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Wireless Magazine

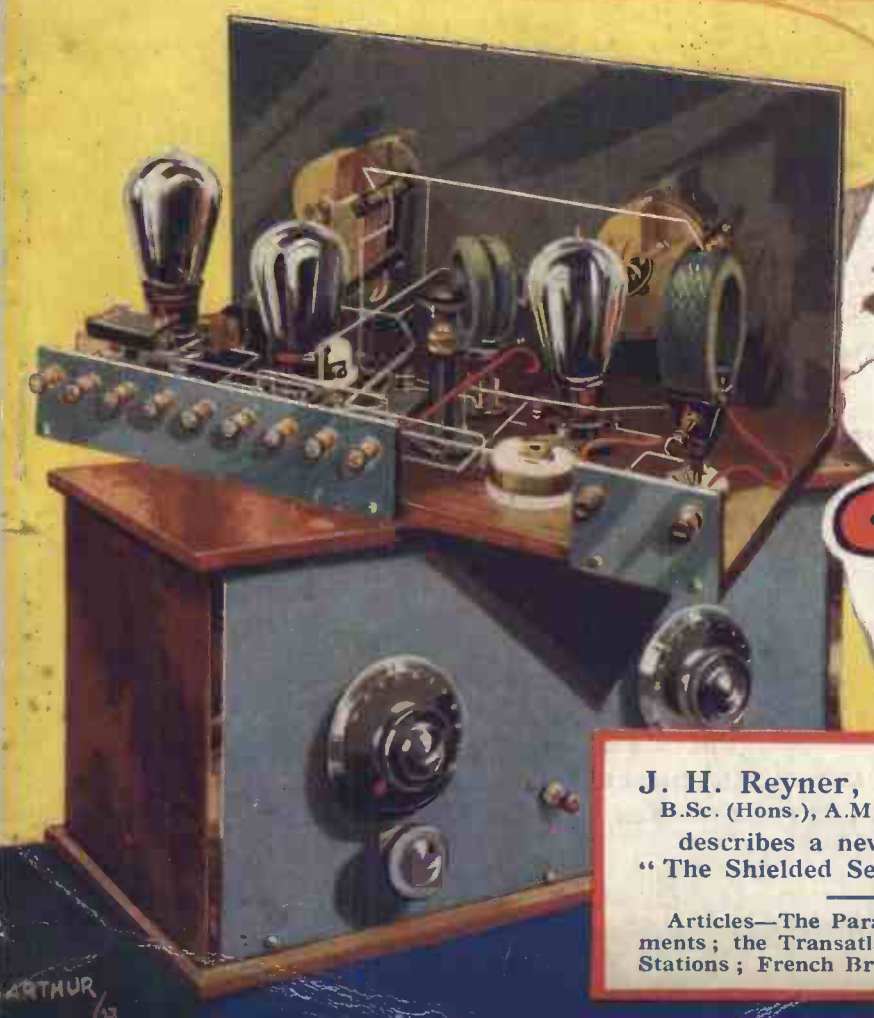
VOL. 5, NO. 27
APRIL · · 1927

EDITED BY BERNARD E. JONES
TECHNICAL EDITOR: J. H. REYNER, B.Sc. (HONS) A.M.I.E.E.

1/-

The Continental Three

ALLOWING OF HIGHEST-GRADE BRITISH COMPONENTS



ONLY £5

J. H. Reyner, B.Sc. (Hons.), A.M.I.E.E., describes a new set, "The Shielded Searcher."

Capt. H. J. Round, M.C., M.I.E.E., on Resistance-capacity Amplifiers.

Articles—The Paradyne; J. L. Baird's Latest Television Developments; the Transatlantic Telephone Service; Picking Up the Distant Stations; French Broadcasting; and Public-address Loud-speakers.

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WITH PLATE GRIDS AND PASTE MADE OF PURE LEAD.

Entirely of British Origin and Workmanship.

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Wood Separators in other Batteries (not used in Tungstone) create high internal resistance and excessive heat quickly destroying the life of the plates. Decaying Wood produces impurity of Acid, constantly lowering the Amp. hour efficiency necessitating repeated re-charges at unreasonably short intervals.

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Plate Grids are perfectly pasted uniformly in weight and thickness by automatic machinery. Not pasted by Hand.

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Accessibility, the keynote of practical usefulness, is exemplified by the fact that any single part or plate in a 2-volt Cell or complete battery, can be replaced by unskilled labour in a few minutes.

All component parts, including plates and 2-volt Cells are Standardised and Interchangeable one with another.

All-metal Container, Cell Connector Bridges are acid-proof, unoxidizable and indestructible. Will outlive very many sets of plates.

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TUNGSTONE High Tension 60-volt Battery 3 a.h. is sold in the United Kingdom on monthly payments over extended period. Apply for particulars. Further interesting information on points of this advertisement are to be found on pages 58, 59, and 67 to 73 of the Illustrated Booklet, "Photography tells the Story," which will be sent on application to the—

TUNGSTONE ACCUMULATOR CO., LTD., St. Bride's House, Salisbury Square London, E.C. 4. T.M.70

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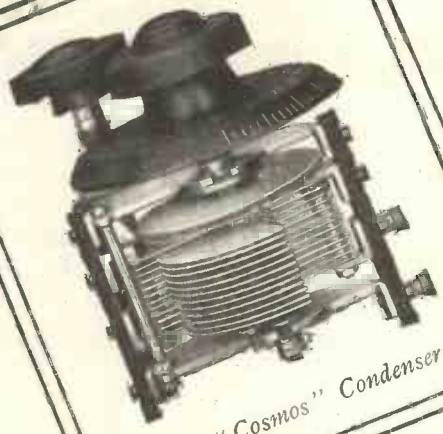

The "Cosmos" Condenser.

