it has been a most interesting problem to determine the cause. The set referred to was specially selective when it was first put together, and I was very pleased with its performances. When it was at its best I could pick up London, Manchester, and Bournemouth on one turn only of the vernier plate of the tuning condenser. Of course, a careful adjustment of reaction was essential.

Gradually, however, the set lost its selective powers. So marked was this loss that I began to search round for the cause. I went over the set carefully but found everything as it should be. The aerial was as good as ever it had been. I dug up the earth connection and found that quite in order. I replaced the earth, a mass of buried metal, and inspected the earth leads. Everything was in excellent order outside the house. When I came to inspect the flex lead to the earth lead-in inside the house, however, I saw what had caused the trouble. This thick flex lead had not only worked slightly loose where it was attached to the earth lead-in,



"Losing 'Selectivity'"

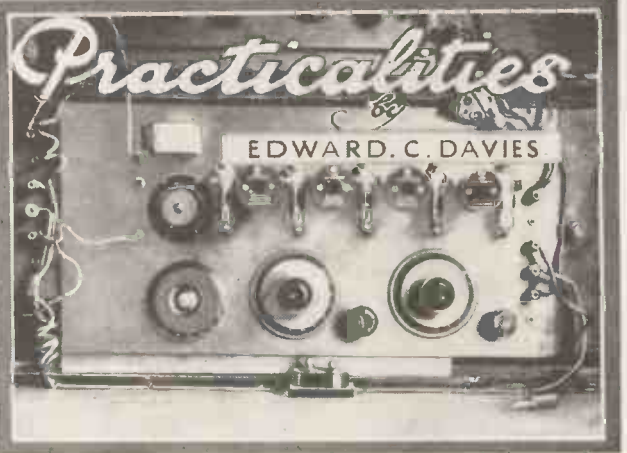
but it had also worked loose where it was fastened to the earthing switch.

I made good both these connections and the set was as selective as ever. If you should find your valve set losing in selectivity go over the earth connections carefully. Extra resistance in an earth lead will affect selectivity.

HALYARD



The Author Tuning-in.



Near View of H.F. Amplifier.

THE types of receiver now being used for short-wave work may be divided briefly into three: the single valve with reaction to the aerial, the supersonic heterodyne, and the neutrodyne. All these are capable of giving good results.

The single valve, which is usually a form of Reinartz circuit, is admittedly excellent, but it does suffer from the usual failing of single valves. It is not possible to guarantee reception under all conditions with

But the chief trouble with this receiver is the fact that it interferes with other listeners on the same wavelength. I am prepared to admit that this heterodyning of the carrier wave may possibly increase the strength in the phones of another instrument, but it certainly introduces distortion into the modulated signals.

I might even request those who are experimenting with this type of short-wave receiver to be extremely

signals on any wavelength from sixty metres to twelve thousand, an advantage which is lacking in most of the special short wave receivers.

Short-wave Circuit

In Fig. 1 I give a circuit for a two high-frequency and detector receiver which should easily tune down to sixty metres while bringing in all the ordinary broadcasting stations as well. It is a purely theoretical circuit which experimenters will be able to modify for themselves.

The two anode circuits can be tuned with a dual condenser operating on the one knob.

The valves would preferably be of the low-capacity type, such as a couple of V 24's and a D E V.

It will be found, if first-class components are used, that this receiver will bring in K D K A at somewhere about its minimum tuning with the indicator of the "pot'meter" a very few degrees back from full negative.

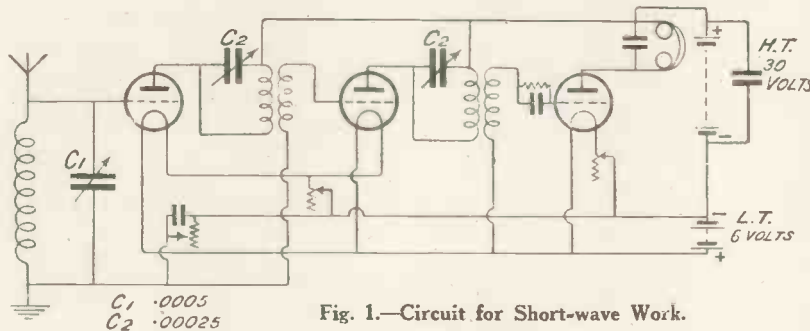


Fig. 1.—Circuit for Short-wave Work.

a single valve however near to its utmost limit of sensitivity it may be worked. It does not employ several stages of high-frequency amplification and therefore I am dismissing it with these few observations.

The "supersonic" is still in its infancy. There is a field for an immense amount of work here, as the principle of converting short waves into long waves so that one may use many stages of amplification is theoretically quite sound. The difficulties which arise are mainly practical and resolve themselves into the question of discovering the best method of attaching the exterior oscillator so that it does not affect the tuning of the main receiver to any great extent.

careful that they do not cause any more interference than is necessary.

The neutrodyne, in its various forms, is also worth some extensive examination, but in my opinion it is not worth the time of the amateur for exactly the same reason that I discard the previous two types. It employs cumbersome methods of controlling and harnessing a tendency to self-oscillation in short-wave receivers which may very easily be controlled in a much more simple manner.

I have not yet discovered any freak circuit which is capable of results as good as a simple, straightforward circuit. And the straightforward circuit may be built so as to receive

Constructional Details

There are some points regarding the construction, planning and wiring of receivers which are to be used for short-wave work that must be carefully studied by anyone who hopes to make a success of the work.

In the first place low-capacity valves are essential. It is always better to use rheostats which will deal with both dull- and bright-emitters so that all types of valves can be tried. A potentiometer which will give a good movement of the indicator between the commencement of reaction and the point where self-oscillation begins is useful, as reaction is always critical on this

work, and it is very often advisable to use a condenser across the potentiometer.

One of the greatest troubles the experimenter will meet with will be "overlap." This may often make itself manifest for no apparent reason in a receiver which has previously worked perfectly well. It may be handled by slightly detuning the various H.F. circuits.

Every component must be of unexceptionable quality, condensers especially. Those which have metal end-plates are to be preferred. I invariably use Marconiphone components; not on account of their excessive price, but because they are certainly to be relied upon.

Simultaneous Tuning

It will be found, by the way, by the experimenter who gets as far as three or four stages of H.F., that there is a crying need for a dual condenser which incorporates a couple of fine-tuning adjustments, also working together for the fine control of the two circuits at once. A condenser using a "balancing plate" is made by Dubilier, I believe, but this varies the relationship between the two circuits and is not quite what is required for this work.

It is possible to incorporate into the receiver an entirely separate unit for the fine control of H.F. circuits, but this becomes practically an impossibility in short-wave work owing to the additional wiring required and the consequent addition to unwanted capacity.

Any receiver which is being constructed for short-wave work must be built outright as though it were intended for sale. It is useless to expect results from a "higgledy-piggledy mass" of components thrown on a desk and connected with yards of flex. There can be no intermediate stage between the theoretical diagram and the finished instrument here. Testing must be done on the finished instrument itself, and if it does not work

properly it must be reconstructed on an entirely new panel.

For wiring these receivers it is as well to do the grid and anode wiring first, keeping it close to the panel surface, and wiring the grid terminals and anode terminals in such a way that the respective wires run as far from each other as possible.

This may often be achieved by using a good pair of pliers and

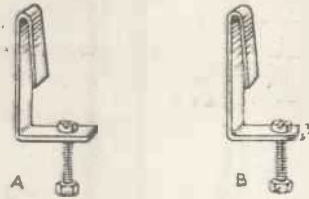


Fig. 2.—
A, End left Square; B, End Shaped.

clipping off some terminals close to the panel surface while leaving others their natural length, the selection being a matter for the constructor.

A peculiarity of clips for low-capacity valves is the unnecessary amount of metal that is left projecting on the inside of the screws. This can, and should, always be rectified by cutting with a good pair of scissors—while their owner is, of course, absent—so that they are shaped to the screw head. A glance at Fig. 2 will make this clear.

Personally I advise experimenters to use only single-circuit tuners for their early experiments. It is quite possible to use a double-circuit tuner, but it is doubtful if there is any benefit to be gained by so doing. The chief merit of the double tuner is increased selectivity, and most people will find the ordinary short-wave receiver quite selective enough as it is.

For ordinary work the usual plug in type of H.F. transformer may be used; personally I always use McMichael. The aerial coil should be arranged so as not to lie in the same plane as the transformers, and a switch for cutting out the reaction

coil completely should always be incorporated, as, though reaction will be found essential when more than half of the condenser is in, with a minimum of condenser the receiver will generally oscillate without assistance.

In Fig. 3 I give a theoretical circuit for a short-wave receiver comprising three stages of H.F., detector and two stages of note magnification. This, modified, will prove interesting to work on.

It is quite probable that experimenters reading these circuit diagrams will complain on the score that they are neither original nor practical.

Simple and Practical

The criticism may be, to some extent, correct. They are certainly not original, as they may be found in any book dealing with the theory of wireless. But they are practical in that they are intended to indicate line-upon which experiments in short-wave reception may be conducted. The essence of successful short-wave reception is simplicity, and these circuits are simple enough.

It is beyond the power of the average wireless enthusiast to test out a hundred and one different types of circuit. In my personal opinion it is not necessary at all that they should. The straightforward circuit on the lines of the diagrams I have given will without any doubt at all prove superior every time to the more elaborate construction with its manifold gadgets and controls.

It will be found possible to do practically what one wishes with the L.F. circuits, but extreme care must always be taken on the H.F. side, switches being absolutely taboo. If the constructor aims always at the most extreme simplicity of control and wiring he will not go far wrong. Several condensers may easily be controlled from the knob of one of

(Continued on page 202)

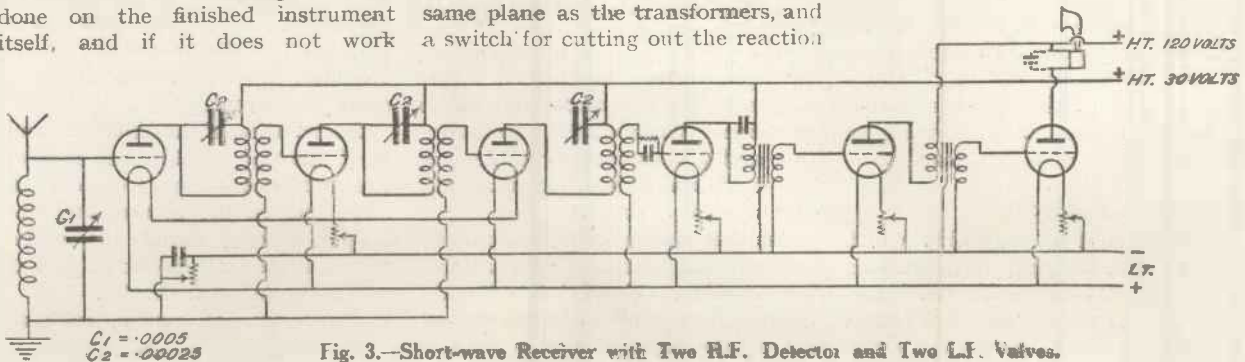


Fig. 3.—Short-wave Receiver with Two H.F. Detector and Two L.F. Valves.



IN the last issue of this magazine some particular outlines of policy were stated by the Managing Director of the British Broadcasting Company. In this, and in subsequent articles, it will be our endeavour to dilate on such topics as are of current interest from our (that is, the B.B.C.'s) point of view.

Theatres and Broadcasting

At the moment of writing, one subject of interest is the attitude of the theatrical industry with regard to broadcasting. Whatever may be the outcome of the negotiations, no harm can be done by indicating our attitude towards this question prior to the discussion between the contending parties.

In the first instance, it should be borne in mind that we have never closed the door to negotiations. So far as we are concerned, they have always been conducted in such a manner that there has been an ever-open door leading into the B.B.C.

The theatrical industries, however, maintained an attitude of uncompromising hostility to any aspect of broadcasting until almost the end of last year. Then, owing to various causes which need not be recapitulated, several of the theatrical managers broke away, and portions of various shows were broadcast

Enormous Publicity

The amount of publicity which these enterprising entrepreneurs obtained was so enormous that, quite apart from the effects of broadcasting, the shows had unprecedented

free advertisement, with the not unnatural result that the bookings for the plays were very swiftly and substantially increased.

It was also demonstrated beyond possibility of doubt that as a result of the actual broadcasting hundreds of seats were booked.

Naturally, this state of affairs caused immense perturbation in the hearts of the theatrical magnates, and they were forced to face up to the vexed question of broadcasting once more. In doing so they took advantage of a statement which Mr. J. C. W. Reith, our Managing Director, had outlined to a Press representative some months before, when he gave full conditions on which he would at all times be prepared to discuss terms with the theatrical managers.

Our Terms

These terms were :

Only excerpts from plays should be broadcast, and the managers should decide what these should be.

Limitation to once a week broadcasting, and amicable settlements.

On January 15 the theatrical management intimated their desire to meet us to discuss the whole situation. We accepted the invitation and a very friendly conference was held, and adjourned until the first week in February.

Another matter of public interest has been the question of educational broadcasting. The London County Council have reported adversely on our experimental educational trans-

missions, and restricted the time in which scholars of L.C.C. schools can listen to the broadcasting to one half-hour per week, from 4 till 4.30 p.m.

Country Schools

After all is said, the London schools ought to be able to have direct access to the best that there is in the educational world, but there is a great field for educational broadcasting in private schools, and in country schools in rural areas. In some of these schools they have only women teachers, and there are pupils who pass through the whole modest curriculum without ever hearing a man's voice giving them instruction in school hours.

Unskilled Operators

The principal explanation of the trouble has been, of course, that a great many sets have been installed by unskilled persons, and we are trying to give more adequate instructions regarding the installation of sets and loud-speakers, but, as everyone knows, if a hundred people tried to make sets from the same plans and instructions, there would be a hundred different results—some splendid, some moderate and many quite indifferent.

One solution of the difficulty would be if one firm would make it worth while to put cheap foolproof efficient sets on the market and have people touring round the schools with a little car, who would put the sets in order periodically.

There are, of course, in many

(Continued on page 232)

When Mary Listens-in! By RENÉ BULL





MOST amateurs will have noticed that the average broadcast receiver is incapable of tuning down to a wavelength as low as 100 metres.

There are, however, many interesting transmissions taking place on this wavelength, and short spicy conversations from one amateur station to another are frequently to be heard.

In this article is described a set specially suitable for short-wave work.

The Circuit

The theoretical circuit of the receiver is shown in Fig. 1. It will

be observed that the Reinartz tuning system is employed in conjunction with a detector and low-frequency amplifying valve.

The two great advantages of the Reinartz circuit are high selectivity and simplicity of reaction. With a good outside aerial and an efficient earth it is sensitive enough to bring in all the broadcast stations. A test report is given at the end of this article.

No H.F. Choke

It has been found unnecessary to include a high-frequency choke coil between the plate of the detector valve and the primary of the low-

frequency transformer. With a transformer of low self-capacity such a coil is superfluous.

The Reinartz tuner consists of a

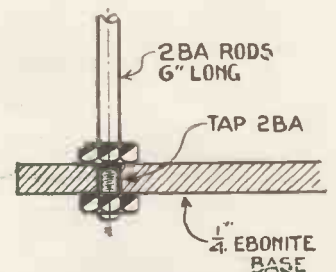


Fig. 3.—Method of Fixing Rod.

semi-periodic aerial coil, a grid coil and a plate coil. All three coils in the present receiver are fixed, reaction and wavelength variation being carried out by the two variable condensers.

Special Coils

In order to eliminate losses due to self-capacity the coils are wound in a special manner using No. 18 gauge d.c.c. wire. This is done as follows:

A piece of ebonite sheet or wood, 6 in. square and $\frac{1}{4}$ in. thick is required. Lay out on this a circle of $4\frac{1}{2}$ in. diameter and divide the circumference into 13 equal sections by means of a pair of dividers (See Fig. 2).

At these intersections drill holes suitable for tapping 2 B.A. Thirteen screwed 2 B.A. rods, each 6 in.

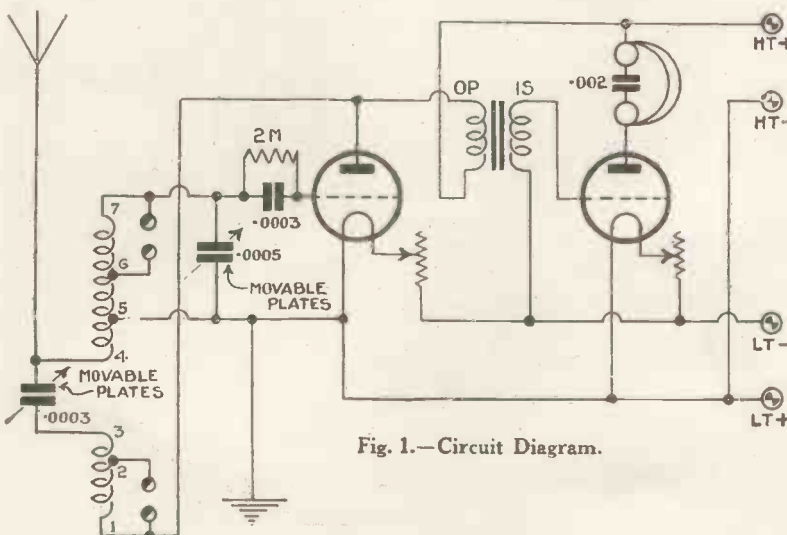


Fig. 1.—Circuit Diagram.

Special Reinartz Two-Valver

With This Issue
are
Presented Free

**A Wiring
Diagram**

in Colours

And a

**Blueprint Panel-
Drilling Template
for this Set**

Coil Support

To support the coil on the panel four ebonite strips 5 in. long, drilled at each end (see Fig. 5), are required. One strip is put through the loop formed in the winding of the coil and another strip placed on the inside of the coil up against the winding so that the two strips when screwed together firmly clamp the coil.

An angle bracket, Fig. 6, is fastened to the bottom of the strips for securing the coil to the panel.

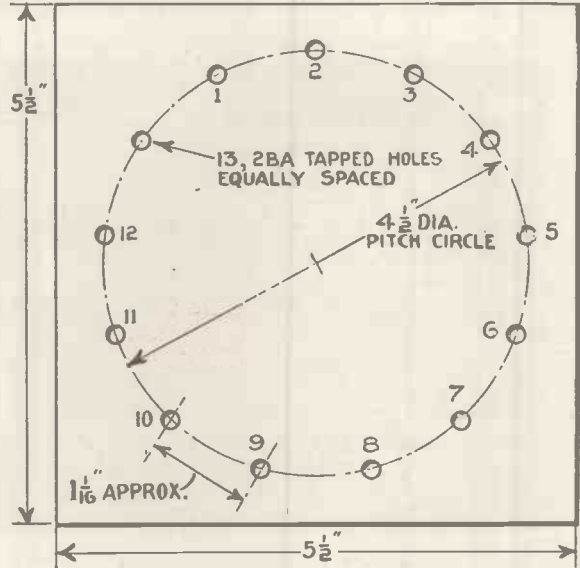


Fig. 2.—Markings for Coil Former.

Other Components Required

- 1 Radion mahoganite panel, 14 in. by 12 in. by $\frac{3}{16}$ in. thick.
- 1 variable condenser, .0003 microfarad (Bowyer-Lowe square-law).
- 1 variable condenser, .0005 microfarad (Bowyer-Lowe square-law).
- 1 fixed grid leak with clips and terminals (Grafton Electric).
- 1 fixed condenser, .0003 microfarad (Lissen).
- 1 fixed condenser, .002 microfarad (Lissen).
- 2 valve holders for mounting valves behind panel (Aermonic).
- 2 filament rheostats (Lissenstat Universal).
- 1 L.F. transformer (Lissen).
- 8 terminals (Refty).
- 2 valve windows (Grafton Electric).
- 2 nickel-plated shorting plugs for panel mounting.

Quantity of square tinned-copper wire for connecting purposes.

- 1 wood cabinet (Fig. 7).

The weight of No. 18 gauge d.c.c.

copper wire required for winding the coil is approximately 1 lb.

The necessity of using ebonite of guaranteed quality is vital. Troubles

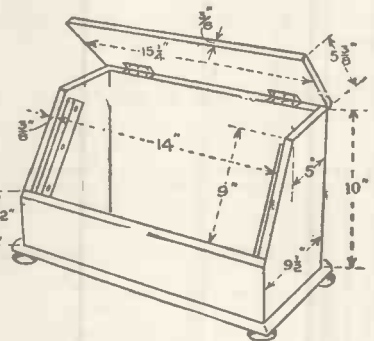


Fig. 7.—Details of Cabinet.

arising from the use of cheap ebonite possessing poor insulating qualities are numerous and very difficult to trace. Having purchased a piece of guaranteed ebonite, drilling may be commenced with the aid of the blueprint given away free with this issue of THE WIRELESS MAGAZINE.

Lay the panel flat on a bench and place the blueprint (which is full-size) over it, marking through the centres of all holes to be drilled

long, are screwed into the holes and locked firmly by nuts on each side of the ebonite, as in Fig. 3.

The windings should then be started. The plate coil comes first and consists of 45 turns of the No. 18 gauge d.c.c. wire. Start by going outside one rod and inside the next two, then outside one and inside the next two and so on.

Tappings

Take a tapping at the 30th turn. When 40 turns have been wound leave 6 in. of the wire for connecting purposes and cut.

The aerial coil comes next and consists of 8 turns wound on top of the plate coil. A tapping is taken at the 8th turn and 40 more turns are wound, thus completing the grid coil.

These 40 turns are tapped at the 10th turn. An idea of the method of winding and tapping may be obtained from Fig. 4, and the photographs.

When the winding is completed tie up the coil between the rods where the wires cross. The coil may then be removed.

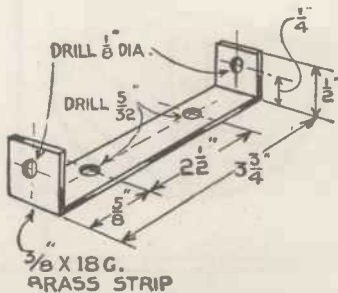


Fig. 6.—Angle Bracket.

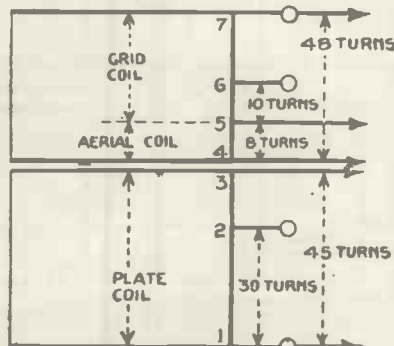


Fig. 4.—Details of Tappings.

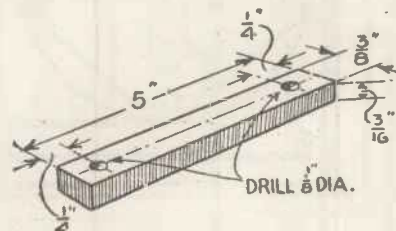
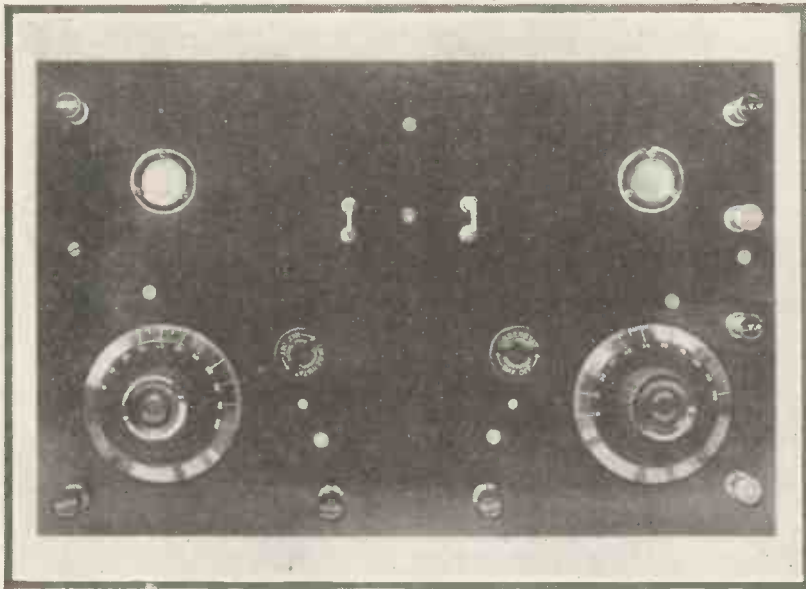


Fig. 5.—Coil Support.



Front of Panel, showing Layout.

with a sharp steel point. In this manner the panel remains free from unsightly scratches.

Holes should be drilled through the panel at these marks, the sizes being indicated on the blueprint.

Assembling and Wiring Up

With the aid of the photograph,

the blueprint and the coloured wiring diagram, the mounting of the components will be easily accomplished. For reasons that will become obvious, the low-frequency transformer should not be mounted until the wiring of the other components is near completion.

In the coloured wiring diagram

the filament lighting circuit is shown in red, the aerial circuit in broken blue lines, and the remainder of the circuit in full blue lines.

The Cabinet

Since the design of the cabinet does not affect the working of the set, the constructor may please himself as to the type he chooses.

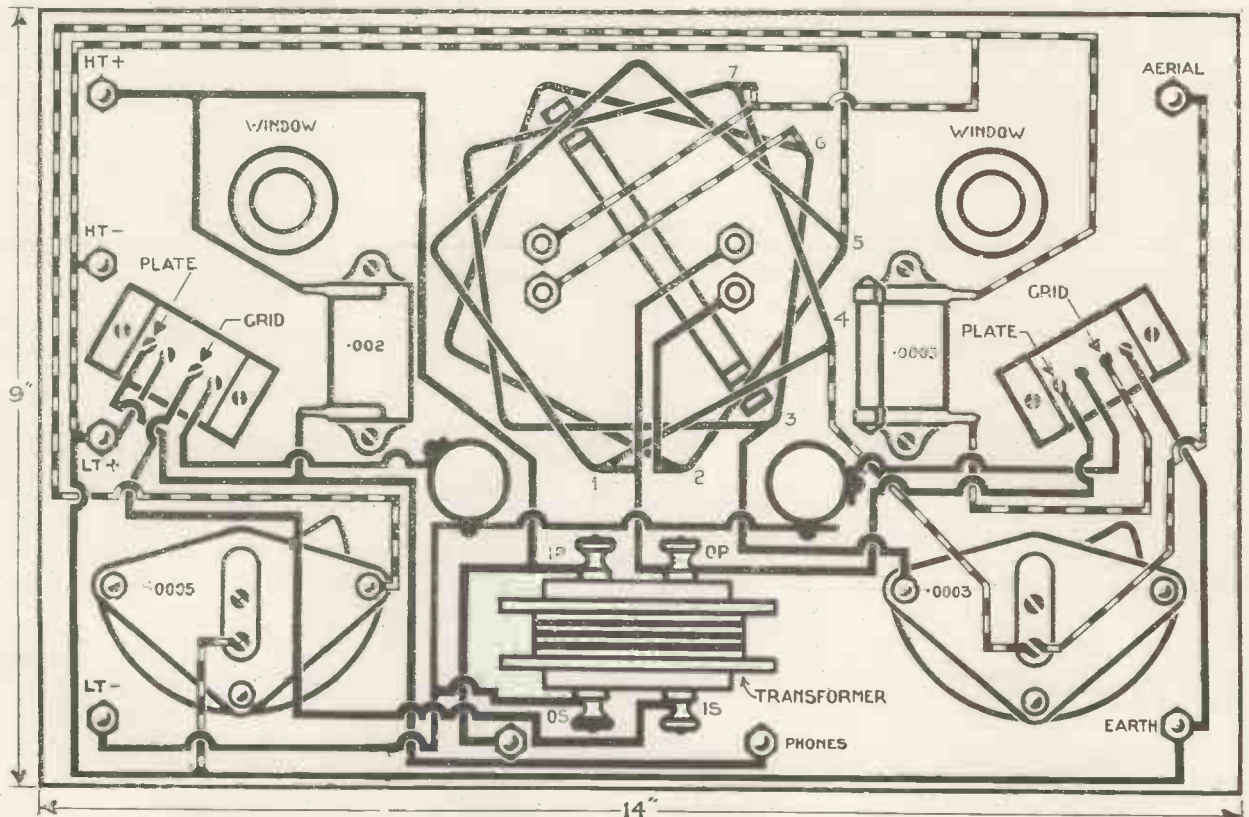
As the valves, however, are mounted behind the panel so as to avoid accidents, provision should be made for easy access to the back of the panel. From the aesthetic as well as the utility point of view the cabinet shown in Fig. 7 is recommended.

Operating the Set

The wiring being completed a valve is plugged into each of the two valve holders. Dull- or bright-emitter valves may be employed.

In the original set Mullard D.F. Ora valves—detector and low-frequency types—were used.

The panel is then screwed down into the cabinet and aerial, earth, phones, and H.T. and L.T. batteries connected to the proper terminals. Adjust the two filament rheostats until the phones indicate that the set is "alive." The two shorting



This is a reproduction of the Coloured Wiring Diagram given as a Free Supplement with this Issue.

plugs on the front of the panel are pulled out for broadcast wavelength range.

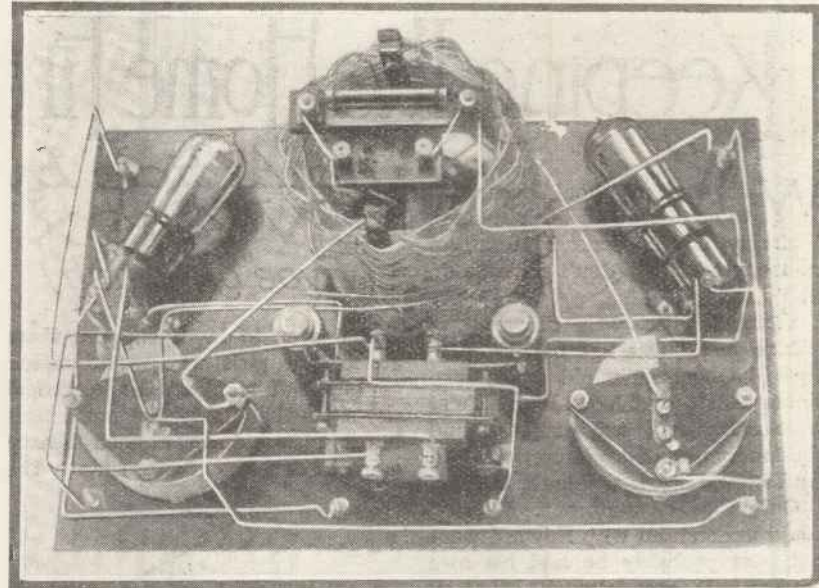
Tuning is accomplished as follows : Set the reaction condenser at zero and tune on the aerial-tuning condenser. As soon as signals are heard turn the reaction condenser until the set oscillates ; now turn the reaction condenser back until the set has just ceased oscillating. A further slight adjustment of the tuning condenser will be necessary.

In order to receive amateur stations the two shorting plugs are placed in the sockets mounted on the panel. These sockets are not intended for loading coils for high wavelengths.

Results Obtained

The set was tested on an outside aerial in Chiswick, London, and 2 L O came through at full loud-speaker strength. Other stations received on the loud-speaker were Bourne-mouth, L'Ecole Superieure, Glasgow and Newcastle.

The signal strength of these stations was sufficient to fill a small room. Using phones, Cardiff, Bir-



Under Side of Panel, showing Positions of Components.

mingham, Aberdeen, several of the relay stations and many amateurs were logged.

The German stations, Voxhaus and Hamburg also came through well. Selectivity was all that could

be desired, London being only faintly audible when the set was tuned to Cardiff's wavelength. The wavelength range of the set lies approximately between 100 and 600 metres, using the coil described.

THE MYSTERY OF THE SILENT HOUSE!

THE moment the front door opened, Villiers was conscious of something different. An indefinable difference, but it was there all the same.

He felt it as the maid took his hat and coat ; there seemed such an unnatural stillness about the house, which was reflected in her subdued manner. Usually every member of the family came to welcome him, for the Ponsobys were warm-hearted people. They would have been telling him the latest news, chaffing him—but now, though it was so long since he had seen them, no one came, and a chill of foreboding crept over him.

Out of Touch

"I suppose being abroad does put a chap out of touch with his friends," he thought, "anyway they asked me to come round and see them. I expect they will be out directly."

But he was wrong. No cheery voices came to him, as in deathly silence the maid took him upstairs, with the air of an executioner leading his victim to the scaffold.

"I'm absurdly fanciful," he told himself, "just because I haven't seen them for months, and the house is a bit quiet, I imagine that something must be wrong."

In spite of his efforts to banish it, the impression persisted, and when the maid threw open the door, without announcing him, the silence struck him almost like a blow.

That "Atmosphere"

The room was dim, lighted only by two or three candles, and the Ponsobys' faces shone out palely in the gloom. Not one of them got up to greet him.

This was not imagination, this reception, so utterly different from any that he had ever known, and the conviction that something serious had happened returned with renewed force.

Phyllis, the youngest daughter, the chatterbox of the family, would usually have been half-way across the room by this time, plying him with eager questions—and where was Jack, the idolised only son? Uncon-

sciously Villiers' fears focused themselves on him.

What was this mystery? Why was the house so silent? These disquieting thoughts raced through his head like lightning—and then the solution came to him—the Ponsobys were "listening-in" to music which was more effective if heard with the lights dimmed!

L. M. O.

"BIG STEAMERS"

WE give here a list of the better known liners, working on wavelengths between 2,000 and 2,400 metres, together with their call signs:

<i>Aquitania</i> . . .	MSU
<i>Berengaria</i> . . .	GBZW
<i>Caronia</i> . . .	MRA
<i>Homeric</i> . . .	GDLJ
<i>Majestic</i> . . .	GFVV
<i>Mauretania</i> . . .	MGA
<i>Orsova</i> . . .	MOF
<i>Montcalm</i> . . .	GFTJ
<i>Empress of France</i>	GYH

Keeping the Home Fires Burning

An Article by
E. V. KNOX
(“Evoe” of “Punch”)

WHY anybody should ever want to go out at all after 6 p.m., I simply cannot see. I mean, of course, when they don't have to do it.

Victorian life was different in this respect. One had euchre, cribbage, backgammon, old maid, missionary lotto and loo. When those were exhausted, one passed round the family album or did crewel work. And crewel work no doubt it was.

Only Edward went out. Nobody could understand why Edward went out, but probably he had his own reasons. It was thought that it might be billiards. It was feared that it might be music halls.

Restaurants, of course, had not been invented then. There was a suspicion, caused by the odour of tobacco, that Edward might be becoming a dog.

At one time, I remember, a kind of billiard table was invented, about the size of a whatnot, which it was supposed would keep Edward at home. Somehow or other it failed.

As for the girls, a couple of dances and the opera or a concert once in a blue moon were all they ever required.

As I survey the stream of English life, from those happy, simple days



“One did crewel work.”

onwards, it appears to me as a constant struggle between the home life and the growing allurements of the life outside. Till recently the contest has been a sadly one-sided affair.

And even to-day I suppose there are lots of girls who would rather go out and look at the electrical sky signs than keep the home fires burning and have a good hearty game of consequences or snap. The



“Skirts became practically extinct.”

pull, in fact, has been all in favour of the giddy world outside.

Hopes were entertained of diablo, but they had to be relinquished when it was found that it brought down the chandelier. There arose then such vices as the restaurant, the motor-car, the cinema, the musical comedy, roller-skating, the dance hall, the political meeting—girls were not supposed to mention politics in my young days—and I don't know what besides. Orgies were multiplied. Temptations increased.

Skirts and the hinder part of the hair became practically extinct.

Pogo was a slight improvement when practised on the front lawn, but before its brief reign was ended, people were pogoing to fancy-dress balls.

Bridge (to go back a little way) helped the home fires to a certain extent; and pit—do you remember pit? It was a wonderful game.

You pretended to be people on the Corn Exchange at Chicago and roared at each other like bulls and bears; and whist, of course, was always with

us. But nowadays one plays bridge in a club, and whist in the parochial room.

Edward is out, Evangeline is out, so are father and mother, and so are Susan and Jane. There is no one to listen to the canary, no one to let the cat in, and no one to feed the dog.

I would not put this gloomy picture of English life in front of you if I could not see signs of hope and reviviscence. Certain things have been fighting on the side of the angels. There are cross-word puzzles, no doubt a mere temporary victory for the forces of right; and now for something like two years there has been wireless in the home.

There is a rustling of aerial wings. The fire burns. The parlour is brightly illuminated. Even Edward can be kept away from his billiards. The canary is cheerful again. The dog licks the last crumb from his pannikin and lies down contented and full.

Anyone who walks among the outer suburbs of London and looks at the forest of wires and masts, making them resemble a great harbour, as in fact they now are, of all that is beautiful and good, will begin to wonder how it is that the cinema



“The forest of wires.”

theatres have any audiences at all, and who there are left in the evenings to go to dances, public houses, and whist drives in the parish room.

It is surprising, in fact, that so many Edwards and Evangelines still

steal away from the home fires to these unspeakable dissipations. Assuredly they must be in an ever-lessening minority.

Nor can I help feeling suspicious of the preachers who are so fond



"One can foxtrot."

of denouncing the foxtrot, shingled hair, short skirts, and beer. Are not all these things on the wane? It is true that one can foxtrot to a wireless band. It is true that shingled hair was probably shingled in order to enable one to listen-in more easily through earphones.

But nobody, at least nobody that I know of, drinks heavily in the home whilst listening-in. And I wonder whether the real grievance is not that papa is tuning the valve set to catch Vienna or Madrid, instead of listening-in on Sunday evening to the sermon which is being broadcast from 2 L O.

Home life, at any rate, is increasing by leaps and bounds. Perhaps I ought rather to say by casts and catches. I know this for a certainty. I am acquainted with a young couple who recently became engaged to be married, and conducted their courtship almost entirely in the home, and not, as you might have expected if you had listened to these outcries on the immorality of the age, at a night club, at a roller-skating rink, or at a public spelling-bee.

What is more, so enthusiastic were they about listening-in, so eager not to miss the nightly concert, that nearly all the soft nothings that William poured into Majolica's shell-like ears had to pass through the obstacle of the pair of earphones that Majolica was wearing at the time and it was just the same with her coy whispers to him.

"Majolica!" he would shout. "I have something to say to you!"

"Wait a moment!" she would scream. "I am listening to the Savoy band."

And so their simple courtship went on, the fond parents having tactfully withdrawn, until the day came when William could conceal his passion no longer, and flung himself ardently at Majolica's feet, unfortunately dragging the crystal set off the side table, so that it fell with a loud crash on to the floor.

"William," she murmured, "this is so sudden"—as indeed it was, for the mahogany box had slightly bruised one of her tiny feet—"I must ask papa. Now, do get up, there's a dear, and let us listen to the weather report."

It was "*Uncertain, local fog,*" of course. But bless you, they did not care. And any evening now you may see them sitting together, listening-in to a string quartet and looking for a



"The nightly concert."

large wild Asiatic sheep in four letters with a Z in the middle, as happy as happy can be.

But every now and then their hands will leave the pages of the dictionary and you will know that they are clasping them under the table.

Is this, I ask, what is meant by the decay of family life and the breaking up of the home?

Why, even in cases where there is a motor-car in the family, as so often occurs with young married people nowadays, there is not nearly so much gadding about and dissipation as there might be if wireless had not been installed as well.

The small car is a delicate thing, and subject to many diseases. As much time has to be spent tinkering about with it in the toolshed, which has been turned into a garage, as in driving it rapidly over the countryside. And I know at least one small car owner who, by a happy thought,

has installed his crystal set in the motor nursery, so that he can listen-in of an evening while he is magnifying the magneto or decarburising the carburettor, or whatever it is that they do.

And now and then, when it is too foggy or too expensive to go out, he has told me that he has started his engine, taken the wheel in his hands, and with his wife sitting by him, but without opening the garage doors, listened to a lecture on "Chinese Customs," or "Untrodden Tibet," or to the nightingale in Surrey, or whithersoever it might be that the fancy of 2 L O directed their wheels.

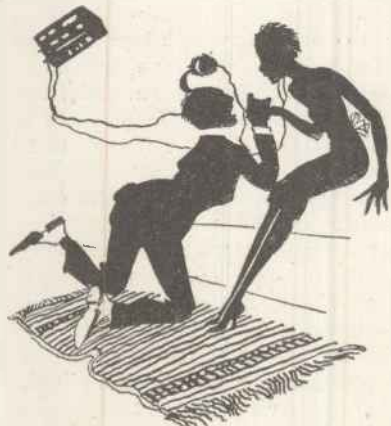


WIRELESS is now being used to transmit energy. We hear that there is likely to be strong opposition to this policy by the Bricklayers' Union.

AN amateur boasts that with a crystal set he has received a German station. That's about all we in this country are likely to receive from Germany.

SEVERAL suggestions have been made for deadening the "tinny" sound of loud-speakers. We are glad that nobody has been so tactless as to ask Mr. Henry Ford for his opinion.

AN ocean liner has been fitted with a wireless device which carries music played in the saloon to all other parts. We hope this invention is not brought to the notice of our local Salvation Army captain.



"Flung himself at Majolica's feet."

A WRITER says that the valve sockets in his home-made set are in the form of an "L." This is identically the term we applied to ours the other night when we mislaid them after taking the set to pieces.



Wireless Femininities

I MUST confess to a deep interest in the B.B.C. scheme to experiment in "thinking-in" by getting people to think into the microphone instead of speaking in the usual way. If such a process can be established, it will go a long way towards authenticating telepathy—though many women, being more intuitive than men, have had enough personal experience of the transference of thought to require no such proof.

Misunderstood Facts

On the other hand, if the "thinking-in" experiment does not succeed; it may well be that the methods used, and not the thing itself, are the cause of the failure. No one, of course, can be dogmatic about mental wireless at the present stage of knowledge, but it is extraordinary how widely the most elementary facts about it are misunderstood.

For instance, it has been insisted upon in more than one newspaper lately that great concentration will be necessary to enable listeners to intercept the thought that is being broadcast. Whereas, as every telepathic person will agree, the exact contrary is the case.

The transmitter at the microphone must, of course, use all the concentration he or she can summon—and even that may be insufficient. But the first essential for a person receiving a telepathic message is complete passivity and blankness of mind. Telepathy would be far more common than it is at present if it were not so difficult to stop oneself concentrating in a greater or less degree.

Why Not a Wireless Room?

Last month I mentioned the difficulties of the average household where there is usually only one fire

in the evenings, and the interests of those who want perfect quiet for listening-in clash with those of other folk who prefer to talk or indulge in hobbies that make more or less noise. It is almost the only disadvantage of wireless that tempers so often get frayed in this unavoidable clash of interests.

Wireless and Manners

The subject seems to be a burning one in various quarters. "Does wireless corrupt good manners?" asked an article that appeared in the provincial Press recently, and I came to the conclusion that it certainly does, owing to the squabbling between wireless "fans" and those who don't want to listen-in.

The article writer's solution, since "we have ceased to be sociable in our leisure moments," was a bed-sitting-room for each of the household, with, presumably, a separate set in each room.

This would certainly obviate complaints such as: "I don't care to listen-in when my husband does. He will read the paper all through the musical items, and the rustling of it drowns the softer notes."

Furnishing

Without arranging a room and a set for each member of the family, I think many large families could set aside a "wireless room" and have the set installed there. As practically no furniture would be needed beyond a few comfortable chairs, a wee third sitting-room or hall bedroom would be large enough, and a gas fire or oil stove could provide the occasional heat needed. The general sitting-room would then be free for talk, visitors and the sewing-machine.

Again, in many maid-less households where mid-day cooking prevails, the kitchen is tenantless during listening-in hours, and could easily be made cosy for the wireless enthusiasts.

Talking of wireless in the kitchen, it appears as if "the servantless" may take new heart again, for on more than one occasion lately, the installation of a set in the kitchen

has proved the most potent lure in enticing a canny maid to take a new post.

Domestic service is in general a lonely job, and it is easy to see how the music, talks and plays that are broadcast night after night help to keep the maid, sitting alone by the fire, interested and in touch with the big world outside. It may not make such a difference in town, where friends and the ever-popular "pictures" are available, but it is easy to understand that in country situations a kitchen wireless installation is the greatest possible boon.

So would-be mistresses, please note!

Wireless and Witchcraft

Has it struck you that really uneducated folk of to-day, especially if they're no longer young, regard new inventions such as wireless just as people did in the Middle Ages, when everything they didn't understand was diabolical, and women were burnt as witches for possessing an elementary knowledge of medicine.

I know an old charwoman, born before the days of compulsory education, whose scanty learning was acquired at one of the now extinct dame schools. She brackets together as dangerous "don't-touch instruments" everything of which the mechanism isn't apparent at first glance.

"That There Wireless"!

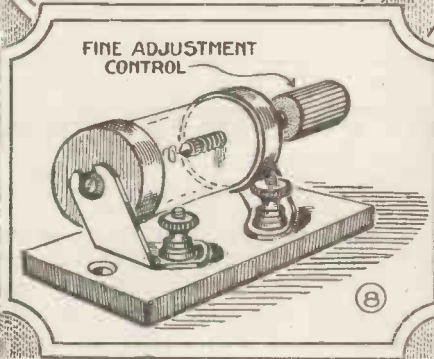
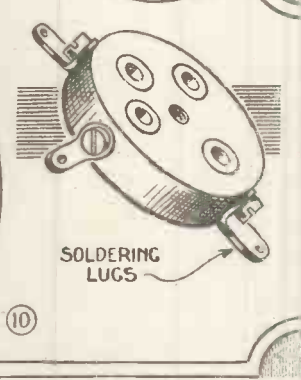
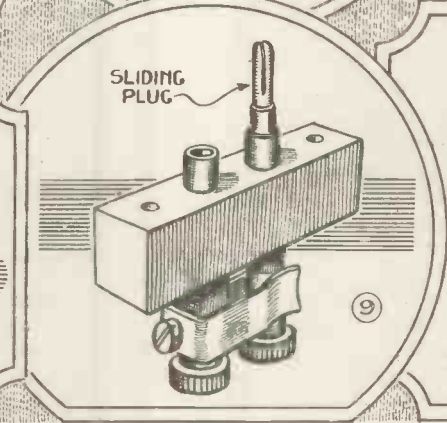
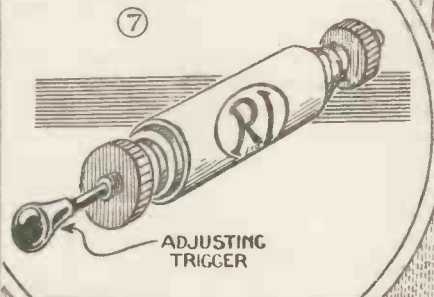
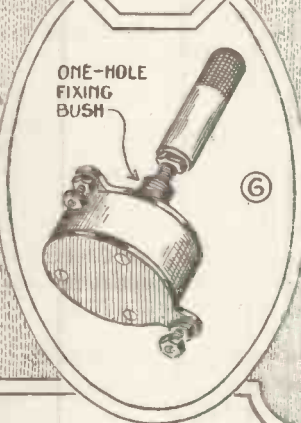
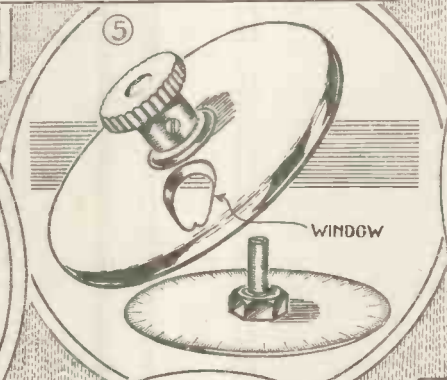
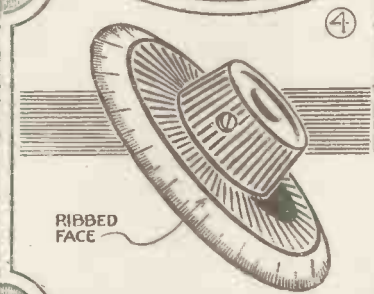
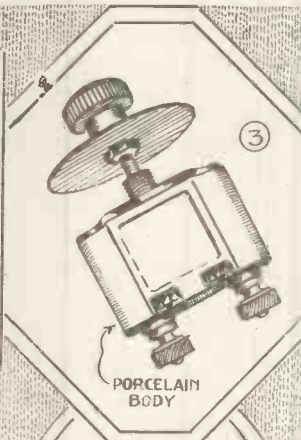
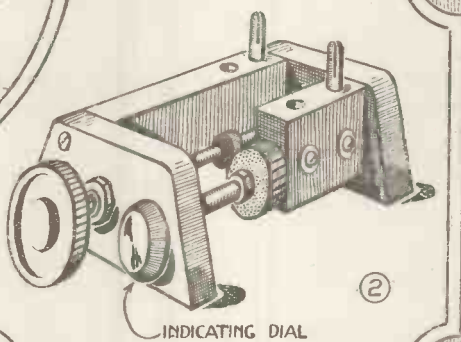
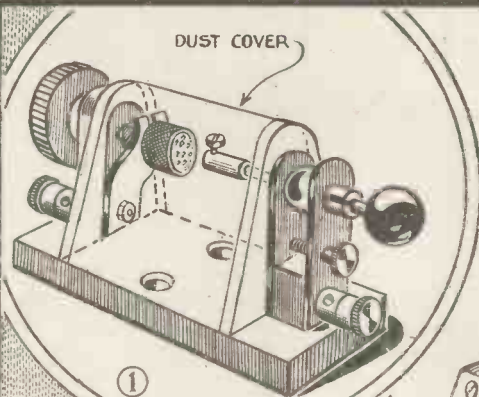
Not for a hundred pounds would she send or answer a telephone call; she daren't touch the electric light globes if the gas fire is burning, apparently under the delusion that every form of lighting is controlled by the same tap. When I had a dictaphone it might accumulate dust for ever before she would risk her life by removing it. And nowadays I am always requested to "come and move that there wireless, please," when she wants to clean the window-ledge that houses my set.