The "Cosmos" Coupling Unit and spring valve holder.

The "Cosmos" Permacon.

Cosmos
RADIO COMPONENTS

are designed to conform to the most exacting requirements of the constructor and to keep pace with the rapid developments in wireless research Insist upon "Cosmos" Components if you would have a neat and reliable set.

"COSMOS" LOW LOSS SQUARE LAW SLOW MOTION CONDENSER

The "Cosmos" Condenser is a slow motion condenser with absolutely no backlash either when new or after use. This desirable feature is accomplished by the use of a spring belt held in tension which permits coarse tuning with the large knob, and a 10 : 1 slow motion with the small knob. Cone bearings allow for adjustment, and the slow motion bracket can be mounted for *remote control*.

The Condenser for fine tuning.

Slow Motion .00025 mfd. . .	14/9	Ordinary Motion .00025 mfd.	12/-
" " .0005 " . .	15/6	" " .0005 "	13/-

THE "COSMOS" RESISTANCE COUPLING UNIT

Real purity of reproduction can only be obtained with resistance capacity coupling. The "Cosmos" Coupling Unit with a suitable valve is as effective as an ordinary transformer coupled stage. It avoids all distortion and effects considerable economies in first and operating costs. Designed primarily for use with the "Cosmos" S.P. Blue Spot Valves, it can be used successfully with any valve having an amplification factor of 30 or more. Special attention is directed to the following advantages of the "Cosmos" Coupling Unit:

(1) It takes up little space in a set.
(2) It is not liable to be broken.
(3) It has permanent resistance values.
(4) It allows for simplified wiring.
(5) It is economical in L.T. current (S.P. Blue Spot Valves consume 0.09 amp.).
(6) It is economical in H.T. Battery consumption (less than 1/20 normal).

And lastly its use results in purity of reproduction without loss in volume.

Type "O," the Unit alone 8/6
Type "V," the Unit incorporating spring valve holder 10/6
Suitable valves for use with this unit are "Cosmos" S.P. 18/B, and "Cosmos" S.P. 55/B.

The "Cosmos" Permacon is an ideal fixed condenser, being light in weight, of guaranteed accurate capacity, and having the lowest possible losses.
The dielectric is mica, and each condenser is tested at 500 volts during inspection. Nickel-plated cases give them a particularly neat appearance.

.0001 mfd.	1/6	.001 mfd. . . .	1/8
.0002 "	1/6	.002 " . . .	1/10
.0005 "	1/6	.005 " . . .	2/8
.0003 " (with clips for grid leak) . .	1/8	.01 " . . .	3/9

Ask for "Cosmos" Leaflets on Components, Valves, Sets, etc.

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(Proprietors: Metropolitan-Vickers Electrical Co., Ltd.)

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P70

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BE A RADIO MISER

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By putting a Lissen 2 mfd. Mansbridge Condenser across your H.T. Battery (1 mfd. will do, but larger size is better) you will lengthen its life by 10 per cent.

LISSEN Mansbridge Condensers

2 mfd. **4/8.** 1 mfd. **3/10.**

Other capacities :

·01	**2/4**	·25	**3/-**
·05	**2/4**	·1	**2/6**
·025	**2/4**	·5	**3/4**

A specially moulded solid insulating case totally encloses each Lissen Mansbridge Condenser.

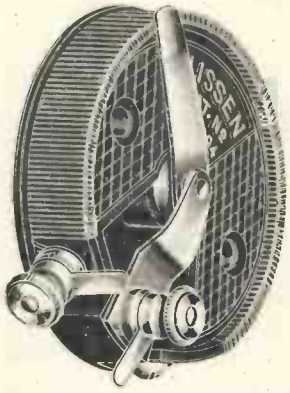
NEVER LEAK or VARY

Lissen fixed condensers are accurate to within 5 per cent. of their marked capacities. They never leak, they never vary. Less than a year ago they were being sold at twice the price—and since then they have been still further improved. You can't buy a finer condenser.

LISSEN Fixed Mica Condensers

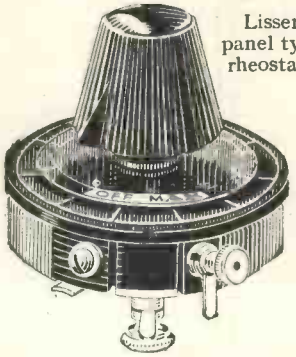
·0001 to ·001, **1/-** each (much reduced)
·002 to ·006, **1/6** ,, ,, ,,
A pair of clips is included free with every grid condenser.

NOW COSTS 1/- LESS



The baseboard type of Lissen Resister is now reduced from **2/6** to **1/6**. This type has, of course, no knob, dial and pointer, but is provided with 2 holes for screwing to baseboard. 7 ohms Rheostats ; 400 ohms Potentiometer, each **1/6**. (Previously 2/6)

ALSO REDUCED

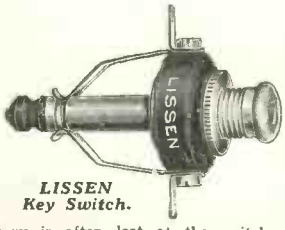


Lissen panel type rheostats.

The wires do not loosen, the arm keeps in perfect contact—nothing ever goes wrong.

Rheostats 7 and 35 ohms .. **2/6**
(Previously 4/-)
Potentiometer 400 ohms.. .. **2/6**
(Previously 4/6)
Dual Rheostat 35 ohms **4/6**
(Previously 6/-)

SAVE CURRENT



LISSEN Key Switch.

Energy is often lost at the switch points. These Lissen SWITCHES are designed to prevent energy leaking away while they do their work efficiently. There is one for every switching need—each one is very neat. **NOW**

LISSEN TWO-WAY SWITCH **1/6**
(Previously 2/9)
LISSEN KEY SWITCH **1/6**
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(Previously 4/-)
LISSEN SERIES PARALLEL SWITCH **2/6**
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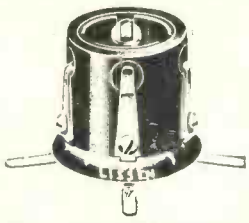
LISSEN FIVE-POINT SWITCH **2/6**
(Previously 4/-)
LISSEN D.P.D.T. SWITCH .. **2/6**
(Previously 4/-)

STRONGER SIGNALS



There is not a square inch of superfluous ebonite in this Lissen Valve Holder. That means low capacity and low loss, and therefore stronger, clearer signals. Shown ready for baseboard mounting, but can also be used for panel mounting by bending springs straight. Patented.
Previously 1/8 NOW 1/-.

ABSOLUTELY SILENT

Lissen Leaks are absolutely silent in use ; their resistances never alter. This was proved some time ago by exposing them to the rain and sun on our factory roof.
All resistances. Previously 1/8. NOW 1/-.

LISSEN LTD., 500-520, FRIARS LANE, RICHMOND, SURREY.
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L 296.

Wireless Magazine

for April, 1927 :: Vol. V :: No. 27

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Announcements.—*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. Research Editor : J. H. Reyner, B.Sc. (Hons.), A.M.I.E.E. One Shilling Net. Subscription rates are 15s. 6d. a year, post free ; Canada, 13s. 6d. a year post free.*

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From the Editorial Pen—

I AM glad to find that the special blueprint service is so greatly appreciated. Readers recognise that they are obtaining at a moderate price first-class blueprints produced from extremely clear and well-made original drawings, absolutely full-size, and each constituting in itself a guide to the construction of the set.

They are not, you see, mere circuit diagrams or small reproductions of the layout drawings—they are blueprints in which every instrument and connection is shown in its right place and of its full size.

We shall soon be thinking of portables. With the spring a young man's fancy does turn that way, and I have been discussing them on many occasions recently with our Technical Editor, J. H. Reyner. He has something particular up his sleeve. There are portables and—portables, and most of those I have had through my hands have been—just portables.

I think the mistake generally is to try to crowd a valve, a few components and a couple of batteries into a space a little larger than a watch-case, or, maybe, as big as a small attaché case, and expect that to do the trick.

Our Technical Editor, J. H. Reyner, B.Sc., A.M.I.E.E., standing at the door of his Elstree laboratory with an assistant.

The amateur portable is seldom a really serious proposition, but Mr. Reyner is tackling the problem from a new standpoint, and judging from his early experiments is on the threshold of something really good and different. You will learn all about it in a month or so.

There are one or two special features of this issue about which I should like to say a word. Capt. Round touches on a subject which all wireless people are discussing nowadays—resistance-capacity coupling for L.F. amplifiers. Capt. Round believes that—well, turn over a few pages and learn for yourself.

J. H. Reyner contributes to this issue a set which in its construction is as interesting as in its name it is glamorous. The set incorporates a wavetrap separated from the rest of the receiver by a metal screen, and is particularly suitable for use in localities where the local station happens to be specially incisive or where there is marked interference from tramways, lifts, flashing signs, etc.

The free blueprint this month relates to the All-broadcast Two, a set fully described in this issue, and next month we shall describe a companion power amplifier taking its H.T. from the mains.

A particularly interesting receiver is the Continental Three. The whole point about this set is while it is high-class in every way, the whole thing—components, ready-to-make cabinet, wiring, etc.—can be bought for five one-pound Treasury notes. The components are of the best, the construction is on simple, approved lines—frankly without novelty—and it has a much longer range than would be imagined from an inspection of the diagrams and constructional drawings.

And here a little story! Look at the coloured cover of this issue. You cannot help noting those curious label-like objects on which the legend "£5" is superimposed in red. Those "labels" in the original were beautiful £1 Treasury notes—rather picturesque and none too faithful—but on submitting our design to the authorities we were duly warned against breaking the law and threatened with dire penalties if we persisted in using the design. As we were on the point of printing, all we could do was to remove the details of the notes and leave their outlines.