"Witchcraft!" is her unspoken comment on it. Most of us, I think, agree that wireless is witchcraft but of a wholly delightful kind.

(Continued on page 211)

NOVELTIES AND NEW APPARATUS

Illustrations of Some of the Newest Components



1.—Crystal detector made by Quality Products. 2.—Peto-Scott coil holder with reduction gearing. 3.—Atlas filament resistance with porcelain body. 4.—Radion dial with ribbed face for making fine adjustments with the fingers. 5.—Cozwhy calibration dial. 6.—Bowyer-Love fine adjusting or neutrodyne condenser. 7.—Foolproof R.I. detector that has no "catwhisker." 8.—G.E.C. detector with micrometer adjustment. 9.—A Will Day loading-coil plug that completes the circuit when the coil is removed. 10.—The Enterprise Manufacturing Co.'s panel-mounting valve holder.

Making the Crystal Oscillate

HAVING for some time past been engaged on experiments with a view to ascertaining the extent of the possibilities of oscillating crystals, I give the following results in the hope that they may be of interest to others engaged or interested in this fascinating and important branch of research work. The apparatus re-

should immediately restart and not be disturbed by a slight mechanical shock to the crystal detector.

Having thus generated low-frequency oscillations and found a good spot on the zincite, it will be interesting to proceed to H.F. oscillations. For this purpose apparatus should be connected as

circuit is then broken at the point Y. The note heard in T 1 may cease suddenly or rise in pitch till it becomes inaudible because the steady note due to L 2 and C 2 is far above the audible range, the final result being either absolute silence or "mush." This "mush" corresponds to microphonic noises with L.F. oscillations—it is the probable starting point for H.F. oscillations.

Nothing further can be done with telephones T 1, so they are laid aside but not disconnected, and telephones T 2 are donned. On altering C 2 (which is preferably of .001 mfd.) a heterodyne note may be heard; if not, the detector should be gently tapped and C 2 altered over the whole of its range.

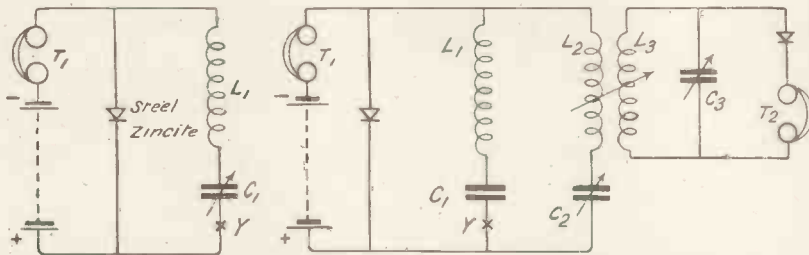


Fig. 1.—Circuit for Generating L.F. Oscillations.

Fig. 2.—Circuit for Generating H.F. Oscillations.

quired for achieving the results are: 1 pair high-resistance phones, 1 H.T. battery, 36v. tapped, 1 crystal detector (preferably Leslie Miller's patent) fitted with steel wire and zincite crystal, 1 large coil (value immaterial, Paris or Chelmsford coil will do), and 1 condenser, 1 microfarad or larger.

Low-frequency Oscillations

The apparatus is connected up as shown in Fig. 1. The zincite must be connected to the positive pole of the battery and the detector arranged to give a light contact. About 15-30v. should be used—the value not being particularly critical.

On tapping the detector with a pencil or similar light object two sets of oscillations may be distinguished: (a) Microphonic noise due to the mechanical vibration of the catwhisker; (b) a sustained howl, which may start from the microphonic noise and will generally alter in pitch before settling down to a steady condition.

The pitch of the note depends on the values chosen for coil and condenser—the larger these are the lower the note, but for the values given a perfectly audible and steady note should result. To determine whether a good spot on the crystal has been found the circuit should be broken at the point marked Y. When reconnected, the oscillations

shown in Fig. 2. In addition to the coil and condenser L 1 and C 1 already used, L 2 and C 2 are connected in parallel, being of such values as will tune to any C.W. transmission available. L 3 and C 3, etc., is any receiver tuned to this same transmission, L 3 being very loosely coupled to L 2.

In the first place, L.F. oscillations are obtained as before. The small coil and condenser L 2 and C 2 will hardly cause any appreciable difference in the pitch of the note. The

Sensitive Points

The writer has sometimes obtained generating points twice in three tries and has also struggled for half an hour to get one at all. With patience, however, a point will eventually be found which will stay constant for hours, even admitting of slight mechanical shocks being given to the detector, and which may be tuned to a heterodyne note by alteration of either condenser C 2 or C 3, thus enabling C.W. to be received on a set employing crystals alone.

A. HINDERLICH.

THE B.B.C. AND THE BUTCHER

IN view of the present outcry against fluctuating food prices (which always show more "increment" than "decrement"), it is an interesting fact that many American stations already make a practice of periodically broadcasting lists of the ruling prices of the more important foodstuffs.

Daily Price List

There seems to be no reason why a similar practice should not be instituted here. A daily price list of say a dozen of the staple articles of diet would not be a greater inflic-

tion to most of us than "Foreign rates of exchange" or the Stock Exchange quotations. On the other hand, it would be well worth its place in the programme to the good housewife, and would undoubtedly help to standardise the charges of local tradesmen.

One would presently see something to the following effect over the shop window of the ancient enemy Cuttem and Hackett—Butchers: "Broadcast prices strictly adhered to." I leave the suggestion to the earnest consideration of the Royal Commission on food prices.



Why I Prefer the GRAMOPHONE

THE almost universal vogue of wireless, in part at least,

may be attributed to its novelty, and in part to the fact that the construction of the necessary apparatus is well within the capacity of the amateur craftsman. Quite apart from results there is a fascination in being able to tap the broadcasting programme and have in one's home a concrete object lesson in the wonders of wireless transmission.

Overlooked Shortcomings

The whole subject so bristles with interest that at first one readily overlooks its shortcomings. My first experience in listening-in was to the Cardiff station on a two-valve set. Duly provided with phones I awaited results with that pleasurable anticipation that one always experiences in exploiting a new phenomenon.

My nervous tension relaxed as the significant words "Cardiff speaking" smote my ears, and I settled down to enjoy the feast of sweet sounds that a cultured voice proceeded to promise me. It was to be a budget of Wagnerian selections. Good! But the first few bars of the band hardly had materialised when the music died down to an indistinct murmur.

The operator apologised, twisted certain knobs, and squeaky sounds followed, in turn giving place to an insistent series of morse signals too rapid for my untrained reading. Then Wagner again asserted himself, but with morse accompaniment. Half an hour of this gallimaufry would have reduced me to a nervous wreck.

The operator looked foolish and promised me better results when he had installed his loud-speaker. My next experience was with a loud-speaker, in a Bournemouth hotel. The *pièce de résistance* was to be a

speech by the Prince of Wales. We got it in detached fragments interspersed with scraps of conversation in a cockney voice that clearly had no connection with the royal orator.

Later experiences did nothing to dispel my opinion that wireless fare, like the Scotsman's haggis, is a thing of mixed ingredients.

Perhaps I have been unfortunate. Perhaps I have expected too much. No doubt I shall be told that the former is the correct explanation,

"In this article 'Weare Giffard' deals with only one side of the question. For the best answer to his criticisms, in not more than 250 words, we will give a prize of wireless apparatus (chosen by the winner from the catalogues of advertisers in this issue) to the value of Three Guineas. For any other answers printed we will give an Edison valve."

Entries should be addressed:
"Gramophone,"

THE WIRELESS MAGAZINE,
La Belle Sauvage, E.C.4.

Closing date March 21.

and that I should be induced to tell a different story once I have been permitted to listen-in on a "really good set." It may be so. All the same I turn from wireless to my gramophone, an old and trusted friend that never misbehaves so long as I feed it with the right kind of food. I can enjoy its music when and where I like.

I have not to consult the newspaper to discover just when I shall be privileged to listen to *Poet and Peasant* or *Tannhäuser*. My

musical fare is under control. My instrument renders its melo-

dies faultlessly. I can repeat those that appeal to me as often as I wish. I have no need to block my ears and decorate my head with a pair of phones, or get their wires hung up on my coat buttons or entangled in the cord of my eye-glasses.

The glamour of wireless leaves me cold. The most soul-stirring programme it could offer me would not induce me again to crown my greying and fast disappearing locks with those horrid phones. As for the loud-speaker, well, it is wireless masquerading as a gramophone—a very strident one at best.

An Unsightly Affair

If I find the programme of wireless a disappointing one, on aesthetic grounds I protest against its unsightly outside trappings. My neighbour's aerial worries me. Its mast bends like a bow, and threatens to fall over on to my flower beds. His leading-in wire has more kinks than a last year's bean stalk. And as I view the perspective offered by the range of garden ground that backs the houses in my street, its sky-line crossed with every kind of wire at every possible angle, I am tempted to observe "So this is wireless!" Thus our twentieth century marvel has its sordid side, and its "wireless" wires usurp the prerogatives and ape the inelegant showing of the family clothes line. Incidentally I may remark—what a glorious opportunity there is for some enterprising firm to offer at a reasonable price tubular steel masts with buckled base plates that can be set upright and will remain so. Perhaps they have done so. In that case where are they to be seen? WEARE GIFFARD

SELENIUM

A Key to Television

Specially written for "THE WIRELESS MAGAZINE"
by Dr. E. E. Fournier D'Albe

SELENIUM is a sort of black sulphur, that is to say, it is an element belonging to the sulphur group, but is distinguished by its dark colour and certain very peculiar and valuable properties.

Like sulphur, it exists in several "allotropic" states, convertible into each other by heating or cooling.

The element was discovered in 1817 by the great Swedish chemist Berzelius, but its one unique property was not suspected until it was noticed by accident in 1873 at the cable station at Valentia Island.

The engineers in charge of that station required a resistance of several megohms, and as they knew

that selenium, in one of its forms, had a high resistance without being actually an insulator, they constructed some resistances of fused and crystallised selenium.

To their amazement (and annoyance) they found that the resistances were not constant, but lost about a third of their value in sunlight, though the original value was restored after some "rest" in the dark.

An Important Discovery.

The importance of this observation was realised by Mr. Willoughby Smith, the engineer of the company, who investigated the matter and reported to the Royal Society.

This report caused a considerable stir in scientific circles, and for twenty or thirty years afterwards countless efforts were made to turn this unique property to some practical use.

Attempts were made to use it (1) in photometry, for measuring the brightness of lamps or of daylight in a manner independent of the eye ;

(2) in burglar alarms, a bell being rung through a relay when light was either switched on or off ;

(3) in automatic lighthouses and light-buoys, enabling them to light in the dark only ;

(4) for the automatic lighting of electric street lamps at nightfall ;

(5) for comparing the brightness of stars ; and

(6) for determining the time of greatest darkness during an eclipse.

Countless other applications were suggested, including a system of television, and there is no doubt that some of them could be realised to-day. But in the nineteenth century the resources of physical science were not what they are now, and it took much additional research to bring the properties of selenium into practical use.

Difficulties with Selenium

Many of the failures were due to an insufficient acquaintance with the difficulties attending the use of selenium. One of the difficulties is that its resistance is affected by the temperature, so that a selenium cell having a resistance of 200,000 ohms at freezing point may have a resistance of only 180,000 ohms at ordinary temperatures.

It may also undergo a sudden change at a certain temperature,



Professor Barr, F.R.S., Demonstrating the Optophone.

which, however, does not occur if the change is gradual and moderate.

A more serious difficulty lies in what is sometimes rather inappropriately called this "lag" of selenium.

The word means that selenium does not acquire its final resistance instantly, but takes several seconds or even minutes to adapt itself to new conditions of illumination or darkness.

When, however, these difficulties are thoroughly understood there is no further trouble, and selenium becomes as reliable as, let us say, a good detector crystal.

Use of Selenium Cells

Some of the prettiest lecture experiments can be made with a selenium cell and a relay working with, say, a milliampere, or with a Weston relay working with a tenth of a milliampere.

Bells may be rung by throwing a beam of light upon a selenium cell, or "mines" may be exploded.

Or, by reversing the current, the passage of a shadow may be made to produce any desired electrical effect. The author in 1911 made the star Aldebaran ring a bell and record its passage on an electric chronograph.

Steering a Boat

But the most remarkable exploit of this sort was the steering of an unmanned boat by a selenium pilot (see heading photograph).

This was done in 1917 by Mr. Grindell Matthews, who, after a fine display on the Penn Ponds in Richmond Park, obtained from the government a "deposit" of £25,000 towards the further utilisation of selenium in warlike operations—a great sum, which, however, appeared to be justified in view of the destruction wrought by Zeppelins and the possibility of fighting them by some such method applied to aircraft.

Sorting Cigars

In the United States, attempts have been made to use selenium cells for sorting cigars and coffee beans by their colour, thus saving a large amount of manual labour.

But the real selenium relay has not yet arrived. When it does, it will probably be a different one, based on the change produced by an alternation of light and darkness.

As a well-made selenium cell always

shows some change of resistance under those conditions, its action would be quite reliable whatever the temperature and illumination.

Meanwhile, the only really successful uses of selenium so far worked out are based upon the response of the element to rapid fluctuations of light.

In wireless, selenium probably has more possibilities than any other element.

It can be used in burglar alarms, in automatic lighthouses and life-buoys, and for comparing the brightness of stars. In the United States attempts have even been made to use selenium for sorting cigars and coffee beans.

Selenium also makes it possible for the blind to read ordinary books and newspapers. One of these days it will almost certainly make commercial television an accomplished fact.

Many of its wireless possibilities are discussed in this article, which has been specially written for THE WIRELESS MAGAZINE by E. E. Fournier d'Albe, D.Sc., F.Inst.P., Author of "The Moon Element."

It may appear strange, in view of the much-discussed "lag" of selenium, that it is at its best when responding to a rapidly changing illumination of audio frequency.

But it should be borne in mind that this sort of response eliminates all difficulties connected with in-

stability and temperature effects, so that a shifting zero, for instance, is of no account.

Although the curves representing the conductivity of selenium in alternating light and darkness are not straight for slow rates of alternation they become straight as the pitch rises, and the amount of rise and fall for high audio frequencies is strictly proportional to the intensity of the light.

It is also inversely proportional to the frequency. There will, therefore, be less response to a high note than to a low note.

Universal Response

But there is no note, however high in pitch, to which selenium does not respond at all. If, for instance, 20,000 flashes of light fall upon a selenium cell per second, and a 20-volt battery and a high-resistance telephone are put in circuit with it, a very high-pitched note will be heard in the telephone if the latter is capable of detecting a twentieth of a microampere.

The Photophone

One of the instruments recently placed before the public in this connection is Professor A. O. Rankine's grid photophone, which transmits speech and music along a beam of light. The audio frequencies impressed upon the beam by means of a small mirror attached to a

(Continued on next page)



A Blind Girl using an Optophone for Reading.

diaphragm are received at the other station on a concave mirror which concentrates them on a selenium cell and makes them audible in a telephone.

This really constitutes a system of "beam wireless" on an extremely short wavelength, to wit, a 12,000 of a millimetre.

It is practically secret, but has the disadvantage that it can only operate in straight lines free from obstruction.

The Optophone

Another instrument based upon the use of intermittent light is the author's optophone, which converts ordinary print into musical sounds for the use of the blind. In this case an optical image of the type is broken up into a set of audio frequencies by means of a revolving perforated disc having five concentric circles of perforations, producing as many different notes.

The passage of the letters "plays a tune" on these notes, and as each letter makes its own characteristic "motif," reading is soon accomplished. The fact that reading of an ordinary book or newspaper takes place at the rate of some 80 words a minute is the best testimonial in favour of the responsiveness of selenium it would be possible to conceive.

Transmission of Pictures

Various suggestions have been made for the wireless transmission of pictures by means of selenium. One of the earliest attempts at transmission was made by an Italian, Perosino, as long ago as 1879.

He proposed to move a selenium cell over the optical image to be transmitted and to transmit the resulting current by wire to the receiving station, where it would be recorded by a synchronously moving platinum wire on paper worked in ferrocyanide of potassium.

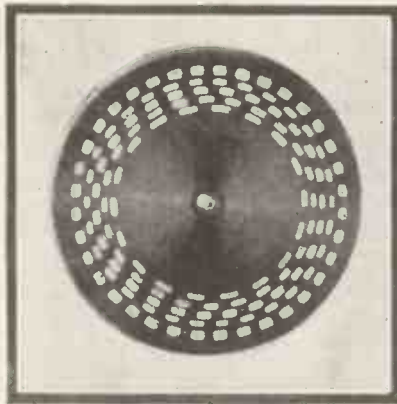
Many other names have since then been prominently associated with the same problem. We need only mention Shelford Birdwell (1881), Heinzerling (1890), Silberstein (1899), Korn (1904), Belin (1905), Campbell Swinton (1908), Ruhmer (1909), Rignoux and Fournier (1912), Sanger Shepherd (1913), Bartholomew (1919) and Macfarlane (1920).

But the great majority of these investigators did not contemplate wireless transmission, being satisfied

with ordinary telegraph or telephone wires. And, indeed, one can understand that where pictures are intended for private persons or firms a transmission by wire is, in the present state of wireless science, to be preferred.

The difficulty attending present methods of wireless transmission of pictures is mostly due to the necessity of synchronising the sending out and receiving mechanisms.

This can be avoided by "coding" the picture (as was done by the author



Optophone Disc.

in the picture broadcast from 2 L O on June 24, 1923). But as a rule the picture is transmitted line by line, and as the simplest picture consists of at least 1,000 separate elements—more usually 10,000 to the square inch—the correct transmission of a picture is, as a rule, a formidable proposition.

The recent Transatlantic wireless transmission of pictures was a synchronised line transmission, but the lines were wavy instead of straight, and the effect was very pleasing.

It is fairly obvious that, if selenium is to be used, it is not advisable to employ the plain current passing through the selenium cell, but the fluctuating current produced by intermittent light.

Flashing Light

If a narrow pencil of light flashing at the rate of 259 flashes per second traverses a photographic negative and falls on selenium, a telephone in circuit with the latter will sound the middle C of the piano so long as the flashes continue, and the strength of the sound will be great when the beam traverses the high lights of the negative and feeble when it encounters the opaque portions.

It then only remains to transmit the sound by wireless and record it

on a synchronously moving plate at the receiving station.

The "tuning note" sent out by the B.B.C. before the time signals is just the sort of note which could be best transmitted and received, its frequency being 1,000 per second. Such a frequency has been chosen as the pitch which most headphones and loud-speakers are best adapted to receive.

Recording

One of the best recording methods is that described by the author in last month's issue of this magazine. It consists of a compound resonator tuned to the pitch of the note to be received.

The small mirror on the reed of the resonator produces a small line of light on a screen. When the note is sounding, the line is drawn out into a band.

The central portion of the band is the darker the more the band is drawn out. The amount of drawing out is proportional to the loudness of the note, as also is the darkness in the centre.

If, therefore, we make a narrow slit where the line was when the note was not sounding, a "negative" of the sound will be transmitted through the slit, and a quantitative record of the sound on a photographic plate moving behind the slit obtained.

The advantage of this acoustic resonance method is that a large number of lines can be transmitted simultaneously without mutual interference.

Different Frequencies

All that is required is to allocate a different audio frequency to each line at the transmitting station and a corresponding resonator to each line at the receiving station.

As the resonators need only differ by a semitone, or even less, the seven octaves of ordinary music would yield 84 different frequencies, all of which would be available for transmission on the same radio-frequency wavelength.

The "picture" would thus be received as a wild and rather discordant medley of sounds, and would only become intelligible when straightened out and sorted by the imperturbable selective action of the acoustic resonators.

Eighty-four lines compressed into an inch give quite a useful "grain"

(Continued on page 206)

"A Sunday on the Continent"

CEC turned away from the window in disgust. It had been pouring with rain since breakfast-time and the street had all the appearance of a miniature lake of mud.

"What price Evangeline?" he queried. "Any reserve juice?"

I looked up from my newspaper. Cec, you may like to know, is a public-school boy home on his hols, for the first days of which he just lounges about the house with hands thrust deep in trouser pockets, enjoying what he terms "a well-earned rest."

Evangeline

Evangeline is not a beloved daughter or an adored relative but just my four-valve set. It, or rather she (as most intricate pieces of mechanism are deemed to be of the feminine gender) was so christened by my wife with the accusation that she daily monopolises a greater percentage of my conjugal and fatherly affections.

I nodded. "Plenty . . . so if you like . . ." We reached the table on which rested the receiver together; it was a dead heat.

"Dads, I suggest a short Continental tour. Here's a list of Sunday transmissions. Berlin first."

Coils were plugged in, filaments lit and condensers slowly revolved. "Here she is." A few adjustments, the coil coupling slightly loosened, a little more H.T. voltage and the sounds of a 'cello solo were heard. Morse on this wavelength was very persistent but, with care and patience, I subdued it considerably. We had arrived at our destination, "Hier Hauptsendestelle Königswusterhausen auf Welle Zwei Tausend acht Hundert meter." "I can make that out," said Cec. "It is the principal transmitting station of . . . what he said. LP, I suppose, on 2,800 metres."

Violin Solos

Two violin solos by Sarasate and Brand-Kreisler followed. The announcer's statement of the soloist's name was perfectly clear: Herr Ernst Lossow. We then listened to a further valse and the station closed down to the melody of

"Austria," the present German National Anthem.

"What's next on the list?" I queried.

Hamburg

For several minutes we could find nothing, then with coils Nos. 40, 60 and 75, we picked up a carrier wave. The excitement was great. We held it for a short time until three strokes on a gong struck our ears.

"Hamburg," I exclaimed. This was an orchestral concert but morse interference was heavy, so rapidly changing coils we tuned-in its relay station, Bremen, 330 metres, and enjoyed about ten minutes' good music.

Our tour was to cover a wide area and we could not afford to linger, but as from experience I knew that all stations were resting we adjourned for lunch.

A further search on the Continent was made at 14.30 G. M. T. We soon met with success. The words picked up, though faint, were understandable; a reference to the "Kunstglerkapelle Silving."

This was Vienna, but it was found impossible to tune it more clearly, and although a further stage of low-frequency was used, "mush" was greatly increased and the music faded away fairly frequently.

Back to London at 15.00, as the family wished to enjoy the concert given by the military band and the Salisbury Singers at the 2 L O studio.

Radio-Paris

At 17.00 permission was granted for a further stroll farther afield. Coils were rapidly plugged in and Radio-Paris came in strongly on loud-speaker. The programme was very similar to our home entertainments including, as it did, such well-known items as Greig's "Peer Gynt" suite, "Zapateado" of Sarasate and Glazounow's "Spanish Serenade" for violin.

Cec declared himself bored. Hamburg again offered a change and we took it. This station heterodyned frequently with Newcastle and Bremen was again tuned in. It was difficult to believe, at first, that a foreign station had been "netted."

A woman's voice described "British Life of To-day" with sundry references to the then coming festivities, Christmas plum-pudding and our mistletoe custom. Mrs. Theo. Drill, so the announcer confirmed in German, would continue her talks on these topics every week. She spoke deliberately but fluently and with a slight harsh teutonic accent.

As the information given was not new to us we decided to leave for Paris. FL was due at 18.00 G. M. T. and usually provided a good concert.

"An Easy Station"

"Quite an easy station to pick up," I volunteered. "About 5 k.w. with rather poor modulation at times, but on a wavelength fairly free from interference." Almost all artists were of the feminine gender—singers, pianist, violinist and 'celloist. The concert was an average one, but, for some reason, could not be received at sufficient strength to work the loud-speaker.

As my young listener lacked the essential quality of patience to hear a full programme, a further move was decided upon. The Continental list advertised a concert at Zurich at 20.30, Central European Time. This was a favourite station as, although not of great power, I always receive it easily.

The carrier wave was picked up immediately and although prone to "fading" we were able to follow the different items played by the Gilbert Orchestra of that city. "Overture to the Merry Wives of Windsor," part of a symphony (not recognised) and two violin solos were exceptionally good.

Zurich-Höngg

Coils and condenser readings proved that Zurich-Höngg was transmitting on about 515 metres, which confirmed the report that the official 650 metres had been abandoned for the time being. (Tests are still being made and this wavelength is temporary.) "Not at all bad," generously conceded Cec. "Zurich is 475 miles from London as the crow flies." A discussion

(Continued on page 191)



The Author with the sets he has constructed.

My Five-valve Receiver by ERIC ROY, A boy of Fifteen

coupled together, the anode coil being in the centre. In this system more critical tuning is got, but great care has to be exercised to prevent radiation. It will also be noticed that switches are utilised for the cutting out of the different valves.

The circuit is a very reliable one and has great possibilities in the way of distant reception. I have experimented with grid bias on the two low-frequency valves, but have found that there is little improvement on the fourth valve. By using about four volts on the last valve, however, I found that there was a decided improvement both in volume and in quality of tone.

Necessary Components

It is absolutely essential that reliable components should be used in such a set as this, or for that matter, in any set. The variable condensers used all had fine tuning adjustments. The transformers are extremely important since they have so much to do with the tone of the reception, and well-known makes, ranging from 20s. to 30s., are strongly advised. The

WHEN at the end of last year our local station opened I ventured to indulge in a humble crystal set, little thinking that in the course of a year I would be listening to KDKA and other distant stations.

But many things happen in a year. To pry into the inner secrets of my crystal receiver was my first venture. Then soon afterwards I aspired to a one-valve set.

From that stage things moved rapidly, and I spent much time at this hobby which ought, perhaps, to have been devoted to other studies.

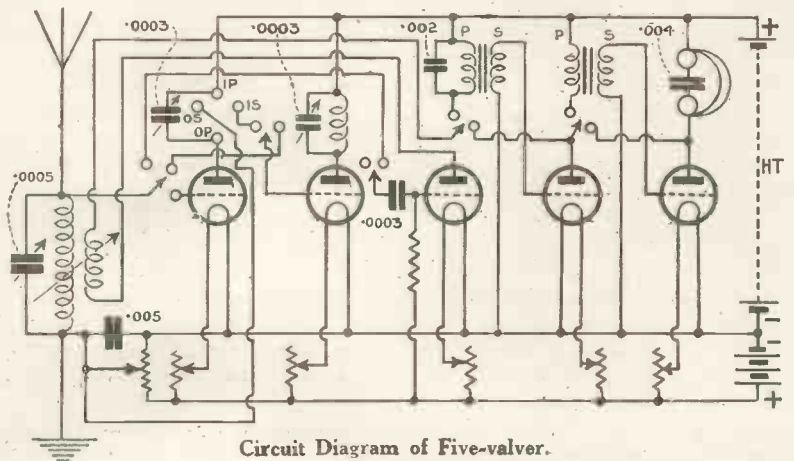
Five Valves

With the aid of my trusty friend *Amateur Wireless* I came to understand the uses of the valve and other components which are used in valve receivers, and eventually constructed a set incorporating five valves: two high-frequency, detector and two low-frequency.

The circuit was taken from *Amateur Wireless* just over a year ago, with slight modifications— which I thought were improvements. The aerial and earth were connected

to the secondary coil, the reaction reversing switch was omitted, and a small switch was placed between the low-tension negative and the filaments to switch off the valves. I also placed a Mansbridge condenser across the high tension. For the edification of readers who have not seen that circuit I give it here. It will be noticed that the first valve is transformer coupled while the second has a tuned anode.

In the set described the aerial coil, anode coil and reaction coil were

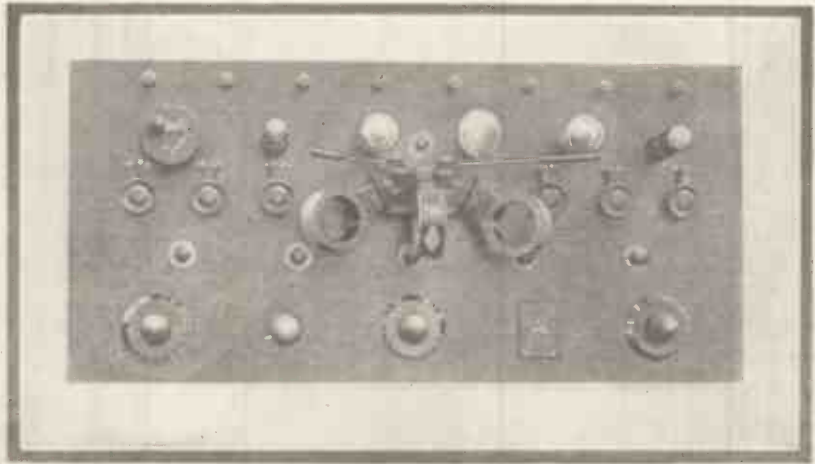


coil holder was also fitted with fine tuning adjustment which is very useful for long-range work.

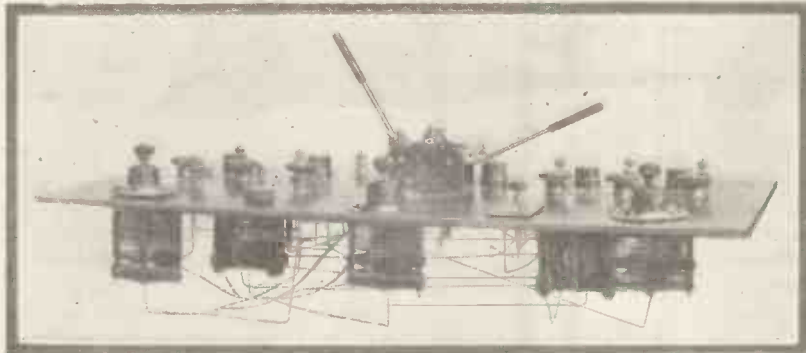
With a set of this size a big accumulator is very desirable—one of about 60 ampere-hours would be required when using R valves. It is also necessary to use two ordinary size 60-volt high-tension batteries in parallel, since one has not a heavy enough output to supply five valves and the result is that indifferent results are obtained and the battery is quickly run down.

The Cabinet

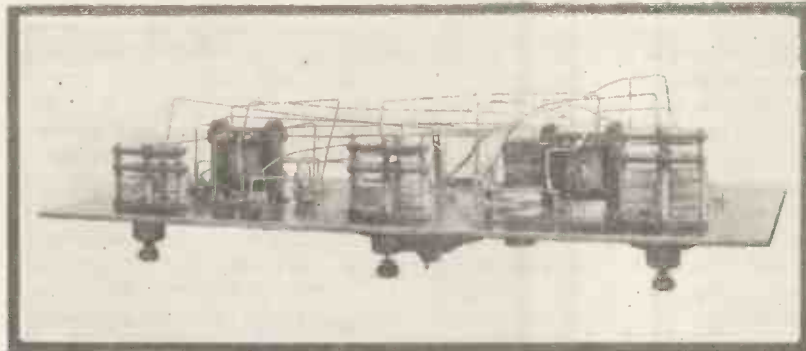
The cabinet in which the set is placed is of the bureau type and is made of canary wood, which is very



Top view of panel showing switches and controls.



Side view showing position of components.



Under view showing wiring.

easy to work and takes on a fine polish. The two sides are made of 1-in. material; they are 4 ft. long and 18 in. deep. The folding lid slopes at an angle of 45 degrees, and is 30 in. long and 12 in. deep. It is hinged to the front and is supported by slides.

There are two rectangular frames; one on which the panel rests, and the other 8 in. from the bottom. On the latter are compartments for batteries; the base of the loud-speaker is also fitted into this frame.

The front panel is of three-ply canary. It is $\frac{1}{2}$ in. back from the front and is surrounded by a plain moulding. In the centre of this a

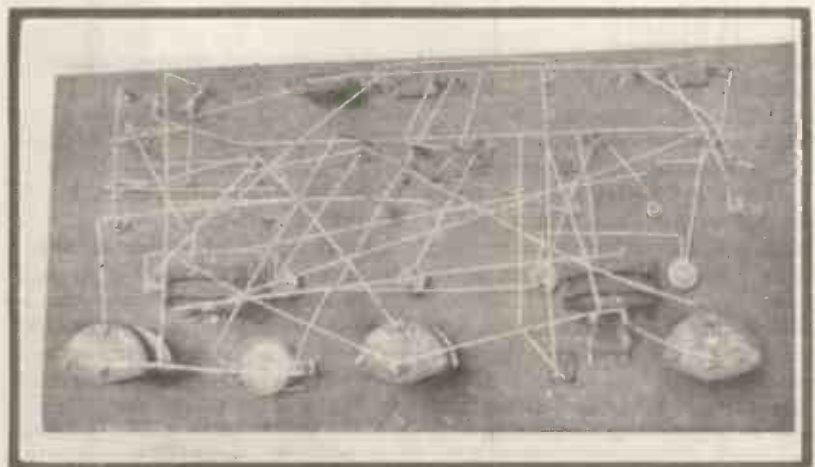
circular hole is cut for the flair of the loud-speaker. There is not any great difficulty in the making of this cabinet, and anyone with quite a slight knowledge of tools could easily make a cabinet of the same or similar design provided that he uses great care. I may say that the design is quite original, and it was made without my having any instruction in woodwork.

Results Obtained

When using this set on Aberdeen's transmission three valves are quite sufficient to operate the loud-speaker in a large room; in fact, when using a power valve and about 120 volts on the plate two valves are all that is required.

When using one high-frequency, detector and one low-frequency, the three stations of Paris can all be received with perfect clearness and audibility on the loud-speaker. While using the same combination, Berlin on 430 metres and Madrid on 392

(Continued on page 213).

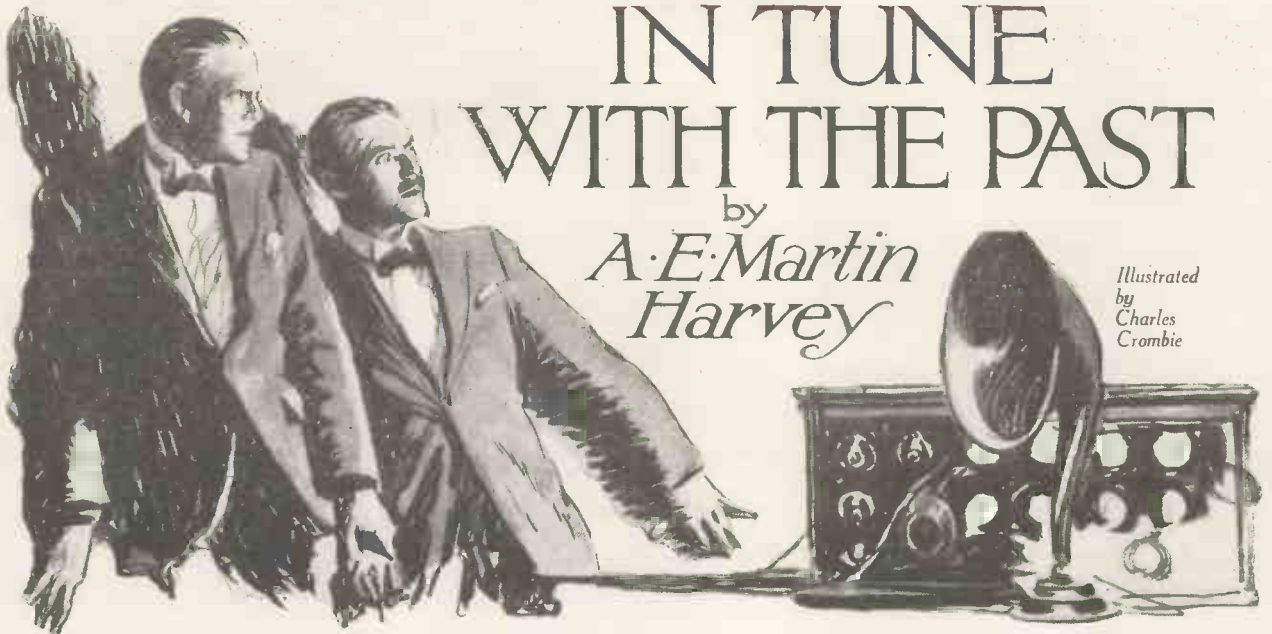


Under view of panel showing disposition of components.

IN TUNE WITH THE PAST

by
*A. E. Martin
Harvey*

Illustrated
by
Charles
Crombie



NOT so very many years ago, a uniformed messenger called at my office and handed me a note, telling me that he was to wait for an answer. I opened the note and read these lines:

"Can you spend a week-end with me? I am experimenting in wireless and need congenial company. I have bought Eyesham. Take the 6.10 from Waterloo on Friday evening, and I will meet you at Guildford. Tell this man yes or no."

Yours, C.—W.

Crighton-Wood and I were at school together, and we discovered in those far-off days a fundamental disagreement on most things under the sun which has kept us in touch with one another ever since. I was pleased by this characteristic note, and I told the man yes, with my compliments.

Eyesham, when I saw it standing dim and solemn in the dusk, caught me by the throat and filled me with rage against my perverse generation. This house was the patent of a nobility beyond the comprehension of the men to-day makes peers of: this was a place which should breed splendid rulers of men and affairs; and it belonged, with all its lands, to Crighton-Wood, who had clambered into the light by his wits alone and his cry of "Money! money! money!"

He watched me while I thought of these things, and then he said, "It does seem a shame, doesn't it?"

"I'm not so sure—if that's how you

feel about it," said I, more than a little ashamed of myself. "Who built it, and how long ago?"

"Come and get changed," he ordered, shutting himself up quickly, like a snail.

I laughed because I recognized his old way with a thing that was precious to him and, from that moment, I held my peace and let him tell me as much or as little as he liked. By that means, in the course of hurried visits to me to see if I had all that I wanted, and in fragments as we passed from room to room, I heard the history of Eyesham.

It dated, as it stood, from 1503, when it had been built round the remains of an older house probably of monastic origin. It had belonged from the beginning, with the exception of three short intervals of foreign ownership, to the same family. And that family had consisted, with no exception at all, of handsome, well-bred, loose-living, charming wasters.

"They are eternally dying, but never dead," said Crighton-Wood. "I am only another interval. When I am dead and forgotten, they will come back—somehow."

Every room in Eyesham had a name carved on the lintel of its door. There were rooms which were named from their purpose, and rooms which were named from their outlook, and there were the Queen's Chamber, the Cardinal's Room and Harry's Room, which spoke for themselves.

"There is one thing I would like to ask while there is still a flicker

of spirit in me," I said at last, "and that is—who furnished Eyesham? The things come from every conceivable period, but they have obviously been chosen and placed by one man."

Crighton-Wood coloured up in his queer way and began to ramble about the indifferent taste of the last two baronets and the simplicity of clearing out a deal of accumulated rubbish and importing a little fresh stuff here and there.

"In fact," I suggested, "you stepped in and made these people's house this thing of beauty for them. I hope they record it on your tomb. How do they like you?"

"Oh! they find me odd but entertaining. See this?" He switched on the lights in the great hall. Any description of it must be a profanation. It was wagon-roofed and full of lofty shadows.

"This is where I dine my Labour members," said Crighton-Wood. "Now come here."

He led me along a twisted corridor and through a low doorway, where he switched on other lights.

"This is the refectory," he said. "That table is very little younger than the walls."

I had nothing to say. I felt intrusive and unnecessary.

"I save this for my Die-hard neighbours," said my host. "It does 'em both good—Tory and Labour. Now we'll dine ourselves. I use a smaller room in the ordinary way."

And so we dined and drank uncommonly well, and I slept deep into



Saturday morning in a room called the Chaplain's.

At breakfast I mentioned the object of my visit, but Crighton-Wood stated that his experiment was to be made late that night, and that the day was mine to do as I liked in. I strolled over to the open window and breathed a deep breath of the air that was blowing in from the hills.

"I would like to walk," I said.

We walked ourselves tired and happy and returned in time for a magnificent hot bath before dinner. After dinner, with a visible effort—for this was another thing next his heart—Crighton-Wood outlined briefly what he had learned about the science of wireless communication, and what it was that he wished to do this night. I could not attempt to tell his tale in his own language, but I remember the end of it.

"I have thought a great deal," he said, "copied others with extreme care and read everything. The set of instruments that I am now going to show you is the result. There is not another quite like it in the world. Think of it in scientific terms and I agree with you that it is incredible. But think of it as an ear adjusted to remote sounds, and it is no more wonderful than your own ear which hears a sound in this room. Space is very comparative. You may have your idea of a great distance, but what about this little fellow here?"

He pointed to a tiny fly staggering over a crumb on the table. This was reasonable, and I said so.

"Then we will go and listen,"

he said, "and if there are intelligible sounds to be heard outside this planet it is only reasonable to suppose that we may hear them."

He rose and led me through the length of the house to a room in its most westerly corner which I saw was called "Annabelle's Room." It was a small, graceful room, hung with tapestry and furnished with two tables and a suite of slender chairs. It had a casement window overlooking a stretch of upland, and was so full of untroubled moonlight that we scarcely needed any other. Two wires lay writhed across the floor from the window to the tables, and on the tables were placed Crighton-Wood's instruments. I am no student of wireless science, but even I could detect in these instruments the work of a serious investigator.

Crighton-Wood closed the door.

"There are phones if you care to use them," he said, "but you will hear everything which is likely to happen through this loud-speaker. There is something to read, to smoke and to drink, and that is the most comfortable chair. I rarely talk at this game, and no one will come near us until breakfast time to-morrow. Would you sooner go to bed or will you stay with me?"

I stayed with him.

While he was busy with his preliminary adjustments, I heard a church clock not far away strike ten, and I was surprised at the stillness of the air and at the warmth of the evening which allowed us to keep

open windows in late September. The last note of the hour died slowly, but after that there was no sound to be heard but that of Crighton-Wood's deft movements. I chose a book from a full shelf and mixed myself a comfortable whisky.

Before long the loud-speaker started to play a very modern, very naive dance tune.

"London," commented Crighton-Wood, as who should say, "God help it!"

Then for some time we heard a diversity of fragments from every programme which was being broadcast in the kingdom, a performance which appeared to try Crighton-Wood severely. After a while, however, this tumult died down and left us again in silence.

We next heard what was apparently a quarrel between a gnat and a very dour bumble-bee. The argument finished with the gnat's singing, very high and very fast, "Umpty-umpty iddy-iddy iddy-iddy-umpty iddy-umpty iddy-umpty iddy-umpty iddy-umpty iddy." "Umpty," commented the bee, and that was that.

"Where and what were they?" I asked.

"Atlantic vessels," said Crighton-Wood, and I marvelled.

For perhaps half an hour we listened to vague whispers from the far seas, and then these too yielded to profound silence.

After some minutes this was broken by a low roll of thunder; and neither I nor, apparently,

(Continued on page 216)

Absolutely for the Novice!

WIRELESS energy radiated into space from the aerial of a broadcasting station becomes dissipated as it travels on. That is only what one would imagine. You do not get so much heat from a fire or so much light from a lamp at a certain distance as you would do at only half that distance. Hence one of the first points to take into consideration in deciding upon the kind of wireless set to buy or make up is how far off the nearest broadcasting station may be.

Power of Transmitter

The next question is whether it is a full-power transmitting station, making use of about one and a-half kilowatts (roughly two horsepower) of energy, or whether it is a low-power relay station sending out its re-transmitted signals less than one-tenth as strongly. Having got this far, we must decide whether we shall be satisfied if we are able to listen-in on not more than three or four pairs of phones at a time, or whether we shall want to work a loud-speaker.

A loud-speaker can give out enough sound to fill a large room, or even a concert hall, but it has to be supplied with power at the listener's end.

Popular Crystal Sets

Crystal sets with phones are so popular because, if the aerial and earth wires are efficient, and if a full-power broadcasting station is not more than fifteen to twenty miles away, you can pick up the music and speech with them, quietly but pleasantly, without any need for subsidiary power-amplification at the receiving station, or, in other words, at the listener's home.

When necessary, by attaching to a crystal set a "note magnifier" fed by electricity from dry batteries and an accumulator, or from two sets of dry batteries, the range of

the set may be increased to twenty-five or thirty miles and the volume of sound made great enough to operate a loud-speaker.

A Single-valve Set

Where the nearest broadcasting station is over twenty miles away, a single-valve set will do distinctly better than a crystal set. A "thermionic valve" looks like a small electric lamp, the light from the filament of which is shielded by a metal plate or tube inside its glass globe. The action of a "valve"

from the H.T. supply source, but this has to be at a voltage of from twenty to one hundred, depending upon the valve itself, forty-five to sixty volts being usual.

A suitable H.T. battery may be made up at home by connecting fifteen fresh pocket flash-lamp batteries in series, that is to say by soldering the positive brass strip of one flash-lamp battery to the negative strip of the next, and so on.

H.T. Batteries

More conveniently arranged commercial H.T. batteries can be bought from any dealer in wireless goods. They occupy less room and have brass sockets at intervals in their pitched-over tops, so that by fitting connecting plugs into various pairs of these sockets, varying voltages may be taken from the same battery at will.

But, of course, when you start running a valve set it means that you have to keep your accumulators charged and batteries renewed. In other words, you are now yourself providing and paying for the bulk of the power that energises the set. That picked up by the aerial only supplies the initial trigger action, as it were, which starts the set functioning.

No Local Energy

The rest you build up with your own locally bought and paid for "juice." With a crystal set, when used without amplifiers, the whole of the energy going into the phones has been picked up out of space by your aerial, and no local auxiliary electrical energy has to be provided or paid for at all.

By adding a note magnifier, or two note magnifiers, on to a single-valve set, it becomes a two- or three-valve set, capable of receiving broadcasting up to fifty miles or more away, and of operating a

In this, the second article of a series written specially for the "absolute novice," our contributor deals with that difficult proposition, the choosing of one's set. The subject is treated in such a manner that it cannot fail to be comprehensible to that section of listeners for which it is written.

will be explained later. It rectifies nearly as well as a crystal and at the same time amplifies, or makes the sound louder.

Still, the difference in strength between the performance of a plain single-valve set (without reaction) and of a crystal set, is not great. Unlike the crystal, a valve requires two separate sources of local current to make it work. One source may be a six-volt accumulator if the valve is of the "bright-emitter" type. If it is a "dull-emitter" valve the low-tension (L.T.) current supply may be from one or more fairly large dry cells or Leclanche battery cells, of the same kind that are used for household electric-bell circuits.

The second source of current supply for a thermionic valve is quite separate from the first, and is called the high-tension (H.T.) supply. Very little current is used

MEMORISE THESE SYMBOLS												
	Crystal Detector	Aerial	Earth	Headphones	Fixed Condenser	Variable Condenser	Fixed Coil	Coil with Slider	Coupled Coils	Variometer	Wires Joined	Cross Wires not joined

CHOOSING A WIRELESS SET

loud-speaker. Each note magnifier consists of a thermionic valve and an iron-core static transformer, and, like the rectifier, or "detector" valve, each note magnifying, amplifying or "low-frequency" (L.F.) valve needs feeding with L.T. and H.T. current from accumulator and battery, as described.

Note magnifying units have to be connected on to the phone terminals of the receiving set. They themselves carry terminals to which the phones or loud-speaker should be connected.

H.F. Amplification

If the nearest broadcasting station is more than fifty miles away, the range of the receiving set has to be increased still further. This is done by building in between the aerial and rectifier valve one or more stages of high-frequency amplification.

A high-frequency amplifier consists of a valve and an air-core transformer. A single well-planned high-frequency stage can easily increase the range of a wireless set to a hundred and fifty or two hundred miles, while the addition of "reaction" will make the range indefinitely greater still. Many three-valve sets with one stage of H.F. and reaction have in this country successfully picked up such foreign broadcasting stations as Königswusterhausen (Germany), Rome and even New York.

Receiving America

America is, however, still pretty much of a snag for British listeners. On a few nights in the year it comes over quite easily. These are called freak reception nights. Usually it eludes the average listener. Sitting up till three o'clock in the morning on the chance of getting it is therefore in the nature of an off-chance for the enthusiast rather than an ordinary listener's pastime. To receive America the aerial must be very good and some reaction is necessary.

The principle of reaction is this:

The wireless impulses after rectification are led back through another inductance coil before being passed on to the L.F. transformer of the first note magnifying unit. This "reaction coil" or second inductance, is placed close to the aerial inductance, with the result that the impulses passing through it excite corresponding induced impulses in the aerial coil which merge with those set up by the energy from the aerial. The whole of the energy then proceeds back through the wireless set, the effect being a continuous building up of power, just as a snowball gathers to itself more and more snow in rolling along.

Obviously all good things must come to an end, and if reaction is taken too far these augmented impulses coming through the set build themselves up into a hideous howl or scream. The set is then said to have "spilled over" or to be "howling" or "oscillating," though it is possible for a valve receiving set to oscillate quietly when it makes no other sound than a slight rustling in the phones. A set on the point of "rustling" is at its best for faint and distant signal reception.

Howling

Some wireless sets have two stages of H.F. These should be "transformer" and not "reactance" or "tuned-anode" stages, as more than a single stage of either of the latter is extremely "unstable" or likely to howl. Experimenters are fairly well agreed there is no point in trying to couple up more than two stages of high-frequency or two stages of low-frequency amplification in a wireless broadcast receiving set. More high-frequency spills over, and more low-frequency badly distorts any speech or music picked up.

We may now make out a list of alternative sets, with their strong and weak points, as follows:—

Single-circuit crystal set.—Very cheap in first cost, or can easily be made at home. Has range up to fifteen miles. Costs nothing in elec-

tric current to run, except when used with note magnifiers. Reception clear but not loud, except when note magnifiers used.

Double-circuit crystal set.—Range a little better than with single-circuit set and reception a little louder. More "selective" (it will tune out unwanted sounds more perfectly).

Single-valve set.—Range twenty-five or thirty miles. Louder than crystal set, but in no way more faithful rendering of broadcast programmes. Requires local L.T. and H.T. electric current. Will take note magnifiers as with crystal set.

Loud-speaker Strength

Two- or three-valve (detector and L.F.) set.—Range fifty miles, or over, with good aerial. As two-valve set will work loud-speaker in small room; or as three-valve set, with two note magnifiers, will work loud-speaker loudly enough for large room or small hall.

Three-valve (H.F. detector, L.F.) set. Improved by potentiometer control.—Range up to 150 or 200 miles, depending on aerial and earth wires. Very efficient with tuned-anode H.F.

The above with reaction. Improved by potentiometer control.—Range indefinitely increased, according to aerial and earth wires and local and temporary climatic conditions. May be anything from 200 miles upwards.

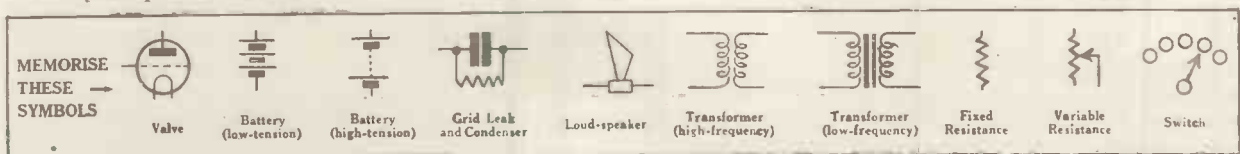
Experimenter Set

Four-valve set: two stages H.F. (transformer), rectifier, one stage L.F. reaction.—Most interesting experimenter's set. Very long range, but tricky to tune and liable to howl badly and give trouble in inexperienced hands.

Five-valve set, as above, but with two stages L.F.—Very loud reception, but liable to pick up unwanted noises such as atmospherics and distant morse signals.

Both the latter require potentiometer control. COLIN BENNETT.

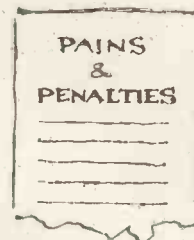
(To be continued)





THE LISTENER AND THE LAW

*A Barrister clears
up some points.*



THE wireless enthusiast first makes contact with the "law of the ether" when he goes to take out his licence from the Post Office. If he is simply interested in the broadcast programmes he probably regards the cost of the licence in much the same light as the price he would be charged for a seat at a theatre or music-hall. In other words, it is his contribution towards the upkeep of the B.B.C. service—cheap enough in return for a year's entertainment.

This point of view does not, however, cover the whole of the facts. For example, our friend may be one of the D.X. enthusiasts who disdain to listen to anything nearer home than America or even the Antipodes. This distinction will be found to "cut no ice" at the Post Office. They will want his ten shillings a year just the same. Should he by chance desire to join the select ranks of those who transmit messages into the ether, he will probably find the cost of the licence to be the least of his troubles at the hands of the P.M.G.

No Legal Freedom

In short, there is no legal right to the freedom of the ether either for sending or receiving messages. Such a privilege is in law the sole monopoly of the Postmaster-General, who alone has the power, under the direction of Parliament, to issue permits or licences authorising others to share in his monopoly. In the first place the B.B.C. must themselves be licensed by the P.M.G. before they can transmit their programmes, and in the second place every user of wireless receiving apparatus, whether for broadcast or otherwise, must also be licensed by the P.M.G.

Having regard to the special circumstances under which the B.B.C. now operate, they have been granted for a certain period an exclusive licence which protects them from

competition in their own particular sphere of activity. By the terms of an agreement made between the two parties, the main portion of the revenue received from the issue of receiving licences is paid over by the P.M.G. to the B.B.C., the remainder being retained by the Post Office against general administration expenses.

Wireless: A Definition

The peculiar position of the Postmaster-General with respect to wireless is the outcome of a Royal privilege which dates back to the early middle ages. By common law the transmission of letters or other communications for profit has always been recognised as a prerogative or perquisite of the Crown. In these more democratic days it still remains a state monopoly, but is now vested in the person of the Postmaster-General.

Extended Right

The right in question has been extended rather than diminished in course of time. When the ordinary line telegraph was first invented the new system of communication was held to fall within the Post Office monopoly, and a special Act of Parliament was passed in order to grant certain exemptions in favour of Railway Companies, etc. Otherwise the transmission, reception and delivery of telegrams was retained solely in the hands of the Postmaster-General. The same position arose when ordinary wire telephony first came into existence and was dealt with on similar lines. The advent of wireless further extended the scope of the P.M.G.'s monopoly, the new situation being regularised by the passing of the Wireless Telegraphy Act of 1904 which still remains in force.

The first and essential clause in this Act reads as follows: "A person shall not establish any wireless telegraph station or install or work any apparatus for wireless tele-

graphy in any place . . . except under and in accordance with a licence granted in that behalf by the Postmaster-General."

The Act defines "wireless telegraphy" to include any system of communication "without the aid of any wire connecting the points from and at which the message is sent and received." It therefore covers wireless telephony. The expression "install or work any apparatus for wireless telegraphy" obviously applies to receiving apparatus as well as transmitting.

This point is emphasised because later on in the Act there is a proviso, or excepting clause, which has more than once been taken to mean that a licence is not legally necessary for reception, but only for transmission. The passage in question reads as follows:—"Provided that nothing in this Act shall prevent any person from making or using electrical apparatus for actuating machinery or for any purpose other than the transmission of messages."

Other Purposes

Taken out of the proper context, and interpreted at their apparent face value, the last ten words might be taken to mean that everyone was free to use receiving apparatus without let or hindrance. This is not, however, the case. The object of this proviso is merely to except from the general operation of the Act electrical apparatus, of the same nature as that used in wireless, when such apparatus is, *in fact*, being merely used "for actuating machinery," e.g. the distant control of an engine or motor-car or aeroplane, or for any other purpose than signalling. Such "other purposes" might for example be the use of a valve oscillator in a diathermy appliance for giving medical treatment with high-frequency electric currents, or the use of valve circuits for measuring the frequency of oscillating currents in the laboratory. Such uses have nothing to do

with the transmission of messages and therefore do not fall within the scope of the P.M.G.'s monopoly rights.

Experimental Rights

Another point in the Act which is of particular interest to the genuine experimenter lies in Section 2, which gives him the power to demand a licence for transmission or reception as a matter of right and not as a matter of privilege. In order to be placed on this footing, however, it is necessary for the applicant to prove to the satisfaction of the P.M.G. that he is a competent and genuine experimenter. His licence, when granted, is also subject to such reasonable conditions and restrictions as the P.M.G. may think proper.

It is perhaps unnecessary to add that severe pains and penalties are set out in the Act for those who neglect or refuse to obtain the necessary licences. The maximum punishment is a fine of £100, or twelve months' imprisonment with hard labour. Needless to say, such a sentence would not be inflicted except for the most flagrant and persistent defiance of the law.

Household Law

The 1904 Act, although still in force, is obviously out of touch with the present position of wireless, particularly as regards the broadcasting position. A new measure is being drafted and will shortly be presented to Parliament, in which it is hoped to remove many of the present anomalies.

Quite apart from the law regarding the use of the ether, differences of opinion frequently arise in connection with other legal aspects of wireless. For instance, it is by no means unusual for the landlord of a house to take objection to his tenant setting up an aerial. The landlord may fear damage to the fabric of the building, either from lightning, or from

the extra strain upon the chimney or other part to which the aerial is attached. Possibly he thinks the aerial may fall down in a gale of wind and thereby cause injury. It may even be that he objects to the appearance of an aerial on his property upon purely æsthetic grounds.

There are two guiding principles to be borne in mind in all such cases. In the first place, when a landlord lets a house to a tenant, he is presumed by law to include all the reasonable enjoyments of occupation. Broadcasting is now one of the ordinary amenities of life, and in the absence of any specific agreement to the contrary, the tenant has a prima facie right to erect an aerial, subject, however, to what follows.

The Tenant's Responsibility

The second rule is that the tenant is personally responsible for any damage that may result from his own fault or negligence. If he, in fact, does damage to the building in putting up his aerial, then he must pay.

The point may perhaps be illustrated in another direction. Apart from any special clause in the lease, a landlord cannot prevent his tenant from burning garden rubbish (within reason). If, however, the tenant is foolish enough to light his bonfire where it burns down a hedge or outhouse, then he must pay for his folly. Similarly if he sets off fireworks on November 5, (again

within reason), he is safe in doing so, unless he sends a rocket either through his own or a neighbour's window. In such a case he must naturally be prepared to foot the bill.

The matter now comes down to one of fact. If the tenant causes damage to the building, he must pay for it, but he need not take down his aerial on that ground alone. He can liquidate the damage and stick to his aerial. If the work of erection has been carefully carried out no damage should arise—or at most nothing that would not be covered by a shilling or two.

As regards damage by lightning, this is rapidly becoming a bogey of the past. Houses were occasionally struck long before wireless aerials were in evidence, and no doubt they will continue to be struck. In order to incur liability on this ground it would be necessary to prove that the presence of the aerial was the decisive factor. In any case this liability to the house will be covered by most fire insurance companies on existing policies, provided that the companies are duly notified of the erection of an aerial. Damage to the set (as distinct from the house), is a different matter, but this can also be covered on very easy terms.

Liability for Injury

Liability for injury arising from the presence of the aerial in storms or gales is again purely one of fact.

The attachment of one end of an aerial wire to a chimney or wall will not, in fact, cause any appreciable extra strain. If the gale is sufficiently fierce the building may fall, but it would be impossible to prove that the catastrophe was really due to the presence of the aerial. Should the aerial alone fall, and do damage, liability arises and must be met by the owner of the aerial.

Special regulations apply to
(Continued on p. 213)



There is no legal freedom of the ether. All broadcasting and receiving is the monopoly of the Postmaster-General (Sir W. Mitchell-Thompson, seen above) and may not be carried out without his permission.

Wireless Slang at its Worst!

ARE we in danger of developing a horrible wireless jargon? Judging from the weird terms used in conversations that one hears between enthusiasts I am rather afraid that we are. Every pastime; whether it is a sport or a hobby, tends in course of time to possess itself of a kind of little language of its own. A hunting man will smile if you speak of the "head" or the "tail" of a fox; to him they are the "mask" and the "brush." But the special words of fox hunting are hardly jargon. They are age-old terms dating back over the centuries to the days of our sporting ancestors, amongst whom they were the correct and only way of speaking of these things. To come down to later times, the advent of the bicycle gave us a few special words, such as to "scorch" or to "back-pedal." But these were comparatively harmless, and they never showed signs of expanding into a full-blown jargon. The conversation of cycling enthusiasts never became unintelligible.

Wireless "Slang"

Wireless is a brand-new pastime. It has no ancient specialised words to make use of, though it has borrowed a certain number of the slang expressions belonging to electricity. Examples are "short" and "dis." The first of these has been in use for some years as an abbreviation for short-circuit; the second dates, I believe, from the Great War, when Army telephonists shortened "disconnection" by cutting it down to its first syllable. Now it has become a kind of past participle, and you may hear a man say: "He couldn't think why his set wouldn't work until I showed him that his grid leak was dis."

If you want to hear wireless jargon at its very worst, tune in when the amateurs are working. Every reply begins "Hello, old man." Signals (often "sigs.") are "O.K." or they "come in with a shout" and can be heard "with the phones on the table." That last is a real stock phrase amongst wireless folk. Usually it is to be taken with a pinch of salt—unless you are to understand that the lis-

tenor's head was *also* on the table! Heaps of people, too, use in conversation the abbreviations employed by professional wireless telegraphists in actual working—"fine for D.X. last night; no QRM."

Amateurs Suffer Also

Slang names for the enthusiast are many. We may hear him called a "radio fan" (an expression borrowed from America, "fan" being the first syllable of "fanatic") a "condenser wangler," and an "ether searcher" or a "broadcatcher!" (The last term was the result of a prize competition in a London daily paper). If he is one of those who have an inordinate love of reaction he is dubbed an "ether hog," a "howl fiend," or a "squeal merchant."

Into a wireless shop enters an intending purchaser. "I want six lengths of busbar," he says, and the assistant serves him with half a dozen pieces of square tinned rod. A busbar is an electrical term for a main conductor which supplies current to a number of points. One of the many uses of square rod in the wireless set is for high-tension and low-tension busbars, and so it gets a new name in wireless jargon.

One of the worst offenders is the man who talks always in initials. This is the kind of thing you hear: "The E.M.F. of the H.T.B. was O.K., so I suspected the L.T.B. Nothing wrong there, so I tried first the L.F. gadgets and then the H.F. Found the A.T.I. not properly connected to the A.T.C." Continuous waves are now universally C.W., whilst simultaneous broadcasting has become S.B., and there is even a verb "to S.B."—"So-and-So must be a celebrity. I see he's being S.B.'d from all stations." I have actually heard of one enthusiast who when setting out by train for Manchester asked for a ticket to Z Y!

Proper Names Only

An amusing person is the man who considers himself an expert and regards it as beneath his dignity ever to speak of anything by its popular name. To him a coil is

always an inductance, the primary and secondary of the tuner are the oscillation transformer, and the plate is the anode. If one insists on calling the plate the anode, then to be strictly accurate the filament should be spoken of as the cathode.

But perhaps the most wonderful user of jargon is the fellow who likes to think that he is an expert, though really he is very far from being one. One of the crimes of which he is frequently guilty is to talk long and loudly about the abuse of reactance, when he really means reaction. Reactance is certainly an electrical term; but it does not mean the use of a coil to produce squeaks. Impedance is another stumbling block. I doubt whether one wireless man in a hundred could explain clearly what it does mean, though probably ninety out of a hundred use the word often—and generally misuse it! Valve makers, by the way, are amongst those who stray from the paths of accuracy in this way. The impedance of a valve cannot be given as a single definite figure, for it depends upon the frequency. "Internal impedance" generally signifies nothing more or less than the direct current resistance between plate and filament at zero grid volts.

Danger Ahead!

Yes, I fear that we are developing a wireless jargon which is not pleasant to read or to listen to. Already it is difficult for a layman or a beginner to understand more than an odd word or two when a wireless enthusiast is "explaining" things. Some books, too, seem to be written purposely in the most obscure way—whenever a writer does this kind of thing he uses an insulting "obviously" in about every fifth line.

Unless we are careful we run the risk of coming in the near future to express ourselves in a way as technical and as involved as that of the doctor who says of a patient that he "has sustained a simple fracture of the radius" when he means no more than that he has broken his arm. TUNIN.

Do You Care for Glass Panels?

FROM time to time suggestions have appeared in the technical press for the use of glass panels instead of those of the more orthodox ebonite or composition. It is perhaps not a difficult matter to appreciate why glass for panels has not come into more general use, owing to the difficulty or supposed difficulty of drilling this material.

On all other counts glass is the equal of ebonite; in fact, in many respects it is superior, being unaffected by light and the atmosphere. In addition, glass possesses one very great advantage—it is transparent. This means that *all* the components of a receiver may be totally enclosed in a dustproof case and yet be visible. This last factor makes a glass panel worth while.

Drilling the Panels

Admittedly, there is a difficulty in drilling glass; but this is not so great as may be supposed. Moreover, no elaborate tools are required. There are several considerations to be taken into account in the design of the set itself if a glass panel is to be used. First, all the components should be enclosed; this, of course, includes tuning coils and valves. Second, the design should be such that all renewable or removable components (coils, etc.) are accessible. Third, all components that are to be mounted upon the glass should be suitably chosen; for example, although it is a fairly simple matter to drill a $\frac{3}{16}$ -inch hole, it would not be easy to make one $\frac{1}{2}$ in. in diameter.

In the majority of cases, therefore, one-hole fixing components are not suitable.

The only tools required for the actual drilling are a breast drill, a square file, a short length of copper rod (say 4 in. long by $\frac{3}{16}$ -in. in diameter), some carborundum paste and turpentine. As regards the drilling, the procedure is as follows:

They are more difficult to work than Ebonite, but here we show "how"

The copper rod, smeared with a little of the grinding paste, is first put in the drill chuck and revolved upon the surface of the glass. After a few minutes the surface of the glass will become roughened. About 4 in. of the file is next broken off and mounted in the chuck and, after the paste has been wiped off the glass, the file with its jagged end is used as a drill.

It will be found that the improvised drill makes rapid progress by splintering the already roughened surface; the use of turpentine as a lubricant will considerably facilitate drilling. When the hole is halfway through the operation should be repeated from the opposite side so that the break occurs in the middle, and does not make a jagged edge.

Other Considerations

Actually there are one or two other considerations in the drilling process. A guide is necessary at the start, and the glass must be laid upon some soft material. The guide may be made from a strip of wood placed over the glass and lightly held in position by two screws. A paper template should be attached to the under side of the glass, so that the points marked on it may be seen. This can be removed, of course, when the drilling of one side is completed.

The amount of pressure to be used is a matter for judgment; a few tests may be made upon some scrap pieces of glass. Different kinds of glass vary considerably in the matter of hardness, but the writer experienced no difficulty whatever in drilling fairly stout window glass. The time taken to drill each hole was under five minutes. If after use the file loses its cutting or "splintering" properties a fresh piece should be broken off the end.

There is one final point to be mentioned, and that is the mounting of the components. It is essential that some resilient material be placed on each side of the glass before any screws or nuts are tightened up.

For this purpose small cycle inner tube patches are excellent; but even with these interposed discrimination must be used in the degree of tightness, as allowance must be made for the expansion and contraction of the glass due to temperature changes. These remarks, of course, apply to the fit of screws, etc., in the holes.

H.C.



Drilling a Glass Panel.

For giving a loud-speaker demonstration in the West End of London, a wireless dealer was fined £2. He ought to have known that the only loud-speakers allowed there are the flower ladies.

WHAT is the number of valves needed for good reception of broadcasting?

Opinions are widely divided on this very interesting point. On the one side we have such an authority as Captain P. P. Eckersley, who believes in using a great many; on the other, we find any number of expert amateurs who never use more than a single valve even for the reception of trans-Atlantic transmissions. Not long ago Captain Eckersley said that if listeners-in would use one valve for every mile that lay between them and the transmitting station they would get better results. He was joking, of course, but there is a good deal behind his words. He maintains, too, that thirty miles is the utmost range at which perfect reception of telephonic transmissions can be obtained.

Is Our Reception Perfect?

You will say at once: "Oh, that's absolute rot. Newcastle (or Aberdeen, or Bournemouth, or Cardiff) is two hundred miles from me, and I get him splendidly." Yes, reader; I know. So do I. But do we get these distant transmissions *perfectly*? The next time that you tune in—this evening, for example—forget that you are the designer and constructor of the receiving set. Forget that you are its owner and operator. Forget that you are a wireless enthusiast. Put yourself, if you can, in the place of one who has never before heard a wireless transmission. Endow the imaginary being whom for the moment you are impersonating with a really musical ear—and then be quite candid in your criticisms.

Is there not, if you are perfectly frank with yourself, a certain undercurrent of "mush"? Does not the fine tuning needed to give adequate signal strength lead to a little harshness on loud passages? Are the words of the announcer as delivered by your loud-speaker really as clear as if he were standing in the room with you? Can you hear the words of a song, even if you are conscious that the singer is articulating to perfection? Don't some of the instruments seem slightly out of tune when the orchestra is playing? Can you hear each part if you try to do so? Are all of the composer's subtle harmonies as distinctly to be heard

How Many Valves?

as they would be in a concert hall?

I will not attempt to answer these questions. Your replies to them will depend upon your conscience, your enthusiasm for long-distance work, and the quality of your musical ear. On the whole, however, you will, I think, be forced to admit that there is a difference between the "musical" and the "wireless" idea of perfection in long-distance reception.

One realises fully the thrills that come from the reception of a concert given on the far side of the Atlantic. You listen, for example, enthralled to the strains of the wonderful prologue of *Pagliacci* sung in New York. But, to be quite frank, is it the music itself or the idea that it comes to you over three thousand miles of sea and land that most excites your admiration? The latter, I think. If you heard exactly the same thing on the gramophone, would you not say that it was a pretty poor record?

Stop Distance Work!

If you want perfectly pure broadcast reception you must rid yourself, at whatever may be the cost to your pride and your ambition, of what Americans call the "distance itch." You will get results that approach perfection *only* from your nearest station—and you will get them by working your valves well within themselves. A tendency to "press" spoils many a man's game of golf. In the same way the "gingering up" process ruins fifty per cent. of the wireless reception that one hears.

If you overwork your valves, keeping the set always just (and only just) short of the oscillation point there will always be a little something that jars upon the really musical ear.

You, sir, who live within ten miles of 2 L O, use a valve rectifier and a note amplifier to work your loud-speaker. Your results are passable, but they are not perfect. The best reception of the London station that I have ever heard took place at this distance. The man responsible employed a crystal as rectifier and followed it with three resistance-

capacity coupled note magnifiers! Though I cannot equal its wonderful quality, I rather pride-my-

self upon my own reception of 2 L O. The distance from my aerial and his is but twenty-five miles as the crow flies. Yet I use four valves, two high-frequency amplifiers and two note magnifiers. Rectification is done by a crystal detector. I can get him well enough with three valves, but I have to press them a little. With four I can work right off the oscillation point and still have ample strength.

The Best Station

Reaction, so far as pure reception goes, I regard as anathema. It is most useful for long-distance work, and for obtaining selectivity when there is interference, but it does away with the silent background, brings up mush and makes for distortion. For loud-speaker work give me the big set working well within itself. If I am to use the phones, and it must be admitted that they give truer reception than the finest loud-speaker, I plump for one high-frequency valve coupled by an aperiodic transformer to a crystal detector. I would use the crystal alone if I could get 2 L O with it, but unfortunately I cannot. The crystal is not efficient unless the voltages across it reach a certain value. My aerial is a bad one. Therefore one H.F. stage is essential.

Reserve of Power

The conclusion that I come to—I am conscious as I write that I shall be assailed by a host of correspondents who are not in sympathy with these views—is that you get the best from your nearest station and that to receive him to perfection your set must have a generous reserve of power. Never push it to its utmost. Be able to get far louder signals if you want to—but don't do it! When there is no need to tighten up couplings, to run filaments over-brightly, or to pile on the high-tension voltage in the receiving set, then both speech and musical items are really pleasing. Make it your aim to obtain quality rather than to bring in, fading and accompanied by distortion, the transmission of some distant station.

J. H. R.

COMBINING the GRAMOPHONE and BROADCASTING

The Hausdorff Super Wireless System
Explained by Dr. ALFRED GRADENWITZ

THE average wireless amateur certainly is anything but optimistic about future developments of the gramophone. The sometimes disturbing secondary noises, the impossibility of direct renderings, and the extremely limited capacity of gramophone records are so obvious disadvantages that the talking machine, once upon a time so popular, seems to be doomed to an early death. As regards the broadcasting of gramophone records—i.e. a combination of the gramophone and wire-

A Wonderful Arrangement

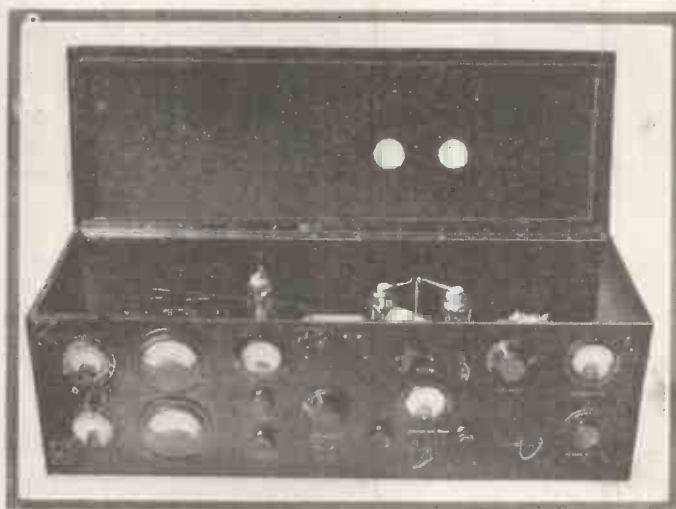
It was my good fortune a few weeks ago at the laboratory of Dr. Max M. Hausdorff, Berlin, to acquaint myself with a novel arrangement for the recording and rendering of sounds, an arrangement suitable, not only for telephony, both wired and wireless, but for talking machines of the gramophone and phonograph types, which does away with any membrane and acoustic capsule, and, therefore, with their disturbing noises.



Dr. Hausdorff with his invention.

thirds to a maximum of, say, 80 r.p.m., thus giving rise to additional secondary noises.

While all regulators so far used in connection with gramophone



Two other photographs of Dr. Hausdorff and his new wireless apparatus.

less—this at most seems to be a temporary expedient.

Still, so pessimistic a verdict would, to say the least, be premature. In fact, the possibility of a definite conservation of speech and music is too valuable an asset to be given up lightheartedly, and records of the voices of celebrities as well as linguistic samples for educational and scientific purposes cannot possibly be dispensed with. Moreover, gramophone records may prove a welcome supplement to direct wireless broadcasting, provided an addition of secondary noises could be avoided.

This arrangement enables the capacity of gramophone discs to be increased from three minutes to a maximum of 100 minutes, i.e. an interval amply sufficient to record even the longest pieces of music, such as whole operas.

This part of the inventor's arrangement at the same time does away with another drawback, viz. the gradual loss in quality of reproduction as the tracing approaches towards the outside portion of the record, and accordingly increases in diameter, which in turn must be made up for by raising the speed of the record during the last two-

records are of the centrifugal type, keeping the speed of rotation at constant figures, the clockwork driving the record is, according to the new arrangement, allowed to run unchecked, a brake regulator being provided at the edge of the disc and causing the tracing to pass below the needle at constant speed, in spite of unceasing variations in the speed of the disc.

This, then, is how it becomes possible to reduce the total number of turns to a fraction of its usual figure, e.g. from 80 to 5-10 r.p.m., while increasing the capacity of the

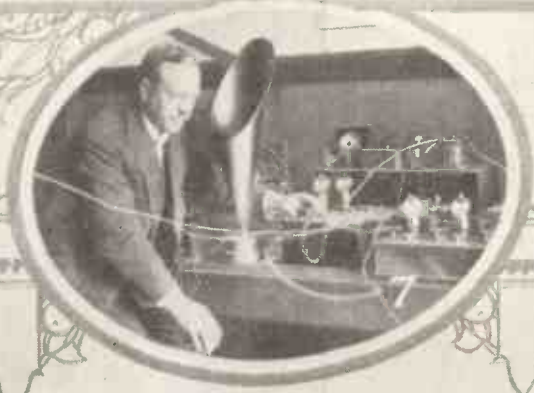
(Continued on page 200).

Wireless Pictures

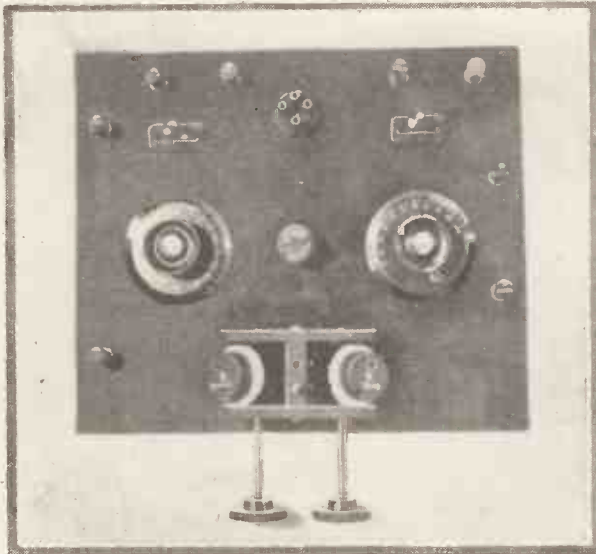


1.—Members of the "Yoicks" revue cast facing the microphone. 2.—Mr. J. H. D. Ridley, of South Norwood, who has received Mexico. 3.—Mr. C. F. Elwell with De Forests' apparatus for projecting talking films. 4.—The response to the Birmingham station's appeal for toys for hospitals. 5.—Eighty-nine-year-old Mr. Jimmy Rothwell, of Brixton, listening to broadcast songs that revive old memories. 6.—Patients at the Royal Devon and Exeter Hospital enjoy a broadcast programme. 7.—Busy enthusiasts in Harrow School workshop constructing their own wireless sets.

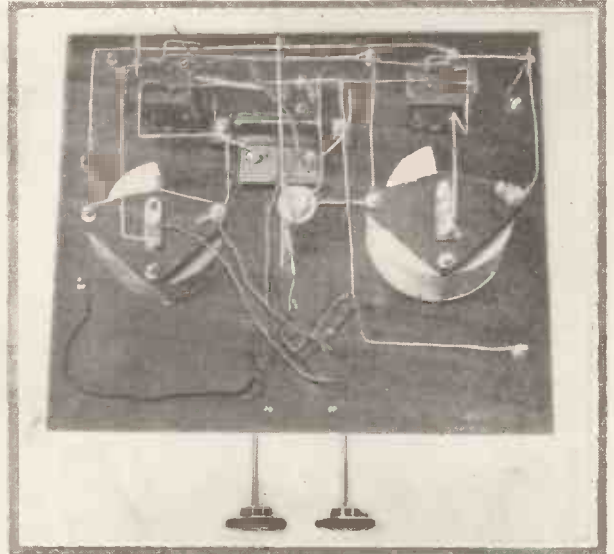
of the Month.



1.—The Prince of Wales listening in at Mill Hill School. 2.—No aerial and earth erection to worry this young lady who uses a portable set! 3.—Dr. Wireless is a great favourite at the Children's Hospital in Gl. Ormond Street. 4.—American enthusiasts doing things properly! 5.—Six-valve cabinet set built by an "Amateur Wireless" reader. 6.—Mr. R. E. Jeffrey, B.B.C. dramatic producer, directing artists at 2LO from the control room. 7.—Major Vitty, chief of the Scotland Yard wireless department. Is he listening for cat-burglar clues?



Front view of panel.



Positions of components

A Selective One-valve Set

Designed & Built by "THE WIRELESS MAGAZINE"

A SINGLE-VALVE receiver used with an efficient aerial-earth system will frequently give results which are envied by multi-valve set enthusiasts, the reason being that the one-valve man adjusts his set until it gives the utmost efficiency, while others probably content themselves by adding more valves.

Interesting Work

A great deal of interesting work can be carried out with a one-valve set and a fund of valuable information gained. The crystal-set user is strongly advised to experiment with a single-valver before passing on to complicated circuits employing several valves.

The set to be described is modelled on the circuit diagram, Fig. 1. A test aerial had been erected about 8 miles from 2 L O, so that

to receive other stations without being troubled by interference from the London station the tuning system had to be selective. This selectivity is obtained by the employment of a

For this reason a switch has been incorporated in the set to cut out the secondary circuit, so that the direct method of aerial coupling may be employed. The simpler coupling may therefore be used when no interference is experienced.

To the unskilled user the loose coupling may give a slight loss in signal strength, but with practice this loss will diminish, and very little difference will be noticed between the two forms of coupling.

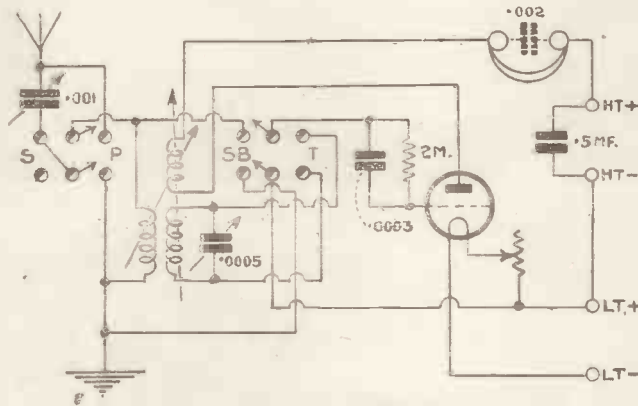
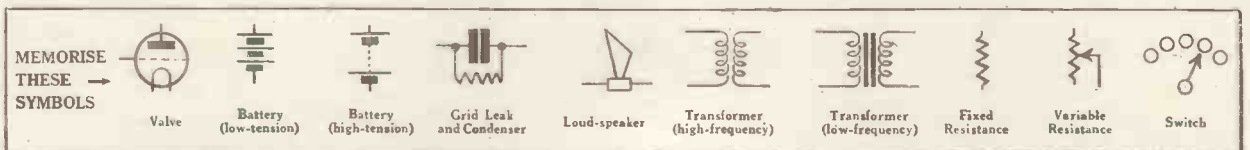


Fig. 1.—Circuit Diagram.

loosely-coupled aerial tuning system. It is pointed out, however, that a loosely-coupled aerial circuit may prove difficult to handle at first in the hands of a novice.

Components Required
 1 Radion panel, 12 in. by 10 in. by $\frac{3}{16}$ -in. thick.
 1 three-way coil holder
 1 .001 microfarad variable condenser (Bowyer-Lowe).
 1 .0005 microfarad variable condenser (Bowyer-Lowe).
 1 .0003 microfarad fixed condenser (Lissen).

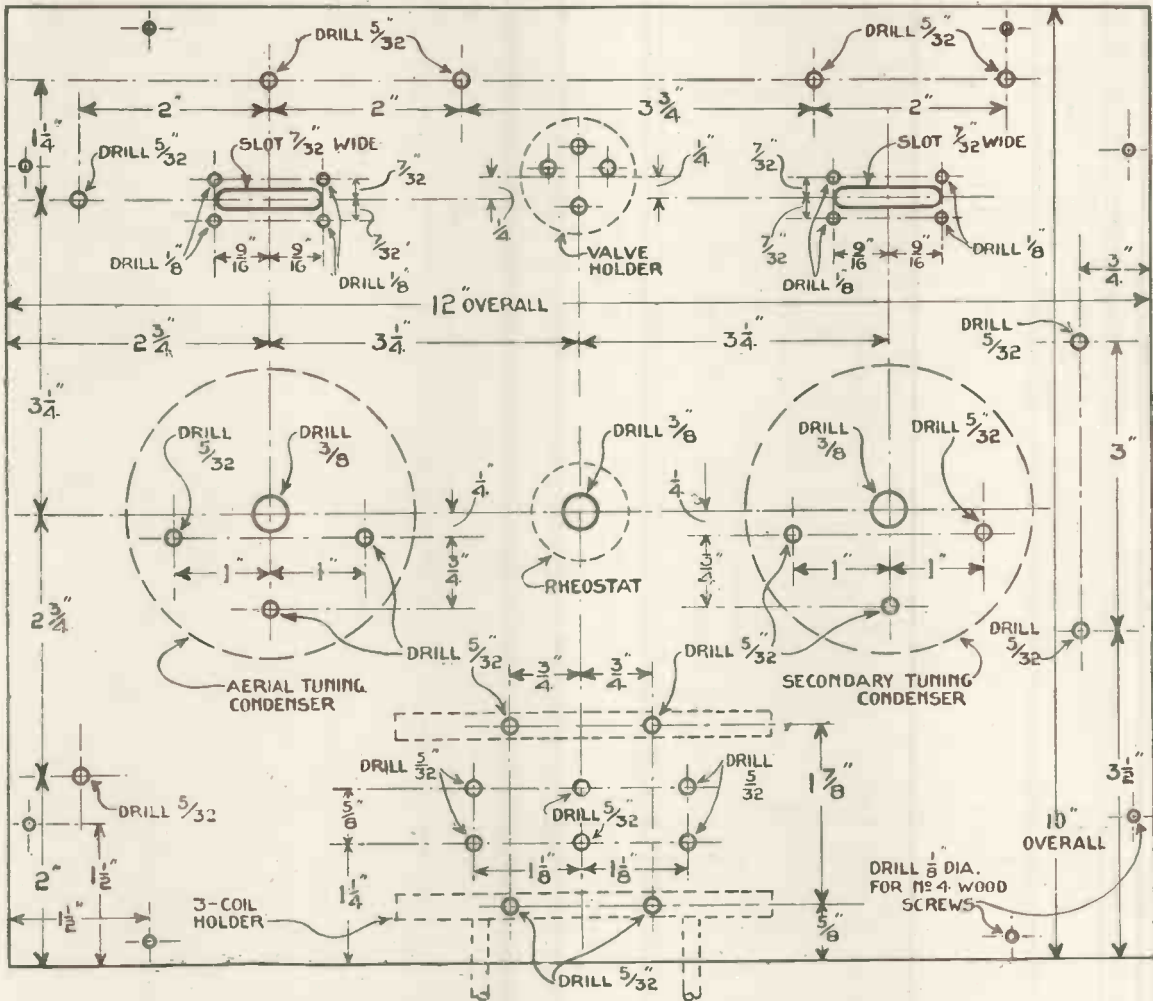


Those who wish to construct this Selective One-valve Receiver should carefully study the Free Coloured Wiring Diagram and Blueprint Drilling Template given with this issue.

- 1 .5 microfarad fixed condenser (Ediswan).
- 1 2-megohm fixed grid leak complete with holder (Grafton Electric).
- 1 valve holder.
- 8 terminals (Refty).

For those readers who like to know exactly what components have been used in the original set, the names of the manufacturers are given. Other components, of course, may be substituted.

of all holes to be drilled. Clamp the paper on the panel and mark the positions of the holes with a sharp point through the paper. Scratches and marks on the panel will thus be avoided. An ordinary



This is a reproduction of the Free Blueprint Drilling Template.

- 1 filament rheostat (Lissen Universal).
- Set of Igranic coils.
- 1 valve (Cossor P 1).
- 1 6-volt accumulator (Exide).
- 1 60-volt H.T. battery (Ediswan).
- Square tinned copper wire.
- 3 ft. of flex.

Provided that the specified components are used, the panel should be drilled according to the blueprint template. Otherwise it is best to lay out the arrangement of instruments on a sheet of heavy paper cut to the size of the panel, locating centres

twist or a straight fluted drill should be used, and the panel must not be drilled fast enough to heat the drill. The screw holes for attaching the panel to the cabinet must be large enough to permit the screws to pass through without binding. If the panel is to be engraved, use a sharp



SELECTIVE ONE-VALVE RECEIVER—(Continued)

pointed steel tool. Fill in by wiping over with paste or paint.

Assembling Instruments

The next step is to mount the various components on the panel. This is done exactly as shown in the wiring diagram. With the help of this diagram and the photograph of the underside of the panel wiring should be a very simple matter.

The usual practice of spacing the wiring as much as possible should be followed out. For connections

batteries and phones should be connected up to the proper terminals. Tuning is now accomplished by the rotation of the left-hand dial (aerial tuning condenser), the reaction coil being kept well away from the aerial coil. When signals are received they can be greatly strengthened by bringing the reaction coil closer to the aerial coil.

Reversing Reaction

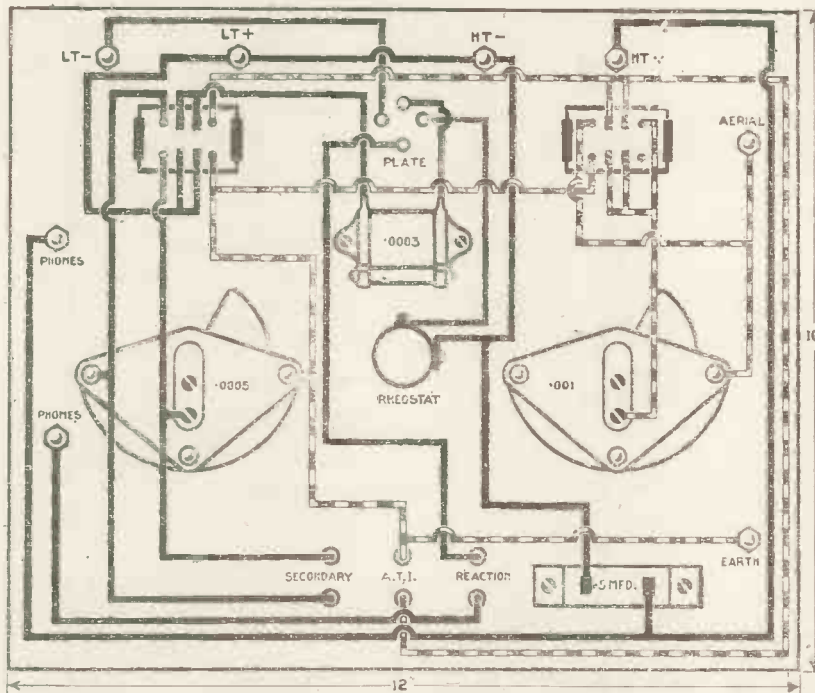
If no strengthening effect is noticed the two wires connected to

can be adjusted so that either type of valve may be employed.

A Test Report

The set was tried out on a test aerial 8 miles west of 2 L.O. This station came through on the loud-speaker with remarkable clarity. Used in conjunction with the low-frequency amplifier described in last month's issue of THE WIRELESS MAGAZINE this set should give full volume loud-speaker results up to 25 miles from a broadcast station.

Bournemouth, Glasgow, Chelmsford and Newcastle came through at excellent strength. Using the loose-coupled system Cardiff could be separated from London—a good test of selectivity at this distance from 2 L.O. Radio-Paris also could be heard during the day-time transmitting news.



Reproduced here is the Free Coloured Wiring Diagram of the Selective One-valve Receiver

to the coil holder short lengths of ordinary lighting flex were used.

The phone condenser (shown in dotted lines in the circuit diagram) may be omitted if found unnecessary.

Operating the Set

For ordinary broadcast wavelengths, Igranic coils Nos. 35, 50 and 75 should be plugged into the aerial, secondary and reaction coil holders respectively of the three-coil holder. Place the tune-stand-by switch in the "tune" position, and the "series-parallel" switch in the "parallel" position. Keep the secondary coil well away from the aerial coil.

The aerial, earth, H.T., L.T.,

the reaction coil should be reversed.

Should any interference from other stations be experienced the switch should be placed in the "stand-by" position, and the secondary circuit tuned to the incoming signals by the rotation of the right-hand condenser dial.

With practice, judicious adjustment of the two condenser dials and the coupled coils will give maximum signal strength and selectivity.

With this particular filament rheostat—the Lissenstat Universal—a bright- or dull-emitter valve may be used. On the bottom of the Lissenstat is a nickel-plated screw which

THAT METRONOME STUNT

THE metronome stunt at the Breslau station appears to have caught on, inasmuch as some of the other German stations have adopted the same method in the intervals of their programmes. When a number comes to an end and a couple of minutes intervene, the announcer places a loud-ticking alarm clock in the neighbourhood of the microphone, thus proving to listeners that they are still tuned in.

Should private transmitting become general (Heaven help us!), I can already foresee important developments. In the distant—or is it near?—future, the love-sick swain who, over the ether, vows eternal love to his captivating "fiasco" will demonstrate the frantic beating of his heart by the cheap substitution of a 1s. 11d. "slumber breaker" purchased at the nearest cash chemists. Fie on such a deception! JAY COOTE.

PLAYS that we should like to hear: *The Penny Post* in one act, from P.M.G.

Most ships use the spark system of signalling. This is doubtless why the sailors are such gay "sparks" when they come ashore.

What I think of Broadcast Talks

by J.C. STOBART, M.A. *Director of Education, British Broadcasting Company.*

ONE feels just a little difficulty or delicacy in addressing readers of THE WIRELESS MAGAZINE on the subject of Education. I have an enormous respect for the practical-minded fellows who prattle so lightly of mysteries which are too hard and steep for me. We keep some fine specimens at 2, Savoy Hill. They are a proud race. One fears them with a great fear, as the prophets of a dark ritual. One feels that they do not venerate Education. I think most of them were badly bored at school, and retain a well-grounded suspicion of anything that smells schoolmasterish. I expect the amateurs are even prouder than the professionals. I expect they will regard me and my activities with even deeper suspicion; yet I would fain woo them with soft words, because I love them.

Pangs of Boredom

I, too, suffered the pangs of boredom in my youth, both in and out of school, and to this day would prefer the sudden pain of stripes to the long drawn-out torment of dull books and dreary talk. But there is too much ego in this. Let us begin another tune.

Warburton Sandringham Prendergast showed from his infancy a conspicuous talent for practical engineering. At five he invented a Perpetual Toaster, based upon the principle of the torsion of string. By seven he had equipped the whole of his paternal house with electric bells, electric telephones and burglar

alarms. At eight he invented an Alarm Laying-box in the hen-house, which made it quite unnecessary for the hen to cackle when the egg was laid, for the egg announced its own arrival electrically. Now, Warburton Sandringham Prendergast was assisted in all these enterprises by his brother, two years his junior. Walsingham Penberthy Prendergast was also a lad of enterprise and some inventive faculty. Unfortunately, fate had made him a junior and doomed him to the status of electrician's mate.

The joyous springtime of Walsingham's youth was spent in hotting up the glue-pot or trying to remember where we put those pliers, or just stepping round to Tringham's for a couple more ounces of sal ammoniac, or looking slippy there with the screw-driver (no, not that one, you little idiot, the big one). In short, the whole point of this paragraph is that we must give and take, live and let live, since the practical enthusiast can be just as boring as the literary gentleman, if he insists on monopolising all the fun.

Our Mutual Idol

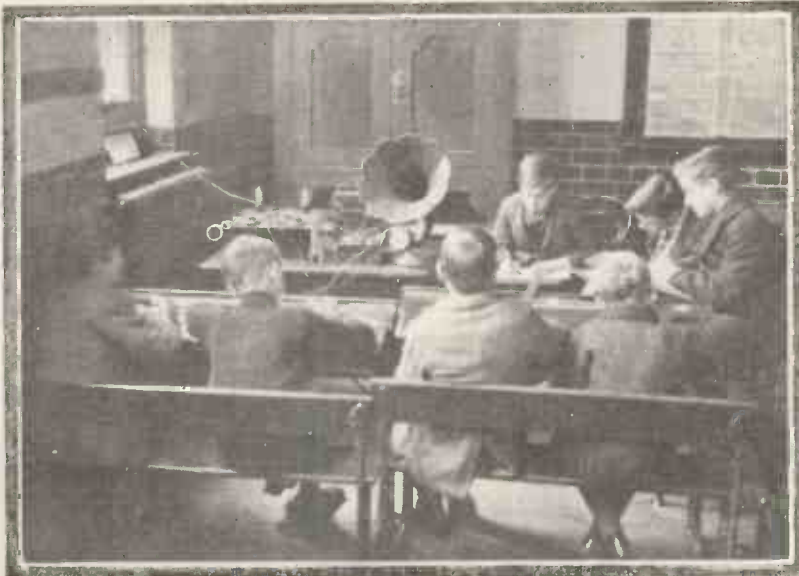
I speak to the practical wireless amateur as one acolyte to another, since we are both servants of the same mystery. Supposing that this Wireless Idol, whom we both serve, uttered through that wonderful voice of hers nothing but ragtime and platitudes, would not some of the charm of serving her evaporate? When I first started my little crystal set, nearly two years ago, I used to hear, late on a Sunday night when 2 LO had gone to bed, the voice of an amateur at — wooing his mate. I used to envy him, at first, the power of private transmission to his friends, with a few thousand eavesdroppers dropping their eaves around his private conversations.

But, dear Heaven, what utter rubbish the poor fellow used to talk! What miserable tunes his gramophone exuded: it seemed blasphemy to use a power so god-like for purposes so beastlike. He is silent now, that — amateur. No doubt he felt ashamed to insult the ether perpetually; to have the gift of miraculous tongues and

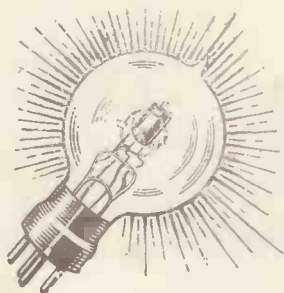
nothing whatever worth saying.

So you, dear and honoured Sir, should, I think, take even more pride and pleasure in devising new circuits and building more and more powerful and selective sets if the voice you are liberating is one worth hearing. It is our business on the programme board at Savoy Hill to provide good and varied fare for everyone, especially good music,

(Continued on p. 224)



Bovs at a London school taking notes of a broadcast talk



Bright - Emitter or

ALPHA believes the Bright-Emitter Valve to be MORE RELIABLE

ONE of the principal reasons why I prefer a bright-emitter valve is because, being an experimenter, I naturally require a general purpose valve which is simple, reliable, and at all times adaptable to varying requirements.

A few other good reasons are: (1) because it is possible to inspect the electrodes at a mere glance, usually the bulb is quite clear and thus one can watch for symptoms of "filament sag," etc.; (2) because microphonic and self-oscillation troubles can be marked off the slate with a big cross if the valve is properly handled; (3) because the adjustment of the plate and filament current or, in other words, the "proper handling" is a comparatively simple matter; (4) because one can use a simple and inexpensive filament rheostat; (5) because a large accumulator can be relied upon to deliver a steady filament current; (6) because it functions quite well in ordinary low-frequency circuits without necessitating the application of grid bias; (7) but should this be desirable, as it usually is when working a loud-speaker, then it is very easily applied and adjustments are in no way critical; and (8) because I have always found it necessary to use bright-emitters for testing.