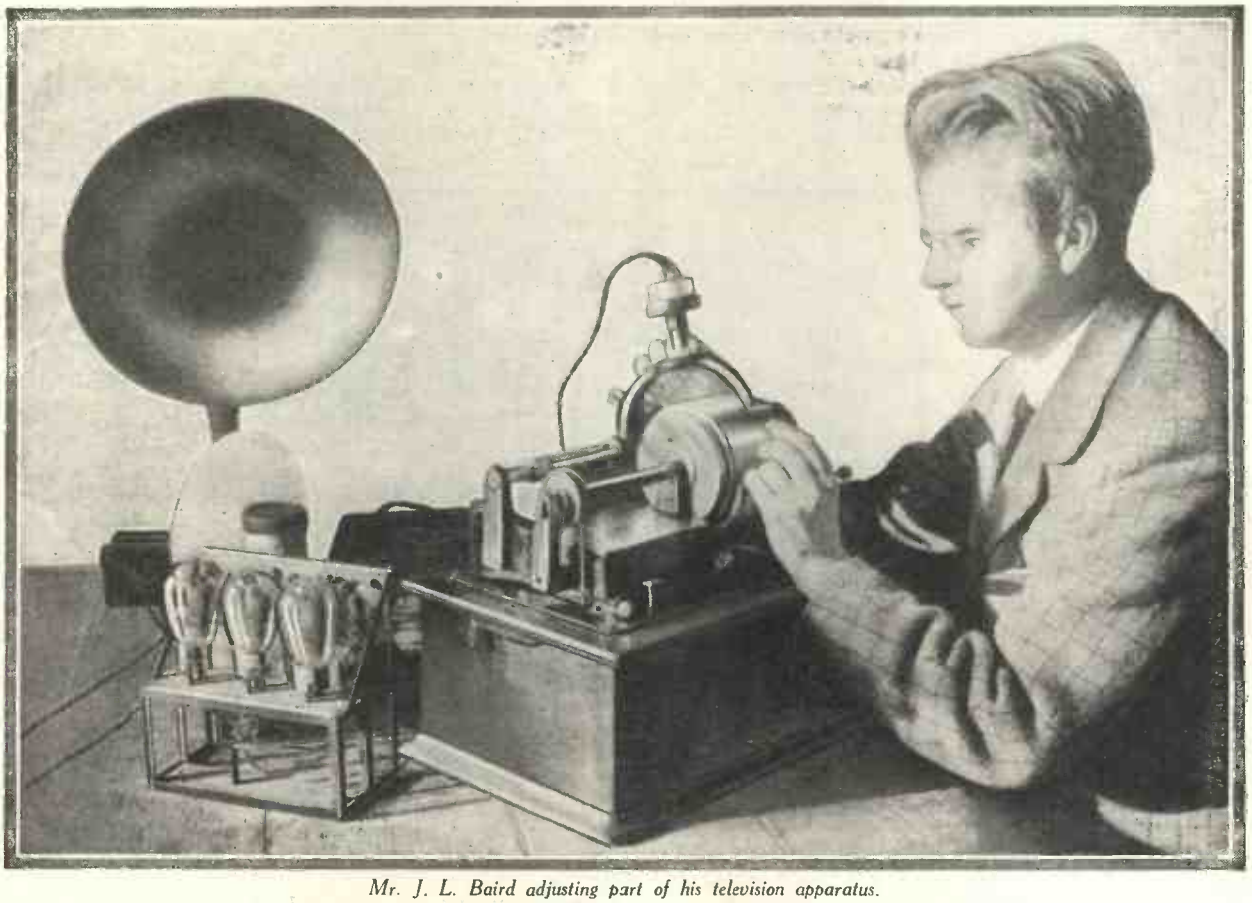
It is only to the authorities that the idea would occur that forgers of £1 notes would go to the cover of WIRELESS MAGAZINE *for their "copy." We should have thought they would have saved up to get a genuine £1 note to work from.*

The Editor, B.A.

Television—or seeing by wireless—is attracting the attention of many scientists, and it is believed by many people that the problem is near a practicable commercial solution. In this article our contributor outlines the latest developments achieved by J. L. Baird, the well-known British television worker.

Seeing in Total Darkness

A Special Article by A. DINSDALE.



Mr. J. L. Baird adjusting part of his television apparatus.

IT is now about a year ago since I first had an opportunity of witnessing a demonstration of television at Mr. J. L. Baird's laboratory in London. I sat in a large room and saw on a little screen the face of a friend who was seated before the transmitting apparatus in a different part of the building.

What I Saw

His voice came to me from a loudspeaker: "Can you see me?" he asked, and see him I did, a small sepia-tinted replica of him about six inches square. I saw him turn his head, open his mouth, wink his eye, etc., according to my directions to him over the telephone. I could even see the curling wreaths of smoke from his cigarette.

At that demonstration, one of Baird's first after finally solving the problem of television which has baffled the leading scientists of the world for so long, tremendously powerful lights were necessary to illuminate adequately the sitter whose image was to be transmitted to distant points. So powerful were these lights, in fact, that the "victim" was well-nigh blinded and burned by their intensity, and Mr. Baird was told that even a music hall star would shrink from such an intense spotlight.

Whilst working on the problem of reducing the amount of light required the thought occurred to the inventor, why not dispense with light altogether and use invisible rays? But would the light-sensitive cell respond to such rays?

In order fully to understand the latest development it will be as well, at this point, to consider briefly the spectrum.

Range of the Spectrum

Readers of the WIRELESS MAGAZINE are familiar with wireless waves and know that they are electrical

vibrations the frequency of which depends upon the wavelength. The longer the wavelength the lower is the frequency. Wireless waves extend in length from a few centimetres, as used in the laboratory, to about 30,000 metres, as used by the great transoceanic wireless telegraph stations. The frequency of vibration of a one-metre wave is 300 million per second, and that of a 30,000-metre wave is 10,000 per second.

Very Short Waves

Beneath the range of the shortest wireless waves are other wavelengths extending in length down to infinitesimal fractions of an inch. The frequency of these waves is enormously high, and the entire range of known frequencies, from the highest to the lowest, is known as the spectrum.

Starting at the highest frequencies, the spectrum is divided up into sections in which fall first the gamma rays given off by radium, X-rays, ultra-violet rays, the visible spectrum (light), infra-red rays, and finally wireless waves.

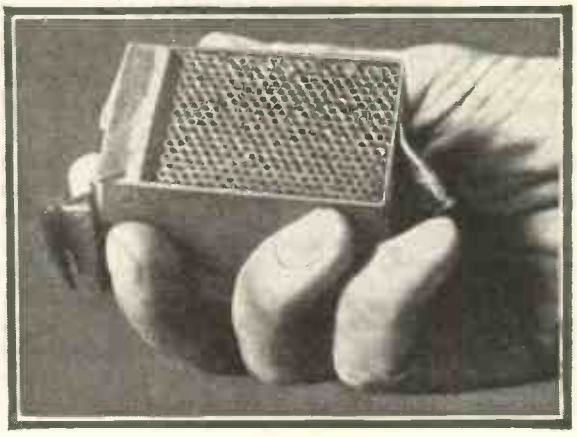
Visible Spectrum

The visible spectrum, familiar to most people, extends through the colours violet, indigo, blue, green, yellow, orange and red. Of the entire frequency spectrum, the human eye is only capable of responding to the colours lying between violet and red. To detect the other frequencies, special instruments are necessary, such as, for example, a wireless receiver, when it is desired to detect wireless waves.