Dull-emitters

Now if we consider the so-called "advantages" to be gained by using dull-emitters, and tabulate them as above, one might say with conviction that (1) the bulbs of most dull-emitters are internally coated with a very dense substance which completely hides the electrodes, and that it is often impossible to ascertain whether the filament is burning or not; (2) most types are prone to be microphonic and their very marked self-oscillation tendencies are a continual source of trouble; (3) accurate control of the filament current calls for the constant attention of the operator

and becomes nothing short of a farce when a dry battery is used; (4) a special type of filament rheostat is required which, having a resistance of 50 ohms, is somewhat complicated and expensive; (5) a dry battery was never designed to deliver a steady current over long periods, and although at the advent of the D.E. we were all told that the accumulator was destined for the scrap-heap, it still remains an essential piece of apparatus, and *without this*, the dull-emitter itself might have taken the prescribed route to destruction, for who can say that the average D.E. works satisfactorily, for any length of time, from a filament heating dry cell? (6) Distortion invariably occurs in L.F. circuits if grid bias is omitted, and (7) the adjustment of same usually gives considerable trouble. Dull-emitters are certainly quite disappointing in L.F. circuits, and (8) therefore, on the whole, one cannot place a good deal of confidence in them.

Good Rectifier

The average dull-emitter is a good detector, a troublesome high-frequency amplifier, and an exceedingly doubtful low-frequency amplifier, and therefore it cannot be rated as a general purpose valve. I do not infer that it is a complete failure, for no doubt many of them excel as rectifiers in single-valve sets and especially in portable sets, but since they were originally designed to effect the wholesale slaughter of the accumulator and the bright-emitter in single- or multi-valve long-range receivers, I must say they have ultimately failed to bring about such a drastic change, and that they have been a source of disappointment to most experimenters.

It is true that small accumulators can be used for heating their filaments, but such extravagance is not likely to be tolerated by the average enthusiast. An accumulator cannot be tapped lower than two volts and

if a one-volt valve is used then naturally a great deal of energy is wasted in the filament resistance. On the other hand, the most suit-

able dry battery is an expensive item; it must be duplicated and used in pairs via a "cell resting" change-over switch; and besides being a general nuisance when in its prime, it must be replaced by a new one when it is scrapped.

"Dull-emitting" Fever

It was just a year ago when I first began to think unkindly of the D.E. About that time even the sun was smitten with the "dull-emitting" fever and so I took up quarters in a more pleasing atmosphere, some 850 miles from London.

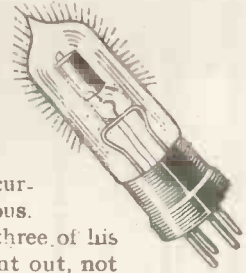
Prior to my departure I had purchased four expensive dull-emitter valves of a well-known make, intending to test them out on long distance work. After trying many different three- and four-valve circuits (all of which I knew to be O.K.), these tests were eventually abandoned as hopeless. I then purchased four ordinary (very) French "R" valves of the bright-emitter type, again tried several of the circuits, as before, and was soon receiving London, Bournemouth, Cardiff, etc., at distortionless loud-speaker strength. I obtained fairly strong phone signals with the dull-emitters, but could not suppress the distortion.

Fair Trial

I arranged a separate H.T. control for each valve; I constructed special filament resistances, for at that time, although the D.E. was fairly well known, nobody had thought of placing a suitable rheostat on the market; I tried dry cells and an accumulator; in fact I gave them a really good run and tried every possible means of rectifying the trouble before giving them best. Needless to say I have stuck to the bright-emitter ever since.

It is a fine thing to be able to place confidence in the valves you are using, and unless one is able to do this, then, as John Henry would say, "It's all wrong." ALPHA.

Dull-Emmitter, Which?



BETA is sure the Dull-Emmitter Valve is LESS WASTEFUL

FOR more than two years now I have used nothing but dull-emitters, and so far as I can see I shall never use a bright-emitter again except, possibly, for purposes of experiment or comparison.

I have given up bright-emitter valves for a great many reasons, but mainly because they seem to be so inefficient when the current necessary for heating their filaments is taken into consideration. The question that most people ask when one speaks of dull-emitters is: Are they as good as ordinary valves? There appears to be an idea that any valve whose filament requires only a small fraction of an ampere at low voltage to heat it must somehow be feeble in its performances and altogether less sensitive than one which devours the best part of an ampere.

As Good as Ever

In answer to this I can only say that the results obtained by using good dull-emitters are in every way as good as those with bright-emitter valves. One's range does not suffer, the selectivity is as good as ever, the set remains just as sensitive to weak signals as ever it was, whilst signal strength in phones or loud-speaker leaves nothing to be desired.

And now let me tell you why it is that I pin my faith to the dull-emitter valve. We can never get anything like perfect mechanical or electrical efficiency, but there is no reason why we should not try to approach perfection as nearly as we can.

Let us suppose that you are offered two motor-cars of different makes. One of them, though it consumes a gallon of petrol every five miles, is speedy, powerful and comfortable. The other is in every way a match for the first, and it is just as pleasant to ride in. It certainly costs rather more in original outlay, but it runs thirty miles to the gallon and is much more economical in oil. Which of the two would you choose? Obviously, I think, the second. It is just the

same with valves. In the dull-emitter you have a valve whose filament consumes from one-fifth to one-fifteenth of the watts required by what I regard as old-fashioned valves. Results, as I have said, do not suffer in any way if the low-consumption valve is used; therefore why waste current by using the bright-emitter?

The whole question is this: Can we obtain from the dull-emitter the same electron emission that we have in the bright? Current applied to the filament serves only one purpose: it heats the metal until a temperature is reached at which a satisfactory emission takes place.

If the filament is made of tungsten alone, it must be brought to a brilliant white heat before this takes place. But if tungsten is treated either by the admixture of thoria or by a special coating process, the electronic emission takes place at a very much lower temperature.

Now the current consumed by the filament depends entirely upon the temperature to which it must be brought. In the dull-emitter valve we obtain the same emission when the filament is glowing at a dull red heat as we do in the bright-emitter with its filament running at a blinding white heat. Of the two the dull-emitter is more efficient in proportion to the current consumed.

A Confession

Let us take a concrete case. Last year a friend of mine built a five-valve set, on the panels of which he mounted bright-emitter valves. These were of good make and their current consumption was never above or below the average. He purchased a 4-volt 50 actual ampere hour accumulator. The drain made upon it when the set was working was 3.5 amperes when the valves were new, but this increased to rather more than 4 amperes as their filaments aged after some months' use.

At the end of every week his accumulator had to go to the charging station, each visit to which cost half a crown. His results were certainly very good indeed, but the

consumption of current was enormous.

By September three of his valves were burnt out, not through ill-usage or accident, but as the result of ordinary work on the set. He decided then to give dull-emitters a trial, and borrowed five DER's from me. He became at once converted to the dull-emitter, for he found that his reception was as good in every way as it had been previously. Now the position of affairs is this. The DER valve is rated at 4 ampere, and it does not appear to become more greedy with age.

Long Service

Those that I lent him had seen long service, but the ammeter, when the set was working, showed a consumption of two amperes. He had his accumulator divided into two single cells.

One of these cells is in use upon the set whilst the other remains at the charging station until it is required. The single cells now last nearly three weeks, costing eighteenpence for a recharge. He has reduced his running costs to about one-fifth of what they were—and what is rather an important matter, he has half the weight to carry.

If we examine the wattage figures, the inefficiency of the bright-emitter becomes even more glaringly apparent. With a 4-volt accumulator no resistance is usually necessary in series with the filament which thus has the full voltage across it. Let us be very kind to bright-emitter valves, taking their average current consumption at 7 ampere. This gives 2.8 watts per valve or 14 watts for a five-valve set. The dull-emitters referred to require 1.6 volts, but as the accumulator's output is 2, the difference being wasted in the rheostat, we will be quite fair and take the necessary E.M.F. at 2 volts.

At 3 ampere each valve consumes .6 watt, and the total for the set of five is 3 watts. That is to say, *five* of these little valves have about the same total filament wattage as *one* standard bright-emitter.

BETA.

Some "Reflex" Mysteries Solved

REFLEX circuits, as a whole, seem to have earned for themselves a reputation for being very uncertain in their action and unreliable in operation. They have probably caused more disappointment to enthusiastic constructors than any other type of circuit. Many people seem to be content to

enjoyable reputation above referred to is due primarily to the general lack of knowledge as to the exact functioning of this type of circuit and to ignorance of the various interactions which may take place in a reflex, but which are not usually met with in a "straight" circuit.

As the number of possible reflex circuits is very large only a typical circuit will be dealt with here. This is the popular circuit shown theoretically in Fig. 1. This circuit, used alone or with a note magnifier, is the one probably used in 90 per cent.

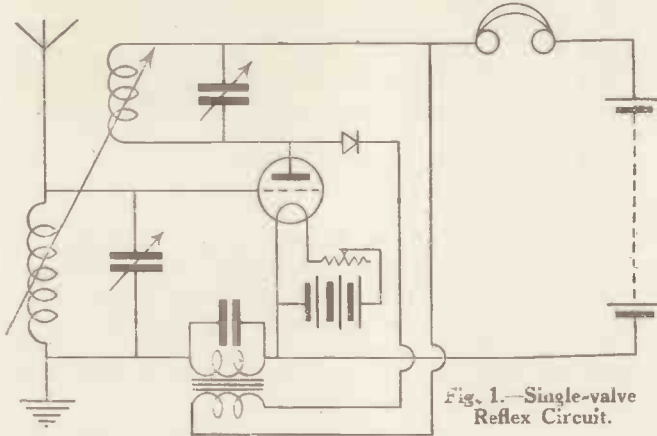


Fig. 1.—Single-valve Reflex Circuit.

accept the erratic behaviour of their reflex sets with resignation as an inherent feature of this class of circuit.

Illogical

This is clearly illogical, as to be consistent it would be necessary to believe that the set were endowed with an almost human capacity for wilful misbehaviour, which being inanimate, it obviously has not. It is

of the total number of reflex sets.

Two of the effects most puzzling to the uninitiated are connected with reaction and, curiously enough, are exactly opposite in character. In some cases it is found that reaction is obtained as the coils are brought together whichever way round the

tory circuit possesses three qualities—inductance, capacity, and resistance—which are always present, though in varying degree.

In the circuit shown in Fig. 1 we are concerned with two oscillatory circuits: the grid and anode circuits respectively. In the action of the grid circuit resistance plays a small part and its effect, for our present purpose, may be neglected. We will regard it for the moment as a practically undamped oscillatory circuit.

Anode Circuit

In the anode circuit conditions are different. Here we have a definite resistance, that of the crystal contact and transformer primary winding, connected in shunt with the oscillatory circuit. The actual value of this resistance may vary between wide limits and will depend principally upon the kind of crystal, thickness of material of contact wire, and the type and quality of transformer used. The resistance of the contact between catwhisker and crystal will vary with the pressure of contact and will not be the same at all parts of the crystal's surface. We must regard the anode circuit as an oscillatory circuit with an unknown amount of damping (due to the shunted resistance).

If the resistance is fairly low the

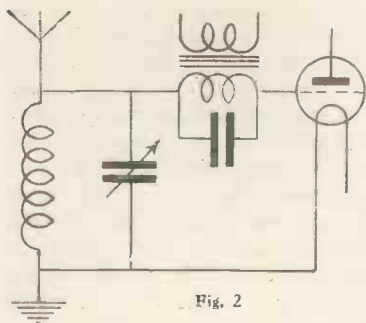


Fig. 2

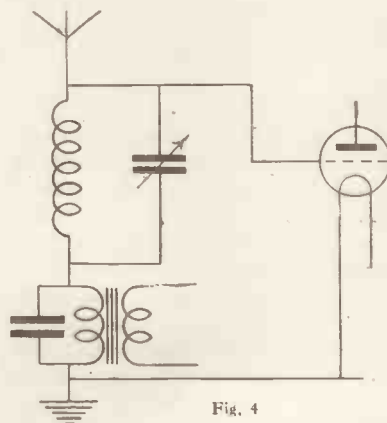


Fig. 4

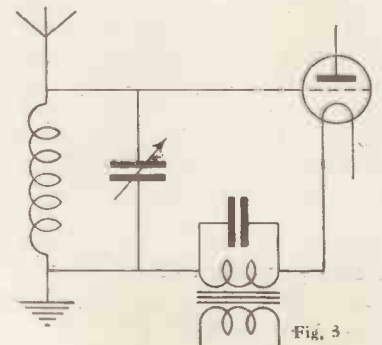


Fig. 3

Figs. 2, 3, and 4.—Different Positions of Reflex Transformers.

a well-known axiom of science that every effect must be preceded by an adequate cause, and therefore there must be a reason for every unexpected action, even of a reflex circuit.

There can be no doubt that the un-

anode coil is connected, while in other cases no reaction effect is apparent under the same conditions.

The causes of these two effects, though apparently obscure at first, can easily be understood after a little consideration. Every oscilla-

damping may be considerable, and when the grid and anode coils are coupled together a large proportion of the energy in the grid circuit may be transferred directly to the anode-circuit (by virtue of the coupling be-

(Continued on page 202)



The Savoy Orpheans.

LOOKING back over the music of the month at the various stations, I think the outstanding impression is—variety. This has been the keynote aimed at by the B.B.C., and gradually managers and agents have come to see the utility of wireless as an adjunct to their present advertising campaigns.

I was glad to see Mr. André Charlot and Mr. Calthrop allow their respective shows to be broadcast, not because of their especial merits, but because it marks another step onward; the making of a film of one of Mr. Charlot's scenes by Messrs. Pathé and synchronising it at the cinemas carried wireless success still further. The announcement also that part of Mr. Harry Welchman's new play at the Adelphi, *Love's Prisoner*, should be broadcast on the actual first night was an added triumph.

Most people are fond of what is popularly termed "programme music." Given the very dullest of high-brow works with a story attached to it, the average listener will let his imagination do the rest.

I know one listener who was aghast at the idea of hearing Beethoven's Symphony in C minor, at the Second International Symphony Concert at Covent Garden, but once told that it was called the "knocker symphony" (and the theme "Fate knocks at the Door" attributed to the watchman knocking at the door while Beethoven was composing), he listened with intense interest.

So with the "Country Pictures in Music," given us from 2 L.O. Truly we needed our imagination as regards the actual works, but we had the titles and presumably the best of our British composers—including Vaughan Williams, John Ireland, Stanford, Róger Quilter—interpreted by such names as Wynne Ajello and Dale Smith.

Dialect Songs and Stories

Country dialect songs and stories were represented by masters of their art—Charles Wreford, George Stockwin and Fred Beck.

The choice of Mr. Wreford was a particularly wise one, for he holds the unique record of having appeared at twenty-one consecutive annual concerts of the Devon and Cornish Association in London, so if his dialect is not the real "Devonshire cream," then the natives of the counties don't know their own language.

A happy idea on the part of Cardiff was to give us some of the old pre-war songs and "hits," including "Everybody's Doing It," and certainly everybody was "humming" it.

The range of items from Sousa's Band and "The Policeman's Holiday" was most interesting, and the vocalists announced were popular broadcasting artists—John Collinson, Miss Dorothy Bennett and Miss Grace Daniels.

I always like Miss Bennett's singing, and



Miss Dorothy Silk.



Mr. Kneale Kelley.



Sir Landon Ronald.



Miss Constance Willis.

she is a favourite all round the stations. She is a true coloratura soprano, a pupil of Gregory Hast and Eleanor Simon, and a noted opponent of the Delle Sedie method. Her recitals at Wigmore Hall and at the Cramer Concerts in London have placed her amongst the front rank of singers.

Ambitious Cardiff

Cardiff is nothing if not ambitious, and its latest achievement was the preparation of Wagner's opera



Mr. Andrew Shanks.



Miss Marie Novello.



Mr. Vivian Foster.



Mr. Walter Widdop.

Lohengrin, with a powerful cast of B.N.O.C. stars and the full 5 W A Choir.

The former included Miss May Blythe as "Elsa," Miss Constance Willis as "Ortrud," Mr. Herbert Thorpe as "Lohengrin," and Messrs. William Michael and Harry Brindle respectively, as "Count Telramund" and "King Henry."

For the Cardiff programme, designed more expressly for listeners of Bristol and the West Country, one of the best-known male-voice parties, The Bristol Glee Singers, was chosen.

Wireless has done more to revive the love of operatic music than is generally realised. The increasing number of operatic performances in the various studios all go to prove this fact.

Mozart's *Magic Flute* was the first ever broadcast, and when recently *Figaro* was given a special performance at 2 L O, I noticed that the artists of the British National Opera Company were again drawn upon, some of them in their original parts.

In this connection may be mentioned Mr. Andrew Shanks, who took his original part of "Count Almaviva." Of Scottish birth, Mr. Shanks says that he was intended for an engineer, but came to London and entered the R.A.M.

His operatic chance came when he obtained

his first engagement with Oscar Hammerstein at the London Opera House, then a real palace of music and not of films. Here he played in Holbrooke's *Children of Don* under Nikisch.

Since then he has toured the world, and acted with the Beecham as well as the B.N.O. companies.

Another favourite operatic singer is Mr. Frederic Collier, and this month he has been heard at nearly all stations.

His resonant bass voice is particularly well suited to the needs of the microphone. Personally, I like him just as well when he is singing German's "Four Jolly Sailors" or "The Company Sergeant Major" as "Kothner" in *The Mastersingers*, which is one of his favourite parts.

At Cardiff also sang another famous opera star, Miss Constance Willis. Here she sang the ungrateful part of "Petru" but it is as "Maddalena" in *The Mastersingers* that her rich, full voice always sounds to the greatest advantage, I think.

I notice Miss Willis's voice is one of the few contraltos that do not suffer by being heard through the loud-speaker instead of over the footlights.

Apart from the orchestral symphony concerts and those broadcast from the municipal orchestras, such as The Hallé at Manchester, the Scottish at Glasgow, and the Municipal Winter Gardens at Bournemouth (under Sir Dan Godfrey), the best work has been done by individual soloists.

Classical Players

Amongst the classical items may be noted the performance of the London String Quartet, Harold Samuel (the Bach pianist), Marjory Hayward (the leader of the Virtuoso Quartet and the English String Quartet and Trio), and the playing of Miss Jeanne Chevreaux (the brilliant young harpist of the B.N.O.C.).

At a recent concert I heard Miss Chevreaux repeat her triumph of the Three Choirs Festival, namely, her solo interpretation of Debussy's "Danse Sacrée et Profane"; it is little wonder that she has been acclaimed, and justly, the finest harpist in Europe.

I was glad to note, too, that her playing was con-



Mr. Mayer Gordon.



Miss Vivian Worth.



Mr. Charles Wreford.

sidered of sufficient importance to be relayed from the high-power station at Chelmsford.

Though not strictly speaking a musical performance, the production of *The Tempest*, by Mr. R. E. Jeffrey, was full of interest, both dramatic and musical.

Cast New to Broadcasting

Many of the cast were new to broadcasting, but I noted the inclusion of Ernest Milton, who will be remembered for his performance in one of the earliest of Shakespeare's plays broadcast the year before last, *A Midsummer Night's Dream*, in which he played "Oberon."

As previously indicated, opera has figured very largely in the programmes of the month, and though there has been no London season of opera this winter, music lovers have had abundant opportunity for hearing the finest opera singers under the best conditions.

No one will refute the idea that, however fine the performance given on the stage, when seen as well as heard, the same singers are heard to better advantage when singing before the studio microphone.



Miss Grace Ivell.



Mr. Frederic Collier.



Miss Dorothy Bennett.

This month we have had at the various studios the stars of the B.N.O.C., amongst them Mr. Walter Widdup, the clever young Yorkshire tenor, to whom, I have heard, befell one of the strangest experiences in operatic history, when a whole opera had to be changed at the end of the first act.

Commencing with *Siegfried*, at the Royal Opera House, Covent Garden last year, a most successful debut was made, and Mr. Widdup was due to awaken the sleeping "Brunnhilde," within her circle of fire.

Unfortunately the said "Brunnhilde" (Miss Florence Austral) turned out to be imprisoned within the "circle" of a railway waiting-room, somewhere about Rugby, owing to the railway strike.

There was no help for it but to hurriedly "put on" *The Valkyrie*, so that when I returned to my set, in the middle of what should have been the second act, I was naturally astonished to hear the love-duet

of "Siegfried," a generation before my previous hero's song. But since then Mr. Widdup has sung many rôles, notably in *Aida* and *Samson and Delilah*.

Many of his fellow members have also "toured the ether," including Andrew Shanks, Denis Noble, Raymond Ellis and Sydney Russell, and also Miss Gertrude Johnson, these being combined for the special performance recently of Mozart's opera *Figaro* at 2 L.O.

Miss Johnson is always chosen for coloratura parts and will be remembered for her rendering of the difficult aria "Queen of Night" in Mozart's other opera, *Magic Flute*, the first opera ever broadcast.

It is often said by the "mere male" that woman has no sense of humour, and he asks with polite interest for proofs of its existence in the feminine mind. The B.B.C. have contrived to secure many really talented women entertainers.

Besides others, can be named Miss Helena Millais, Miss Ray Wallace, Miss Wish Wynne, and for lovers of "jazz" in vocal form, great favourites are the Misses Grace Ivell and Vivian Worth.

These clever duettists are known both singly and in collaboration, and they have appeared at the London Coliseum, the Alhambra, Palladium, Queen's Hall, and all over the country.

The singers met when forming part of a quartet at St. Paul's Cathedral, and each soon recognised the capabilities in the other.

Toured the World

Miss Ivell had previously toured all over the world, and during the war she sang at soldiers' concerts in France, Italy, Egypt, Malta, Palestine and Germany.

(Continued on page 204)



Mr. E. H. Robinson.



Miss Gertrude Johnson.

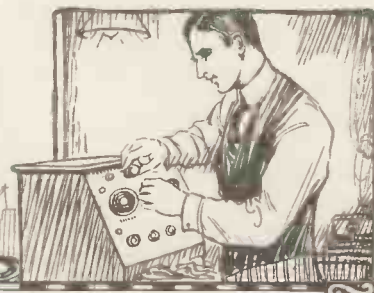


Mr. Willie Rouse.



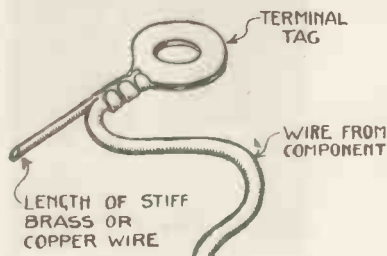
Miss G. Edgard.

Gadgets, Hints and Tips



Universal Connecting Tag

IT often happens that a certain wire has to be connected to various types of terminals during experiments or



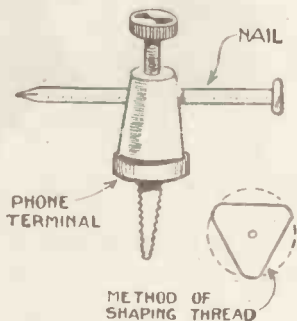
Universal Connecting Tag.

when different makes of apparatus are used. The illustration shows a simple method of overcoming the difficulty, enabling a sound joint to be made whatever the type of terminal.

When fitting the wire to the tag a length of stiff brass or copper wire is inserted and secured. This extended piece of stiff wire is used for connecting with phone-pattern terminals, while the tag proper is used for W.D. pattern terminals. A. R.

Tapping Ebonite

A CONVENIENT method of tapping a few holes in ebonite is to use a home-made tap formed from screwed brass rod of the size required for the hole to be threaded.



Device for Tapping Ebonite.

By using a terminal for the tap as shown in the illustration—the leg being shaped with a small file so as to provide cutting edges and clear-

ance space—no tap wrench or chuck need be used as a nail or other similar object passed through the hole in the terminal can be employed for turning purposes. O. S.

H.T. and L.T. Switches

Two excellent methods of switching on and off H.T. and L.T. batteries

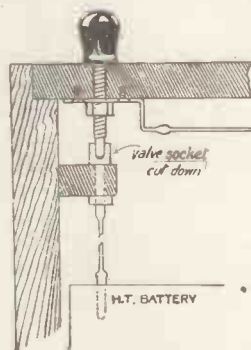


Fig. 1.—H.T. Switch.

that are accommodated under a panel are shown by the diagrams.

Fig. 1 shows a simple under-panel H.T. switch. A short length of threaded rod is tapered at one end to fit into an ordinary valve socket. This is fixed rigidly to the side of the

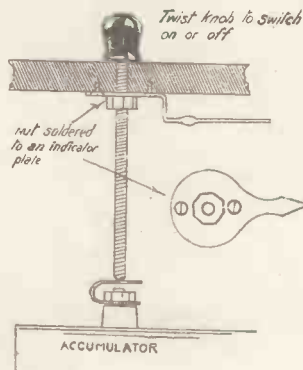


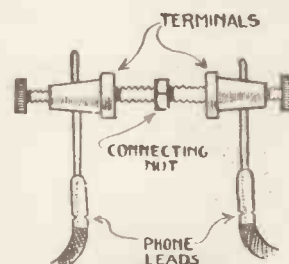
Fig. 2.—L.T. Switch.

cabinet, as shown, and is extended to make contact with the battery.

A similar arrangement for an L.T. battery is shown by Fig. 2. A U-shaped brass spring is held under one accumulator terminal and the circuit is made or broken by screwing the rod up and down. C. E.

Phone Connecting Hint

WHEN the inevitable visitor arrives probably bringing his or her own pair of phones, the problem arises as



Simple Phone Connector.

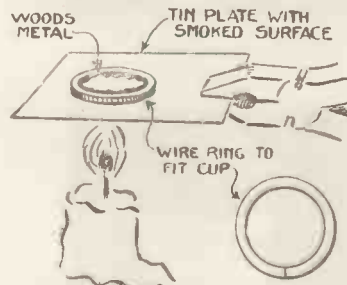
to how to connect up the extra phones in a neat manner.

The illustration shows a convenient method of joining the two leads of each set of phones, using two small terminals fixed together by means of a nut, the leads to be connected together being clamped by means of the terminal screws proper. W. S. C.

Crystal Mounting

MANY crystal users do not get the most out of their sets owing to the poor contact the ordinary screw-type crystal often gives. The illustration shows a simple way of overcoming this disadvantage.

Ordinary square wire should be bent into a ring that fits the crystal cup. This is placed on a sheet of



Method of Mounting Crystal.

tin, with some Wood's metal in it. It is necessary to smoke the tin to prevent the Wood's metal from adhering.

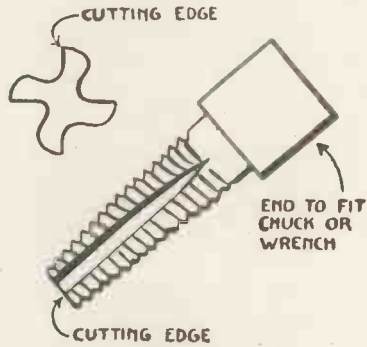
When this has melted, the crystal should be pressed in and the whole allowed to cool. Finally the ring containing the crystal should be screwed tightly into the crystal cup.

In this way both large and small crystals may be easily mounted.

E. J. J. L.

Improvised Taps

AMATEURS requiring B.A. taps for only a few holes and not wanting to



Details of Improved Tap.

buy them can make them in the following way.

Take a screw for the size of hole to be tapped, and file with a half-round file four grooves similar to those in ordinary taps. After that square off the top to fit a small tapping wrench.

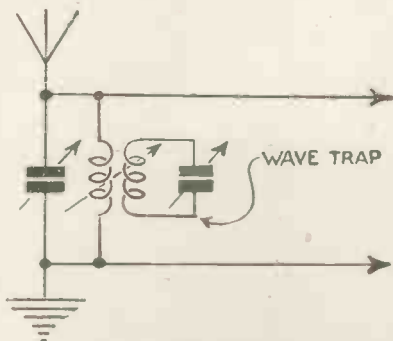
The screws for wireless are generally of brass, so a tap made from them can only be used for ebonite.

D. C.

Simple Wave Trap

If a set is provided with a loose-coupled tuner and a tune-stand-by switch, a wave trap is already provided without further addition.

If both aerial and secondary coils are plugged in and the switch turned to the stand-by position, it is



Simple Wave Trap.

possible to cut out almost all interfering signals by tuning the secondary (or as it should be called when used in this way, the wave

trap) coil by means of its variable condenser.

It will be found necessary after tuning the wave trap to slightly re-tune the aerial circuit.

G. H. L.

Catwhisker Hint

ONE of the most satisfactory catwhiskers to use is a piece of narrow brass or phosphor-bronze strip. This can be cut slantwise at the end, thus providing a sharp point for contact with the crystal.

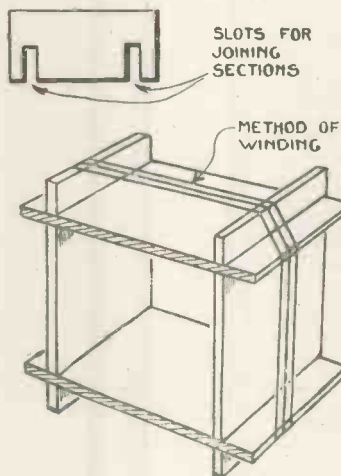
A fresh point can be quickly obtained by cutting the strip slantwise with a pair of scissors. D. S. R.

In your constructional work you must come across a wrinkle now and then. When you do, send it to us. We pay for everything we print.

Low-loss Coils

To get the utmost from a receiving set the use of some type of low-loss coil is essential.

The illustration shows a simple type of winding former which lends itself admirably to the construction of an efficient tuning coil. The sections may be cut with a fretsaw



Low-loss Coil Former.

from thin wood or ebonite and are joined together in egg-box fashion by simply pressing the parts together; if a specially long coil is to be wound the use of glue or seccotine on the joints may be found advisable.

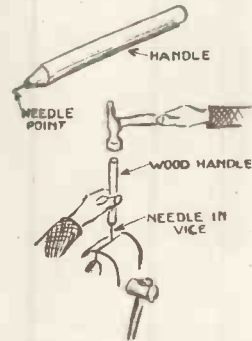
As regards wire for winding the coil, No. 16 or 18 d.c.c. wire will be found to give excellent results, but if the former is made throughout of ebonite a winding of bare stranded aerial or tinned copper wire will be found superior, each turn being, of course, air-spaced from its neighbour.

M. B. R.

Easily-made Panel Scriber

IN order to correctly mark out a panel some kind of line-marking tool is necessary. A blacklead pencil should never be used unless the panel is to be thoroughly emery-clothed after drilling, as components are likely to be short-circuited by a pencil line, to the detriment of the correct working of the set.

The illustration shows a simple home-made scriber which anyone



Making the Panel Scriber.

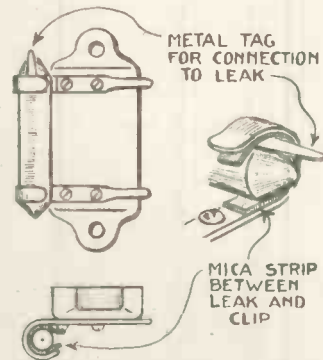
can make for practically nothing. The tool consists of a needle point which is forced into a circular wood shaft about the size of a pencil.

To obviate spoiling the point the needle should preferably be held in a vice during the handle-fitting operation. J. C. T.

Mounting the Grid Leak

To save an extra mounting clip for the grid leak when the latter is not to be wired directly across the condenser the idea shown in the illustration may be successfully used.

A strip of mica or other good insulating medium is interposed between the metal end of the leak and the clip; electrical connection is then



Details of Leak Mounting.

made to the leak by means of a tag of copper foil placed in between the mica and metal cap of the leak.

K. S.



Dear Boys and Girls,

I wonder how many of you have decided to have a "shot" at the wireless cross-word puzzle which appears in this issue of THE WIRELESS MAGAZINE? Most of the hidden words are related to wireless in some shape or form and with the help of a magazine such as this you should not be long before you have filled in the vacant squares.

The prize offered by the Editor is well worth striving for, and you must not forget that you stand the same chance of winning as anyone else.

Another feature in this issue which should appeal to you is the set described on the following page. Fancy using an ash-tray for tuning!

When you write, address me

COUSIN CRYSTA,
 "The Wireless Magazine,"
 La Belle Sauvage,
 LONDON, E.C.4.

A COMPETITION

IN writing the following little story I am informed by the Editor that I have made several mistakes. I wonder if any of you can find them?

To the writers of the first two letters received containing complete lists of the mistakes I will award prizes of crystal sets (which I shall choose from the lists of advertisers in this magazine) that, with phones, will not be worth less than 50s. each.

Should none of you be successful in sending correct lists, the prizes will be awarded to the writers of the first letters opened containing the most nearly correct lists. Address your attempts to:

"Cousin Crysta,"

THE WIRELESS MAGAZINE,
 La Belle Sauvage, E.C.4.

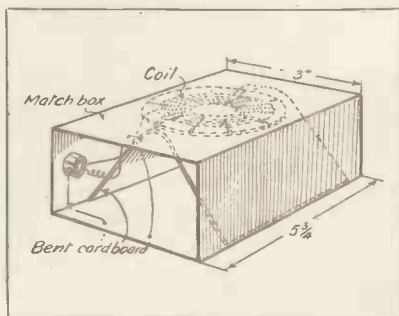


Fig. 5.—Completed Set.

Here is the story:

It was a happy moment in Rob's life when he made the final adjustments to his valve set and prepared to pick up American broadcasting.

BO-PEEP TO-DAY

WHEN poor Bo-Peep had lost her sheep,

They never *would* be led,
 She, being wise, showed no surprise
 But "listened-in" instead.

She heard a song, and then ere long
 The bleating of her sheep.

"They're safe, I know," she said,
 and so

She calmly went to sleep!

LESLIE M. OYLER.

Rob's aerial was erected on very low ground a few miles from London, and he had decided to build a long-wave set for the broadcasting.

A few turns of the knobs controlling the filament resistances and a little "fiddling" about with condensers brought in his local station Z Z Y.

Readjusting the filament-rheostat controls so that less resistance was introduced and the valves glowed more dimly, the secondary coil was moved farther away from the primary, the coupling thus being tightened.

It was clear that his set was not capable of receiving the signals of stations as far afield as America, so Rob decided to see if the connecting in of a low-frequency amplifier before the detector valve would improve matters.

A short time afterwards he was successful in picking up the carrier wave of 5 B M, the Pittsburg station. Later the announcer's voice was easily distinguishable.

Proud at the thought that he had tuned in a station so far distant with a set made by himself, Rob plugged in a smaller coil and heard the Sydney broadcasting station (in Ireland) on a high wavelength.

How many mistakes have you found by just reading this once? Try again and find a lot more.

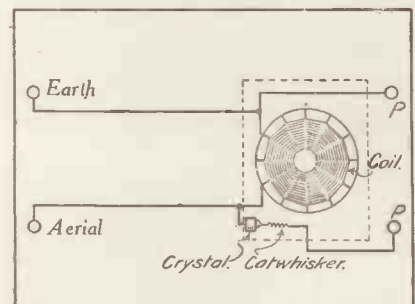


Fig. 6.—Wiring Diagram.

A MATCHBOX SET

THE novel crystal set illustrated in the accompanying diagrams and photograph is very simple and inexpensive to construct. The cost of the parts (including the crystal) does not exceed 3s., even if special fretwood has to be purchased.

Since a complete set of coils may be obtained for 2s. to 2s. 6d., nothing is to be saved by making one at home. The size of the coil chosen will depend upon the wavelength of the station it is intended to receive.

The proximity of the tuning ash-tray to the coil reduces the value of the inductance; so that a coil which is generally used to receive the local station with the tuning condenser in series may be suitable for this set.

Materials Required

Obtain a piece of fretwood 8 in. by 9 in. and bore four holes as shown in Fig. 1. Into each of these holes a threaded rod about 2 in. long is inserted. The threaded rods are secured on the under side of the board by means of a nut and washer, and a number of spacing washers such as are generally used for spacing condenser vanes are slipped over the long end of the rod, which projects through the top of the board. Four



Fig. 1.—Baseboard.

or five of these washers are sufficient.

Two strips of fretwood are now cut and bored as illustrated in the diagram (Fig. 2), and one slipped over each pair of rods. These form the carrying handles of the tray. The terminal heads should next be screwed on to the top of the rods.

These terminals are marked as shown in Fig. 3. An empty double-sized matchbox as sold by Bryant and May's is obtained and the sliding portion removed. Three more small holes are bored in the wooden base of the matchbox to go through and the matchbox is stuck to the board by means of seccotine, the holes being at each end of the box, as shown in the sketch (Fig. 4).



Fig. 3.—Terminals in Position.

The end of the coil wire projecting through the nearest end of the box is connected to the wire on the under side of the tray.

Now turn the tray round so that the terminal labelled "aerial" is on your right hand. The wiring here is slightly different. From the terminal labelled "aerial" a wire is led through the hole at the end of the box. This wire must be long enough to join behind the crystal cup.



Fig. 2.—Wooden Strip.

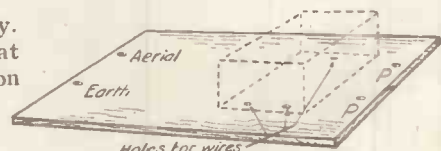


Fig. 4.—Position of Box.

now placed on top of the matchbox. Adjust the catwhisker and listen.

(Continued on page 234)



Tuning the Matchbox Set.

The coil is put in the matchbox close to the top of the box, and the under side is packed with a piece of thick cardboard bent to the shape illustrated by the sketch (Fig. 5).

The crystal cup is fitted to the inside of the box, the screw head being on the outside and passing through the cardboard into the cup.

Wiring the Set

The wiring of the set may now be proceeded with. From the "earth" terminal a piece of thin wire is connected to one end of the tuning coil, which in turn is connected to the opposite terminal of the pair labelled "telephones."

The end of the coil wire is also joined under the crystal cup with this wire.

The Catwhisker

Another piece of wire of sufficient length to curl up and press against the crystal so as to form a "catwhisker" is secured to the top of the matchbox by means of a piece of sticky paper or by threading it in and out of two little holes made in the box with a large needle. The long part of the wire is now passed through the hole in the tray and the end secured under the other "telephone" terminal.

Fig. 6 shows the wiring very clearly. Four little screws are fixed part of the way into the under side of the board, the heads of these serving as little feet so that the set stands firmly.

To operate the set the aerial and earth wires are fixed to the terminals so marked, and the phones connected to the terminals marked "phones." A large golden syrup tin lid or a metal cigarette ash-tray is

F.W. Thomas's "Joking Apart"

[Copyright by Loiter, the Guess Association, De-ranged Telegraph and Mental Blues.]

His Tips for Tyros "Illustrated" by Himself

And then, after all the trouble I'd taken, Grummitt said it wasn't a ticking-spider at all. He said it was an earwig who'd been

AS the man next door remarked, wireless has certainly come to stop.

The devil of it is that his doesn't. It goes on all the time. And in between as well.

But mine did. Last Tuesday night just in the middle of a piece by Debussy. Some French title or other. I think it was the *Après midi d'un faune* or else the *Omelette aux fins herbes*. And for the next half hour all I could get was a sort of a kind of noise like a ticking spider. Chip-chip. Chipchipchip. Chip-chip.

Most annoying.

So I sent for my friend Grummitt. He knows a whole lot about wireless, does Grummitt. Last winter, I remember, he got WEA F on a crystal, and knocked me up at 3.30 a.m. to come and hear it. But by the time I'd changed from my pyjama bags to the other ones, and done my hair, and knocked over the goldfish in the dark trying to find my boots, and got the front door open, and explained things to the policeman, and also to Grummitt's dog, they'd gone. But it was WEA F all right. Grummitt said he could distinctly hear the mastication of the spear-mint.

So I sent for Grummitt; and while I was waiting I took the whole box of tricks and gave it a good shaking. And, sure's you're born, out there popped a teeny little ticking spider. He'd been sitting on the grid leak, listening to the Savoy Orphans. He told me so himself, in dots and dashes.

"And don't they play lovely, them poor little kids?" he said. "No fathers or mothers, too. I think it's wonderful."

But I was in no mood for airy persiflage. "Look here," I said. "Listen to me, my tintinnabulating friend, and take warning:

I sit me down at supper time, and turn the 'fluence on, And wait to hear Sir Oliver or maybe Henry (John),

Mr. Thomas is the well-known "Star" humourist, of "Low & I" fame

It makes me very angry, and I go all cold and hot. At your iddy, iddy, umpty, and your dot, dash, dot.

I try for Captain Eckersley to get some useful tips

On how one ought to oscillate, explained with merry quips; But after wasting quarts of juice, the only thing I've got

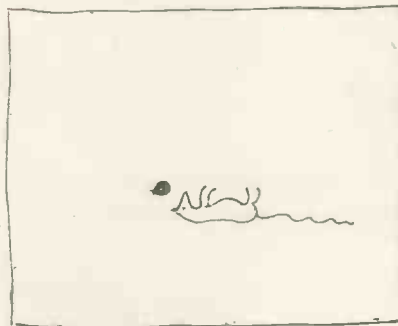
Is your iddy, iddy, umpty, and your dot, dash dot.

Or maybe on a Sunday night I try to get De Groot

(The tinkle of the glasses and the tooting of the flute),

And seeing that my little set has cost me quite a lot,

I look for something better than your dot, dash, dot.



Wireless mousetrap (after Rembrandt).

Owing to the fact that only the cheese can be seen, this trap is exceedingly fatal. The mouse has just finished wondering what the juice has happened to him

I've not the faintest interest in hearing you discourse

In the longs and shorts invented by the late Professor Morse;

So pack your bag, my little friend, ere I begin to swat,

And stop your iddy umpty, and your dot, dash dot!

trying to wig one of my ear-phones.

Now I have a rooted objection to slaying spiders, of any sort; ticking or otherwise. But earwigs! I simply dote on earwigs. So I doted on this one with a clothes brush; after which he wasn't an earwig any more.

Then Grummitt got busy. He sniffed at the set, and twiddled this, and tapped that, and said "Ah!" and "Um!" and other scientific remarks; and finally diagnosed the trouble as Northolt.

"But I don't wonder you can't hear anything," he said. "Look at this, for instance. This ought to be on there, and that ought to be on here. And by the way, where's your earth?"

"On the water-pipe," I said. "And now I come to think of it that probably accounts for the milk in the cokernut. Because I haven't paid the water rate yet. Or doesn't that make any difference?"

D'you know, there are times when Grummitt's conversation verges on the coarse, and this was one of them. I will not repeat his remarks verbatim, but in effect he advised me to discontinue being two four-letter words, the first meaning condemned, and the second a synonym for fat head.

"And there's another thing," I said. "Those two little lamp-gadgets at the back. The things you see to fiddle about by. They're not giving at all a good light. D'you think another shilling in the slot—" And then he was coarse again. Much coarser than before.

But he got her to gee in the end all right, though she'd sort of break off every now and then, which made it sound as if Pitt and Marks had got the hiccups.

And then, the very next night, blow me if she didn't go and conk again. Right in the middle of Big Ben. Wherefore I thought it was half past, and put all the clocks on,

and so lost a quarter in the morning. However, I got to the office in time to go out to lunch, so it was all right.

But that night I decided to have a go at the contraption myself. Maybe the high-tension wasn't high enough, though it smelt pretty bad. Or perhaps the volts and things had gone off. Anyway, I took the thing to pieces. Several pieces. And gave it a drop of oil here and there to stop the squeaking. And polished up some of the wires that had gone dull.

It certainly looked a whole heap better when I'd finished, and I had nearly enough wire and screws and things left over to make another set. But still it didn't work. However, after due consideration I'm inclined to think that it isn't the fault of the set at all. Either the ether in our neighbourhood is under-proof, or else one of that earwig's antennæ must have got across the whatsname and shorted the howjedo.

When one comes to think of it, we know very little about wireless. As a science it is still in its infancy. Which probably accounts for some of the strange noises that used to come out of my box of tricks. Like teething or windy colic.

Undoubtedly there are tremendous possibilities in the thing, and I for one look forward with confidence to a future pregnant with important discoveries.

Before long we shall sit at home and listen to the roar of Niagara. ("Are you sure that's Niagara, dear, or did you leave the bath taps running?")

Deep in our armchairs before the wintry fire we shall hear the tinkle of the two-headed ha'penny that the Australians use for tossing purposes, and Gilligan's strong, silent voice calling "Tails." The temple bells of Mandalay will be brought into our drawing-rooms, with the banging of an occasional saxpence from Aberrrrdeen.

But there are times when my heart misgives me. These banquets and lunches, for instance.

Not long ago, my own set being temporarily hors de combat, which it is mostly all the time very nearly on and off, I went round to Wallaby's place to listen to the Annual Gorge of the Amalgamated Society of Superannuated Sanitary Inspectors, where Professor Thwostlepate was delivering a dissertation upon The True Inwardness of Drains.

Normally Wallaby is a very temperate man. A little invalid port

once a week (so-called because it's too weak to come out of the bottle), and a little gin with one bitter on his birthday; and that is all.

But as we listened to the clatter of the dishes and the comments of the diners on the *salle d'agneau* and the *sal volatile*, we heard in the background, as it were, the musical popping of a long-drawn cork. Like a couple of giants amusing themselves under the mistletoe.

At the sound of it I licked my lips and Wallaby went pale behind the ears.

Again it came, followed this time by a beautiful guggleguggleguggle

Well, I ask you. As loyal listeners could we do anything else but leap to our feet, fill our glasses, and drink the King? Certainly not!

And the same with the rest of the Royal Family.

And success to the Amalgamated Society of Sanitary Inspectors.

And the visitors!

And the ladies!

And of course, Professor Thwostlepate, with musical honours. Faw-haw he's a jolly goo' feller, and shoy shay all of us. Hic-hic-hic—

It would have been highly discourteous to have sat quietly there

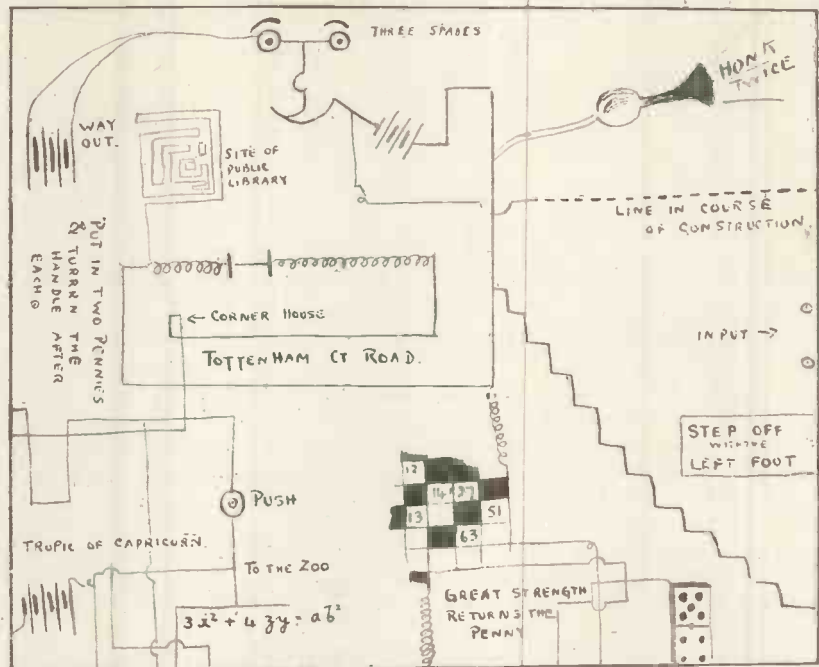


Diagram of F. W. Thomas's lay-out. Solutions should reach us not later than this morning. Send no money, a postal order will do.

effect, a slight sizzling, and a voice which said "Not all the soda, please."

Wallaby could stand it no longer, and before you could say variometer he had dashed to the sideboard, and the bottle was between his knees. And so eager was he that he nearly pulled the corkscrew straight.

Then, waving our glasses at the loud-speaker, we said "Chin-chin!" and "Here's another thousand a year!"

Five minutes later there was a loud wallop, and we heard the cultured voice of the toast-master announcing "Me lords, ladies and gentleMEN, perrrrray silence for your chairman." Bangbangbang wallopwallopwallop, hear, hear, good old Bill!

ignoring these convivial sentiments. After all, we had been invited to the banquet more or less, and though we were not there in the flesh, lapping up the Creme Portugaise and Peche Melba, yet we were present in the spirit. And when the toastmaster spoke he was speaking to us, wasn't he? Very well, then! Don't argue.

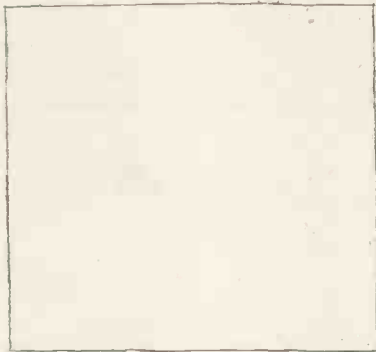
I forget the gist of the Professors remarks, but they dealt with the importance of sewage works as a civilising influence; and once or twice they verged on the slightly unsavoury. Not at all a nice subject for after-dinner conversation.