Light-sensitive cells, such as are used by Mr. Baird in his television apparatus, are capable of responding to frequencies lying slightly above and below the visible spectrum, and it is this fact which has made possible the latest development in television.

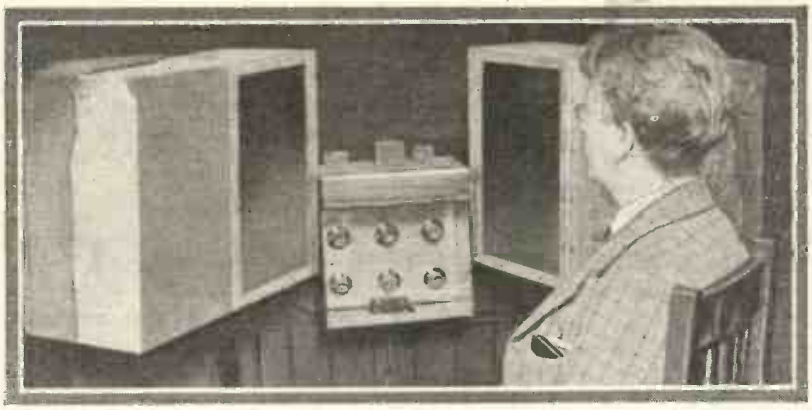
In his first attempts to make use of invisible rays, Mr. Baird turned to the upper end of the spectrum and tried ultra-violet rays, because these have a more powerful effect upon a light-sensitive cell than the infra-red rays at the other end of the spectrum.

Successful results were obtained with these rays, but they proved very troublesome, and had a bad effect upon the eyes of the sitters, so he discarded them and began to experiment with infra-red rays. By means of these latter rays, the inventor was able ultimately to dispense altogether with visible light, with the somewhat remarkable result that it was possible to *see in total darkness!*



The "analyser" part of the apparatus of the electrical eye that sees in the dark.

This is, perhaps, the most spectacular development of all in connection with television, and it has an uncanny and impressive effect upon visitors to a demonstration, as I found for myself recently when I was privileged to witness a demonstration of this latest scientific achievement.



Mr. J. L. Baird sitting in front of his television apparatus. The box-like objects on either side of him produce infra-red rays.

First of all I was shown into the transmitting studio, the windows and doors of which are heavily draped to exclude all daylight. The place was in pitch darkness, and even after having become accustomed to the gloom, it was literally impossible to see my hand in front of my face.

Receiving Theatre

Leaving a friend of mine there I wended my way downstairs to the receiving theatre, where I conversed with him over the telephone and simultaneously watched the movements of his features on the televisor screen. He assured me he was still in total darkness, and yet there was his image on the screen before me, complete in detail and with even gradations of light and shade. No difference in the received image could be detected, whether the sitter at the transmitting end was illuminated by ordinary visible light or the special infra-red rays.

Thus have the powers of darkness been dispelled, those mythical powers which, right down through the ages of man's history, have struck terror into the hearts of the ignorant and the superstitious.

It is difficult to estimate the full extent of the importance of this achievement in warfare, for it renders it possible to follow the movements of the enemy when he believes himself to be under cover of darkness.

Enemy Aircraft

Attacking aircraft, approaching under cover of the night, will be disclosed to the defending headquarters by the electric eye of a television apparatus. They will be followed by searchlights emitting not visible light but infra-red rays, and as these rays will be invisible to them they will continue to approach until, without warning, they are brought down by the guns of the defence.

Darkness, the great cloak for

Seeing in Total Darkness! *(Continued)*

military operations, will no longer give any security. The attacking party creeping forward for a surprise attack on a pitch black night will be swept by an invisible searchlight and watched on the television receiving screen of the defenders. They will be permitted to come well within range, and then find themselves, in spite of the apparent protection of darkness and the absence of visible searchlights, overwhelmed and decimated by well-directed gunfire.

It is to be hoped, however, that other uses may be found in peace time for this latest development of television. The fact that infra-red rays possess great fog penetrating powers opens up possibilities in connection with the navigation of ships during foggy weather.

Penetrating Powers of Infra-red Rays

To understand the possibilities in this direction it is only necessary to consider the behaviour of ordinary visible light during foggy weather. The most intense white lights, it will be noticed, show through fog as a dull red colour. The thicker the fog the duller the red which shines through.

This phenomenon is not due to any change in the characteristics of the original source of the light. The fact is that any given light source emits not one single colour of light, but several, which combine to give the effect of a single colour. By means of filters which will allow only certain component colours to pass, all other colours can be eliminated. Fog acts as a filter which will only pass red light.

The penetrating power of light varies as the fourth power of the wavelength, so that red light penetrates some 16 times better than blue light, and infra-red light some 16 to 20 times better still.

Red light has already come widely into use in aerodromes and for other purposes where fog penetrating properties are of importance. This new application of television renders possible the use of infra-red rays with their still greater penetrative powers. They will not, of course, be visible to the naked eye, even through fog. It will be necessary at the receiving end (for example, a ship at sea) to make use of a television apparatus in order actually to *see* through fog.

Used as Ordinary Light Rays

For the purpose of seeing in the dark by means of infra-red rays used in combination with a television apparatus, the rays are used in exactly the same way as ordinary visible light. That is to say, the rays are shone on to the sitter, and the "dark light" rays reflected from his face are passed on to the television transmitter.

The enormous possibilities of television, especially when used in conjunction with invisible rays, stir the imagination and open up long vistas crowded with marvellous speculative visions, transcending even the potentialities of the fabled magic carpet of our childhood days.

On Unknown Wavelengths!

MAN has had very many definitions. There is none more apposite for our age than "Man is a wire less animal."

IT is stated that a Scottish amateur wireless station GC2WL (Glasgow) on an input of four watts has transmitted messages to, and received messages from, a station in India. Evidently both stations used Scotch *whiskers*.

WE are informed that schools' receiving sets, which cost about £20 each on an average, are installed by the teachers themselves in nine cases out of ten. We believed that school teachers were well off.

THE P.M.G. announces that the Transatlantic telephone service is now extended to include places in the States of Michigan, Illinois, and Wisconsin. A neighbour states it is time the P.M.G. included 2LO and 5XX in his receiving set's reach.

FRANCE is following America in broadcasting auction sales. At a recent sale it took the auctioneer three hours to sell six articles. The next day at his wife's request he sold his own listening-in set.

WITHIN a few weeks over a hundred actions were brought against persons who had not paid their receiving-licence duty in Dublin. Is this another instance of *Home* Rule?

A WIRELESS paper in a questionaire asks, "In a broadcast receiver, do you prefer single control?" ("Yes" or "No"). Hardly a fair question to ask a married man!

DRAMA has received due consideration in the new studios that are now being built at Savoy Hill. There is an echo room, the noise room, the mixing room, and the thunder room. The room marked "Silence," we understand, will broadcast silence when its turn comes in the drama.

AN American whaling fleet of twelve vessels has been fitted with wireless receiving sets. *Broadcatching* whales!

"THE best amplifier on the market," states an advertisement in a wireless monthly. It's strange how a cat's purr is amplified when one listens-in.

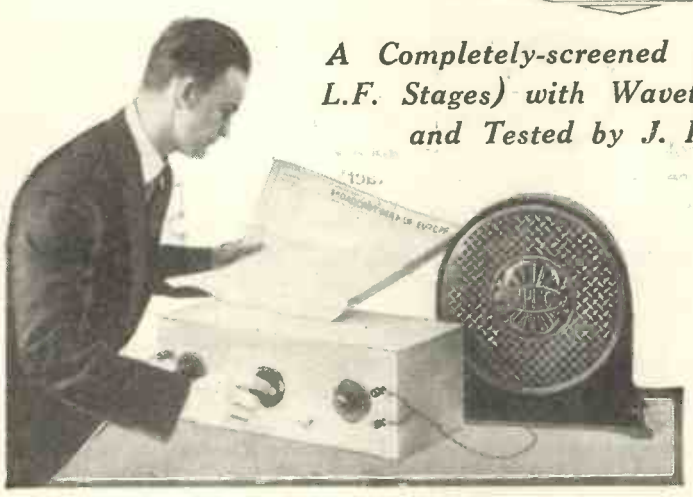
THE Alpine clubs of France, Switzerland and Italy are equipping their mountain huts with wireless. Even the huts on the Matterhorn and Mt. Blanc are to be so equipped. We are getting nearer Mars at last.

THE American Naval Research Laboratory has recently been conducting tests. Messages were exchanged between Bellevue and Mare Island, a distance of 3,000 miles, and this on a wavelength of about 13 metres. Yet I cannot hear Daventry 50 miles away. Some arithmetic!

For many months J. H. Reyner, B.Sc., A.M.I.E.E., has been an advocate of screened coils—in these pages he goes a step further and describes a completely-shielded three-valve receiver with a series-rejector wavetrap incorporated. This set—the Shielded Searcher—is ideal for long-range work.

The Shielded Searcher

A Completely-screened Three-valver (Detector and Two L.F. Stages) with Wavetrap Incorporated. Designed, Built and Tested by J. H. REYNER, B.Sc., A.M.I.E.E.



Although this set has no high-frequency amplifying stages it is possible, by virtue of the absolutely "silent background" that can be obtained, to carry out astonishingly long-range reception

SOME time ago, in connection with some experiments on wavetrap circuits, the extreme importance of avoiding all coupling between the trap circuit and the tuning circuit proper became very evident.

Increased Selectivity

Even in the simplest case, where one has only a detector valve with a suitable wavetrap in the aerial circuit, the selectivity is markedly increased if care is taken to avoid interaction effects between the trap and the tuning circuit.

W. H. Fuller, who was assisting me at the time of the preliminary experiments, has built up an experimental model of a simple Reinartz receiver, fitted with a wavetrap in which both the receiver itself and the wavetrap are individually screened, his theory being that it is necessary to avoid not only interaction between the parts of the circuit, but also direct pick-up on the tuner.

Interesting Results

The results obtained on these lines were so interesting that I have incorporated them in a receiver which is described herewith for the benefit of WIRELESS MAGAZINE readers. The preliminary experiments were carried out with screened coils, which make a very ready and simple method of trying a circuit out in a hook-up form.

Somewhat better results were obtained by complete shielding of the whole of the circuits, but this has the disadvantage, from the constructor's point of view, that the building up of the necessary screening is a matter requiring considerable care and trouble if a satisfactory job is to be the result.

Metal Cabinet

There are many cases in practice where the use of a completely shielded receiver would be beneficial, and to a large extent the same remarks apply, namely, that a considerable expenditure of time and patience is required in order to make a satisfactory shield, especially in view of the ever-present demand for reception from Daventry. This necessitates the shield being made in such a manner that the coils inside can be interchanged at will, so that either the lower or the upper broadcasting wavelengths may be received.