So we had to have another one. But his audience didn't seem to mind. They are a hardy crowd, these sanitary inspectors, and when

the professor wound up his discourse with a toast, "Success to Drainage," they leapt to their feet as one man, and from the noises they made there were no heel taps.

Always ready to oblige, Wallaby leapt to his feet as well. . . . Well, as well as he could. And together we drunk to the future of sani-sanitisation. Who-blooming-ray!

And then in the silence that followed we heard a voice coming down-stairs. Not a still small voice by



Design for wireless dog muzzle. (Pat. appld. for.)

any means, but a large three-cornered two-valve voice, with knobs.

"James," it said, "what are you doing down there? That's three corks I've heard you draw. Come to bed at WHUNCE." And when a lady says "whunce" with a little whistle in front of it like "whelks" and "white" and "Whednesday," then you have to go. But Wallaby was equal to the occasion, and called up the stairs.

"No, me dear! Not drawing corks. I was just kissing Thomas goo' ni'. Nishe f'ler Thomas. Don't you wanner kish Thomas goo' ni'?"

So taking it all round I'm not at all sure that these wireless banquets are a wise institution. One doesn't get enough to eat; and as you know, port on an empty stomach is only good while its going down. Afterwards

But we had a very good time. And didn't have to dress for it, either. But as Wallaby was showing me out, or, to be exact, as I was showing Wallaby how to show me out, that still large voice came down the staircase once again.

"James," it said, "if you don't come up AT WHUNCE—"

"Listen!" whispered Wallaby. "Devil of a lot of static about t'night. Think we're going to have a storm."

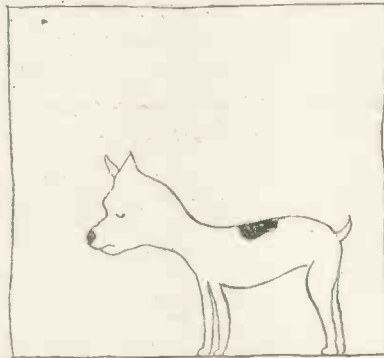
So I went home before it came down.

F. W. THOMAS

RIPPLES

A TELEPHONE operator has expressed herself as disappointed with her receiving set. Perhaps she cannot get out of the habit of switching on to the wrong station.

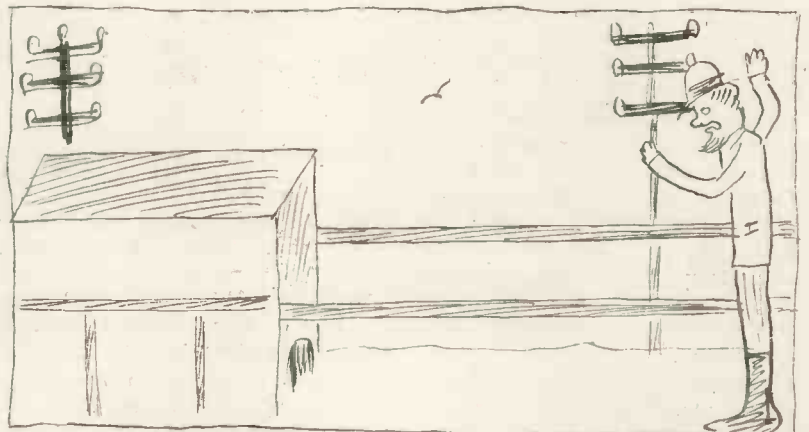
BEFORE many years have passed, it is possible that typewriters will be manipulated by wireless. As a token of remembrance to the displaced typists, shingle valve-sets will doubtless be employed.



Wireless wire-haired terrier wearing same.

A DISGRUNTLED listener-in complains that the programmes are not snappy enough. Never mind, Parliament will soon be in full blast again.

WIRELESS is being installed in an American prison. Fitted with dry-cell batteries, naturally.



Chicken run constructed with wireless wire netting. Wireless telegraph poles in background. Ditto wire-worm in front. Unfortunately the chickens have got out, but they weren't very good chickens.

"ALAS, my poor brother," must have been the moan of many a catwhisker on the night when a lecture on sausages was recently broadcast in America.

It is said that a campaign in favour of purer English is needed. Some crank must have been picking up Pittsburg.

ANSWER to correspondent: Antonio Granelli (Soho). No, your information that macaroni can make a good lead-in is false. Your informant must have said Marconi.

WAS the 2 LO talk on the wearing of medals really useful? About the only people who can afford to wear them nowadays are pawn-brokers.

SEVERAL people who have been deaf since birth have been able to hear since taking up wireless. Now, if they are married, their troubles will begin.

TREMENDOUS interest in wireless is being taken in America. In a dry country we should hardly expect there to be anything to damp their enthusiasm.

ALL the wild animals at the Zoo have had their say on the wireless. But there still remain those who perform in Hyde Park on Sunday afternoons. THE "Chat on Golf" sent out from Leeds will serve to impress upon listeners the necessity for getting the right length.

WE may expect some flowery language in the Royal Horticultural Society's talk that is being broadcast.

AN internationalist says that wireless is knitting the nations together. In appropriate knitting language, this would "seam 2" be true.

WE rarely hear of anyone picking up Mexico. The reason possibly is that their station plants, like their governments, operate at too many revolutions a minute for us.

A WIRELESS talk to women has been given on "The story of a painter." It is a subject on which many of them are experts.

The Loud Speaker as an Ornament.



1 and 2.—Bullphone; 3.—Brown Q Type; 4.—Sterling Primax (pleated paper); 5 and 6.—Decorated Amplions; 7.—Loud-speaker in the Duke and Duchess of York's suite on the *Mulbera*; 8.—Another Amplion.

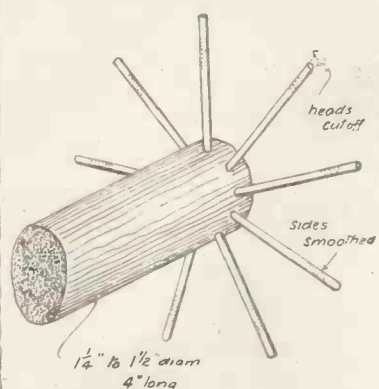


Fig. 11.—Simple Former.

Practical Coil Winding

Making Basket-Coil Formers:
Winding the Coils: Mechanical
Winders: Wire Bobbin Holders

THE function and value underlying the use of an odd number of pegs in the spider is easily exemplified by an improvised trial of a coil wound over an even number of pegs. This can best be done by winding a short piece of string on a piece of stick with six or eight pins only. It will be seen that a coil formed in this manner would be quite unstable and also difficult to wind. It would require extraneous means of support both during and after winding.

Automatic Interlacing

By using an odd number of pegs the interlacing required becomes quite automatic in its sequence, so long as the correct alternations are observed. The chief point is to maintain either the single or the double scheme, i.e. crossing the wire over every one or every two pegs, as the case may be, throughout the whole coil.

Constructing a Former

The simplest construction for a former is a section of a broomstick or

other cylindrical piece of wood. Into this nine french nails are fixed, as indicated in Fig. 11. It must, however, not be imagined that the kind of wood of which the average broom-

A great deal of the literature that is available on the subject of tuning coils (which are needed in every receiver, whether crystal or valve) is devoted largely to the design of coils rather than the difficulties of winding.

These notes, therefore, deal with the ways and means whereby readers of THE WIRELESS MAGAZINE can make coils with the least trouble and with the greatest mechanical efficiency.

stick is made will stand so many nails being driven into it with a hammer without resenting the operation by splitting. The holes should be drilled to receive the nails, and these will be less troublesome in the winding if they have their heads filed off before being driven into the hub of the former. Further, the rough sides of the nails should be rounded off as clean and smooth as possible. Pieces of drawn wire No. 8 gauge in diameter are of course to be preferred for pegs in place of nails.

Winding a coil with the former held

in the hand is obviously the method that would first occur to the amateur, and although quite respectable and efficient coils—as good as the best—can be made in this way, if a representative selection of coils is required the method becomes a little tedious.

In winding, the former is held in the left hand and the wire, having been secured to one of the spokes at the starting end, may be interlaced by the fingers of the right hand in either a single or double coil formation, the tension given to the wire being made as even as possible.

Binding the Coil

The last turn is secured by sewing it with a needle and cotton to the previous turn, before the former pins are removed, a similar operation being performed at the starting end of the coil. Inattention to this point will result in a mess like that illustrated in the photograph (Fig. 12). This "ravell" was caused by attempting to sew a beautifully wound coil, which looked as stiff and as stable as could be desired, after having removed the pegs.

In the case of a hand-wound coil, the writer always recommends a former with a rather long hub—the extension being on one side only, as indicated in Fig. 11, even if such a length of material is not required to prevent the wood of the box from splitting, as would be almost imperative where a common broomstick boss is employed. The extension should be from three to four inches, enough to ensure a comfortable grip for the left hand. The sewing, drying out, waxing, or varnishing operations should follow.

The serious experimenter will not long remain satisfied with such a crude former as that just described.

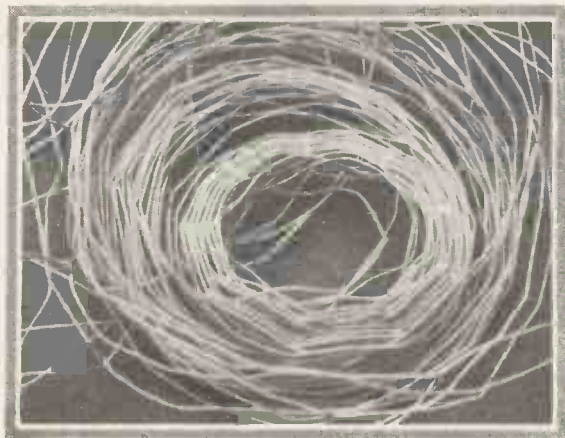


Fig. 12.—Result of Not Securing the Wire.

HOW TO MAKE YOUR OWN BASKET COILS

He will soon find time to make or will purchase a more elaborate spider, and also look about for a mechanical means for rotating it.

A One-man Job

Any suitable and quickly made mechanical device introducing a reduction gear from the operating handle to the spindle on which the spider is fixed may be deemed to be satisfactory. The writer has found that it was a slower process in the end to attempt to rotate the spider direct by a cranked spindle, more especially where the idea of one person rotating the spindle and the other guiding the wire round the pins is adopted. As a matter of fact, a much better coil is obtained if the one person attends to both operations. It is easier to correct a mistake and to maintain perfect

warded not only in the results obtained in satisfying immediate requirements, but in future jobs. A separate bobbin holder is therefore recommended. One never knows

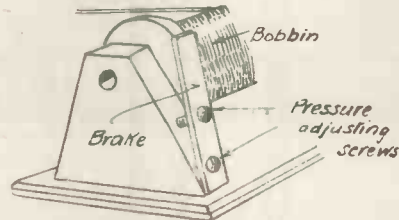


Fig. 15.—Method of Adjusting Wire Tension

what may be wanted as time goes on.

Bobbin Holder

The bobbin holder illustrated in the accompanying photograph (Fig. 13) was made by screwing two pieces of $\frac{3}{4}$ in. hard wood to a base board. The side pieces should be sawn out, finished off to size and smoothness, and bored for the spindle with the two pieces temporarily tacked together, to ensure uniformity. The spindle used was a piece of brass gas-bracket pipe, $\frac{3}{8}$ in. outside diameter, and which happened to have one end screwed (see Fig. 14.)

The hole in one of the uprights was therefore drilled under size and the other over size, so that the spindle passed through the larger hole and the bobbin easily and screwed into the side with the smaller hole. The outer end of the spindle was bent over to form a handle. The base-board was finally drilled at the corners for the fixing screws to the bench and the tension on the wire obtained

by a slat of wood screwed to one of the upright spindle supports, as shown in the photograph and in the detail sketch (Fig. 15).

An alteration in the degree of wire tension is effected by manipulating the screws, thus adjusting the pressure of the slat on the flange of the bobbin.

H. GREENLY.

(To be continued)

"A Sunday on the Continent" (Continued from page 157)

followed on spoonerisms and we adjourned for light refreshment.

A further concession to the family and some friends who had unexpectedly arrived on the scene held us up in London for the Piccadilly Orchestra.

"One half-hour's flight to sunny Spain," I murmured. Until 5 N O closed down we encountered difficulties, but as soon as Newcastle had gone to "bye-bye" Radio-Iberica's "Atencion" came in strongly.

The usual Spanish style of music was enjoyed for about 40 minutes and the wave was fairly well held. Trouble then cropped up as the accumulator showed signs of anæmia.

"Time for bed," I suggested.

A long day's work with heavy travelling. Many stations had been effectively logged for future occasions and further trips were enthusiastically planned.

Such a programme is within the means of most possessors of multi-valve sets.

J. G. A.

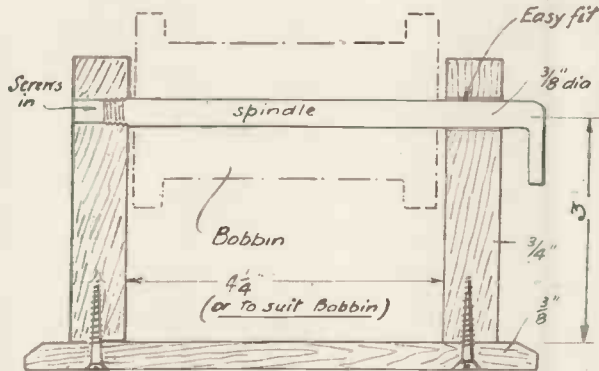


Fig. 14.—Details of Holder for Large Bobbin.

rhythmic motions of the two functions—interlacing and rotating—if one brain commands the two hands.

Both Hands Free

The fixing down of the winder mechanism to the bench or table is also essential. Both hands must be free of any necessity of holding the apparatus steady.

Another *sine qua non* is the provision of a bobbin holder. The writer uses a separate holder, as this can then be clamped or screwed to the bench in any convenient position. A tension brake is also fitted. While all these accessories appear to be formidable, especially when the chief anxiety of the moment is to obtain a coil quickly, the patience necessary to wait until such a useful piece of apparatus is made will be well re-

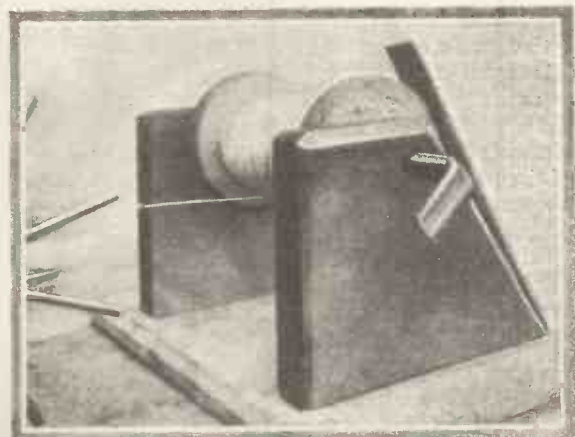


Fig. 13.—Simple Bobbin Holder.



HAVING recently returned from Germany, where a wireless exhibition has just been concluded, my own opinion of broadcasting in that country is now somewhat different from what it was prior to the visit. As one who has at heart the welfare of British broadcasting, I visited the exhibition with the sole idea of gaining some insight into the possibilities of a deluge of wireless material being dumped on our shores and sold at prices with which the British manufacturer could not hope to compete.

It was realised that any commercial opposition likely to ensue from the opening of the British wireless market to the foreigner would be vested in such an eventuality.

Through English Eyes

Whilst to the German "man in the street" German broadcasting may appear to be a marvellous and expensive luxury beyond his reach, when viewed through English eyes it becomes apparent that something is wrong. One was not in the exhibition long before realising that at present broadcast reception in Germany is something beyond the means of the average German.

My view of the present system is that it is lamentably backward. This opinion was amply endorsed by members of the very few firms who deal in really first-class wares. German broadcasting, in their opinion, ran badly off the rails in the first mile.

I have little doubt that the present German system of broadcasting is suitable for that involved mental complex, the Teutonic psychology. It is not so much the system that is hampering German broadcasting as the methods of the manufacturers. Let us see what these manufacturers have to offer.

It was somewhat of a surprise to

me to find that many of the crystal sets offered for sale at the exhibition possessed tuning coils of the slider type made entirely of wood, with absolutely no attempt at insulation.

Other inductances were to be seen with metal ends which certainly gave me the impression that they had been designed with a total disregard for fundamental principles.

The prices asked for such components as these were considerably in excess of those asked for far superior articles in this country. The more advanced sets were equally disappointing and would not, in the writer's opinion, meet with the British listener's approval. Many of the condensers appeared to be both rough and clumsy.

In view of the German official regulations no set is allowed to be sold which is capable of receiving on wavelengths of more than 700 metres.

The "verboten" ideas which appear to pervade the Teutonic mind are, however, in danger of being evaded since in many cases plug-in coils are used when it is desired to receive signals transmitted on a higher wavelength than the maximum allowed.

Typical Valve Sets

Most of the valve sets on view were of the sloping-desk pattern, and in the better class instruments ebonite was used for the panels. In many cases, however, the panels were of wood, artfully enamelled.

A three-valve set, less accessories, costs about £5 10s., and whilst not exactly costly, is, nevertheless, not cheap enough to warrant the British listener purchasing an instrument which he could only tolerate at best. In the cheaper sets the wiring strikes one as being shoddy.

The exhibits of amateur apparatus

made by "Klub" members, revealed some painstaking work. The German amateur, however, is handicapped by the dearth of good literature, and it may be interesting to many in this country to learn that while at the exhibition I heard many glowing tributes to the quality of the British wireless journals.

German Wireless Components

Many of the wireless components on view were identical with the corresponding British products. Especially was this the case with condensers.

With components as with sets, the prices would not tempt the average listener in this country. Variometer types of tuners differed greatly, some being high-class products with moulded shells, others being rather crude affairs with stators made of wood.

There was also a varied array of fixed condensers. Whilst one firm had on view attractive little products at close prices, another exhibitor had for sale clumsy looking articles which were retailed at the same price.

As was to be expected, headphones were much in the limelight, but the average type of these was not such as to appeal to me. There was, however, a welcome improvement to be seen in the way of dry batteries.

To return to German broadcasting I can only say that, in my opinion, the whole system needs revising. As it stands at present I fail to see how German competition can be a danger to this country. While the present system may meet with the approval of German listeners (small in number), drastic alterations will have to be made if German broadcasting is to take even a place among the systems of other nations.

W. S. S.

LISSENIUM

The most efficient simple receiver—

Here is a little receiver so original—so perfectly designed—so ingeniously thought out—so obviously well made—so efficient—and so attractive in price that it cannot fail to appeal to anyone wanting a simple radio receiver.

It will stand all the hard knocks kiddies give things—makes an ideal present for boy or girl—is a family receiver, too—several pairs of telephones can be attached—an amplifier can be added to it at any time—and the inductance can be used for a more ambitious valve set, which may be decided on later.

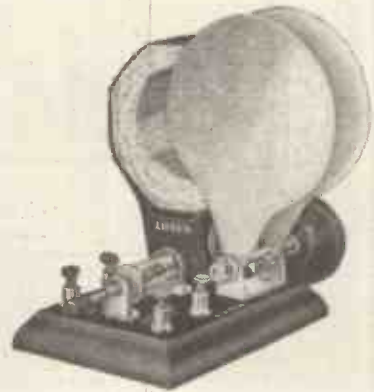
Turn up the base—you will find no loose wires there—the connections are stamped out strips—there are no loose connections—there is an undisturbed electrical circuit—a form of tuning is introduced, which in conjunction with the peculiar efficiency of the LISSENIUM (pronounced LISSENI-AGON) coil used for the inductance, makes this little receiver the most efficient crystal set yet made.

The receiver can be used for any receiver within its range by plugging in the appropriate LISSENIUM coil. Two coils would be needed to receive London and Chelmsford.

Price of LISSENIUM CRYSTAL SET

(Patent pending)
Complete with Crystal **10/-**

LISSENIUM Coil extra, see adjoining table.



CHOOSE THE COIL FROM TABLE BELOW

Station.	Price of LISSENIUM COIL.	LISSENIUM COIL required.
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Sheffield ...	No. 40	4/10
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Bradford ...		
Liverpool ...		
Nottingham ...		
Edinburgh ...	No. 50	5/-
Dundee ...		
Hull ...		
Plymouth ...		
Leeds ...		
Cardiff ...		
London ...	No. 60	5/4
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Bournemouth ...		
Newcastle ...		
Glasgow ...		
Belfast ...		
Birmingham ...	No. 75	5/4
Swansea ...		
Aberdeen ...		

NOTE.—One LISSENIUM coil must be ordered with each set—the receiver will not be sold without a coil because it yields much greater efficiency with this well-known coil.

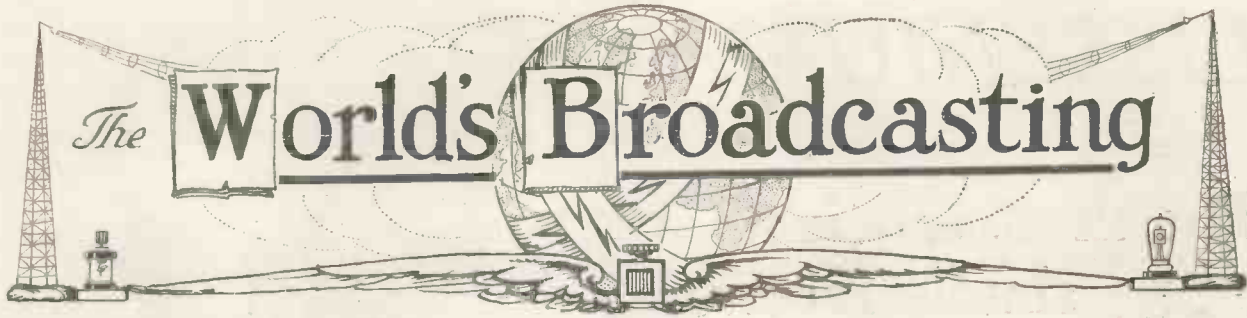
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280	Eberswalde	—
290	Gothenburg	S A S B
292	Cassel	—
296	Hanover	—
301	Sheffield	6 F L
306	Stoke-on-Trent	6 S T
310	Bradford	2 L S
315	Liverpool	6 L V
322	Nottingham	5 N G
325	Barcelona	E A J 1
328	Edinburgh	2 E H
330	Bremen	—
331	Dundee	2 D E
335	Hull	6 K H
335	Madrid	E A J 2
335	Plymouth	5 P Y
340	Nuremberg	—
346	Leeds	2 L S
350	Seville	E A J 5
365	London	2 L O
375-410	Lisbon	—
375	Manchester	2 Z Y
385	Bournemouth	6 B M
395	Hamburg	—
400	Newcastle	5 N O
410	Munster	—
418	Breslau	—
425	Rome	1 R O
420	Glasgow	5 S C
427	Stockholm	S A S A
435	Belfast	2 B E
440-500	Christiania	—
443	Stuttgart	—
454	Leipzig	—
463	Königsberg	—
470	Frankfort-on-Main	—
470	Copenhagen	—
475	Birmingham	5 I T
481	Swansea	5 S X
485	Munich	—
495	Aberdeen	2 B D
530	Vienna	—
551	Cardiff	5 W A
650	Zurich	—

Wave-length Metres	Station	Call Sign
750	Berlin	—
780	Lausanne	H B 2
950	Buda-Pesth	M T 1
1,025	Ryvang	—
1,050	Hilversum	NSF
1,050	Ymuiden	P C M M
1,050	Vossegat	B É
1,050	Soesterberg	—
1,100	Geneva	H B 1
1,100	Haeren	B A V
1,160	Kbely	O K P
1,651	Belgrade	—
1,780	Radio-Paris	S F R
1,800	Komarov	O K B
1,800	Centocelle	I C D
2,125	Amsterdam	P C F F
2,400	Lyngby	O X E
2,450	Königswusterhausen	L P
2,450	Montesanto	C T V
2,500	Boden	—
2,650	Eiffel Tower	F L
3,200	Moscow	—

PRINCIPAL AMERICAN STATIONS

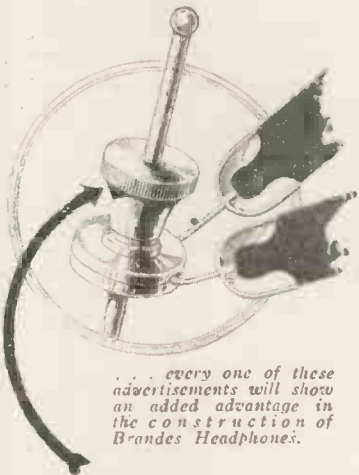
Wave-length Metres	Station	Call Sign
226	Dak Park (Ill.)	W T A Y
227	Joliet (Ill.)	W W A E
234	McKeesport (Pa.)	W I K
236	Knoxville (Ten.)	W N A V
240	Trenton (N.J.)	W O A X
244	Boston	W T A T
244	Galesburg (Ill.)	W R A M
244	Houghton (Mich.)	W W A O
248	Chicago	W S A H
261	Providence (R.I.)	W S A D
273	Tarrytown (N.J.)	W R W
275	Lincoln (Nebr.)	W J A G
275	Kansas City	W A A J
280	East Lansing (Mich.)	W K A R
283	Norfolk (Nebr.)	W J A G
283	State College (Pa.)	W P A B
286	Elgin (Ill.)	W T A S
309	Cincinnati	W L W

Wave-length Metres	Station	Call Sign
309	Cincinnati	W S A I
326	Pittsburg	K D K A
360	Providence (R.I.)	W J A R
360	Pittsburg	W J A S
360	New York	W J X
360	San Juan, Porto Rico	W K A Q
360	New York Police Dept.	W L A W
360	Dartmouth (Mass.)	W M A F
360	Lockport (N.Y.)	W M A K
360	Kansas City	W O Q
360	Wanpaca (Wis.)	W P A H
360	Farzo (N. Dak.)	W P A K
360	Parkesburgh (Pa.)	W Q A A
360	Schenectady (N.J.)	W R L
360	Urbana (Ill.)	W R M
360	Clemson College (S.C.)	W S A C
360	Grove City (Pa.)	W S A J
360	Birmingham (Ala.)	W S Y
385	San Antonio (Tex.)	W O A I
390	Cleveland	W J A X
390	Cleveland (Ohio)	W T A M
395	Philadelphia	W F I
405	New York City	W J Y
405	Newark (N.J.)	W O R
411	Kansas City	W D A F
417	Minneapolis and St. Paul	W L A G
429	Atlanta (Ga.)	W S B
441	Jefferson City (Mo.)	W O S
448	Chicago	W J A Z
448	Chicago	W M A Q
455	New York City	W J Z
469	Washington	W R C
484	Davenport (Ia.)	W O C
492	New York City	W E A F
500	Memphis (Ten.)	W M C
509	Philadelphia	W I P
509	Philadelphia	W O O
526	Omaha (Neb.)	W O A W
546	St. Louis	K S D



All Brandes products carry our official money-back guarantee, enabling you to return them within 10 days if dissatisfied. This really means a free trial.

Matched Tone means a technical improvement in telephone construction which should at once grip your attention. If you are intent on better broadcast reception, if you wish to gather the more distant signals with increased strength and clarity, then Brandes Superior *Matched Tone* Headphones are certainly what you want. Matched by ear, the two receivers of ordinary headphones cannot gain an exactly similar degree in tone and volume by a margin of eighty degrees. Brandes, matched by special apparatus, obtain corresponding sensitivity and volume in each receiver to within five degrees and a consequent increase of tone purity, accuracy and strength. For just home stations or trans-atlantic and trans-continental telephony, get Brandes *Matched Tone* Headphones. Ask your Dealer for Brandes.



... every one of these advertisements will show an added advantage in the construction of Brandes Headphones.

The lock-nut on the receiver yoke is a clutch that tightens and holds the receivers firmly in place when satisfactory adjustment has been obtained. This point prevents the receivers from slipping, keeps the headphones in correct balance without possibility of working askew, and makes the headband follow the natural line of the head. The whole family can wear the headphones with comfort.

British Manufacture.
(B.B.C. STAMPED.)



The *Table Talker* is another Brandes quality product at moderate price. Designed to meet the need for a simple radio loud-speaking device to entertain a group of people in an average size room, its full round tones are wonderfully clear and pleasing. It is matched to the unit so that the air resistance produced will exactly balance the mechanical power of the diaphragm. This means beautiful sound-balance. Gracefully simple of line, it is finished a shade of neutral brown. 42/-

Brandes

The Name to know in Radio

Superior Matched Tone Headphones

25/-



FOR . HOME . STATIONS . OR . TRANS-ATLANTIC . TELEPHONY

THOSE who were surprised to hear that the Manchester station is situated in premises known as "The Parsonage" may rest assured that the announcement was not due to a clerical error.

WAVES in the air are becoming as popular as waves in the hair. And far more permanent.

AN advertiser in *The Times* announces that he has a "staggering wireless set" for sale. This is evidently one that has been specially made for bass reception.

WIRELESS has brought sunshine into hundreds of homes, says a writer. We wish it would bring some into the sky.

A GOOD many people are said to be combining wireless with photography. As we have not met any of them personally, presumably they must be doing it "in camera."

THE broadcasting of sermons is enabling many listeners-in to enjoy their Sunday nap as comfortably as if they actually went to church

A CHESHIRE listener has received Berlin with a crystal. His set must have been on the spree that night.

SPECIAL Burns programmes were broadcast in Scotland quite recently. We hope that the valves didn't enter into the spirit of the occasion.

THOSE stations that are broadcasting wild animal talks should remember that what the public wants is radio, not rodeo.

SINCE the lecture on "Cleaner Milk Supply" during a recent Women's Hour, we understand that the milkmen will use more water when washing it in the future.

IT is now possible to hear yourself speak on the wireless. This should commend it to the consideration of the too-much-married men.

THE large amount of barbed wire about the countryside is interfering with fox hunting. We shall even have to come to wireless fences next.

NOW that wireless is being more extensively used in the Army, we understand that a special super loud-speaker is being designed for the benefit of sergeant-majors.

A WILLESDEN woman told the magistrate that she could not sleep because her neighbour's wireless set got red hot, and the rain sizzled on it. He must have been picking up a message from Moscow.

WAVELETS

A LISTENER says that he has heard the same piece of music at the same time from different stations. That must have been on the night of the club dinner.

RELATIONS between certain theatrical managers and the B.B.C. seem to be at high tension.

THERE is a dog in one of the London suburbs who greatly enjoys listening to the wireless. All that burglars will have to do when visiting his house is to make a noise like a headphone, and they will be safe for the night.

NOW that rat week is over, perhaps we shall not hear so many loud squeakers.

THE comments of spectators were broadcast at the Lord Mayor's Show. We hope this precedent will not be followed in the case of football matches.

A BROADCAST message was recently responsible for the discovery of a relative who had been lost for twenty years. This is likely to discourage many sons-in-law from installing sets.

LADY TREE recently branched out into wireless from 2 L O.

IF YOU WANT TO BUY A SET

and know nothing of wireless, let us help you to choose it. With our special experience we are able to advise as to which are the best types of sets for use in any particular circumstances.

Tell us how much, roughly, you wish to spend, where you are situated, what stations you wish to receive (whether only the local station or others as well), whether you intend to use headphones or a loud-speaker, and we will advise you as to the general lines of sets that will answer your purpose.

Send your enquiry with coupon (p. 235) and stamped addressed envelope to

"Buyers' Advice Bureau,"

THE WIRELESS MAGAZINE,

La Belle Sauvage, E.C.4.

A SCHOOLMISTRESS has expressed the fear that wireless will deter girls from learning to play musical instruments for themselves. This is the

best piece of news that flat dwellers have heard for some time.

SIR PERCIVAL PHILLIPS says that marriage in Russia is easier than purchasing a broadcasting licence. Yes, but you can't let the contract lapse so easily.

A NEW YORK wireless fan has constructed a receiving set in a cigar box. He ought to be able to pick up the Havana Station with this.

ABERDEEN has the longest wavelength of all the British stations. Perhaps this is because it takes an Aberdonian longer than anyone else to pay for a drink.

A WOMAN has broadcast a talk on "How to Listen." It is reassuring to learn that there is one who knows how to.

SOME listeners-in complain that there is too much music in the programmes. The recent introduction of a bagpipe solo shows that the B.B.C. are doing their best to redress the grievance.

A CORRESPONDENT from Barking says that wireless is almost perfect nowadays. In its dog days, so to speak.

THE butcher's boy who wrote to ask if sausage aerials contained cat-whiskers seems to have been confusing his employer's business with his own hobby.

THERE is some talk of Rudyard Kipling being persuaded to Broadcast. But where Mr. Kipling is concerned, there is always a very big "If."

AN inventor says that in twelve months' time we shall be able to see cinema plays by wireless, and picture places will not be necessary. This invention is not likely to be appreciated by the Society of Bright Young People in the back seats.

A FIRM advertising coils says they are "as strong as a house." It is to be hoped that the government houses were not the standard of comparison.

A COMPLETE stand-by set has been fitted at the Glasgow station. This is fully in keeping with the Glasgow custom of standing by while the other fellow pays.

JOHN DRINKWATER says that the advantage of wireless is that it communicates through the ear. Hear, hear!

This remarkable reception of the U.S. Station at Cambridge (Mass.) in Coventry is further proof of



super-efficiency.

Mr. S. Edward Bacon, Steward of the Coventry and County Club, received word by cable that his brother a vocalist, would broadcast from the American Station W.B.Z. (Cambridge, Mass.), on December 29. Mr. Bacon, using a 4-valve A.J.S. Receiver, promptly got in touch from Coventry, and "heard both songs perfectly at loud-speaker strength."

Although "conditions were not good"—— He heard "perfectly at loud-speaker strength" on his A.J.S. 4-VALVE RECEIVER

THE A.J.S. "UNITOP" CABINET RECEIVER

forms top section of "Unit System" Cabinet and contains A.J.S. 4-valve Receiver. Complete in itself, it may be converted into a beautiful pedestal cabinet by subsequent purchase of first a centre section to contain both batteries and then base section containing special A.J.S. Loud Speaker. Used alone, the "Unitop" is a compact and attractive piece of furniture and a highly efficient Receiver, easily portable for outdoor functions. In Mahogany, or Light, Dark, or Wax-polished Oak. Complete with all accessories, ready for use, 30 guineas. (Without accessories, £24 10 0.)

A.J.S. LOUD SPEAKERS.

Accurately proportioned non-resonant horn, giving correct acoustic properties. True reproduction and extreme sensitivity without distortion. With Metal horn and plated fittings, £4 15 0. With Oak or Mahogany horn and plated fittings, £5 10 0.

Ask the nearest A.J.S. Dealer to show you these and other A.J.S. Wireless Instruments, including the "Unit System" 4-valve Cabinet, the "Desk type" 2-, 3-, and 4-valve Receivers, and the A.J.S. 4-valve Pedestal Cabinet.

RADIO SECRET REVEALED.

Story of an Impromptu Concert From U.S.

VOCALIST'S DESIRE.

To Sing to Brother at Coventry.

From a Gazette Correspondent.

COVENTRY, Thursday. To hear his brother's voice coming to him in song across the wide space of the Atlantic has been the unique experience of Mr. S. Edward Bacon, steward of the Coventry and County Club, Coventry.

Listeners in who were successful in getting into touch on Monday night with the American wireless station W.B.Z., at Cambridge (Mass.), were interested to hear the announcement that a short concert would be given for the benefit of one of the artist's relatives who lives in Coventry, England.

THE EXPLANATION.

The explanation is that one of the stages was Mr. Henry G. Bacon, student of the Massachusetts Institute of Technology, and in his desire that his brother should hear him sing, he had cabled him at Coventry the time that the concert would begin.

Mr. Henry Bacon sang two songs, "John Peel" and "Love, I am lonely," both of which Mr. Edward Bacon heard perfectly.

THURSDAY, JANUARY VOICE ACROSS THE SEA.

Coventry Man in America

SINGS TO RELATIVES.

The statement by a correspondent in yesterday's issue of the "Midland Daily Telegraph" that he heard a concert broadcast from the American station W.B.Z., "for the benefit of one of their artist's relatives in Coventry," was read with interest, especially by Mr. S. Edward Bacon, steward of the Coventry and County Club, who was referred to.

Mr. Bacon writes as follows:

"I noticed in last week's issue of the 'Telegraph,' in the column, a notice from reference to a concert given at the American station at Cambridge, Mass., on December 29, to one of the artist's relatives in Coventry, England. My brother, Mr. Henry G. Bacon, of the Mass. Institute of Technology, was the artist, and 'John Peel' an object of which I heard the strength on my four-valve A.J.S. receiver. The correspondent says he heard 'John Peel,' and after the two songs received three or four others. Broadcasts are a combined radio-telephone service, each fixed receiver giving the signal to England. It is done for one of the reasons mentioned above."

A. J. STEVENS & CO. (1914), LTD.. WIRELESS BRANCH, WOLVERHAMPTON.

'Phone : 1550 ; Wireless Call Sign : 5 R I ; 'Grams : "Reception, Wolverhampton."

land. By the... down for a minute, and that they... afterwards with through do a hockey... match which was to be played at eight... check between the Hamilton players and... from the Canadian... National Hockey League. "I picked him up, too, and heard the... afterwards that Mr..."



Your name and address on a post card will bring you our Free Illustrated List.



Re-Radiation and Crystal Sets

Q.—Do wireless valve sets in the vicinity of a crystal set make the reception of distant stations on the crystal set possible by re-radiation?

A.—In most cases of abnormal reception on a crystal set it is generally assumed that the reception is assisted by re-radiation from a neighbouring valve receiver.

In any valve receiver employing direct coupled magnetic reaction it is possible to receive signals on a certain wavelength and to retransmit simultaneously the same signal on another wavelength a few metres above or below the wavelength upon which the signal is received. This phenomena is due to re-radiation, the latter being the cause of much controversy in present-day reception.

Lighting System as Aerial

Q.—Are the electric-light plugs used in place of an aerial satisfactory?

A.—Quite satisfactory results can be obtained with these plug fittings when used as an aerial. They may be used in conjunction with a crystal set within a radius of about 3 to 5 miles of a main B.B.C. station, much, of course, depending upon the locality of the user.

We believe that one well-known firm which manufactures these fittings guarantees their efficiency as being 45 per cent. that of a normal outdoor aerial.

The Telephone Transformer

Q.—What advantages result from the using of a telephone transformer?

A.—Demagnetisation of the phone or loud-speaker magnets is obviated, body-capacity effects due to the wearing of the phones are minimised, and the windings of the phones or loud-speaker being isolated from the H.T. battery, the possibility of a burn-out is eliminated.

High- and Low-frequency Amplification

Q.—What is the difference between high- and low-frequency amplification?

A.—Whether a valve or crystal detector is used it is essential that incoming signals should have a certain amount of energy in order that the detector will appreciate them.

In the case of weak signals some form of amplifier is necessary to increase the power of the incoming signal before being passed to the detector.

The signal reaches the aerial in the form of a radio-frequency oscillation, and therefore a high- or radio-frequency amplifier is used.

To magnify the volume of signals after they have been rectified and reduced to audible frequency, an amplifier dealing with low-frequencies is employed. This type of amplifier is extensively used for loud-speaker work, but is of little use for increasing the receiving range of the receiver.

Crystal Contacts

Q.—What is the best contact to employ with a molybdenite crystal?

A.—A flat strip of silver should prove most satisfactory with this crystal.

Aerial for Broadcast Reception

Q.—Which type of aerial is the most efficient for broadcast reception—the T type or inverted L type, double or single wire?

A.—For general reception the inverted L single-wire aerial is undoubtedly the most efficient. A T type aerial is only used from force of circumstances or for double-directional reception effects.

There is no appreciable advantage in using a twin-wire aerial for reception and its big disadvantage is increased capacity of the aerial system.

Interference

Q.—Am I likely to experience interference from the tramcars which pass by my house? I propose erecting my aerial at right angles to the overhead cables.

A.—Interference is likely to be experienced if the aerial is within 100 yards of the tramway cables. Much of the trouble may be eliminated by erecting the aerial at right angles to the tram lines with the lead-in wire joined to the further end of the aerial.

A counterpoise earth, loose-coupled tuning and not more than one stage of L.F. amplification will assist in minimising the interference.

Flickering Valve

Q.—Can you explain the reason why my valve occasionally flickers and, after going out for a moment, lights up again?

A.—Provided you are certain that your connections are quite in order, and that the variable arm fits tightly on your rheostat we can only suggest that one set of the accumulator plates is broken away from one of the accumulator terminals. There may also be an internal disconnection in the valve.

Slate as an Insulator

Q.—Can I use a slate panel in place of the more usual ebonite?

A.—The use of slate panels for wireless work should always be regarded with suspicion. Unless the slate is specially selected trouble is likely to ensue.

Much of the common material contains veins of mineral deposit, and in any case it absorbs moisture and "sweats" in a warm atmosphere. Good quality slate may be utilised if given a thorough coating of shellac after the moisture has been baked out.

Condensers across Primary

Q.—Is a fixed condenser necessary across the primary winding of a low-frequency intervalve transformer?

A.—With a well-designed L.F. transformer a fixed condenser is not necessary, but with the cheaper makes of instrument a condenser of .001 or .002 microfarad capacity is often an advantage.

Its use is to by-pass H.F. currents, thus obviating distortion. When more than one stage of L.F. amplification is employed only the primary of the first transformer need be shunted by a condenser.

YOUR QUESTIONS ANSWERED

At some time or other you are certain to come up against some difficulty in wireless that you cannot solve unaided.

Instead of worrying yourself with knotty problems, let the Technical Staff of THE WIRELESS MAGAZINE answer your questions for you.

Replies of general interest will be published each month, but a post reply will be sent without delay to every question if the following conditions are observed.

Ask one question at a time; write on one side of the paper only; attach to it the coupon on page 235; and send it with a stamped addressed reply envelope to: The Editor, THE WIRELESS MAGAZINE, La Belle Sauvage, London, E.C.4.



Britain's
Best
Broadcasting
Sets

GECOPHONE

(REGISTERED TRADE MARK)

1925 MODELS

In the construction of the new GECOPHONE models, it has been the aim to produce sets which combine the finest results with simplicity of operation and handsome appearance. The range of 1925 models has been considerably extended to meet every requirement. They embody to the fullest extent the same superlative qualities which have given the original GECOPHONE model its unrivalled reputation.

IF YOU DESIRE—A Crystal or a 5-Valve Set
Long range, Maximum volume of sound
To use a Loud Speaker or Headphones
Cabinet or Table Models
To use Accumulator or Dry Batteries
To get the best Value for Money

AND TO ENSURE THE MAXIMUM PLEASURE FROM BROADCASTING—

THERE IS A GECOPHONE FOR YOU

Call and inspect GECOPHONE 1925 models at your local Wireless Dealers, where you will be given an actual demonstration and expert advice regarding your installation.

Obtainable from GECOPHONE Service Depots, Electrical and Wireless Dealers, Stores, &c.

*Advertisement of The General Electric Co., Ltd. (Manufacturers and Wholesale only),
Magnet House, Kingsway, London, W.C.2.*



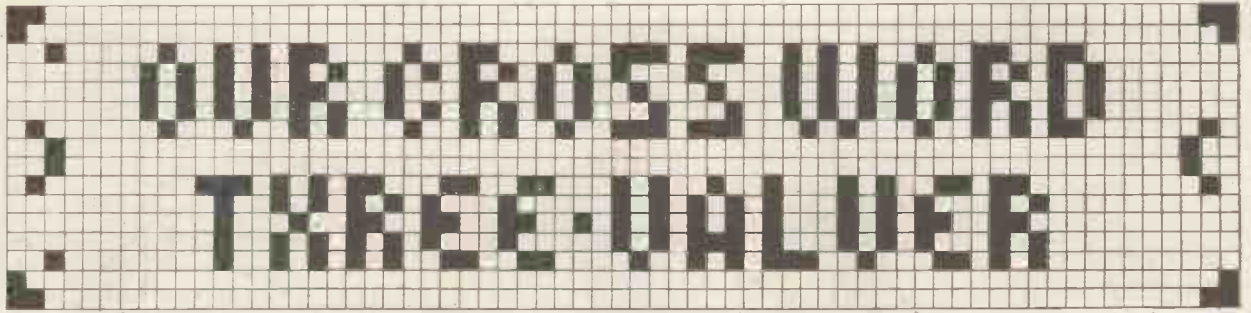
**GECOPHONE
Crystal Set**



**GECOPHONE
Single Valve Set**



**GECOPHONE
Two Valve Cabinet Set
(Det. & L.F.)**



THIS month our cross-word puzzle takes the form of a three-valve set, and though not perhaps so artistic as the real thing, it will nevertheless serve to strike a new note in this irresistible craze. For the benefit of those not conversant with these particular puzzles, we might say that every numeral marks the square in which a word begins. The black squares mark

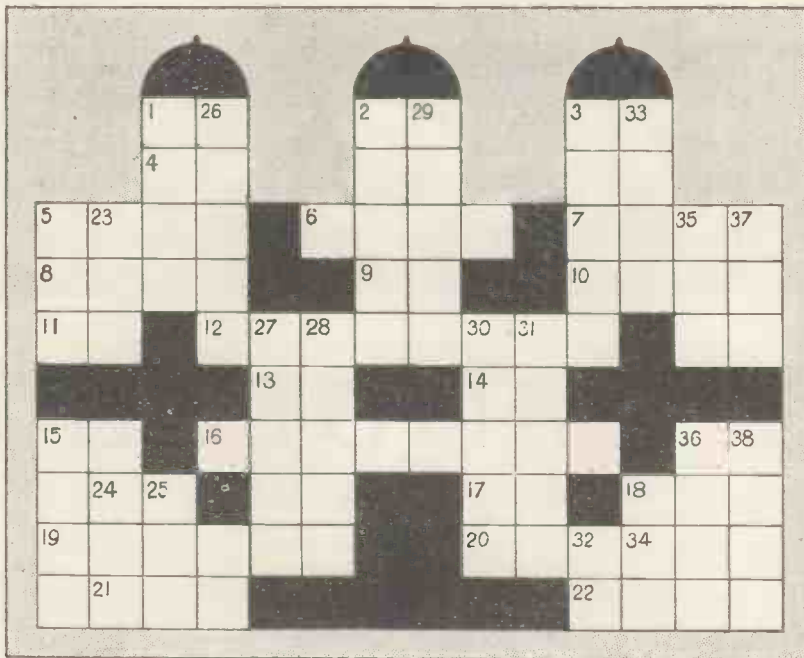
the point at which a word ends. Some words read horizontally and others vertically.

In most cases the words used in the puzzle are wireless terms or names of things connected with wireless, a fact which we feel sure will serve to stimulate the interest of those of our readers who attempt a solution of the puzzle.

To the reader sending a correct

solution accompanied by what we consider to be the most original cross-word puzzle made up of words of a wireless nature, we offer prizes of goods of any description, chosen from the advertisements in this magazine, to the value of *Five Guineas* for the *First Prize*, and *Two Guineas* for the *Second Prize*.

Entries for this competition close on Saturday, March 21st, 1925.



Definitions

HORIZONTALS.—1, A Type of Valve. 2, At the Wireless Dance. 3, Initials of well-known wireless periodical reversed. 4, In Charge of the Signal Section. 5, What the Battery Tastes Like. 6, An American Wireless Organisation. 7, On the Aerial in Frosty Weather. 8, Combinations of Letters and Numerals. 9, Secondary Connections Reversed. 10, Where the First Loud-speaker was Made. 11, Part of a Wireless Firm's Title. 12, Without it this Magazine would not Exist. 13, You. 14, Make of Valve. 15, System of Transmission. 16, Always interesting, sometimes explosive. 17, Aerial coil beheaded. 18, For Cutting Threads. 19, What you take out of a Wireless Shop. 20, For Measuring.

21, A Secondary Condenser. 22, The Economical Man's First Thought.