It was when thinking over this problem that it occurred to me to combine the functions of the shielding and the cabinet of a receiver. If one has a completely shielded receiver there is the expense and trouble of building the screening boxes, which are complete metal cases in themselves. After this we normally insert the whole arrangement into a wooden cabinet, which means an extra and unnecessary expenditure.

Minimising Labour

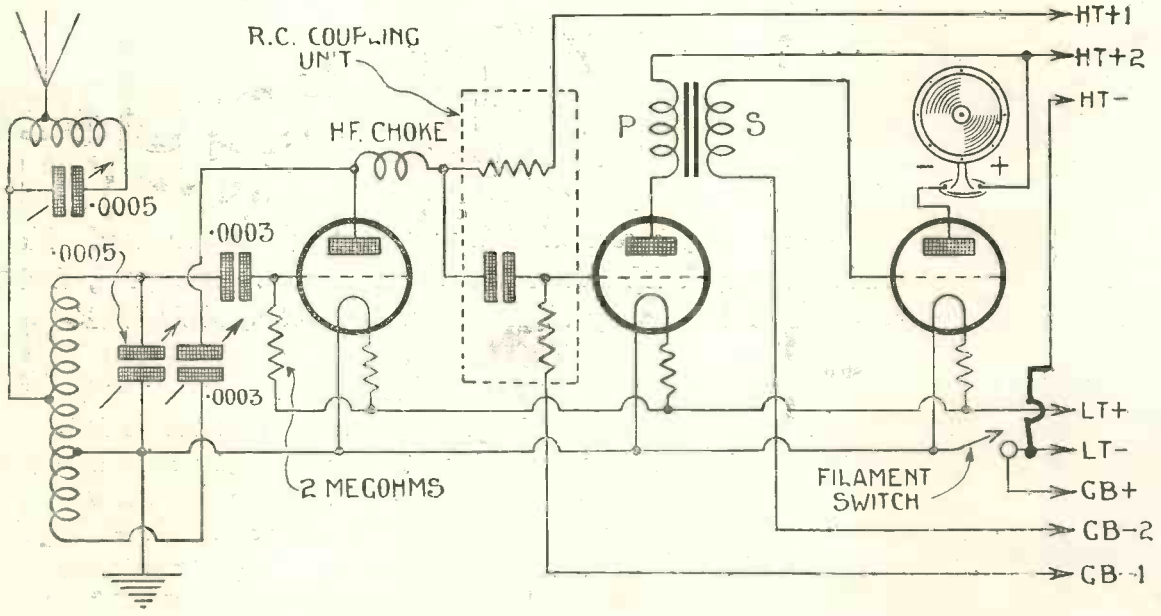
If it were possible to make the screening cases themselves in such a form that they constituted the containing case, then we should at one and the same time minimise the waste labour, so to speak, in building the screens and save money by dispensing with the usual type of cabinet.

A Useful Arrangement

I reviewed the possibilities of making up the cabinet in a series of partitions, but there are minor difficulties to be contended with in such a procedure, and it was finally decided to attempt to build the whole cabinet as a unit of suitable sheets of metal, and to fix partitions on the inside as required.

The sides and bottom of the case are made of fairly heavy gauge metal, while the lid is also of the same material, and is arranged to hinge on to the back. Angle fittings are provided in the corners and along

The Shielded Searcher *(Continued)*



Circuit Diagram of the Shielded Searcher—a Completely-screened Three-valve Receiver.

the top and bottom for bolting the portions together into one complete cabinet. Thus by a simple process of assembling the constructor can make up his own cabinet, which looks quite as neat as the ordinary type of cabinet, while it is automatically shielded practically completely.

I say "practically completely," because the contact between the lid and the rest of the case is not electrically perfect all round, but there is only a very small loss in the shielding properties from this cause.

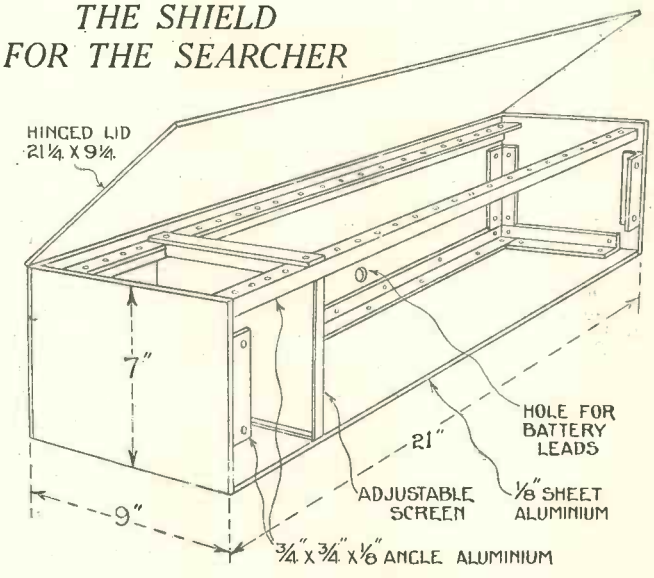
Partition Pieces

Running along the front and the back of the cabinet are two pieces of angle-strip, studded with holes at regular intervals. Thin partition pieces may then be bolted in position to the appropriate holes on the two angle-strips. It is thus possible to subdivide the main cabinet into a series of compartments, so that the various stages of a high-frequency receiver could all be screened and isolated from one another. Here again the screening is not quite perfect, but will be sufficiently good for the majority of purposes.

The front metal panel is finished off in an effective manner, and forms the main panel of the receiver. Any components which require to be insulated from the panel are mounted on ebonite sub-panels fixed behind the main panel.

The baseboard is in two sections, separated by the partition screen. The trap compartment is fitted with an ebonite panel, but the remaining components (except the terminals) are mounted on the metal panel itself.

THE SHIELD FOR THE SEARCHER



Details of the Metal Cabinet, which can be made of aluminium, copper, or brass sheet.