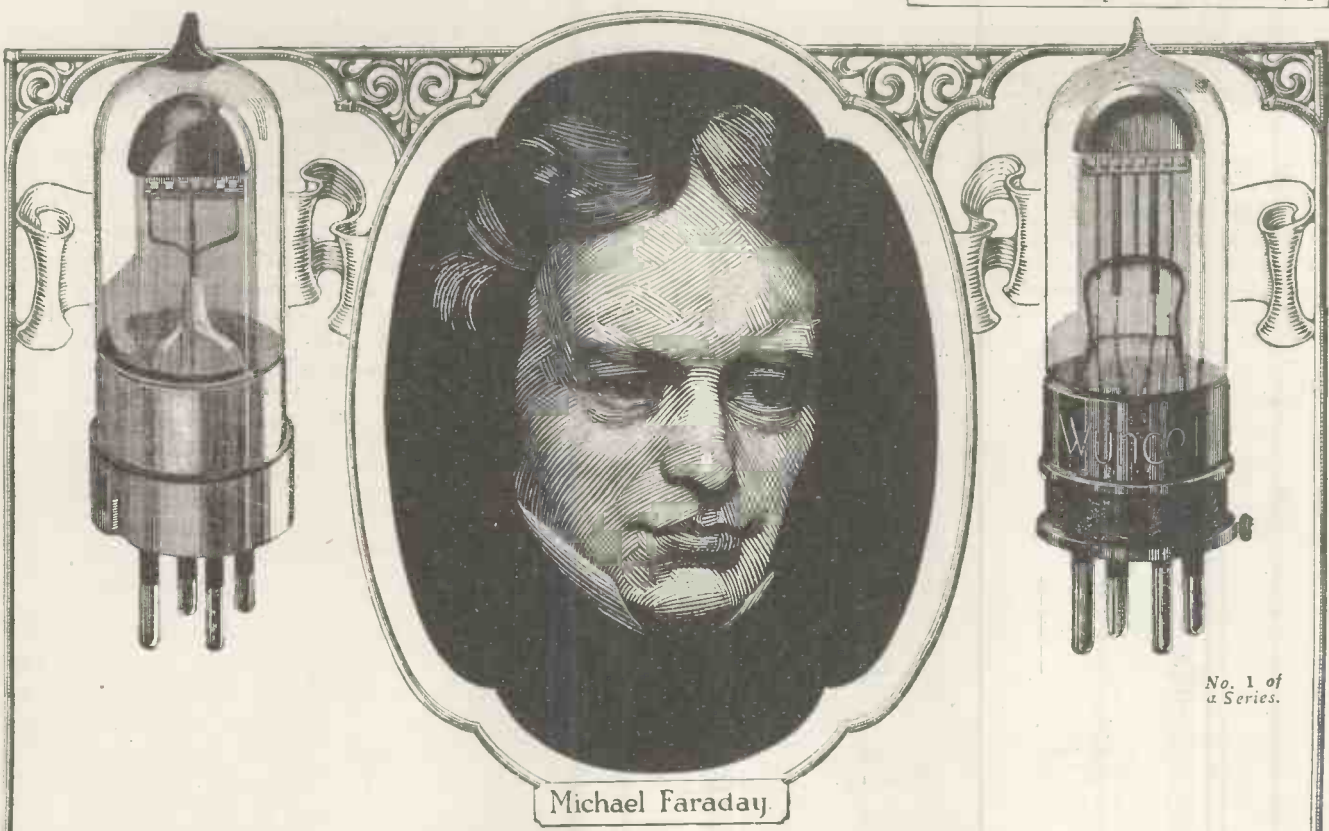
VERTICALS.—1, 2 L.O at Highgate. 2, Used in Telegraphy. 3, Essential in wireless. 5, Insulated wire. 15, Counterparts of Screws. 23, When You Put the H.T. Across the Filament. 24, Part of Name of Battery Suitable for Dull-emitters. 25, Used Instead of Valves for Transmitting. 26, For Fixing Components. 27, Seen in a Polished Panel. 28, What the King's Set is. 29, Broadcast at Christmas. 30, Gives out. 31, Usually with Super. 32, Usually has to be Rectified. 33, In the Accumulator. 34, Part of Well-known Call Sign. 35, A Million of Them (abbreviation). 36, Some long-distance Stories. 37, When the Announcer says "Good-night." 38, The Reaction Fiend.

"Combining the Gramophone and Broadcasting"

(Continued from page 169)

disc and at the same time eliminating any secondary noises due to the stylus. Moreover, inasmuch as the membranes and sound capsules so far indispensable are replaced by the same electromagnetic arrangement as used for transmission to a telephone or a wireless system, any other secondary noises so far inseparable from gramophone performances are effectually eliminated.

This electromagnetic (or rather solenoidal) transmission, which is also used in recording, converts any sounds and musical notes into fluctuations of electric currents, which in a similar way to those of a telephone or wireless-telephone system, by means of an amplifier, are raised to an intensity many times higher, in order eventually to be supplied to another solenoid, and there to be converted immediately into mechanical vibrations of a stylus serving either for recording or reproduction. Conversely, the tracings of a gramophone record can be searched by a stylus of the same kind, the mechanical vibrations of the solenoid core thus set up being converted directly into electrical fluctuations which, after being properly amplified, are supplied either to the sound funnel of a loud-speaker installed on the spot or to a remote (wired or wireless) telephone receiving post.



No. 1 of a Series.

Michael Faraday

The birth of a great idea

TO Michael Faraday we owe the discovery of induced currents. From his first simple experiment of winding two lengths of silk-covered wires around a wooden cylinder and placing in circuit with the one a simple battery, and between the ends of the other a galvanometer, has sprung most of the great electrical achievements of to-day.

Without Faraday's masterpiece there could have been no electric motors, generators or transformers—in fact, the complete structure of electricity is closely interlocked with the corner-stone of electro-magnetic induction.

Truly the birth of a great idea from one simple little discovery.

And in its way the invention of the Cossor Valve provides a striking analogy.

Here you see the inventor carefully considering the action of the thermionic valve. How its whole success is bound up in the efficient use of the electron stream given off by the filament. He, too, gets a great idea. If electrical measurements so conclusively prove that losses in electron emission mean losses in signal strength and sensitiveness, then why not re-design the Valve to keep these losses down to a minimum?

And so you see the inventor's dream crystallised into practical reality with the familiar arched filament almost totally surrounded by the hood-shaped anode of the Cossor Valve.

Cossor Valves

SOME "REFLEX" MYSTERIES SOLVED

(Continued from page 178)

tween them) without passing through the valve at all. If the energy so transferred equals or exceeds that handed back from the anode to the grid circuit no reaction effect will be obtainable whichever way round the coils are coupled. On the contrary, the signals may become weaker when the coils are brought very close to each other. This effect is exceedingly common in practice.

Reaction

If the opposite effect is noticed and reaction can be obtained with the coils coupled in either sense, the damping of the anode circuit is probably quite slight. It is also fairly safe to assume that a good deal of capacity exists between the various leads and components on the back of the panel. As is well known, to obtain reaction, energy must be handed back from the anode circuit in such a manner as to reinforce that in the grid circuit.

Magnetic and Static Coupling

This transference of energy may be obtained by the use of a magnetic coupling or a static coupling. When the anode and grid coils are in close proximity both forms of coupling exist between the two circuits. The magnetic coupling is the more apparent, but the static coupling nevertheless exists owing to the wire of the coils acting as the two plates of a condenser and the intervening air space as the dielectric. Under certain circumstances the capacity of this unintentional condenser, together with that existing between the leads and components of the set, may be so great that any reverse magnetic coupling (owing to the coils being coupled in the wrong sense) is more than neutralised and the valve oscillates whichever way round the coils are coupled.

Owners of reflex receivers often complain of the poor selectivity of their sets. The question of selectivity in these circuits appears to the writer to be closely associated with that of the much discussed question

as to the best position for the reflex transformer. There are various methods of connecting up this instrument, each having its own advantages and disadvantages.

In Figs. 2, 3; and 4, three such methods are shown. The disadvantage of Fig. 2 is that a fairly bulky object, with a considerable capacity to

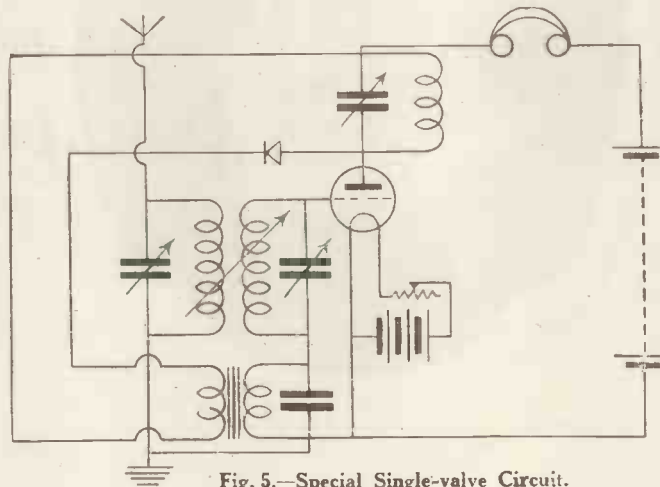


Fig. 5.—Special Single-valve Circuit.

earth, is placed at a point of high H.F. potential, which is always bad practice. The circuit shown by Fig. 3 is the one most commonly used, but it has the serious drawback that the accumulators, H.T. battery, phones, etc., are at a high L.F. potential to earth, which is almost equally bad.

Damping

Fig. 4 shows a method which has none of the foregoing disadvantages, but nevertheless possesses demerits of its own; serious damping is introduced into the aerial circuit, making this perhaps the most unselective of all reflex circuits. This arrangement is, moreover, extremely prone to pick up interference from A.C. mains or any stray earth currents in the vicinity of the "earth."

An Ideal Circuit

The method used by the writer (Fig. 5) has none of the previously mentioned defects. The transformer itself is not at H.F. potential, the L.T. and H.T. batteries are kept at earth potential, and the arrangement is much more selective than any of the arrangements shown in Figs. 2, 3, and 4, and does not seem to be at all

affected by the close proximity of 40-cycle A.C. mains.

Reaction Coupling Unnecessary

Moreover, with this circuit it is unnecessary to couple the anode and grid coils together to obtain good strength, as sufficient reaction is obtained through the interelectrode capacity of the valve, thus obviating the chance of any energy reaching the anode circuit without having passed through the valve.

J. F. JOHNSTON.

[Practical details of a Valve-crystal Reflex set constructed on the lines of the circuit shown by Fig. 5 will be published in an early issue of THE WIRELESS MAGAZINE. Readers should look out for this.—ED.]

Short-wave Practicalities

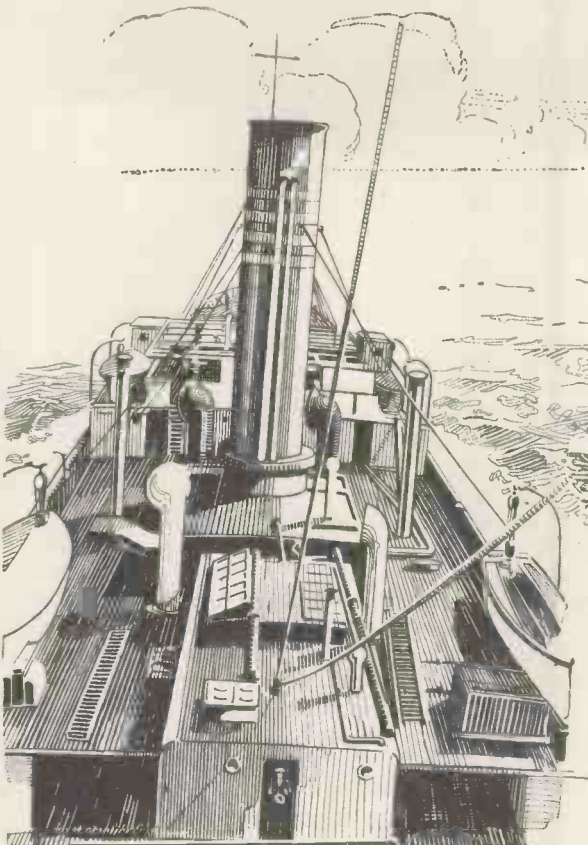
(Continued from page 141)

them by connecting their collars by a strap of good ribbon, leaving the one to be used for control reasonably tight and loosening the others. Many ways will easily be found for doing this.

H.F. Condensers

Good values for H.F. condensers, are .00025—for aerial condensers, .0005. Control will be found to lie chiefly with the H.F. condensers and the "pot'meter," the aerial condenser being almost negligible. An ordinary Igranite No. 25, with a .0005 series condenser, will tune well below 65 metres and the No. 00 McMichael transformers though nominally commencing at 80 metres will go below it with the .00025 capacity in parallel. As experiments advance it is wise to wind one's own transformers and even coils. This can be done quite simply and does not require explanation here. The method of trial and error will prove the best teacher.

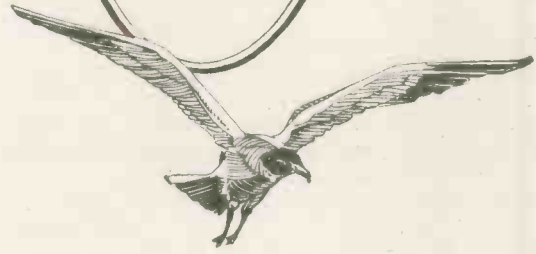
(To be continued.)



"Act as judgment says is proper"

"If to my Starboard
 ..red appear,
 It is my duty to keep
 .. clear
 To act as judgment
 .. says is proper
 To Port or Starboard.
 Back or Stop her -"

*A rule of the road for
 preventing collision at
 sea.*



THE "rule of the road" at sea calls upon the officer in charge of the ship in the foreground to "act as judgment says is proper" in avoiding collision with the approaching vessel.

To be able to form sound judgment and act on it promptly is one of the essential qualities of the sailor; and whether one is driving a car, playing billiards, or catching the morning train good judgment is equally necessary.

* * * *

Consider the components you fit to your wireless set.

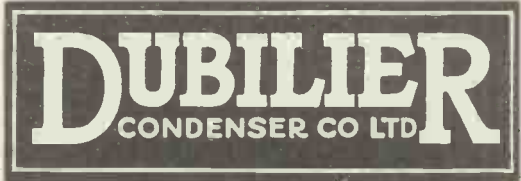
Upon them depends not only the success of the whole set but also your reputation as a wireless expert.

Your judgment tells you that if you choose the products of a firm which has a long specialised experience and a reputation for "making a sound engineering job of things" you will have chosen wisely and well.

It is a mistake to suppose that one make of condenser is much the same as another, and it is a mistake to believe that your set can give the best results if your condensers and resistances are of the just-as-good variety.

Act as judgment says is proper—

Specify Dobilier.



Ducon Works, Victoria Rd., North Acton, London, W.3.

BROADCAST MUSIC OF THE MONTH (Continued from page 181)

Vivian Worth was a student at the Royal College, studying under Sir Hubert Parry. Though she, too, would dearly have liked to have joined the concert parties, she was prevented, fortunately for her art, and by her application to her work gained the open scholarship, subsequently making her public appearance and gaining instant success.

Importance of the Conductor

Everybody nowadays realises the importance of the conductor, and some of the most famous, both British and Continental, have been heard through the medium of wireless. Amongst the latter may be mentioned Pierre Monteux and Ernest Ansermet (at the International Symphony Concerts), Weingartner, Hamilton Harty, Goossens and Sir Landon Ronald. The last has made conducting his strong point since the age of twenty-one, when he conducted grand opera at Covent Garden, but even then he was also considered one of the finest pianists of the day.

Few people, perhaps, remember him as conductor, and composer, too, of the music of that real old musical comedy *The Silver Slipper* at the Lyric Theatre, in which Edna May appeared. Time has brought him to be conductor of the Royal Albert Hall and the Scottish Orchestra, as well as Principal of the Guildhall School of Music.

As composer, Sir Landon has found opportunity for numerous songs, the most popular, though not really the best, being "Down in the Forest," from his song cycle "A Cycle of Life." Best of all are his "Adonais" and "The Garden of Allah," the latter broadcast from Birmingham.

The vocalist on the occasion of the Scottish Orchestra was another popular broadcast artist, Mme. Gertrude Edgard. One of the best known of Manchester singers, she is also an accomplished pianist, and made her first appearance when only eight. She has travelled all over the world, and during the war represented England at the Concert of the Allies in Paris.

Humour—a Difficult Item

Humour is always the most difficult item on any programme, but the B.B.C. have been fortunate in securing some of the best entertainers. Amongst them are Mr. Vivian Foster and Willie Rouse. Mr. Foster became styled the "Vicar of Mirth" by adopting the character of the unctuous country curate, with his catch-phrase "Yes, I think so," which has become as famous as Harry Tate's "Yes, I don't think."

Mr. Foster, though he obtains his humour apparently at the expense of the clergy, does so without causing any offence: indeed, he proudly confesses that some of the most enthusiastic members of his audience have been clerical. "Over the ether" he has been equally successful all along the line. Will he broadcast again, do I hear? Well, let me hasten to say also, "Yes, I think so!"

Mr. Rouse is known to us all now as "Wireless Willie," but few people realise that he is one of the finest organists in the country, having appeared as a professional

player when only thirteen years old, and was appointed Grand Organist of England in Freemasonry. He has been Musical Director of Masonic Festivals for over fifteen years. Turning to the variety halls, Mr. Rouse became famous as an entertainer, and is now Programme Adviser (humorous section) to the B.B.C.

Classical music has formed a very great proportion of the programmes, and some of the best-known London artists have given us examples of highbrow music. Amongst these have been the famous London String Quartet, Miss Dorothy Silk and Miss Marie Novello.

Miss Silk admits to a high ambition, that of popularising the works of Bach. She has specialised in old-world music and her recitals are always attended with interest.

Few big concerts have omitted the name of Miss Marie Novello, for she is a pianist of high technical abilities and a power that has made her name all over the world. Of Welsh birth, she has created a furore from the beginning of her career, and is now about to start another lengthy tour in France.

She played in the symphony concert at 2 L O conducted by Eugene Goossens.

Hardest Test for Artist

To play successfully before the microphone is one of the hardest tests set to any artist. "Don't judge me by my wireless performances," many a player has urged, and truly enough. To retain the purity and sweetness of his or her tone when broadcast is an added tribute to the artist's powers.

Most people will admit that this has been achieved by the Wireless Orchestra at 2 L O, owing a great deal to the leaders, Mr. Kneale Kelley (violin) and Mr. E. H. Robinson (cellist).

Mr. Kelley, who is also Deputy Conductor, is a London Symphony player and his tone possesses a richness and warmth rarely heard in orchestral musicians. Whether in academic works or foxtrots, he is a born soloist, and the amount of expression he can throw into "What'll I do?" is a revelation.

Mr. E. H. Robinson, another Symphony player, is also a member of the Snow String Quartet, heard at classical concerts, as well as being broadcast, the other members being Miss Jessie Snow, Mr. Kenneth Skeaping and Mr. Ernest Tomlinson.

When Mr. Kelley and Mr. Robinson are joined by their confrère Mr. Frank Hook, that very perfect Wireless Trio is obtained to cheer us "from many a talk unseen" in the afternoons.

There is, too, another fine body of String Players always welcome, the J. H. Squire Octet, led by one of the most brilliant of violinists, Mayer Gordon, one of the youngest professors of Trinity College. As a player of technical virtuoso music Mr. Gordon stands pre-eminent, and on his shoulders may be said to have fallen the mantle of Wieniawski.

We may safely say that the public has been well served this month in the way of notable personalities.

STUDIOS.

FALLON SQUARE LAW CONDENSERS

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).

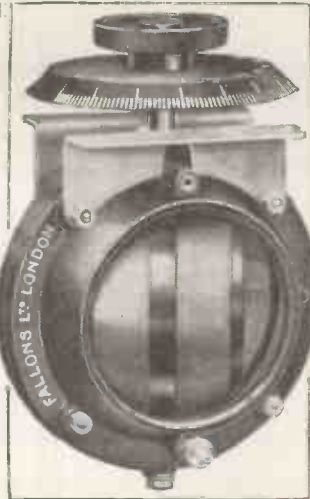
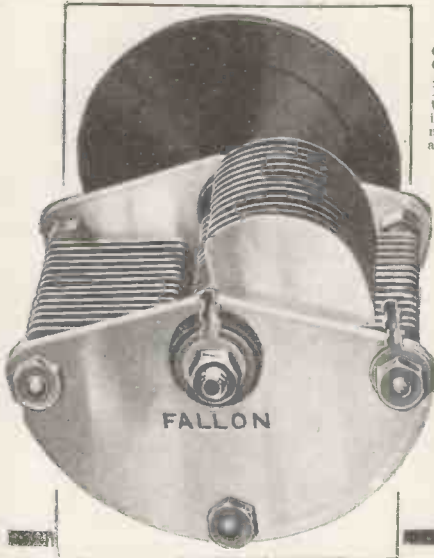
Price.	Capacity	Price.
.001 .. 9/6	.0025 ..	6/9
.0005 .. 8/6	.002 ..	6/-
.0003 .. 7/-	Vernier, 3 or 5,	4/6

STANDARD TYPE

With Ordinary Vanes

Price.	Capacity	Price.
.001 .. 8/9	.0025 ..	6/-
.0005 .. 7/-	.002 ..	5/6
.0003 .. 6/6	Vernier, 3 or 5,	4/-

Features include:
ONE HOLE FIXING, TAG CONNECTIONS, HEAVY ALUMINIUM TOP AND BOTTOM PLATES. Metal to metal adjustable bearings, stout, well-cut aluminium vanes. Complete as illustration.



FALLON FIXED CONDENSERS

—improve results in all sets

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 Fixed Condenser & Grid

Capacities up to .001,
1/3 each.

Capacities up to .004,
2/- each.

Leak COMBINED
(As illustrated.)

2 or 3 megohms, 2/6 each.



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Barclays 614

The SHIPTON New Type Strip Rheostat and Potentiometer

Moderately priced you get perfect filament control. Sensitive valves require delicate control. See you fit SHIPTON. You need nothing more costly—it controls efficiently.

THE Most Perfect Rheostat yet Introduced

Ask for it by name—the SHIPTON. Mechanically well designed and constructed; electrically, free of noise in operation, evenly spaced resistance wire, and a specially designed spindle which allows one-hole fixing and enables the provision of a compression spring which assures good contact of the rotating arm.

Use a wire Rheostat.

SHIPTON VERNIER

2-way coil holder	4/-
3- " "	7/6
Nickel-Plated " 2-way	4/6
" " 3- " "	8/-

SHIPTON NEW TYPE VARIABLE GRID LEAK

Silent in operation; constant under different settings; can be calibrated accurately and reliable under all conditions.

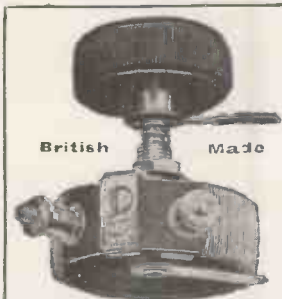
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SHIPTON New Type STRIP RHEOSTAT 7 ohm (with fuse) - 3/-
 SHIPTON New Type STRIP RHEOSTAT 30 ohm - 3/-
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 SHIPTON POTENTIOMETER 600 ohm - 4/6
 Packed in neat lined te boxes.

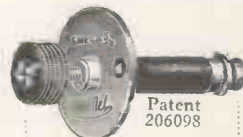


It's the refinement on the plunger!

which makes the difference. Many mysterious noises have their origin in the detector circuit. After considerable experiment we discovered that slackness of the plunger causing bad or intermittent contact was responsible for them. This same slackness permitted foreign matter to house itself between the collar and plunger—yet another cause of noisy operation.

The WATMEL therefore is now designed to obviate this trouble. A small but strong spring is recessed through the collar and compresses on to the plunger. This device ensures good contact. Slackness is automatically taken up, and the point of contact is always bright and clean.

The advantage: of the Watmel Variable Grid Leak, incorporated in the Detector panel, are already well known. The addition of the compressing spring makes the WATMEL super-excellent for assisting detection.



Patent 206098

5 to 5 Megohms . 2/6

50,000 to 100,000 Ohms 3/6

Other Resistances to suit any circuit.

Watmel

All goods of our manufacture bear this mark. It is your only guarantee.

See this name on every Grid Leak and BEWARE OF IMITATIONS. Get the Genuine WATMEL from your dealer.

THE WATMEL WIRELESS CO.

332a, Goswell Road, London, E.C.1.

Telephone

CLERKENWELL 7990.

Listening on the Long Waves

TO those who are fortunate enough to be able to read morse, there are numerous stations operating on the higher waves which are interesting to listen to. Even though one has no knowledge of morse, it is still interesting to listen to the signals, and to know where they are coming from, and thus be able to gauge the range of a receiving set.

These long-wave transmissions are much easier to tune in than are the short-wave broadcasting stations. In the case of the latter stations, critical tuning is needed, while in the case of the former there is no need to be so particular. Most of the high-wave traffic is worked on C.W.

American Stations

There are several American stations which can be received in this country comfortably on a two-valve set, provided, of course, that it is possible to tune up to the high wavelengths. Tuckerton (W G G) is perhaps one of the best known American stations; it works on a wavelength of 15,900 metres at intervals throughout the day. Tuckerton is in New Jersey. Another station is Coram Hill (W Q L), situated in New York State, and working on a wavelength of 17,500 metres; also Long Island (W Q K) on 16,465 metres.

New Brunswick (W I I) on 13,600 metres and Barnegate (W C I) on 16,700 metres are both New Jersey stations of considerable power, and can be heard working almost at any time.

To come nearer home, there are many high-power C.W. stations in Europe, among which may be mentioned Leafield (G B L), the Post Office station on 12,300 metres.

Then there is the Bordeaux (Lafayette) (L Y) station on 23,450 metres which transmits at frequent intervals, and is received regularly in New Zealand, and the Lyons (Y N) station on 15,000 metres. In Egypt, there is the Abu Zabal Radio near Cairo on 11,000 metres, whose call sign is S U C, and which has a considerable range. Some of the long-wave stations which still use spark are Paris (F L) on 2,600 metres, Budapest (H B) on 3,100

metres, and Moscow (M S K) on 5,000 metres.

There is a branch of long-wave work which is extremely interesting. I am referring to the traffic which is carried on between liners and shore stations at all times of the day and night.

Some of the larger liners employ C.W. apparatus which can communicate for distances up to about

2,000 miles on wavelengths varying between 2,000 and 2,400 metres. Most of this traffic is carried on with Devizes (G K U) when the liner is within range.

The various stations mentioned in this article can all be received on valve sets in this country, and in the case of the ship stations, reception should be up to about 2,000 miles. S. W.

SELENIUM (Continued from page 156)

for the reproduction of pictures for press purposes.

Most press photographs in the daily papers have a "grain" of that order.

And as each line is continuous and therefore gives the finest possible detail in one direction at all events, the eighty-four lines can be made to cover more than an inch without making the grain too coarse.

Such a transmission of a picture of eighty-four lines need not take more than a couple of seconds or so, so that a rapid change in the picture might be used to produce a sort of kinema effect

Towards Television ?

This brings us within hail of television, that dream of countless wireless enthusiasts. Let us briefly examine the prospects of its realisation by means of selenium.

We may put a mere acceleration of the above picture-transmission process out of court at once, for the presentation of new pictures in rapid succession would involve their synchronisation, and this is a task of endless difficulty, as most inventors have found to their cost.

The way out of the difficulty seems to lie along a further application of the resonance principle. It is found that the resonators can be made so selective that a discordance of 3 per cent. suffices to make them unresponsive.

Since an octave means a difference of 100 per cent. in the pitch, this means that we can get some 30 resonators into the same octave. And as there are ten octaves used in music, we ought to be able to get 300 different

resonators capable of working independently of each other.

Each of these we can make responsible for reproducing one point or patch of the image we wish to transmit.

Now 300 patches can be used for a quite recognisable reproduction of a human face.

Press Photographs

Many press photographs remain recognisable with an even smaller number, as can easily be seen by a close scrutiny of faces in a crowd on a newspaper photograph.

We are now within measurable distance of television itself. It only remains to devise a good method of breaking up the image of the object to be "seen by wireless" into patches of several hundred different frequencies.

There are several ways of doing this which cannot now be discussed. But the problem is now deprived of most of its terrors, and its final solution will not tarry long.

In that new achievement of science selenium will, in my opinion, have the first place. For it is an element, not a compound. Native stibnite and some artificial compounds like thallium oxy-sulphide ("thalofide") have a certain light-sensitiveness, and the latter is said to have a very constant zero.

But an element has always the advantage of being immune against electrolysis by a long-continued current. And nothing can approach selenium as regards "output."

THE U.S.A. contains over 500 broadcasting stations. Only a few more are needed, and then they will beat the number of illicit distilleries.

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"HOW-TO-DO-IT"
Weekly

A paper devoted entirely to helping all who like to turn their hands to some useful domestic job or interesting practical hobby.



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It helps you to make profitable use of your spare time.

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It gives reliable help with in-and-out-door repairs and construction.

□ PRACTICAL

It is written and illustrated throughout by people who know the amateur's difficulties and needs.

Special Offer

To Readers of "The Wireless Magazine." A free copy of the current issue of "The Amateur Mechanic" will be sent post free to any reader who sends a postcard before March 14th to the Editor, "Amateur Mechanic," 29, La Belle Sauvage, E.C.4.

"The Amateur Mechanic" makes all the difference to you between failure and the supreme satisfaction that comes from "something attempted, something done." It is edited by Bernard E. Jones, editor of "The Wireless Magazine," Cassell's "Work" Handbooks, "Amateur Wireless," and other famous technical publications; and the contributors to it—each an expert in his own department—not only know the Amateur's difficulties, but know exactly how to direct the Handyman to achieve his purpose. The articles are simple, practical, clear and illuminating.

3^D EVERY THURSDAY

Cassell's



ONE has to be mighty quick, these days, to follow amateur working between this country and the United States. Our own amateurs are not supposed to go below 150 metres, whereas the Americans are working well below 100 metres. The consequence is that you hear a station calling or perhaps working with another, and you have either to soar up or dive down to get the answer. Ten chances to one, the answer is something in which you are particularly interested, but you are very lucky if you get it.

This division of working bands has certainly made it easier to pick up Americans, because there is not a great deal of interference close at hand. We get some from the Continent, it is true, but that is not so bad as having it all around one.

Some extraordinary work has been done recently by British amateurs, both in picking up their American friends and in working with them, but there is no doubt that much of this success is due to the minimising of interference, as well as to the increasing skill of operators.

An Interesting Letter

I recently received a most interesting letter from an American listener describing the type of apparatus that is used for short-wave reception on the other side of the Atlantic. Of course, as we all know, conditions are very different over there from those which obtain on our island.

In the States they seem to aim at a very high degree of selectivity, as well as range. I should have thought that the Reinartz circuit, an American invention, was selective enough for anyone, but they do not seem to think so. According to my informant, the favourite circuit amongst the most successful "D.X." (long range) workers is an ordinary loose-coupler, with reaction on the secondary inductance. The inductances are made up with great care and in a special way

Personally, I do not think the description I was given sounds like a very efficient arrangement, but you shall judge for yourselves.

The primary, of about No. 18 gauge wire, either cotton- or silk-covered, is wound on a three- or four-inch ebonite former. At either end of the ebonite tube is a ball-shaped former revolving inside it, and wound with about No. 20 cotton-covered wire. One of these rotors acts as a reaction coil and the other as a secondary coil.

Apparently both ball formers and the tube former are solid. This would appear to be likely to have very high losses, and yet the Americans are more than merely keen on "low-loss" components.

No Amateurs

I have heard very little amateur telephony of late on the short waves; but on one or two evenings I have tuned in the transmissions of that mysterious Frenchman who *never* gives a call sign. It would be interesting to find out who he is. Very often he has quite a good deal to say, calling various friends, and giving messages; but never, no never, does he say who he is.

Short-wave Broadcasting

We are still waiting for news of our proposed short-wave broadcasting station, and, meanwhile, others are forging ahead. The German station seems now definitely camped on 120 metres, and is doing some really excellent work.

It has a really first-class orchestra, and though reception suffers because of distance, the programmes are quite enjoyable. I am not sure, yet, whether this station is situated at Berlin or at Nauen. It can usually be heard on Sunday evenings and on many other days of the week; but, so far as I know, there is not, as yet a definite and fixed programme

What is "Below the Belt"?

The transmission, which is, of course, broadcasting, brings up the question as to what can be called "below the broadcast belt"? For the present we can take it to mean below 300 metres, the lowest of our own stations being the Sheffield relay station on 301 metres, but doubtless the broadcast belt will be dropped lower and lower, and the amateurs will go lower in sympathy.

The other day I heard, on about 100 metres, what was apparently a "boost" of a much advertised system of memory training. I was just wondering what amateur had the temerity to disobey the strict rules against the broadcasting of advertisement matter, when I discovered that it was an army station giving a five-minute reading test.

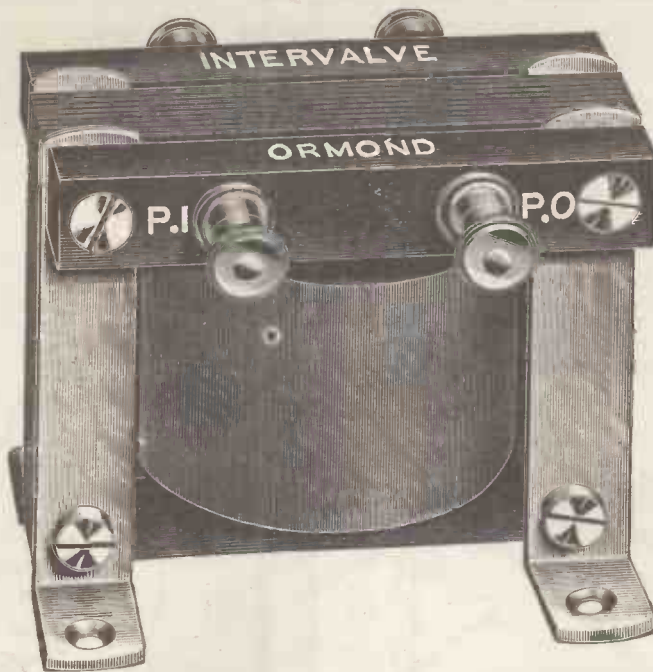
I suppose the operator had picked up a paper from his table and was reading the first big type advertisement he saw.

By the way, those who can get down to 50 metres will find there a useful calibration point in the transmissions of A I N, the French Army station at Casablanca, Morocco. This station seems to do a great deal of work and can be heard over the greater part of this country. I hope, in the near future, to have something to say about work on 50 metres and below. At present I am experimenting.

Still They Come

The same old crowd of Frenchmen are "coming across," headed by 8 A B with his unmistakable note. Since British 2 K F (Mr. J. A. Partridge) showed them the way, many of them are trying to get into communication with their own colony, French Indo-China.

2 K F was picked up in Saigon in December. I have heard a rumour that two-way working has been established. If so, it must mean another broken record. 5 Y M.



“ORMOND” TRANSFORMERS, 15/- each

You should look for the name “ORMOND” on your purchase—it is your *GUARANTEE*.

This Transformer has been entirely re-designed as the result of extensive research, particular attention having been paid to:—

- (1) Elimination of objectionable resonance.
- (2) Correctness of ratio.
- (3) High Resistance of primary.

The use of grid cells is strongly advised. To obtain the best results the Transformer should be connected as follows:—

- P.I. to + H.T.
- P.O. to plate of detector or last L.F. Valve.
- S.I. to grid of next valve.
- S.O. to negative side of grid cells.

The positive side of grid cells should be connected to negative L.T.

It is recommended that the primary be shunted by a fixed Condenser having a capacity of from .0015 to .003 M.F. The secondary should be shunted by a variable high resistance, a good quality variable grid leak is most suitable.

Grid cells should be tried from 1.5 to 6 Volts to obtain best results.

The testing of these transformers is most searching, each being tested on our own aerial before being boxed.

We specialise in turning Brass and Steel Screws and Machined Parts and Accessories of all descriptions.

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LOOSE-COUPLED SETS WERE USED WITH ADVANTAGE IN DISTRICTS SUBJECT TO "JAMMING"

TAPPED COIL AND CONDENSER TUNED SETS GAINED FAVOUR AMONG DISCERNING AMATEURS. CARBORUNDUM AND SILICON WITH A STEEL NEEDLE CONTACT WERE COMMONLY USED FOR DETECTION

AMERICAN EXPERIMENTERS GAVE US THE VARIOMETER - AND THE PERIKON DETECTOR

WHILE "AMATEUR WIRELESS" INTRODUCED THE CRYSTAL LOUD SPEAKER

AND THE MULTI-PHONE CRYSTAL SYSTEM

Taff.

SODION VALVES

THIS ingenious type of detector possesses certain advantages which have already brought it into favour with American experimenters, and which deserve to be better known to the amateurs of this country. Although having an equal range and sensitivity to that of an ordinary back-coupled valve, there is no reaction between the Sodion circuits.

The tube contains three electrodes,—an anode of sodium, potassium, or other electro-positive metal, an ordinary filament taking a maximum current of .26 ampere, and a U-shaped plate or collector which partly surrounds the filament. In series with the filament is a heating-wire which is wound around the bottom of the tube and serves to keep the sodium anode warm, thereby liberating a copious supply of sodium vapour inside the tube. A high-tension battery is connected in series with the phones across the anode and filament terminals, whilst the potential of the plate or collector relative to the filament is adjusted by a tapping to a potentiometer bridging the filament battery. The rectifying action of the tube depends upon the production of positive ions owing to the bombardment of the sodium vapour by the electron stream from the filament. These ions cluster around the filament and form a space charge, which, in turn, is controlled by the signal voltages applied to the collector plate.

B. A. R.

Wireless Femininities

(Continued from page 150)

Wireless has given us a new appreciation of the human voice, and a beautiful pronunciation of English. Moreover, a new dramatic technique is evolving from the broadcasting of plays.

Creeping Into Art

Now it is beginning to creep into art, as apart from the comic cartoon and the news photograph. Have you seen that delightful picture (I'm afraid I don't know the artist's name), entitled "The Children's Hour"? Just a youngster wearing phones, and a wholly absorbed expression—very charming, very true to life and very up-to-date.

A. M. M.

LEARN LANGUAGES

The Linguaphone Way

Do you enjoy Mr. Stephan's talks from 2 L O ? Perhaps you do not understand French well enough to thoroughly appreciate them ? Why not overcome this disadvantage by learning to speak French by means of

LINGUAPHONE LANGUAGE RECORDS

The Records (which can be used on any gramophone) are a series of cleverly graduated talks, including descriptions of scenes and happenings in everyday life, clearly spoken by a cultured Parisian. You follow the speaker by means of the illustrated text-book supplied.

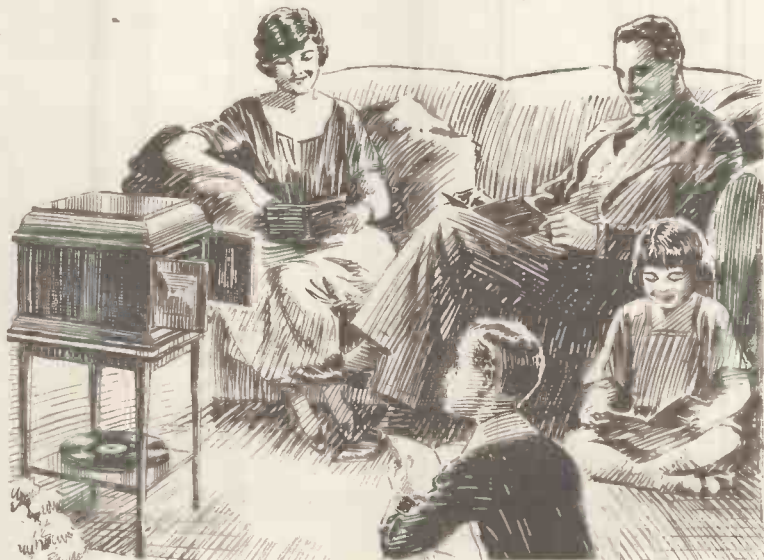
Very soon after you commence the Course you will find you are able to speak French like an educated Frenchman, and to understand it readily whenever you hear it spoken, as well as to read and write it. In the same way you can also acquire

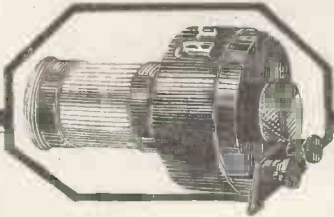
SPANISH, ITALIAN or GERMAN

Why not start to learn *now* ? The cost is extremely moderate and remember that you, your friends, and every member of your family (adults and children) can receive instruction at the same time without any extra outlay.

Write or call to-day for Free Booklet describing the Linguaphone Method in detail and seven days' trial offer.

THE W. LINGUAPHONE INSTITUTE,
34 & 35 HIGH HOLBORN, LONDON, W.C.1.





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

From all Dealers

S. G. BROWN LIMITED

Victoria Road, N. Acton, W.3

Showrooms:

19 MORTIMER STREET, W.1
15 MOORFIELDS, LIVERPOOL
67 HIGH ST., SOUTH AMPTON

Brown

Wireless Apparatus

Gilbert Ad. 2077.

Broadcasting—To-day and To-morrow

(Continued from page 133)

that is missing, and the result is still near enough to reality to afford him, if he likes the programme, intense pleasure.

Far from Reality

The picture at which the world never tires of gazing is actually far from reality; it is merely a flat piece of canvas messily covered with diverse pigments; it is the eyes of the believer that complete the sensation of beauty derived from a mechanical simulation of reality.

So with our sound transference system. We, at our end, are continually working to improve; now let us indicate how the receiver, too, can largely be improved to "bring us nearer to the heart's (or ear's) desire."

Receivers

Space is limited. Did I discuss all receivers, I am afraid the Editor's blue pencil would be busy. I am discussing broadcasting, and therefore I will forbear to mention receivers for listening to stations outside their reliable limit—outside the limit, that is, where interference of any sort becomes serious compared with signal strength. (I don't refer to oscillation; that can be serious almost anywhere.)

The subject necessarily divides itself into high-frequency and low-frequency amplification. If phones are used, it is probably unnecessary to introduce any low-frequency.

Precautions

There is very little distortion in the high-frequency side, provided the following precautions are adhered to:

(1) Use very little reaction; it is unnecessary at the ranges specified.

(2) If a valve is being used as a detector, do not use too high a value of grid leak, preferably use a valve that rectifies without it. This may sound revolutionary, but I have certainly traced certain distortion to the use of grid leaks—at any rate, to those of too high a value. If you must use an open-mesh valve, presupposing a grid leak, cut the value down until your signal is but half its original

value when you had "efficiency" (a word that is so greatly misused for broadcasting).

(3) Use simple, straightforward circuits for listening to near-by stations. While reflex and complicated circuits are excellent for long-distance reception and for loud signals with few valves, they may introduce distortion when listening to local stations.

Against Accepted Practices

It will be seen that all the above advice goes against accepted practice. The public demands the loudest signals from the fewest valves. Manufacturers must live, and they have been forced to a large extent to meet this unfortunate demand. It would be a bold policy, but in my opinion a right one, if sets were designed with a greater number of valves working more within their limits. I think development must lie along these lines if we are to aim at better-quality reproduction.

I do not think that these remarks apply in the same degree to phone reception because, in my opinion, "phones" are the greatest bar of all to progress towards perfect reproduction; a chain breaks at its weakest link.

Cost

I realise very fully that a question of cost is involved, and that commercial concerns must study this aspect. My opinion is purely a personal one. I venture to suggest, however, that with the inevitable cheapening of valves and improvements in mass production, a time will come when not a set will be sold without a loud-speaker, just as no car takes the road without self-starter, hood, wind-screen, spare wheel, etc., all of which were, at one time, luxuries.

In Moscow a limited company has been formed, with the title "Wireless for All." It sounds more like an unlimited company.

"PARLEZ-VOUS FRANÇAIS?"

HAVE you noticed the touch of affectation that creeps into the speech of some of the B.B.C. announcers when they have to use French words and titles?

But all the French transmitted from 2 L O does not suffer from this fault. No pronunciation could be better than that of the admirable M. Stephan, who gives the fortnightly talks on behalf of the Institut Français.

These talks are of considerable value to those who wish to acquire the best French accent.

It may truly be said that broadcasting brings France to our fire-sides—and there is no fear of getting "that sinking feeling"!

My Five-valve Receiver

(Continued from page 159)

metres can very often be tuned in to satisfaction.

If all the five valves are used, many strange stations can be heard, but it is often impossible to recognise them unless a good wavemeter is at hand. As regards American reception there is no difficulty in picking one or other of the stations out, and on a good night, if there are too many atmospherics, the number of valves can often be reduced to three. K D K A can be received on 100 metres very clearly but some special means have to be resorted to in order to get down to that wavelength. An efficient method is to use a counterpoise earth, and anti-capacity valves are also much more suitable than the usual four-pin type.

E. R.

Wireless Legalties

(Continued from page 165)

cases where an aerial crosses a street or highway. Here the local authority (usually the Borough Surveyor) must be consulted. No one has a *prima facie* right to throw an aerial wire across a public thoroughfare. Permission is sometimes given, but only as a matter of privilege, and any conditions attached thereto must be strictly observed. The same applies where an aerial crosses the way-leave of telephone or power supply lines. Permission must always be obtained and the necessary guard wires erected.

Genuine "BRUNET"

STOCKED BY ALL LEADING WIRELESS DEALERS.



SHROUDED TYPE

Ratios 1/3 { 5,000 Primary turns.
15,000 Secondary turns.
Ratios 1/5 { 5,000 Primary turns.
25,000 Secondary turns.

Price 13/6 each

"BRUNET" L.F. TRANSFORMERS

enjoy as high a reputation as the famous "BRUNET" Headphones. Many leading manufacturers of wireless sets in Great Britain and Europe have always used this L.F. Transformer owing to its magnificent amplification without distortion, freedom from breakdown, and high insulation resistance.

OVER 1,000,000 in use.

"BRUNET" HEADPHONES



NEW MODEL, "TYPE D."

Hygienic Horn Headbands. Nickel-plated Stirrup. Black and White Cord. Each receiver stamped with trade mark. 4,000 or 8,000 ohms resistance.

"BRUNET" HEADPHONES

have been adopted by the majority of European Governments and Radio Companies as their standard type, and in Great Britain alone there are over 358,000 in use out of a total of 1,000,000 manufactured since 1914.

In the new model (illustrated) considerable improvements have been made in the head-band to ensure greater comfort; and the cord, of the same first-class quality, has been changed from green to black, striped with white.

Fully guaranteed, will be replaced without question if faulty.

PETTIGREW & MERRIMAN Ltd.,
122-124, Tooley St., London, S.E.1

Sole Distributors

Newey Snap

Terminals

Continental Notes

IT is really remarkable how badly informed some of the Continental wireless papers appear to be as regards events which may take place in other countries but their own. Paris wireless papers are especially great sinners in this respect.

In a recent number of a French wireless paper I read a paragraph in which it was seriously stated that our B.B.C. were now contemplating a series of technical lectures to taxi-cab drivers. According to this well-informed correspondent the chauffeur students were to be taken to a local garage to make themselves familiar with "every kind of characteristic noise inherent to a motor breakdown."

In this manner, when similar noises were broadcast from the studio, in order to illustrate the lecture, there could be no confusion in the mind of these students who would then, without any difficulty, follow the lecturer's technical talk [*sic*].

Learning French

British listeners who wish to improve their knowledge of the French language could do worse than listen to some of the lectures relayed by L'Ecole Supérieure des Postes et Télégraphes (P.T.T.), Paris, from the Sorbonne University.

It is one of the oldest of the Paris educational centres and its lecture rooms are too small to accommodate the increasing number of students. Apart from proving of considerable utility to French scholars, the relaying of these lectures gives us the opportunity of listening to some of France's most eminent professors.

Outside Relays

When, at times, I have successfully netted Frankfort-on-Main, Hamburg, Breslau or Leipzig, it seems to have been my luck to tap the waves when transmissions of grand opera were being made.

In some instances, as in the case of Frankfort, the fact that relay was being effected from the local opera house was immediately apparent—not owing to sounds of applause, which is taboo in a German theatre until the end of the act—but because I got the impression of music and voices emanating from an auditorium considerably larger than the usual broadcasting studio.

You all know that particular echo one hears, and that feeling of spa-

cioussness of which one is conscious when listening to an outside relay. Sounds appear to be fuller, of a "rounder" quality, and then there are always the slight rustlings and coughs associated with a large audience.

Although on the Continent operas are also produced in the station studios, frequent relay is made from the State theatres. The foreigner, in this respect, has many more opportunities of hearing that class of music than we have in this Kingdom. Thanks to the B.B.C. good use has been made of transmissions from the B.N.O.C. and the Old Vic., but it seems a great pity that we cannot, as do even comparatively small European cities, run a ten months' operatic season.

It is a valuable stand-by for a broadcasting concern, and adds considerable variety to the weekly programmes. However well produced, operas performed at a studio cannot vie with the real thing staged on a major scale.

Cabaret

Listening to the relay of the "Midnight Follies" some few weeks ago, took me back, in thought, to Paris, Berlin and Vienna, in which cities the cabaret is a widespread form of entertainment.

I do not know how many actually exist in Paris, but in Berlin and Vienna you find them in almost every West-end thoroughfare.

When in the German capital last winter, I visited very many of them and was able to compare the programmes with those given in the Ville Lumière. Although, in Berlin, one discovers quite a host of talent, the performance itself is always inclined to be of the "azure" variety, and would not for one moment be tolerated in London.

Many of the turns I heard when listening to the "Midnight Follies" were of Austrian origin, and I speci-

ally recognized "Oh, Katherina" and "The Harvest Moon," which latter I had heard at the "Rakete" with Josse Selim and Ralph Benatzky, under the original title of "Die Glocke der Liebe."

It is a haunting melody, and I am not surprised that it has caught on in London. Viennese music is so very typical of that light-hearted and highly artistic city, and the sounds of that familiar tune took me right back to the borders of the Danube and to the gaily-illuminated Prater.

Radio-Wien is a station which, unfortunately for us, does not come well over the ether and appears to be little heard in this country. I have been fortunate enough, now and again, to secure sufficiently clear reception to recognize some of the items and, on each occasion, when the Silving Orchestra has been playing, I have noticed how very local its programme has been.

Austrian music, through the medium of Fall, Lehar and Strauss, is well-known in this country, and in every instance musical comedies or comic operas of Viennese origin have scored a big success.

Hilversum—H D O

It is now quite a pleasure to tune in the new and improved station of Hilversum (Holland). Disguised under the new call-sign of H D O, it is still our old friend N S F of former days, to which a new lease of life, with increased energy, has been given.

With one H.F. detector and a stage of L.F. amplification, it is possible to receive H D O at almost the same strength as 5 X X—at least, in my part of London. Hilversum is far from possessing anything approaching Chelmsford's power, but the new aerial appears to have worked wonders.

The Dutch make a feature of scientific lectures which, as they are given in the native language, may not appeal to all listeners on this side, but music is international, and some of the programmes I have heard were of particularly high quality. Arrangements are being made for the performance at that station of the famous Willem Mengelberg orchestra, so beloved by the Amsterdam public. Relay of opera from both Holland's capital and Amsterdam is also contemplated.

"JAY COOTE."

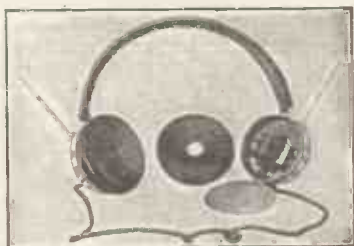


No better 'baccy comes
from "Old Virginny"

**PLAYER'S
NAVY CUT
TOBACCO & CIGARETTES**



WHY PAY MORE?



THAN **1 1/6** PAIR
4,000 ohms Double Headbands
TRIED, TESTED & TRUE

Hundreds of thousands of wireless enthusiasts are buying Headphones daily.

DO THEY KNOW WHAT THEY ARE PAYING FOR?

If only they stopped to think and compared values, would they pay twice as much for practically the same article?

WOULD THEY?

We should think not! And we cannot too strongly advise you to

TAKE WARNING

and insist on being shown the

I.M.I.

“Astoria”

HEADPHONES

Handle them, screw off the cap and examine the inside, try them on and note the comfort over your head and the close fitting at the ears, and you will realise what satisfaction means at a small cost only.

Obtainable from all dealers.

**IMPERIAL MOTOR
INDUSTRIES, LTD.,**

Wireless Dept.,
Denmark Street, W.C.2
Tel. 3317 8 GERRARD.

“IN TUNE WITH THE PAST”

(Continued from page 161)

Crighton-Wood could tell whether this sound had come from the loud-speaker or from the distant sky beyond our window.

We looked at one another without speaking.

“What’s wrong?” asked Crighton-Wood suddenly.

“Nothing,” said I.

But somebody had sighed a long sigh of weariness and oppression.

“It’s your infernal machine,” I said.

“Nonsense!” Crighton-Wood replied. “There’s no sound on earth to be heard at this adjustment.”

“Listen!” I ordered.

There was a step coming along the corridor.

“Who the devil’s this?” exclaimed Crighton-Wood. “They have my definite orders to keep away.”

Whoever it was was walking very unsteadily. Twice we heard him lurch against the panelling.

“He’s dined,” I suggested—rather for the sake of something to say.

Crighton-Wood looked angry.

Then happened a thing which tightened the skin across my cheekbones and lifted the very hair on my scalp. We heard the metal latch of our door lift and the door itself swing open, with the unmistakable creak which I had heard as we came in. But the door at which we were staring did not move!

“May I come in?” asked a thick, uncertain man’s voice.

“God!” whispered Crighton-Wood, “what’s this?”

“It is your machine,” I whispered, and this time he did not answer.

After a horrible pause we heard the door as distinctly shut and fastened.

“Your welcome is not of the warmest,” said the same voice.

“If I were not tired of brawling, I should have forbidden you to enter,” answered a second voice—a woman’s, and most beautiful. But it spoke from the chair in which I myself was sitting, and I leaped up, very frightened indeed.

Crighton-Wood put aside his phones and was listening in a strange mixture of incredulity and terror. Without saying a word, he crossed the room to the corner where I now

stood and seized me by the arm. So we remained.

“Do you suggest that I would have come in against your wish?” asked the man’s voice.

We heard him clutch at one of the tables in the room and the table move a little with his weight. I recognized the sound—Crighton-Wood had moved that table earlier in the evening—and I was watching the table now, but it did not move a hair’s-breadth.

“I do not suggest,” said the woman’s voice, “I know.”

The man—if this could be called a man—laughed.

“B’gad, you’re right,” he said, “you uncompromising little . . .”

He used a very simple, forcible word.

“Would you not care to beat me?” asked the woman scornfully. “It is usual, I believe, with those who speak your tongue.”

At that we heard three dragging steps across the room, passing very close to us.

“What now?” I whispered, my own tongue dry and difficult to manage.

“He’s gone to the window,” croaked Crighton-Wood.

If he had, something there seemed to disturb him, for he sent one of the chairs spinning across the floor. I cannot hope to convey the absolute precision with which we heard that chair slither across the floor before us—and the chair itself standing still and quiet.

A louder, more threatening, clap of thunder made me look eagerly out of the window, but the night was serene and cool. Crighton-Wood shook his head.

“That belonged to ‘these,’” he said, nodding towards the room. “He was probably startled by the lightning.”

We heard “him” swear softly.

“Outside and in,” said he, “there is small sympathy for me.”

“Sympathy?”

It was the woman who laughed now, and that was the hardest, loveliest sound I have ever heard.

“That is something like love, surely,” she said.

“Then I wager you have sympathy and to spare for Fielding,” said the man savagely.

"And if he were my lover," asked the woman, "have you forgotten who bade me find a lover?"

At this taunt the room grew tense with rage: a strange sensation when there was nothing in it to be seen but Crighton-Wood's instruments with their four-and-twenty glowing lamps and one round mouth. Then from this mouth came the sound of quick steps: steps, you understand, across our floor. It was apparently the man who had crossed the room, for when he spoke his voice came from near to the woman's. He had smothered his anger and spoke softly.

"Must you seek for love so far afield?" he asked. "Is it beyond imagining that a lover should live at home?"

"I have met none but drunkards there," answered the woman.

"And why am I drunken, if not because you are so cruel and terrifying?" asked the man. "I never was brave, God pity me!"

"You were once gentle," said she, and it seemed that she softened a little.

"Annabelle!" cried the man, and I felt the sound of it pluck at Crighton-Wood's nerves as it did at mine, remembering the name on the door of that room.

There was a little confused sound, as though of an embrace offered and refused, and then this man whom we could not see started to plead with his lady for her love. As he spoke, I understood a little how it is that a woman will turn from a mute saint to the blackest sinner with the gift of speech. She was a woman of spirit was Annabelle, scornful and resolute, but she let him speak and so was lost. Though she cried out against her weakness, we heard him catch her in his arms and kiss her.

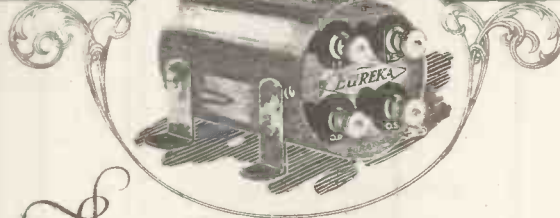
"Annabelle!" The whisper was content.

It was answered by a crashing through the bushes outside our window. It would be hard to say whom this startled the more: Crighton-Wood and I or Annabelle and her lover. We heard these two spring apart and the sound of someone climbing into the room. The stone window-sill was struck by what might have been a spurred heel.

"If only we could see!" said Crighton-Wood.

There was an unsteadiness in his

(Continued on next page)



No. 2
of a
Series

The Living Artist

THERE'S nothing more distressing than to hear a piano solo travestied by wireless. And nine times out of ten the fault lies not in the Loud Speaker at all but in the use of an unsuitable L.F. Transformer.

A good Transformer is something more than a bundle of laminations and a few thousand turns of fine wire. If it is to function correctly it must be designed according to definite scientific standards and not according to hit-and-miss methods.

Before a single Eureka Transformer was placed on the market many hundreds of pounds had been spent in research work. It was not a case of following current practice and adding one more

to the many already available. The designers of the Eureka began where others left off. They ploughed a lonely furrow—but they won through.

Eighteen months ago unknown, to-day the Eureka is recognised as being the country's finest L.F. Transformer. Its handsome appearance would certainly add an air of distinction to your Set, while its immense volume of superb tone would be a revelation to you.

Concert Grand 30/- Portable Utilities Co., Ltd., Eureka No. 2 22/6
Fisher Street, London, W.C.1. (For Second Stage)

Supreme **EUREKA** for Tone

"IN TUNE WITH THE PAST" (Continued from page 217)

tone and look which I did not like. These manifestations were so clearly beyond and apart from us that my fear had given way in part to interest. With Crighton-Wood this could never be so. To understand is his first necessity. Things which mystify him he must either forget or be possessed by.

"There is nothing to see," I said. "If there were, one more or less would make little difference."

"But I can't understand it," he said, like a child.

"Don't try," I advised. "Listen."

"St. John!" cried the Lady Annabelle, sharp and frozen.

Her lover laughed, most uncomfortably.

"Why, I have stayed too long, Annabelle," he said. "Or is your friend before his time?"

"This is a cowardly fool and no friend of mine," bitterly said Annabelle.

"Then we will beg him to leave us," said her lover.

There was a bow suggested by his tone.

"What on such a night? For shame!" cried a new voice. "And I have most earnestly desired to meet you, sir, Annabelle—"

"You have been asked to go," said Annabelle. It was proudly said, but suddenly I pitied Annabelle.

"But I could not believe my ears. Your invitation——" The words had scarcely left the intruder's lips before we heard the sound of a stinging blow.

"St. John! If you hope to see me again!" There was desperation in Annabelle's warning.

Her lover laughed again.

"That is a strange bribe to offer in my presence," he said; then, "Sir, I am most completely at your service."

There was a sound of drawing steel.

"I am honoured," replied the third voice.

Instinctively Crighton-Wood and I stood back against the wall.

"St. John!" cried Annabelle once more, "he is not sober!"

"Enough, my dear, I am afraid." He was a hard, ungracious fellow this other man.

And so we heard them fight, and

very breathless it was. The air sang and whistled about our ears and the room echoed to their ringing blades and trampling feet. Of Annabelle we heard no more than her occasional sobbing breath from over against us. It did not last long. It ended with a sharp cry and the sound of a sprawling untidy fall. There was one strangled whisper of "Annabelle!" and then a pregnant silence.

We heard her kneel down.

"Arthur!" she whispered, and again more loudly, "Arthur!" And then once more, with a horrible dawning suspicion, "Arthur!"

But Arthur made her no answer.

Then came a cry which turned my blood to water.

"St. John! What have you done?"

The very rafters rang again to that cry. It was impossible to doubt her presence who had uttered it with such tragedy. But the room held no one but Crighton-Wood and myself. There was none to answer Annabelle.

Some subtle difference in the silence made me look towards the instruments. I saw that one of the little lamps had burned out and I pointed to it.

"It was my last," said Crighton-Wood. "I meant to buy some more to-day."

"I am glad," I said and I think he understood.

Without speaking, he crossed to his instruments and disconnected them. I heard the same church clock strike two. We turned off the lights and left poor Annabelle's room, and Crighton-Wood locked the door behind us.

The next day was a calm and lovely country Sunday. I slept until my lunch was brought to me in my room. When I came downstairs I found Crighton-Wood in his library. He asked me if I could walk six miles. I said that I could.

"Then we will call on Sir John," he said.

When we had settled to our walk, he told me of all the theories and explanations which he had evolved and rejected during a sleepless night.

"You will take no notice of me,"

I said, when he had finished, "but I am going to state my case."

"Well?" said Crighton-Wood.

"Well," I continued, "I was once told, when I was a very little fellow, that every impulse given to the particles that earth and air and water are made of was possessed of a sort of eternal life. That if one banged one's fist on the table one set up a vibration which would last through the ages."

"It is a theory," said Crighton-Wood.

"Then it appears to me," I said, "that we must send every noise that we make on a journey to the end of nothing. If that is so and if one could thrust an ear out into space, what is to prevent one's catching up with old sounds? Meeting with a species of sound-scene of things long past and gone? Things which happened, say, in Annabelle's Room."

"You forget," said Crighton-Wood, "that a wireless ear hears none but wireless waves. They had no transmitting set in Annabelle's Room in the duelling days."

"It was a strange, electric night," I said, but he hardened his heart against me.

We found Sir John at home. He was a polite and gracious old gentleman who talked well on a wide range of subjects.

"Sir John," said Crighton-Wood suddenly, "who was Annabelle?"

"Oh," said Sir John, "I have been waiting for that. She was a lady of whom we are not particularly proud."

There was a pause.

"If I say," urged Crighton-Wood, "that we have learnt something of her which may have given us a wrong impression?"

Sir John bowed.

"I will tell you all I know," he said.

"There was once a baronet at Eyesham who was, if possible, a trifle more dissolute than the rest of us. He married, as such people often do, a very beautiful and delightful woman. Her name was Annabelle. She gave that name to the room in the west corner of Eyesham, and nothing has been touched in Annabelle's Room since

(Continued on page 220)

Reduction in Prices

of all types of

B.T.H. RADIO VALVES

Effective, February 2nd, 1925

THERE are no better valves in all the world than B.T.H. Valves—and few (if any) as good. The substantial reduction in prices noted below will make the advantage of using B.T.H. Valves even more evident than it was before. They are made in the Mazda Lamp Works, Rugby.

Type	Characteristics	Old Price	New Price
GENERAL PURPOSE TYPES			
R	Filament Voltage 4 volts	} 12 6	} 11 0
	Filament Current 0.7 amp.		
	Max. Plate Voltage 100 volts		
B3	Filament Voltage 1.8 volts	} 21 0	} 18 0
	Filament Current 0.35 amp.		
	Max. Plate Voltage 80 volts		
B5	Filament Voltage 3 volts	} 25 0	} 21 0
	Filament Current 0.06 amp.		
	Max. Plate Voltage 80 volts		
POWER AMPLIFYING TYPES			
B4	Filament Voltage 6 volts	} 35 0	} 30 0
	Filament Current 0.25 amp.		
	Max. Plate Voltage 120 volts		
B6	Filament Voltage 3 volts	} 35 0	} 30 0
	Filament Current 0.12 amp.		
	Max. Plate Voltage 120 volts		
B7	Filament Voltage 6 volts	} 37 6	} 32 0
	Filament Current 0.06 amp.		
	Max. Plate Voltage 120 volts		

Fit B.T.H. Radio Valves and make sure of good results.



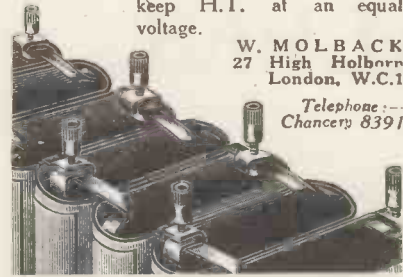
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Hovimo Connectors are a revolution in H.T. efficiency. Their use avoids soldering, cheapens cost of complete battery by from 25 per cent. to 50 per cent., ensures perfect "silent" working. Hovimo connectors are everlasting, allow easy replacement of units, will take ordinary wander plug, and keep H.T. at an equal voltage.

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25th, 1924, gives wonderful results, 3"
Lengths of wire screwed to fit reed with
nut to lock, 6d. each.
GOODMAN'S, 78, Spencer Rd., Wealdstone.
SEE PAGE 236 FOR LOUDSPEAKER
ATTACHMENTS.

DO IT NOW!

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WE HAVE THEM.

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For the WIRELESS BOOKSHELF

"The Story of Broadcasting"

IN his book, "The Story of Broadcasting" (published by Cassell and Co., Ltd., price 3s. 6d.), Mr. A. R. Burrows, Director of Programmes, B.B.C., has much to say of the events leading up to the broadcasting of the first real programme.

Beginning with a résumé of the work of such distinguished scientists and research workers as Huyghens, Clerk Maxwell, Hertz, Dr. Branley and the Russian Popoff, he conducts us to the year 1895 when, at the age of 21 years, Senatore Marconi, whose name will for ever be inseparable from wireless, made the discovery destined to make broadcasting an actuality.

A description of the subsequent work of Senatore Marconi and the story of the distress signal sent out by the East Goodwin Lightship—an event which gave the general public their first insight into the possibilities of wireless as a means of life saving at sea—comprise interesting chapters in the book and, incidentally, in wireless history.

Of his own work, the building of programmes, Mr. Burrows has also much to say. "The provision of nightly entertainment for something approaching a million homes ranging from the palace to the humblest home, is not a simple matter."

Few of us will question this statement by the author. But Mr. Burrows may be said to have "grown to love his work," and despite the many obstacles and difficulties, he has succeeded in placing at the disposal of listeners "fare" which should meet the requirements of all.

As would be expected, the author does not conclude his narrative without making some allusions to the future of broadcasting, which, he assures us, holds great possibilities.

"Practical Radio"

The listener interested in the construction of wireless apparatus and the theoretical side of the science will find much of interest in "Practical Radio," by James A. Moyer, S.B.A.M., and John F. Wostrel (McGraw Hill Book Co., Inc., London, price 8s. 9d. net).

Besides containing much theoretical information which cannot fail to be of use to the amateur constructor, the publication also contains a chapter on common troubles and their remedies—always an interesting and valuable subject.

"All About Motoring"

In compiling this book, "All About Motoring," Captain Twelvetrees has been in the unique position of knowing just what was wanted by the motoring fraternity, that knowledge having been gained through the correspondence which has reached him as a result of his wireless talks on motoring from the London station. There is a wealth of information in the book, which is published by Hodder & Stoughton, Ltd., price 3s. 6d.

In Tune with the Past

(Continued from page 218)

her death. I am afraid that her life was not made very happy for her. I don't believe that her husband actually ill-treated her, but he seems to have been very much of a boor, and she was a sensitive, thoroughbred girl.

"They quarrelled a great deal and he neglected her disgracefully. It is said that he encouraged her to seek the society of other men. Whether that is so or not, I could not say, but the fact remains that before long a certain Fielding appeared on the scene. He was a man of fairly good family from somewhere in West Kent.

"Nobody seems to have paid much attention to this Fielding until one day the whole country-side was astounded to hear that he had killed the baronet in a duel—one night in Annabelle's Room. He escaped the law and Annabelle married him. That was bad enough, but not, perhaps, beyond comprehension. The incomprehensible thing is that she drove Fielding to his death as surely as if she had killed him with her own hands. Something turned that girl into a relentless, pursuing fury and, after a year of her, Fielding hanged himself in a barn. It was a mysterious and terrible thing. I often wonder whether it will ever be explained."

"I wonder!" said Crighton-Wood.

WIRELESS ON TRAINS

ONE of the most interesting items of wireless news that I have read lately concerns the long-distance Canadian trains. The observation cars of these trains are now being fitted with wireless receiving sets, and passengers are able to spend many hours of the journey listening-in on the phones.

Having twice crossed the great Dominion of Canada, once in the height of summer, and once in the depth of a severe winter, I know something of the monotony of those five or six day train journeys. Throughout the hours of daylight the monotony of the journey is not so trying. There is plenty to be seen, and there are the frequent long stops at the important stations. When darkness comes, however, the monotony is almost unbearable, and one sits reading in a dull and desultory manner, waiting for the long cars to be transformed by the black porters into sleeping corridors. As soon as ever the beds are ready one "gets down to it," as they used to say in the Army.

Tremendous Boon

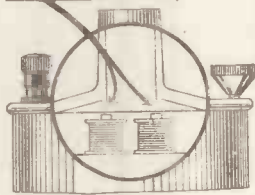
I should imagine that wireless on these Canadian trains will prove a tremendous boon during those hours when the passengers would, under normal circumstances, be waiting to "turn in."

One of the most interesting features of these trans-Canadian railway journeys is that it is possible to obtain different newspapers at various points of the journey—newspapers which are so different from our English papers, and which are also so different from one another. I suppose the same kind of thing will apply to wireless. As the Canadian traveller journeys along at a steady thirty or forty miles an hour he will pass through many different wireless zones and hear many different broadcasting stations.

When I first crossed Canada I had the good fortune to see a magnificent display of the Northern Lights. I am glad to note that a Canadian wireless expert, writing in an American wireless magazine recently, absolves the Northern Lights from the charge of being responsible for the bad conditions for wireless reception which sometimes obtain in Northern Ontario. AERIAL.



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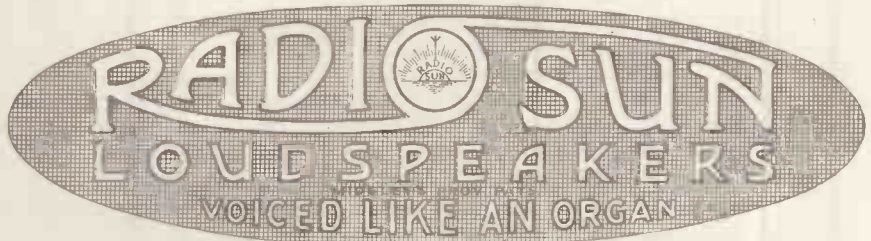
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WIRELESS WEATHER WARNINGS!

LAST night, if you were listening in, you will probably have heard the weather forecast, and it is quite possible that you read a somewhat similar report in the morning newspaper.

This weather forecast, prepared by the Meteorological Office and issued by the Air Ministry, is based on information received from all parts. Before the actual forecast is broadcast, wireless has already played a most important part in the preparation of the statement.

Handicapped Without Wireless

Without the aid of wireless, our weather experts would be very seriously handicapped, as they would be unable to receive reports from certain observation stations, whose only means of communication is by wireless. Then again, the valuable information received from ships at sea would be unobtainable.

Someone has described the Atlantic Ocean as the breeding ground of our bad weather. This is quite true. Many of those depressions or cyclones which we are so used to originate far out over the Atlantic, and then proceed to move slowly eastwards over well-defined routes towards our shores. Ships at sea meet with these depressions many hours before we have any knowledge of them.

Information concerning an approaching depression is wirelessed to certain stations, and from the messages the experts can deduce the nature of the depression, the probable route it will take, and the approximate time of the arrival of the centre of the system over any given point.

Collecting Observations

These messages from ships, and observations from various land stations, are summarised, and the summary is sent out by wireless by the Air Ministry in the form of a weather report. This weather report is picked up by countless stations—British stations, foreign stations and ships—and it is probably used by foreign meteorological stations in the preparation of the reports to be wirelessed by them.

Day and night, at all hours

weather reports are being transmitted by various stations throughout the world.

The weather bureau in co-operation with wireless helps to run many services, which, without their valuable aid, would be dangerous, if not altogether impossible. Take the case of the air services between this country and the Continent. A pilot has only to call up the nearest wireless station on his route, when he will be supplied with the latest weather report for the area for which he has asked.

There is no doubt that the high efficiency of the Meteorological Office is due to wireless. Suppose there were no wireless. Valuable data, if sent by land wire or cable, would probably be subject to delay, and it would be impossible to obtain information as to conditions in the middle of the ocean. Having no reliable data to work upon, it would be almost impossible to prepare weather forecasts and reports with any degree of accuracy.

Reaching Everybody

Then again, suppose a report were prepared from the scanty information available, how would it be issued so that it could reach everybody in time to be of any use? It is true that such a report could be sent by ordinary telegraph, but it is doubtful as to how many people it would reach. Every outlying area (and it is the outlying areas that find the reports most useful) has not a telegraph.

Speed, and the means to reach everybody, no matter how far away, are the main factors in the successful preparation and issuing of weather reports, and wireless has proved to be the necessary medium by which success has been attained by the weather bureaux of the world.

Fifty years ago there was no reliable weather service owing to the absence of wireless. There were weather prophets, but their forecasts were more or less based on guesswork, because it was impossible to collect real facts quickly enough to be of any service. For all one knew, a violent storm might have been raging in the centre of the ocean, and rapidly approaching our shores.

No one would know of this bad weather except ships in the vicinity, and they were unable to communicate with the shore.

Weather forecasting half a century ago could not have been without its humorous aspect. Perhaps the self-appointed prophets foretold a spell of fine weather, only to be rudely disappointed by the hurricane which, a few hours later, struck the west coasts and swept across the country. Such an occurrence today is rare, the weather reports being on the whole fairly reliable.

Perhaps, in the future, wireless will be used to a greater extent by the Meteorological Office than it is now.

Airship Reports

One can imagine the operation of weather observing airships, fitted with all the necessary instruments, which will be able to fly at enormous speeds, and to reach great heights. These airships would carry powerful wireless apparatus and would be in constant communication with the experts in London, to whom information would be flashed concerning conditions in the upper air.

Unfortunately, little is as yet known concerning conditions many thousands of feet above the earth. There is no doubt that the air currents at these high altitudes have an effect upon our weather.

To go a step further, it may be possible to send to even greater heights, by means of wireless control, recording instruments which would, no doubt, give the most valuable information. The information so gained might even cause the experts to adopt different methods in their determinations of the likely future state of the weather.

Automatic Transmissions

Again, recording instruments might be placed in outlying areas, and at stated times the readings would be automatically transmitted to headquarters by wireless. Thus, such instruments could be left unattended for months at a time, and yet at certain hours the readings would be faithfully transmitted by means of a wonderful instrument yet to be invented.

S. W.

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DCC Coil, Chelmsford, use with variometer	1/9
72-in. Phone Cords (best)	1/11
Valve Legs, Goswell Insulated 4	1/3
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Valve Templates	1/4
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B.B.C. 300 600, 5 XX 1100 3000, Ener- go 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/-; 12-12, 6/-	
Diamond Weave Coils (5), 3/6 (equal 25, 35, 50, 75, 100 Honeycomb)	
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Radio Micro .06 Valve	13/11
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Myers De Valve	2/-
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(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
Micro-Met Detector	6/6
Barnes Detector	5/6
Micro-meter Enclosed Detector	2/9
1/16 square Bus Bar Hank	1/-
2 v. 40 amp. Hart Accumulator	15/-
Allen Variable Grid Leak	1/9
D.P.D.T. Panel Switches	1/9
S.P.D.T. Panel Switches	1/5
Bretwood Variable Grid Leak	3/-
Walmel Variable Grid Leak	2/6
Bretwood Anode Resistance	3/-
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Post 6d. SET.


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EBONITE ENDS.



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.002 to .006	2/-
.001	1/3
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Coils: 25, 5/-; 35, 5/-; 50, 5/2; 75, 5/6; 100, 7/-; 150, 7/10; 200, 8/8; 250, 9/-; 300, 9/5; 400, 10/3; 500, 10/6.
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Do. Universal	2/6
Series Parallel	3/9
T1 Transformers	30/-
T2, 25; T3, 16 6; Coils: 25, 4 10; 30, 35, 40, 4 10; 50, 5/-; 60, 5/4; 75, 5/4; 100, 6/9.	
5 point switch	4/-
Lissen choke	10/-
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Type 577, .01 ..7/6
Grid Leaks, each ..2/6
Anode Resistance 50,000, 70,000, 80,000, 100,000, on stand com-
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NEW MODEL
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13 g.	9d.
22 g.	10d.
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D.P.D.T. 10 3/4 d
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S.P.D.T., China Base 10 1/2 d
Rheostats, Ormond 1/8, C & S 1/-, Raymond .. 1/3
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Twin Flex, 2-colour, 6 yds. 10/6
Lighting 12 yds. 1/6
Empire Tape 12 yds. 6d.
Fibre Strip 36" x 1' .. 2d.
Switch Arms 7 1/2
Studs, 2 a 1d.
Lead in 10 yds. 1/5
Bell Wire 10 ft. 5d.

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60 v.	7/6
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60 B.B.C.	8/11
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Spade Tags 6 a 1d.
Spade Screws .. 2 for 1 1/2 d.
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SUNDAYS - 10 to 1

What I Think About Broadcast Talks

(Continued from page 175)

with a nice adjustment for brows high and low. We must also keep on experimenting so as to use to the full all the capacity of wireless. We must not, for example, be discouraged by a few adverse criticisms or a few admitted failures from continuing to explore the possibilities of the wireless drama. But my particular province is the "talks."

Not everyone is musical. Some,

the public exist; whether there is such a being as the Man in the Street. He is certainly not me, and I feel sure he is not you. It is useless to try to please him all the time when he is such an elusive and inarticulate creature.

One feels vaguely of music that it ought to be charming and gay, and of talks that they ought to be interesting. But surely this is not enough. Surely this magical new medium of communication between man and man ought to be made to serve the highest purposes of which it is capable. These voices which speak across the ether ought not to talk feeble trivialities. Ought

list: Art, Natural History, Economics, Literature, Antiquities, Languages, Travel, Science and even Philosophy. Wireless presents them in the most humble and unobtrusive manner. A voice speaks in your ear. Nothing simpler than to close it down. No offence taken anyhow. But often it is worth while to go on listening.

I can assure you of one thing: all these speakers are masters in their subjects, if you care to hear them.

It is the learning of a lifetime which is being offered you for ten minutes or so in the course of a jolly programme. I will make

PROGRAMME of TALKS and LECTURES, FEBRUARY to EASTER, 1925.

Hour	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
6.40 p.m. (S.B. to All Stations)					Ministry of Agriculture Fortnightly Bulletin February 20th	
7.10 p.m. (S.B. to All Stations)	<i>The Sea Shore</i> (Natural History Museum) February 23 March 9, 23 April 6 <i>Law</i> (Professor J. E. C. de Montmorency) March 2, 16, 30	<i>Popular Fallacies in Engineering</i> (A. S. Ackermann) February 24 March 10, 24 April 7 <i>Books</i> (Mr. J. Strachey) March 3, 17, 31	<i>Miscellaneous</i> March 4, 18 April 1 <i>Psychology</i> (Professor Pear from Manchester) February 25 March 11, 25 April 8	<i>French</i> (Institut Français) February 26 March 12, 26 April 9 <i>Architecture</i> (Mr. Allen Walker) March 5, 19	<i>Music</i> (Mr. Percy Scholes) March 6, 20 April 3 <i>Films</i> (Mr. G. A. Atkinson) February 27 March 13, 27 April 10	
9.40 p.m. (S.B. unless otherwise stated)	<i>Topical or Local</i> (S.B., if desired) (For Details of Topical and Local Talks see your Newspaper)	<i>Seven Critical Moments in British History</i> (Professor Rait from Glasgow) February 24 March 10, 24 April 7 <i>Ether and Reality</i> (Sir Oliver Lodge) March 3, 17, 31	<i>The British Drama</i> (British Drama League) March 4, 18 April 1 <i>Travel Pictures</i> (Mr. Hilaire Belloc and others) February 25 March 11, 25 April 8	<i>Topical</i> (S.B. All Stations)	<i>Public Health</i> (Ministry of Health) <i>Foreign Affairs</i> (British Institute of International Affairs) <i>Overseas Trade</i> (Dept. of Overseas Trade) <i>Agriculture</i> (Ministry of Agriculture)	<i>Sports</i> S.B.

indeed, are too musical to care for music. It is impossible for anyone to visualise the vast audience that listens nightly to the wireless and to estimate their tastes to a nicety. Only those who read our daily post-bag can form any conception of what the public likes. It is doubtful whether even that helps very much. The public does not go out of its way to write unnecessary letters. One begins to doubt whether the public really knows what it likes. One even begins to doubt whether

they not to speak wisdom and knowledge, and to serve the cause of good citizenship?

I began rather apologetically, as one intruding in a strange sphere. But a few months' experience of this work has emboldened me to believe that the listening public is enjoying the flavour of intellectual pleasure which they get from our programme of fortnightly talks on great subjects. All the topics which ought to interest the man or woman of normal intelligence are represented on our

another assertion: that anyone who follows our programme of talks with a moderate degree of attention will be a well-informed person at the end of them. A ten minutes' talk cannot exhaust any subject, but it can start trains of thought, arouse interest and map out the fields of knowledge.

How wireless can serve the cause of formal education in schools and colleges is another subject to which I may ask leave to return another month.



Microstat Again!

Mr. C. D., writing us in praise of the Microstat Filament Resistance, says:—

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(Signed) Chas. Dibdin.

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Notings on the Month's Progress

Prospecting by Wireless

PROFESSOR HEINRICH LOWY, of Vienna, has recently published details of a wireless prospecting equipment to be used for locating mineral ores or the presence of subterranean water. The method is based upon the known fact that a conducting mass will reflect wireless waves in much the same way as light is reflected from a smooth surface.

The apparatus used is an ingenious form of combined transmitter and receiver. Signals are caused to penetrate the surface of the ground at a point suspected to contain water or valuable ore, and the time interval between the transmission of the outgoing signals and the receipt of the "reflected" signals is measured.

As the velocity of the ether wave is known, the depth of the conductor below the surface can then be calculated. The principle is, in fact, the same as that used by Fizeau in measuring the velocity of light, and could equally well be utilised for ascertaining the distance from the transmitter of any conducting body, such as a moving aeroplane.

The main difficulty lies in devising some means of accurately measuring the extremely short interval of time that elapses between the outgoing signal and the incoming or "echo" effect.

For example, if the transmitter is a thousand feet away from the reflecting body, the time interval to be measured is of the order of one two-millionths of a second, which is quite outside the range of ordinary perception.

Professor Lowy's Proposition

Professor Lowy proposes to solve this problem by utilising a special construction of thermionic tube, in which a large number of separate plates are arranged in the form of a semicircle around a central cathode. The electron emission from the cathode is rapidly vibrated by means of an electric field, derived from a separate thermionic oscillator, so as to cause the stream to sweep to and fro in quick succession over the series of plates or anodes. The latter are

in turn connected to the transmitter and receiver, in such a way as to switch these alternately in and out of action. In operation the frequency of the electron "switch" is adjusted until the front of the reflected wave arrives back at the aerial at the precise moment when the transmitter is cut out. This gives a maximum effect in the phones, whilst the required time interval is calculated from the setting of the auxiliary valve oscillator.

Re-conditioning Dull-emitters

The extreme sensitivity of thoriated-tungsten dull-emitters is due to the continual diffusion of the active thoria present in the filament from the interior to the surface of the tungsten wire, thus facilitating the emission of electrons at a comparatively low temperature.

If the filament is over-heated the thoria is apt to be suddenly evaporated or driven out bodily from the tungsten. The valve then refuses to function as a dull-emitter, although it will usually work perfectly well as a bright-emitter, using an ordinary four- or six-volt accumulator.

In order to re-condition a dull-emitter valve that has been over-heated, two different methods of treatment have been evolved in America, where many firms specialise in this work. In the first or "boiling" method, the filament is incandescenced for several hours (preferably from an A. C. supply of slightly higher than the rated voltage), and without any potential being applied to the plate of the valve.

In the other method the valves are "baked" in an oven for half an hour, after which the filament is incandescenced for another half-hour, again without any plate voltage. Both these methods usually result in a full restoration of the original sensitivity of the treated valves.

The Stethophone

The stethoscope, as used by the family practitioner for testing the heart and lungs, is probably one of the oldest "listening-in" instruments known. At all events it has been constantly employed by medical men during the past hundred years.

It sometimes happens, however, that important symptomatic "signals" are too weak to be clearly identified, and a wrong diagnosis may be the result.

In order to remedy this defect the old-fashioned stethoscope has been combined with the modern thermionic amplifier to produce an instrument called the "stethophone," in which the characteristic sounds accompanying the passage of air through the lung channels, or the peculiar noises associated with the valve action of the heart, are magnified into something approaching the effect of a stormy night at sea.

An ingenious filter system is used to cut out all sounds other than those under immediate investigation.

The instrument is particularly useful for demonstration purposes in the lecture hall or at hospitals. At a recent test of the super-stethoscope no fewer than 500 medical students were able to listen-in simultaneously to the symptomatic chest and heart sounds of an individual patient.

The Radio-therm Operator

Another interesting example of the application of wireless technique to surgical science is seen in the radio-therm or high-frequency operating knife. Two electrodes are used. One is strapped in firm contact with the patient's body, whilst the other is shaped somewhat like a large sewing needle, and is manipulated by the operating surgeon.

Radio-frequency current up to two amperes is fed to the apparatus and generates sufficient heat to enable the knife electrode to cut sheer through both bone and tissue. Not only is the cut so made absolutely aseptic, but it is also bloodless, the action of the high-frequency currents coagulating the proteins in the blood and thus preventing any loss of the vital fluid.

Carrier Pigeons and Wireless

It has been asserted that the wonderful sense of direction possessed by carrier pigeons, and certain species of migratory birds, is based upon an appreciation of the magnetic

earth field or flux extending between the North and South poles.

This is to some extent borne out by the result of experiments recently made with some carrier pigeons at the transmitting station near Valencia. Several of these birds were released in the vicinity of the aerial masts during a period when the station was transmitting.

It was observed that the pigeons were clearly confused whilst in the close neighbourhood of the aerial field, wheeling round and round incessantly, without being able finally to orientate themselves as usual. The tests were repeated several times with the same result on each occasion.

Oscillating Crystals

Although much credit is due to the young Russian experimenter M. O. V. Lossev for his practical research work at the Nijni Novgorod Radio laboratory on amplifying crystals, it must not be forgotten that the original discovery of the oscillating crystal was made by one of our own countrymen.

So far back as May 1910, Dr. W. H. Eccles, the well-known wireless expert, proved by practical demon-

stration before the Physical Society the fact that galena possessed a negative resistance characteristic, and could be made to generate sustained oscillations.

The circuit used by Dr. Eccles on this occasion consisted of a dry-cell battery placed in series with a high-resistance across the crystal point, and is essentially the same as that re-discovered some months ago by M. Lossev.

Crystal Reception at Sea

Several instances have been recorded from time to time of the amazing distances over which broadcast programmes can be heard at sea, using simple crystal sets of the carborundum and perikon type. Quite recently a sea-going operator claims to have listened-in to 2 L O on a crystal set 1,000 miles away.

The clue to these performances is probably to be found in the superiority of the "earth" provided by the hull of a ship immersed in salt water over the gas- or water-pipe connections favoured by many crystal users on land. Generally speaking the range of reception is largely dependent upon the resistance of the receiving aerial, which, in turn, can

only be kept at a low value by using an efficient earth connection. Paradoxically, the best type of "earth" is apparently only found at sea.

MR. BERNARD SHAW, the latest wireless recruit, says that he writes much of the dialogue of his plays whilst riding about the London streets. Now we can understand that when he wrote certain portions of *Pygmalion*, he must have been on the Billingsgate bus.

WE can hardly understand why a university lecturer has been broadcast "Facts concerning speech." As if facts were necessary in speeches!

A SIXTEEN-YEAR-OLD Glasgow school-boy has a sixteen-valve set. Thank goodness he isn't an octogenarian.

LETTERS the B.B.C. doesn't receive: "Dear Sirs,—A week ago I understood your announcer to say 'Now we will have a quart.' The shock sustained by my nervous system on learning that he really said 'quartette' has necessitated my receiving medical attention. I enclose doctor's bill, which doubtless you will consider it your duty to meet. Yours hopefully, Donald MacLaren."

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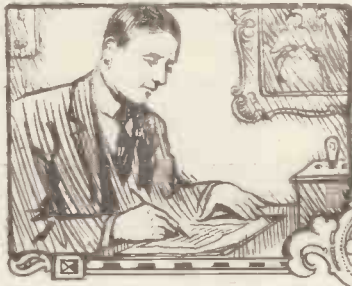
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What the Reader Thinks

That Interference!

To the Editor of "The Wireless Magazine."

SIR,—Capt. Eckersley of the British Broadcasting Company so often spreads the gospel of selective tuning as a cure-all for the avoidance of morse interference that one is forced to the conclusion that he is not fully in touch with the difficulties of the great body of wireless experimenters throughout the country—enthusiastic, tax-paying men, all.

What is the use of talking about selective tuning when it is possible to hear faint morse (from a strong local station) even with the A.T.I. removed? This in south-east London.

I am told that the interference, which only occurs during broadcasting hours, emanates from the H.Q. of a territorial regiment, when wireless instruction is being given.

Apart from this, my own experience forces me to the belief that a great deal of this morse traffic is deliberately adjusted so as to come in on top of the main B.B.C. stations.—*Sufferer (Beckenham, Kent).*

With Just a Crystal

SIR,—Feeling that the powers of the crystal are sometimes greater than many people give it credit for, and being interested in long-distance crystal reception, I have carried out some careful tests. I live just a little over three miles from 2 L O, my set being condenser tuned.

I put up a really good aerial, selected a satisfactory crystal, and, knowing from experience the value of a double earth, I connected up one wire direct to a buried tube and the other to the nearest main water-pipe. Then I put on a pair of 8,000-ohm phones, and, while 2 L O was not working, set out to see what I could get.

Getting on to 475 metres soon after three o'clock on a Saturday afternoon, I was astonished to hear Birmingham, 110 miles distant. Although the signals were weak,

I could clearly distinguish the tunes which were being played, and occasionally catch the words. A little later, on getting down to 385 metres, 6 B M came in at about the same strength as 5 I T.

I also found that, after 2 L O had closed down in the evenings, I could sometimes receive Newcastle and Manchester—very faintly of course, but nevertheless quite definitely.—*C. P. Parsons (London, W.2.)*

Fiddle Loud-speaker

SIR,—I have read with great interest your article on the fiddle loud-speaker.

I have one criticism to offer, how-

ever. Surely, if the strings are left free to vibrate, they will resonate when a note of their natural frequency is being reproduced, and if all the strings are left on, such an occurrence will be fairly frequent, causing unpleasant and distorted reproduction.

If, of course, they are removed altogether, it will be impossible to adjust the tone of the instrument, but if they are left on, a pad of cotton-wool or some other suitable substance placed between the strings and the finger-board should introduce sufficient damping to obviate any resonance.

Of course, in all cases this trouble may not assert itself, but the addition of such a pad is an experiment which is, to my mind, worth trying, as it may make all the difference between good and bad "loud-speaking."—*A. F. Carter (Enfield).*

[We welcome Mr. Carter's criticism but, although theoretically he is right, it is not found in practice that the resonance of the strings is sufficient to be noticeable.—*ED.*]

Romance of Morse

SIR,—Since broadcasting made its entry into our homes is it not surprising how many there are who do not know that the morse code exists till they accidentally drop on it during tuning operations?

The average listener seems to be drawn as if by some magnetic force to telephony, no doubt because the programmes are so much more entertaining. It is very nice, we know, to tune a set and find a favourite station on the same old wave.

But would it not be interesting to search around the scale occasionally for the — — of morse, to listen intently as the words tick by, to translate them, to pen them down, messages from ships—maybe some distress call?—*J. M. Storrie (Prestwich).*

[For every letter printed on this page this month and next, we are giving a Marconi-Osram Valve.—*ED.*]

Below we give some extracts from the first letters of congratulation received as we go to press.

"I wish your new publication every success. In my opinion it is the Rolls Royce of wireless journals."

"THE WIRELESS MAGAZINE is the finest shilling's worth that one could possibly buy."

"It for certain fills a gap That's been waiting to be tapped."

"Allow me to add my voice (or rather, pen) to the chorus of congratulations and praise that will undoubtedly greet you. . . . This new publication certainly fills a very empty niche in wireless literature."

"I must congratulate you on producing quite a novel and very readable magazine for the man who isn't 'well up' in wireless."

"I should like to 're-transmit' Mr. Reith's message of goodwill—abundant and deserved success."

"As a regular reader of all the wireless papers published in England and the United States for the last 12 years, I very eagerly purchased No. 1 of your new venture and did not put it down until I had read it from cover to cover. . . . At long last there is a paper which fully caters for every section of the wireless public. . . . I am a regular reader from now on."

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When the Wind Blows

Some hints on re-erecting an Aerial.

OF the many amateurs who have had their aerials blown down during the recent storm there will be some for whom the catastrophe should turn out to be a blessing in disguise. During the past few years thousands of aerials have been erected on the "pro tem." system, the original intention of the owners being to "give wireless a trial" before going to the trouble of erecting anything in the nature of a permanent aerial structure.

"No use putting up a permanent aerial until I know the thing is going to work," said the cautious one. So we ran up a "pro tem." aerial and, to his great amazement and joy, found that "the thing" did work.

The next conclusion, of course, was simple and obvious: "No use

putting up a swank aerial since the thing works all right with my present aerial." So he went gaily on until the storm came. These are the innocent folk for whom the storm may well prove to have been a blessing in disguise.

Experimental Erection

There is a good deal to be said for the "experimental" way of erecting an aerial, of course. It is an eminently practical way—provided one is determined to improve upon it afterwards. The danger of erecting an aerial on the "pro tem." system, however, is that it tends to make one too easily satisfied with results.

The novice who gets signals—any kind of signals—with a rough and ready aerial is apt to fall into the

trap of thinking that the wisest plan is to "leave well alone." This is a great pity, because the aerial undoubtedly constitutes the easiest and cheapest way of securing efficiency in wireless reception. In saying that I am fully conscious of stating a platitude.

But it must never be forgotten that a platitude is usually a platitude because it is so unassailably true. "The greater the platitude," as someone has wisely remarked, "the deeper the truth that it contains."

Here are some more wireless platitudes which, if conscientiously observed, will be found to contain sufficient truth to enable the majority of amateurs to increase the efficiency of their aerials by at least fifty per cent.

"Platitudes"

(1) Avoid using joints in an aerial wire. If you must have a joint, let it be a soldered joint. A joint made by twisting two wires together may give satisfaction when it is new and clean, but exposure to the elements will sooner or later result in such a joint becoming covered with a film of oxide, in consequence of which its



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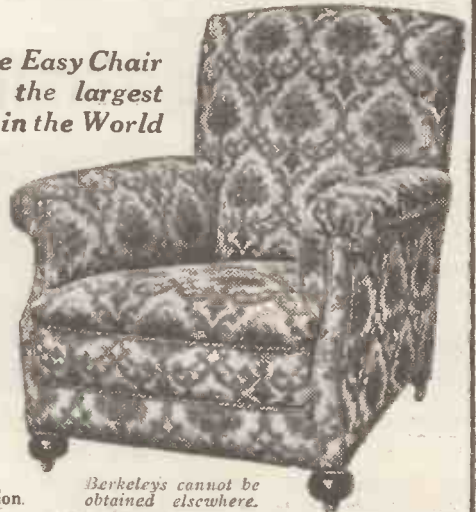
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resistance will be considerably increased.

(2) Don't rely upon a single small insulator for the purpose of insulating your aerial from the ropes which hold it in position. Use two or more insulators, connected in series, at each end. The longer these are, the better. "Bell-shaped" insulators, designed to ensure that a portion of the insulator shall always be kept dry, are the best. Small "egg-shaped" insulators, unless constantly cleaned, are often very inefficient.

(3) When using an inverted L aerial, whether single- or multiple-wire, take the down lead (or leads) from the end of the horizontal wire (or wires)—not from a point at a distance of a few feet from the end. When two or more down leads are employed, these should be joined (and soldered) just before being taken through the lead-in tube—not immediately under the horizontal wires.

(4) Down leads should not be brought down close to, and parallel with, the wall of the house. To avoid this it may be necessary to shorten the horizontal wire of an aerial, in order that the down lead

can be connected to it at some distance from the wall.

In many cases it will be worth while to do this. Sometimes a down lead can be "stayed off" from a wall with the aid of a long pole. A clearance of about six feet should be aimed at.

(5) When a T-shaped aerial is employed the down lead should be taken from the exact centre of the horizontal wire.

(6) If it is necessary to erect an aerial on the roof of a house—from chimney to chimney, as in some instances—the horizontal wire should be raised at least 15 to 20 feet above the roof. This is important. The down lead, as in every other case, should be carried well clear of walls.

(7) When using a double-wire aerial, see to it that the wires are at least five feet apart. A double-wire aerial consisting of wires two or three feet apart is little better than a single-wire aerial of the same length. More than two wires may be used if space is restricted. In this case the best method is to make the wires radiate, fanwise, taking care that all the wires are the same length.

(8) Remember that the "earth connection" is a part of the aerial—as important as the roots of a tree are to the tree. The earth connection is, in fact, the root of the aerial.

(9) If you can choose between an indoor (water-tap) earth and an outdoor earth, choose the latter. When using an outdoor earth, let it be placed, if possible, directly under the aerial. A "buried aerial," running directly under the elevated aerial, often makes an excellent earth.

(10) Don't hesitate to do a little experimenting with a view to ascertaining the best kind of earth for your purpose. A very good earth can frequently be obtained by sinking metal plates, measuring about three feet square, under the aerial, and taking a separate lead to each, in the form of a fan.

(11) Don't use a number of different kinds of earth, e.g., a water-pipe and a buried plate, etc. Preserve as much symmetry as possible.

(12) Keep your earth wire as short as possible, and run it as nearly at right angles with electric mains as possible. This latter con-

(Continued on page 234)

THE BROWNIE WIRELESS

—and the Crystal that made it famous!

For 7/6 you can buy this splendid Crystal Receiver and enjoy broadcasting at a distance of 25-30 miles from a broadcasting station or, with loading coil attached, up to 120 miles from Chelmsford. Complete with solid moulded Ebonite cap, high-grade Nickel fittings, glass protected Detector, D.L.5 Crystal and "Palladium" Catwhisker ... **7/6**

Chelmsford Coil, 1/6.

An ebonite base, of attractive design to fit all models, is now available at an extra cost of 1/6

Two large pieces of crystal and the essential "Palladium" Catwhisker carefully packed in dust proof case ... **2/-**

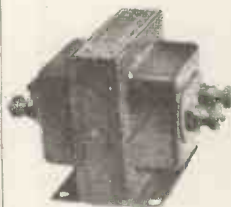
From most dealers or direct.

Now for a word about the D.L.5 Crystal—the excellent "Brownie" Receiver. Possessing a rare sensitivity and stability, it is constantly creating reception records. Get some to-day and enjoy crystal reception at its best.

THE J. W. B. WIRELESS CO.
310a/312a, EUSTON ROAD, N.W.1
(Facing Warren Street Tube Station.)
Telephone: Museum 3747.

D.L.5. CRYSTAL

and "Palladium" Catwhisker



Ratio 5 to 1.

THE "CROIX" L. F. TRANSFORMER

TESTED AND GUARANTEED. Enclosed in a non-magnetic shield. This shield constitutes a Faraday cage, eliminating all magnetic disturbances. The windings are carefully impregnated to avoid absorption of moisture. The price is low but the quality is high.

PRICE 10/6 POST FREE.

From all dealers or direct from:—

ANDERSON'S WIRELESS SALES AGENCY,
9-15 OXFORD ST., LONDON, W.1.

Telephone: Gerrard 1749. Telegrams: Anwisalg, Westcent.

G.W.I. VALVE RENEWALS

THE FIRST OFFERED—NEARLY 3 YEARS AGO. Our credentials and your satisfaction proved by increasing demand making our necessity for increased production. OUR EXTENSIVE ADDITIONAL VALVE-MAKING PLANT which includes the latest type appliances IS NOW IN PRODUCTION.

Most comprehensive service and prompt delivery assured. Almost any type valve can now be satisfactorily renewed. SPECIAL NOTE—All bright emitter renewals will be renewed approximately 33 per cent. in flame-out consumption.

GUARANTEED TONE AND POWER PERFECT.
STANDARD TYPES, Bright Emitters from 6/6 each
DULL EMITTERS, .25 Amp " 10/6 "
" .06 " " 12/6 "
WECO VALVES " 12/6 "
POWER VALVES " 15/- "

Terms cash with order. Delivery 3-7 days according to type.

G. W. I. LTD. (The Pioneer Valve Renewal Specialists),
43, Grafton St., Tottenham Ct. Rd., London, W.1.

Agents available everywhere. Good terms, guaranteed satisfaction.

At 2, Savoy Hill, W.C.2

(Continued from page 142)

schools wireless enthusiasts who are perfectly capable of making sets and securing the best reception; and, needless to say, in schools where they are most enthusiastic about the experiment, some one with a fair knowledge of the subject is in charge.

It must always be borne in mind that this work is only experimental. The cinema and the gramophone have been in existence for a quarter of a century, and no great use is made of them as educational factors, despite the fact that the gramophone at least is easier to handle and install than wireless.

The experiment has lasted long enough for us to know that, so far as we are concerned, it is a success. We can "deliver the goods." We can get authorities on subjects to which the average school has no access. It has been found as a matter of experiment that the time is not yet ripe for giving language lessons by the broadcast medium,

but it has been clearly proved that it is efficacious in all branches of English and Natural History and subjects of general interest.

We are patiently devising an educational technique, just as we are as patiently devising a wireless dramatic technique, and just as we have already devised the best way of transmitting music.

Drama and Education

It will perhaps be found that drama will come to the help of the educational hour, and that the lessons will include a series of dramatic representations of great episodes in history and literature.

We have received congratulations and criticisms in connection with almost all our activities, but it is generally agreed on all hands that we have handled the extremely difficult and delicate matter of religious transmissions with tact.

It is one of the most difficult things in the world to discuss any aspect of religion without giving offence to some person, but when we some time ago asked the opinion of our listeners as to whether these transmissions were acceptable or not, there was an

overwhelming response in favour of continuing the transmissions, even from those who stated that they had no particular interest in religion.

The addresses given have been distinctly undenominational and representative of every aspect of Christian thought.

We are frequently asked to broadcast other forms of religious address, but we have not seen our way, hitherto, to do this. For instance, there are many spiritualists who would like the B.B.C. to broadcast a medium, but spiritualism is still in the highly controversial stage, and it divides the people into devotees and antagonists. It would, therefore, be quite impossible for us to give a transmission of this kind without violently outraging the susceptibilities of hundreds of thousands of listeners.

After all, there are times and places for everything, and for those who believe in this phase of thought there are opportunities in abundance, but we should have no right to send into the homes of English people any communication that would be profoundly disturbing to young people and to sensitive minds.



A.C. MODEL

Output 6 amps. 9 volts. Complete with Pole indicating Ammeter and all connecting leads and adapter. To standard voltages 100/110, 200/220 and frequencies 50/60.

£6 : 6 : 0.

Other voltages and frequencies £1 extra

"ELLA"

BATTERY CHARGERS WORK FROM A LAMPHOLDER IN YOUR OWN HOME

D.C. MODEL

Output 5 amps. 9 volts. Machine only £5 12s. 6d. With Switch-board and Pole Indicating Ammeter and Regulating Resistance as illustrated ... £6 15 0

BATTERIES charged at home have much longer life and give better service than when charged outside.

"ELLA" Battery chargers save their cost many times over.

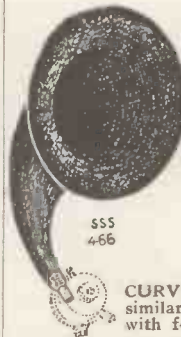
Write to Dept. "M" for descriptive leaflet. Trade supplied.



LIONEL ROBINSON & CO.

3m Staple Inn, London, W.C.2

Telephone: Holborn 6323 (Two Lines)



NON - METALLIC SPEAKER HORNS

Non-resonant, distortionless, and unique in their faithful reproduction of voice and music. Improve results from any speaker. Finished a rough cobbled surface in any of the following superb Bronze finishes: Gold, Silver, Red, Green, Purple, or Natural Bronze. Their exquisite appearance harmonises perfectly with any furnishing or colour schemes.



CURVED HORN (466) for Amplion Juniors and similar bases: diameter of flare 12 ins. PRICE, with ferrule, 11/9. Post, packing and crate, 2/-.

LARGE STRAIGHT HORN (397). Height 24 ins.; diameter of flare, 15 ins. PRICE, with ferrule, 11/9. Post, packing and crate, 2/-.

SMALL STRAIGHT HORN Height 22 ins.; diameter of flare 12 ins. PRICE, with ferrule, 9/9. Post, packing and crate, 1/9.

EFFICIENT LOW-FREQUENCY AMPLIFIER UNITS.

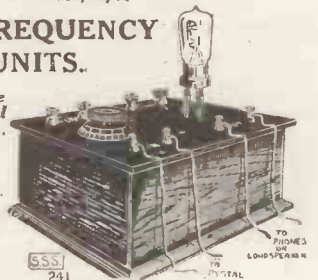
For use with Crystal or Valve Detector. Greatly increases signal strength. Simple to connect up.

1-Valve Amplifier.

As shown (without Valve) 27/6 Post 1/-.
Complete set of parts for above 16/6 Post 9d.
Cabinet ... 3/6 extra.

2-Valve Amplifier.

Without Valves ... 42/6 Post 1/-.
Complete set of Parts ... 29/6 " 9d.
Cabinet ... 3/6 extra.



SCIENTIFIC SUPPLY STORES, PHONE: HOP. 4177.

80 Newington Causeway, London, S.E.1; 126 Newington Causeway, S.E.1; 207 Edgware Rd., W.2; 84 Church Rd., Norwood, S.E.23; 16 Manette St., Charing Cross Rd., W.1; 7 St. George's Circus, S.E.1.

A Useful Series for Wireless Amateurs

Simple Valve Receiving Sets and How to Make Them

This handbook, which is compiled from the writings of many contributors to "Amateur Wireless," seeks to show in close detail, and with the aid of 112 illustrations, how to make and operate about ten different types of valve sets.

Simple Crystal Receiving Sets and How to Make Them

Compiled from the pages of "Amateur Wireless," this handbook deals in a simple, straightforward manner with the making of a number of crystal sets. With 114 illustrations.

Wireless Component Parts and How to Make Them

Detailed instructions for making the various component parts of many kinds of wireless receiving sets. It does not describe the making of any one complete set, but just all the parts likely to be required. With over 200 illustrations.

Wireless Telegraphy and Telephony and How to Make the Apparatus

This revised edition is by Mr. E. Redpath, the well-known writer on wireless. The explanations of principles are up to date, and there are directions for making apparatus, including detectors, amplifiers, single-circuit and complete short-wave receiving sets, a valve panel, and a five-valve amplifier.

"Amateur Wireless" HANDBOOKS

An unrivalled series, uniform in style and price with Cassell's famous "Work" Handbooks, and edited by Bernard E. Jones, the Editor of "The Wireless Magazine." The information is reliable, practical and up to date, and each book is profusely illustrated.

1/6 each
net

Or 1/9 post free from the
Editor of "Amateur Wireless."

Cassells,
Publishers,



La Belle
Sauvage, E.C.4.

When the Wind Blows

(Continued from page 231)

sideration also applies to aerials, of course.

(13) When using an indoor (water-tap) earth, make the connection to the *mains* side of the water supply. Clean the pipe thoroughly, and make the connection as *large* as possible, i.e., covering a large area of the pipe. A good plan is to bind the wire "round and round" about 2 inches of pipe, fixing it with the aid of a broad metal clamp.

(14) When using an indoor earth it is usually advisable to work with insulated wire. The reason for this is because your earth lead is really a part of your aerial, and a bare earth lead is always liable to make intermittent connection with conducting objects, the effect of which is to throw your aerial circuit out of tune.

(15) 7/22 bare stranded wire is suitable for an outdoor aerial as well as for an outdoor earth lead. Ordinary rubber-covered flex is more suitable for an indoor earth lead.

(16) Make all your aerial fixtures

as strong and rigid and storm-proof as circumstances will allow.

M. E.

A Novel Match-box Set

(Continued from page 185)

If you hear music faintly, move the tin lid over the top of the match-box until it gets loud, and readjust the catwhisker so that loudest results are obtained.

When the set is finished your visitors will think that it is a "smokers' tray," but you will be able to show that it is a wireless set.

It has been suggested that wireless might be utilised for locating hidden supplies of water. Makers should remember, however, that there would not be much of a demand for sets of this type North of the Tweed.

"WHAT is better," asks a romantic correspondent, "than to sit on a winter's night in an easy chair in the firelight, listening to the delightful programmes from 2 L.O." We must pass this query on to our courtship expert.

"COMPLETE silence of operation" is claimed in a valve advertisement. We once built a set ourselves that operated like that.

A CERTAIN type of aerial is advertised as being easy to attach to a chimney stack. That is, of course, when you've got to the top of the chimney stack.

THE letter "O" is represented in the morse code by a number of dashes. These are usually what we make when we meet a person to whom we "O" anything.

Now that broadcasting is being carried out near Hong Kong, we may expect the rival Chinese armies to declare a nightly truce so that the troops can listen to the programmes.

RECEIVING sets should not be placed near a window because they are affected by the moisture. For the same reason, Scotsmen should not carry them about in their trunks.

PROFESSOR Low says that wireless television will soon enable us to see people without actually confronting them. This would be the ideal sort of basis on which an interview with the tax collector might be arranged.

No more Pot Shots for the Best Spots on your Crystal



From dealers or Post Free direct 6/6

HOVIMO AUTOMATIC CRYSTAL SPOTFINDER

Spots the Right Spots Right-away

What is the usual method of finding the best sensitive spot on a Crystal? Generally a dig here, a poke there, and various random pot spots somewhere else. If you're lucky you hit a good spot. More frequently you get a bad one, often getting that same bad one again and again, whilst you sometimes lose your good spot in an attempt to get something better still. This cannot happen with the new "Hovimo" Automatic Crystal Spotfinder. If you find an inferior or exhausted spot the "Hovimo" will not, unless you want it to, touch that spot again. When you get a result-producing spot the "Hovimo," by means of the special scale readings, will mark it off. In fact, it will thus mark off as many such spots as you desire, and it will enable you to go back, re-test each one, compare one with another, and select the best of the lot, thus obtaining with scientific accuracy and astonishing rapidity the finest reception a Crystal can give.

W. MOLBACK, 27, High Holborn, London, W.C.1
Telephone: Chancery, 8391

FLUXITE SPELLS SUCCESS



Soldering spells success to any wireless circuit and Fluxite spells success to any soldering job. Delicate currents want no hindrances in the form of bad connections—one of the worst offenders, by the way, is the screw terminal here illustrated—far better to solder the wire to the stem, making it sound and secure and a perfect conductor.

Soldering is simple when you've a tin of Fluxite to help. A mere touch of Fluxite makes light of the most ticklish job.

Ask your Ironmonger or Hardware Dealer to show you the neat little

FLUXITE SOLDERING SET

It is perfectly simple to use. It contains a special "small-space" Soldering Iron with non-heating metal handle, a Pocket Blow-lamp, FLUXITE, solder, etc., and full instructions. Price 7/6. Write to us should you be unable to obtain it.



FLUXITE SIMPLIFIES SOLDERING

All Hardware and Ironmongery Stores sell FLUXITE in tins, price 6d., 1/4, and 2/8.

Buy a Tin To-day.
FLUXITE, LTD., 332 Bevington Street, London, S.E.16.

ANOTHER USE FOR FLUXITE. Hardening Tools & Case Hardening. ASK FOR LEAFLET on improved methods.

Thoughts While Listening *A Wireless Reverie*

THE planets have always intrigued me. On still summer nights I leave my stuffy wireless den to go into the garden and stand under them for a brief period. Up in my little room I have been "combing" the ether, listening to the talking of the ships away across the mighty oceans, the grunting and whistling of powerful stations sending urgent messages across the world to far off lands, messages of hope, fear or death, messages which may cheer aching hearts or plunge nations into warfare. They have said that this creation of man is the world's latest wonder, space is annihilated, distance is no barrier.

Different!

Yet somehow, out here in the sweet-smelling night air, with the heavy dew dripping from the trees and my aerial showing its gaunt outline against the starry skies, things seem different. Not a sound disturbs the peaceful earth, although

those signals are still in the air. I look at those stars which shine as they have done since and before the advent of man. There, in the boundless space, untold things have happened, will happen and are even now happening.

Man is not satisfied with his own earth and the wealth of knowledge which is already his, or within his reach, but he must endeavour to probe the mysteries of the eternal heavens.

I remember the nursery rhyme of my babyhood:

"Twinkle, twinkle, little star,
How I wonder what you are!"

Wonder of the Heavens

How our lisping tongues dwell upon the second line. To-day we are the same as then. We still look at those heavens and wonder. Our knowledge concerning them is no more than that of our mothers. That rhyme expresses the yearning of men through untold ages for

knowledge, knowledge of all things of this earth and of the universe.

And now, in our craving for knowledge, we have called to our aid this latest weapon of science. Our professors endeavoured to signal to Mars by wireless. They signalled from the Jungfrau, that magnificent peak in Switzerland which towers to a height of 13,671 feet. The engineers have already conquered the peak—a railway runs to its summit.

A Lost Treasure

Years ago the inhabitants of Switzerland revered the mountain; they gazed at its snow-capped grandeur much the same as we now do at the stars. They wondered what hidden mystery it contained. Their children looked at it with large blue eyes and wove nursery rhymes and fairy tales about it. Their curiosity is now satiated, and their wonder is no more. They have lost a treasure.

Continued on next page

ARNOLD BENNETT'S

Masterpiece

"Riceyman Steps,"

Record sales speedily followed the first publication of this powerful novel. Its publication at 3/6 net will be welcomed immediately by the wide circle of Mr. Bennett's admirers.

Now **3/6** net.

Cassell's

WHO WANTS WOOD?

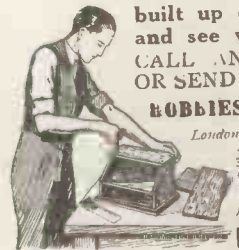
Use "Lightning Polish" to finish.

Save half the cost of a cabinet by making your own. Beautiful mahogany in any thickness, planed ready for use, can be bought quite reasonably and built up quite simply. Get a list now and see what you save.

CALL AND SELECT YOUR OWN OR SEND FOR LIST TO DEPT. W.M.

HOBBIES Ltd., Dereham, NORF. LK.

London, 65, New Oxford St.; 147, Bishopsgate, E.
2, 70, Watworth Rd., S.E. Glasgow, 325, Argyll St
Manchester, 100, Piccadilly, Birmingham, 99, High St.
Sheffield, 274, West St. Leeds, 15, Argyll Arca e.
Southampton, 11, Bridge St. Bristol, 68, London Rd.



VALPO

THE CRYSTAL SUPREME

Uniform, Unchanging Quality
the Secret of Valpo's Success.

OF the myriads sold, not one returned! Not a single complaint from any source! This is the triumphant record of "Valpo"—an Order of Merit indeed!

Join the ever-growing "Valpo" Crystal Circle. Be happy and satisfied with the best crystal in the world—bar none! Our word is pledged to maintain the quality which continues to win golden opinions from scientists and purchasers alike. These are typical:—

Henry C. Braun, Esq., C.E., the well-known expert and scientist writes:—"I tested practically all the advertised Crystals under identical conditions. As a result I have now adopted the VALPO Crystal for research and experimental work."

Messrs. Holmes & Jackson, of the Wireless Laboratories, say:—"A general sensitivity test proved that of 36 points selected on a 'VALPO' Crystal 97 per cent. were sensitive to a high degree." Why not prove it for yourself?

PRICE 1/6, Complete with Silver Catswhisker. Or all reliable Wireless Stores, or post free direct from—

MERTON DAVIS, PARNELL & CO.,
359 STRAND, LONDON, W.C.2.

Trade Enquiries Welcomed. 'Phone: Regent 4232.
AGENTS:—Birmingham: Priestly and Ford, 3, Carrs' Lane;
Belfast: Saffern and Co., Ltd., Shankill Road;
Dublin: W. A. Doyle Kelly and Co., Pearse St.

Are we dwellers of the towns to lose our treasure? Is our wonder at the stars to be taken from us and our minds filled with the knowledge that there are people there, much the same as ourselves, people who labour, people who live and die, people who love and hate, cherish and kill? Are we to lose that sense of hope and promise which we experience when we stand under the dome of that mighty cathedral, the heavens?

Caresses of the Breeze

My aerial sways, its wires vibrating in sympathy with the caresses of a breeze which may have passed over the Jungfrau. Somehow I think that the wonder will not be lost. Empires of the earth will come and go, we shall continue to live, labour, love and loathe, but the wonder shall be ours for all time.

The professors have signalled. They sat on that great mountain and pressed their keys and listened for a reply. I went to my den and wore the receivers and listened to them. I also awaited a reply. The crash and crackle of statics and atmospheric caused by a storm somewhere on this earth sounded

in my ears and interfered with my listening.

The stars remained mute. Outside they twinkled. Lovers looked at them in the stilly night and were silent. Frightened women and children rose from their beds after a nightmare dream and gazed at them, and secured peace and comfort. The wonder shall be ours for all eternity, and the Star of Hope, the Star of Bethlehem, shall be our soul's solace. The earth, and all that is in it, is sufficient for us. J. A. J.

A CONTROVERSY is raging as to which is the best studio. Most of our leading actresses seem to think it is the photographer's.

"I do like to sing in my bath" was one of the songs recently broadcast from Bournemouth. But it was no use listeners trying to pick it up with a bath crystal.

ADJUSTABLE LOUDSPEAKER 12/6

The "Gramovox" Junior converts any Gramophone or Horn into a first-class Loudspeaker in a few seconds. Complete in box with 6 ft. Flex connection. Fitted Stalloy Diaphragm. Adjustable Magnets. Money back Guarantee with every one. 2,000 ohms. Why pay more? **GOODMAN'S, 78 Spencer Rd., Wealdstone.** For Brown A Earpieces see p. 220.

FOOLPROOF DETECTOR

IN a beginner's hands a crystal detector with the ordinary catwhisker type of contact is apt to be rather unstable. It has, for instance, a most annoying habit of coming unadjusted when signals have been tuned in. For this reason a new kind of semi-permanent detector (see illustration No. 7 on p. 151), made by Radio Instruments, Ltd., is of interest.

The detector comprises two crystals, one a highly refractory and very costly mineral (of which only a small splinter is used in the detector), and the other crystal may be bornite, tellurium, or a special alloy made by R. I., Ltd. The two minerals are kept in contact by means of a spring and plungers, but the contact is a very firm one.

It is very important that the ebonite knob should not be rotated when in contact at the extremity of its travel.

The important point to bear in mind is that the detector should be left alone, and the adjustment not interfered with, as it will remain permanent for an indefinite period.

GUARANTEED VERY BEST DUTCH DETECTOR AND AMPLIFIER VALVES

Tubular Type, Fil. 3.5-4.0, Plate 30-80, Amps. 0.5 ... 4/9 each.
"R" Type, Fil. 3.5-4.0, Plate 30-80, Amps. 0.5 ... 4/9 each.
Both these valves give first-class results either as Amplifiers or Detectors.

Dull-Emitters, Fil. 1.6-2.0, Plate 20-100, Amps. 0.06 12/6 each.

Liberal Trade Discounts.
We Guarantee all Valves but do not undertake to exchange any Valve of which the Filament does not light up. All Valves are carefully packed and tested before leaving our premises.

Don't Delay—Buy direct from the Importers.

BISHOPSGATE ELECTRIC SUPPLY (1924) CO.,

Dept. W.M.,
1st floor, 180, Bishopsgate, London, E.C.2.

'Phone:—CENTRAL 7361. Please include sufficient postage.

"MORRIS" SOLID OAK STANDARD CABINET

with locks for any kind of receiver. Bottom cupboard with lock for accumulators and stores. Height, 3 ft. 6 in.; width, 2 ft.; depth, 15 1/4 in. Back Panel removable.

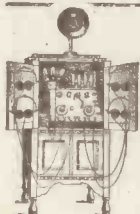
Further particulars on application.

Price £4 10s: part carriage and packing 7/6 extra. Similar cabinet 24 in. inside width, 5/- extra.

Build your 4-Valve Set in this Cabinet and add a handsome piece of Furniture to your Home.

M. VERSTRAETEN,

(Dept. 25), Melville Chambers, 53a, Lord Street, Liverpool.



£300-£400-£500 A YEAR for Certificated Book-keepers.

Let the City Correspondence College experts show you the way to success—they guide you through the various stages, step by step. Postal Tuition 10/- monthly, including books. Success Guaranteed at two advanced examinations. Prospectus, etc., Free on application.

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Dept. 453, 89, New Oxford Street, London, W.C.1.



HEADPHONES "BRIGHTONIA" (Adjustable Type) (4,000 OHMS.) YOURS



THE FAMOUS "BRIGHTONIA" for

Adjustable 4,000 OHMS Resistance Headphones now for the first time offered to "Wireless Magazine" Readers on our unheard-of bargain terms.

READ OUR BRIEF DESCRIPTION.

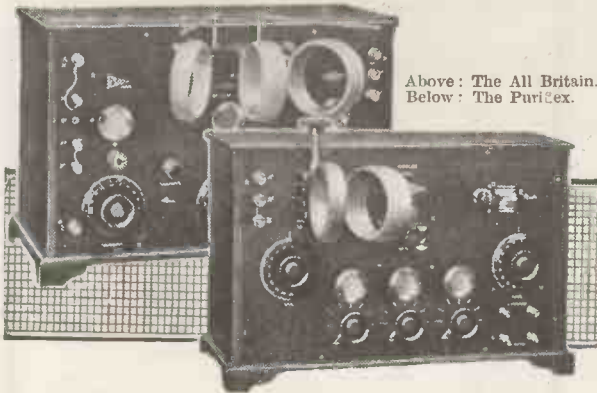
Genuine 4,000 OHMS resistance "Brightonia" double headset-phones, heavily nickel-plated fitted with adjustable head-band of the very latest and most comfortable type. Absolutely pure musical reception is assured by the laminated adjustable magnets and highly sensitive diaphragms of exceptional thinness and accurate adjustments, altogether the finest head set ever offered, no matter at what price.

Fully guaranteed 5 years.

OUR UNHEARD-OF TERMS

We send a pair of these high-quality headphones upon receipt of 1/- deposit. If satisfied you send 2/6 more on receipt and the balance by instalments of 2/6 until only 22/- is paid. (Price full cash with order (or within seven days of receipt) 21/-). Send P.O. now to:—

SIMPSON'S (BRIGHTON), LTD.
(Dept. 1015), 94, Queen's Road, Brighton, SUSSEX.



Above: The All Britain.
Below: The Puritex.

Professional-looking Sets that anyone can build at home

THE Pilot System has solved the problem of the home-built Set for thousands of Home Constructors. It has provided the only satisfactory method of getting an excellent Receiver which possesses the appearance of a ready-built Set costing five times the price at the cost of only the components. And anyone can build one of these Pilot Sets without previous experience. All parts are so carefully made that they fit together with the greatest of ease. The only tools required are a screwdriver and a pair of pliers. No one has ever been known to fail. Even boys of fourteen have built up some of these well-known multi-valve Sets and have got perfect results. With each complete set of parts is supplied a blue print containing all wiring instructions. Every step is carefully shown and failure is quite impossible. Even if you should go wrong the Set can be returned to our Service Dept., to be put into working order for a nominal charge. Remember any set of parts includes every possible item (except coils and valves) and is complete down to the last screw.

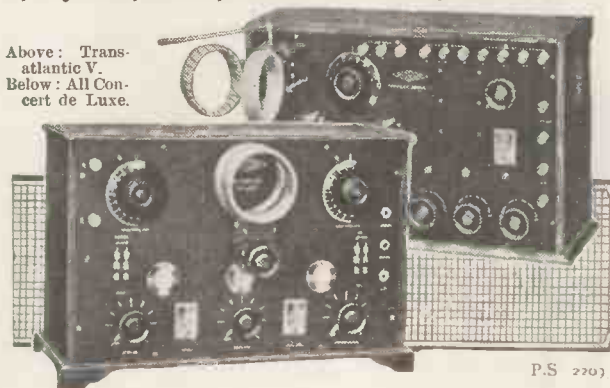
Name of Receiver	No. of Valves	Price of Panel drilled and engraved	Kit of Components	Oak Cabinet	Base-board
		s. d.	£ s. d.	£ s. d.	s. d.
Popular Wireless 1-Valve Re-ex	1	10 6	3 17 6	0 7 8	1 6
All Concert de-Luxe (s)	3	15 6	4 15 6	0 15 8	1 6
S.T. 100	2	7 0	4 14 0	1 10 0	—
Puri ex (s)	3	15 8	4 2 0	0 15 8	1 6
All Britain (s)	3	15 6	4 16 1	0 15 8	1 6
4-Valve Family (s)	4	17 0	5 16 8	0 15 6	1 6
Transatlantic V. (s)	5	18 6	5 8 5	0 15 6	1 6

When all components and panel are purchased together a Marconi Royalty of 12s. 6d. per valve holder must be paid.

Send for the Pilot Book to-day

If you cannot choose your Set from the Chart shown above send 3d. for a copy of our 32-page Pilot Book, giving particulars of our full range of Sets together with prices of every part.

PETO-SCOTT Co. Ltd., Branches:
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 77, City Road, London, E.C.1. CARDIFF—94, Queen Street.



Above: Transatlantic V.
Below: All Concert de Luxe.

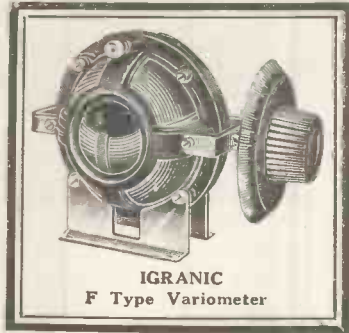
P.S. 2703

IGRANIC F Type Variometer

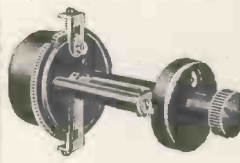
The great feature of this component is in the stator moulding which has been "skeletonised." Instead of the half annular piece, the outer and inner rings are joined by four webs. In addition the rotor winding is self-supporting and thus the usual rotor moulding is dispensed with.

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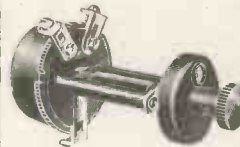


IGRANIC F Type Variometer



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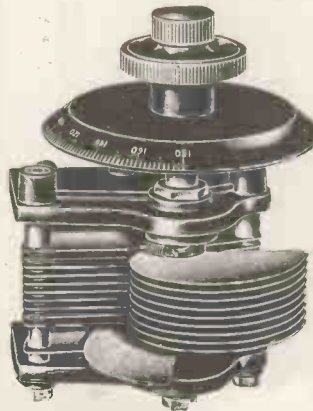
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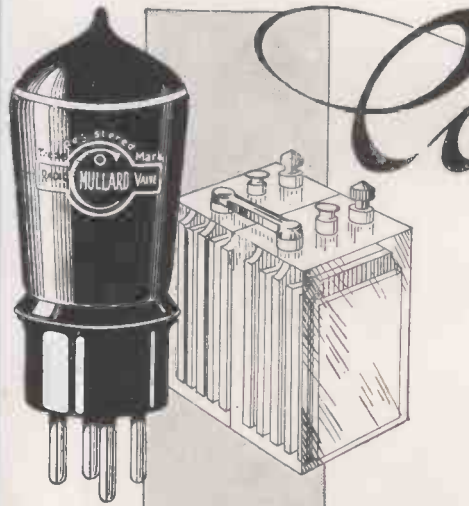
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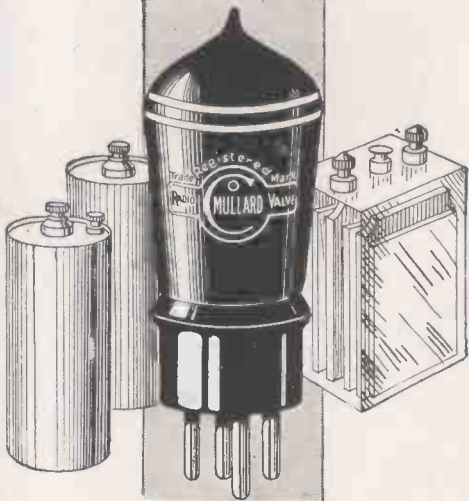
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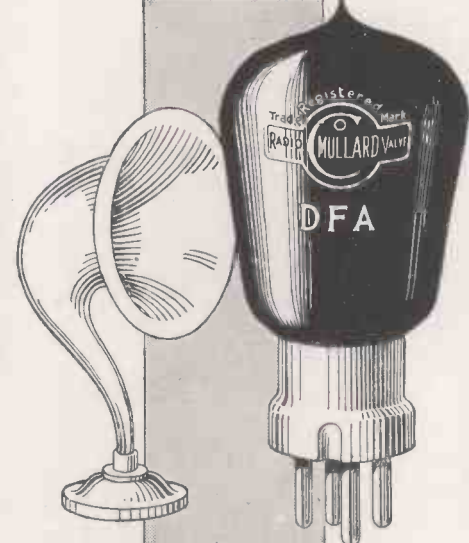
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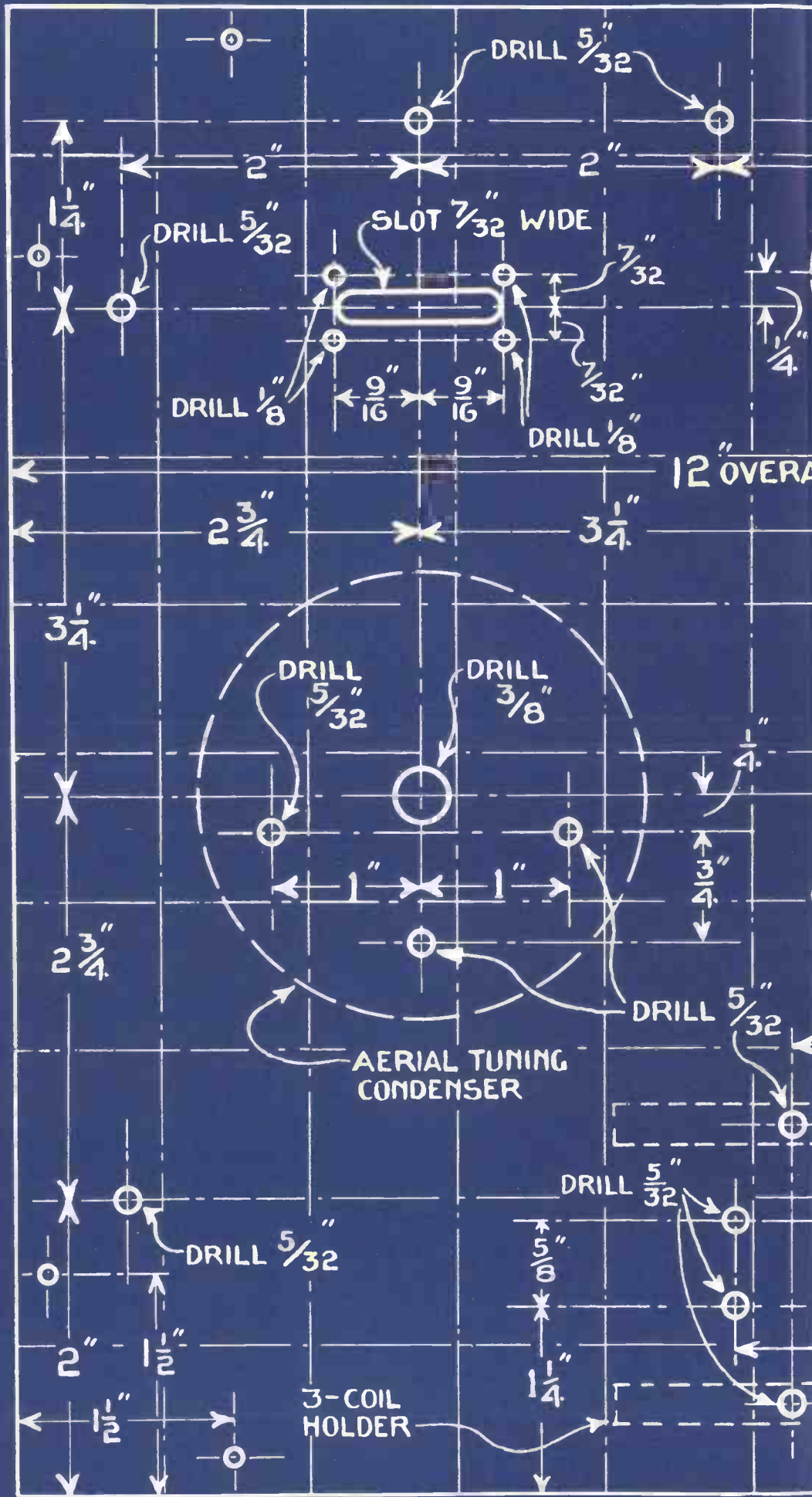
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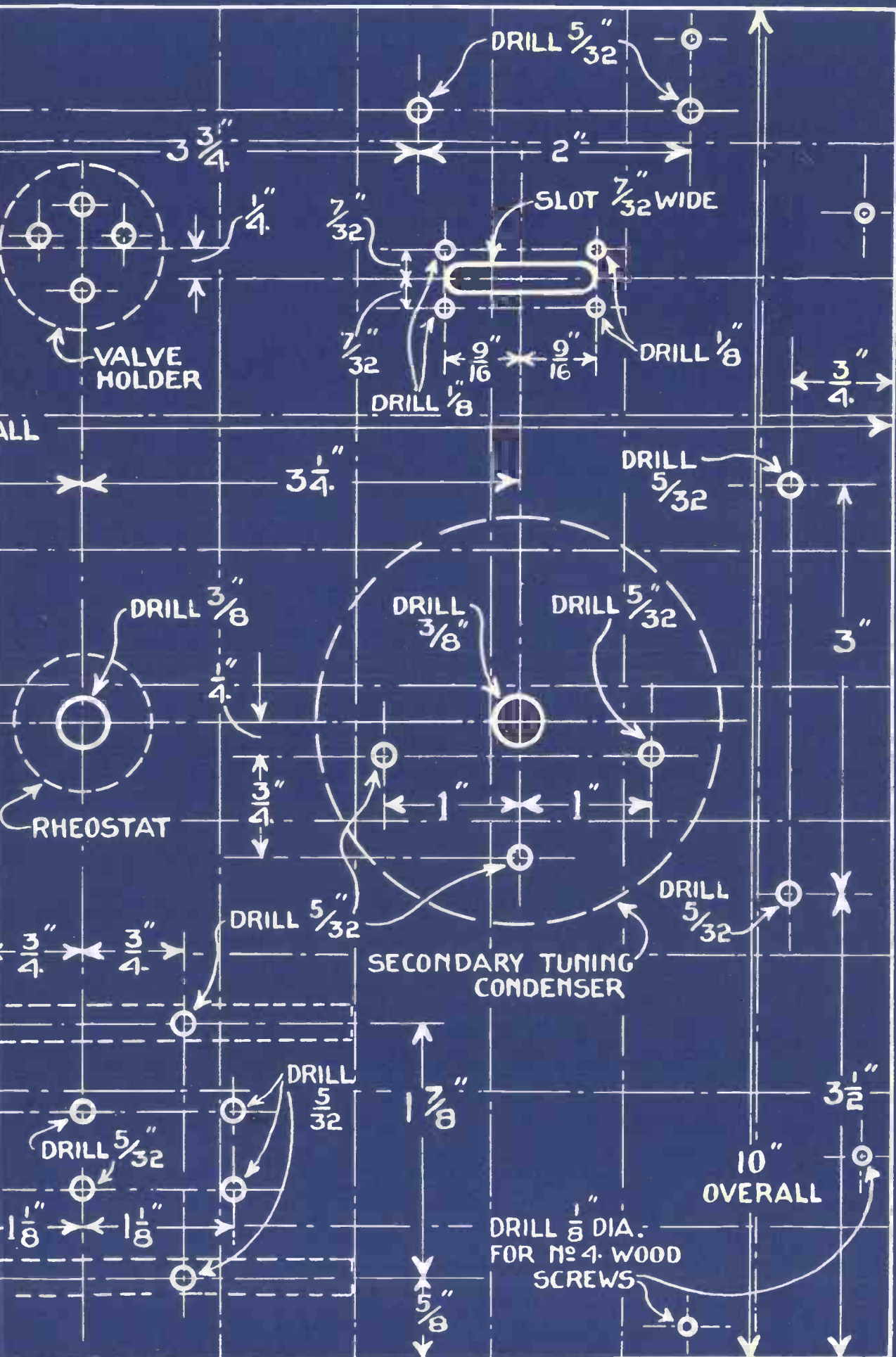
Panel drilling templates

and

Wiring diagrams

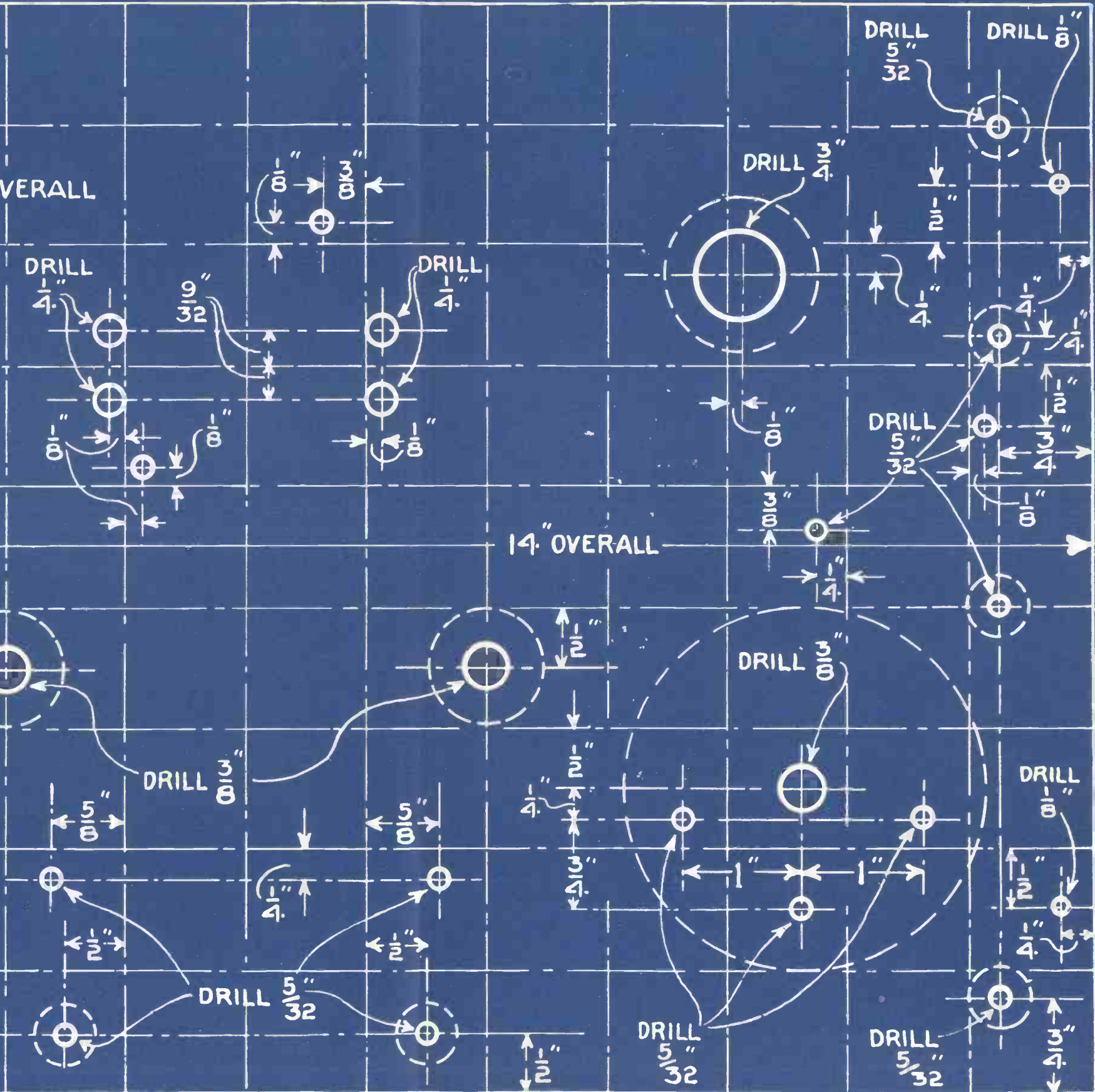
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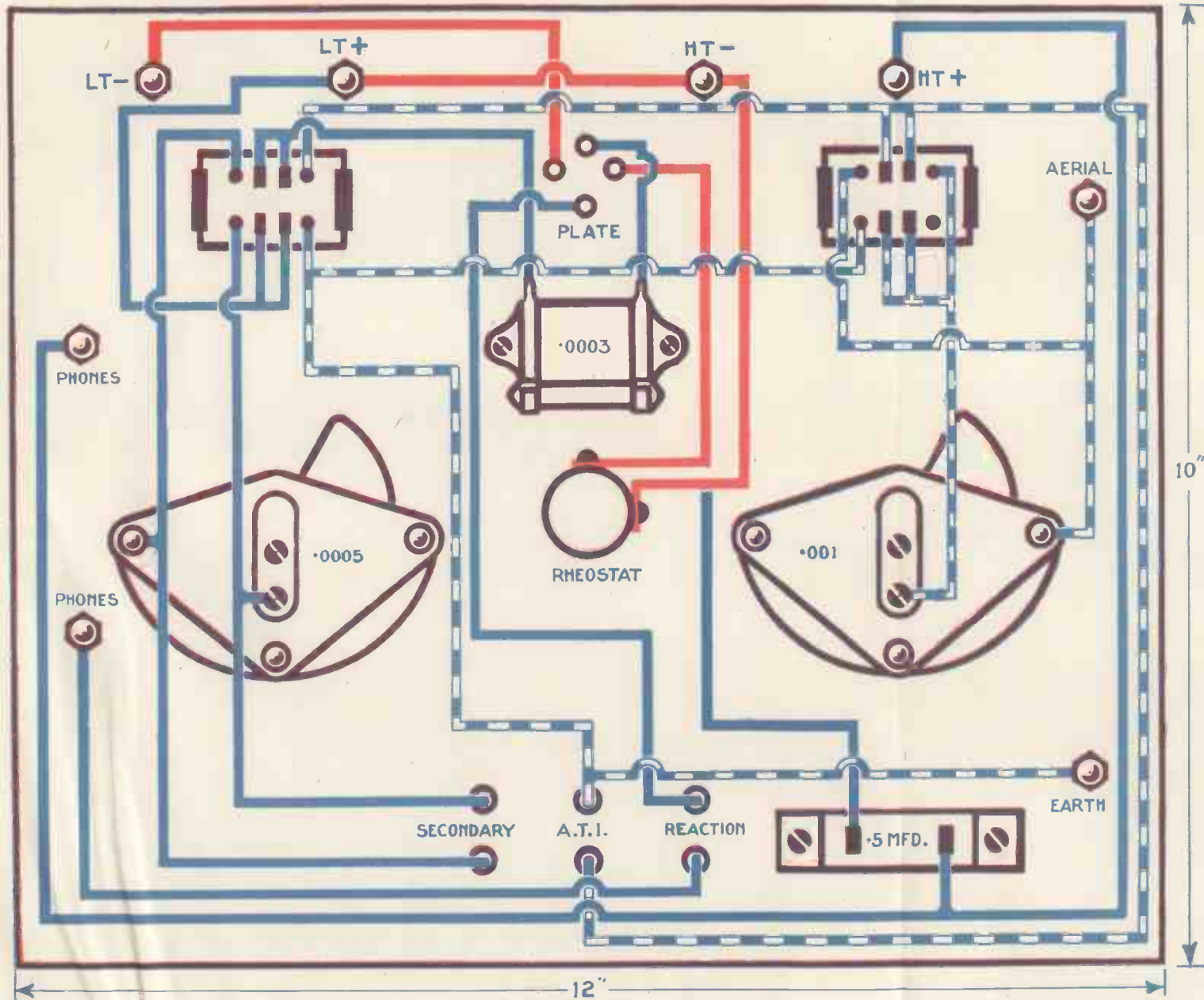


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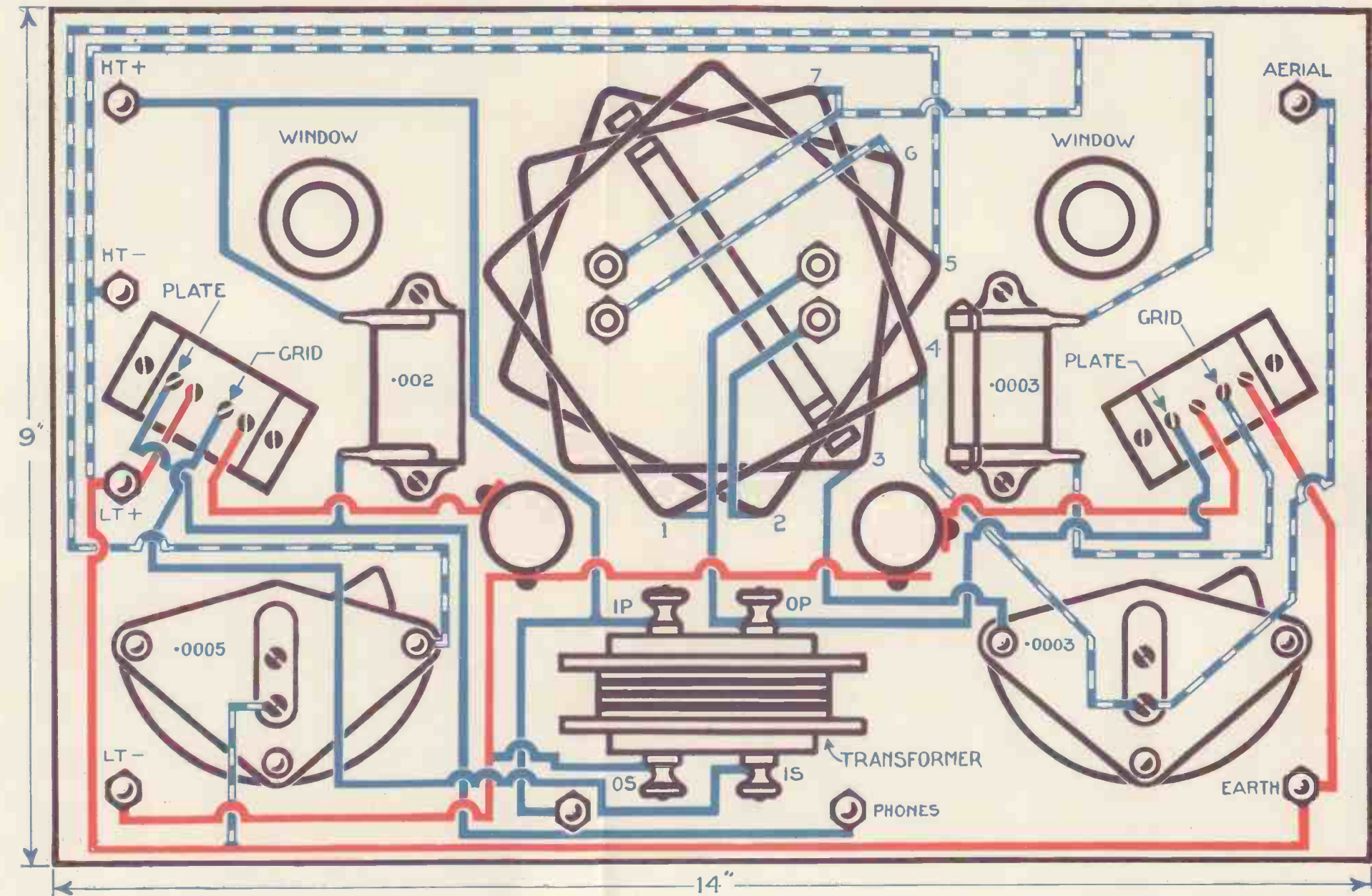
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For Full Constructional Instructions See Page 10
Key to Wiring Diagram : Red Wiring, filament
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