Circuit

So much, then, for the cabinet and general arrangement. Let us now revert to the description of the actual circuit adopted. A simple Reinartz circuit is utilised, coupled with a wavetrap of suitable design. My own experience indicates that the series-rejector wavetrap gives the most satisfactory results. This consists of a simple tuned circuit, a portion being included in the aerial lead to the receiver.

A Completely-screened Three-valver *(Continued)*

The strength of the trapping action is varied by increasing or decreasing the proportion of the trap coil actually in the aerial circuit.

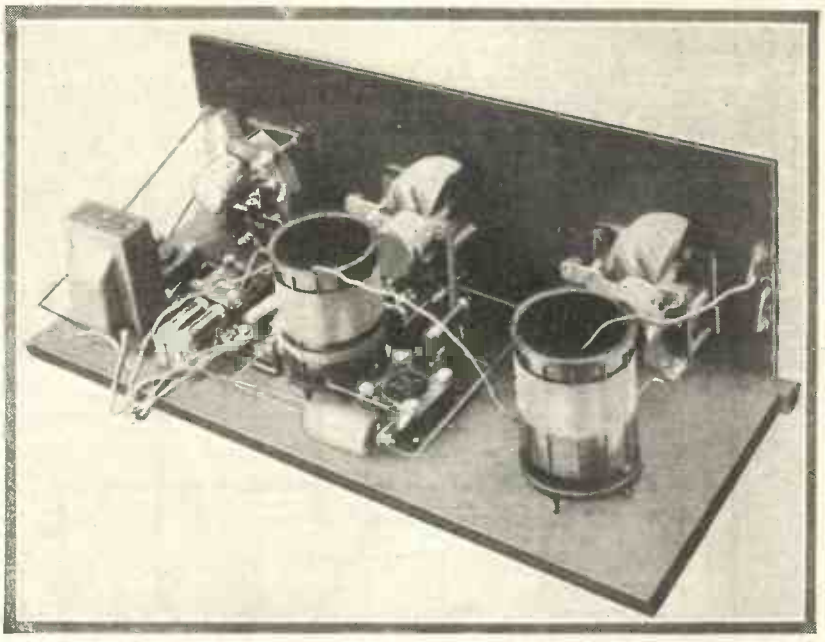
Tapped Wavetrap Coil

The circuit utilised, therefore, is shown opposite. We have the series-rejector trap on the left-hand side provided with a series of tappings, so that the trapping action may be adapted to suit the particular conditions. These several tappings are arranged inside the screening case, because they are only required when the strength is being adjusted to give satisfactory results. Once a good position has been found, the tapping on the trap coil may be set.

Tapped Grid Coil Also

The grid circuit of the detector valve is provided with an ordinary tapped coil, taps having been taken at two different points so that the most suitable point for the particular aerial may be chosen. It may sometimes be found necessary to change from one tap to the other as the tuning is altered from the lower to the upper end of the scale. This depends upon the aerial in use, and one occasionally obtains an absolutely dead spot where the signal strength drops away completely and the tuning becomes flat.

This is obtained when the aerial system comes in tune with the secondary circuit, so that a species of a tight-coupled arrangement results, but this difficulty may be obviated by changing over the aerial circuit to another tapping point on the coil. For this reason, therefore, taps are taken at the 5th and 8th turns respectively on the tuning inductance, so that if one tap proves unsuitable the other may be employed.



View of the Shielded Searcher without the Shielding Partition.

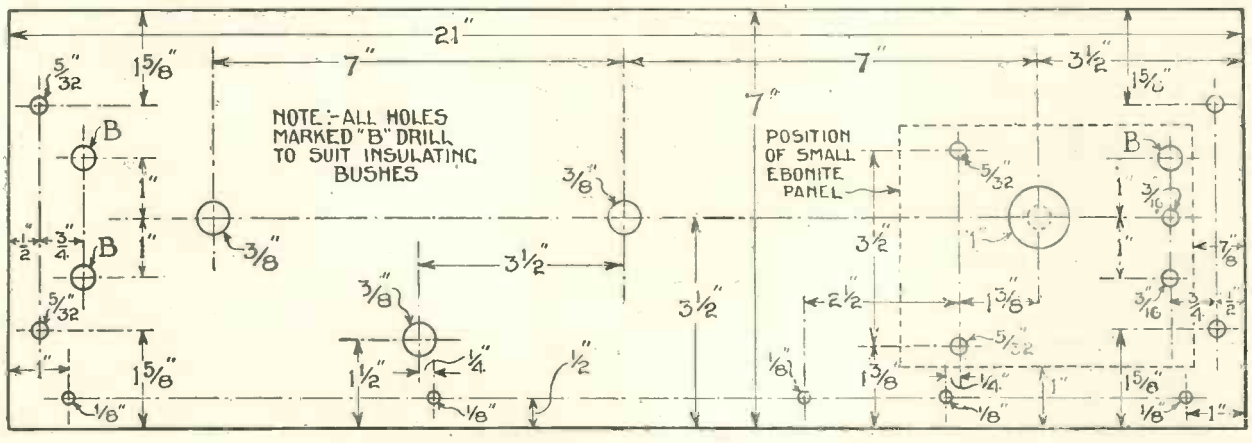
L.F. Stages

For the two note magnifiers one resistance-coupled stage and one transformer-coupled stage have been employed. This arrangement gives adequate signal strength, particularly when one of the high-amplification-factor valves is used for the detector stage, and at the same time it gives a pleasing quality, particularly on the local stations.

Reinartz reaction is employed; this can be adjusted to operate very smoothly, so that quite a number of stations can be obtained on the loudspeaker without difficulty when the trap circuit has been adjusted.

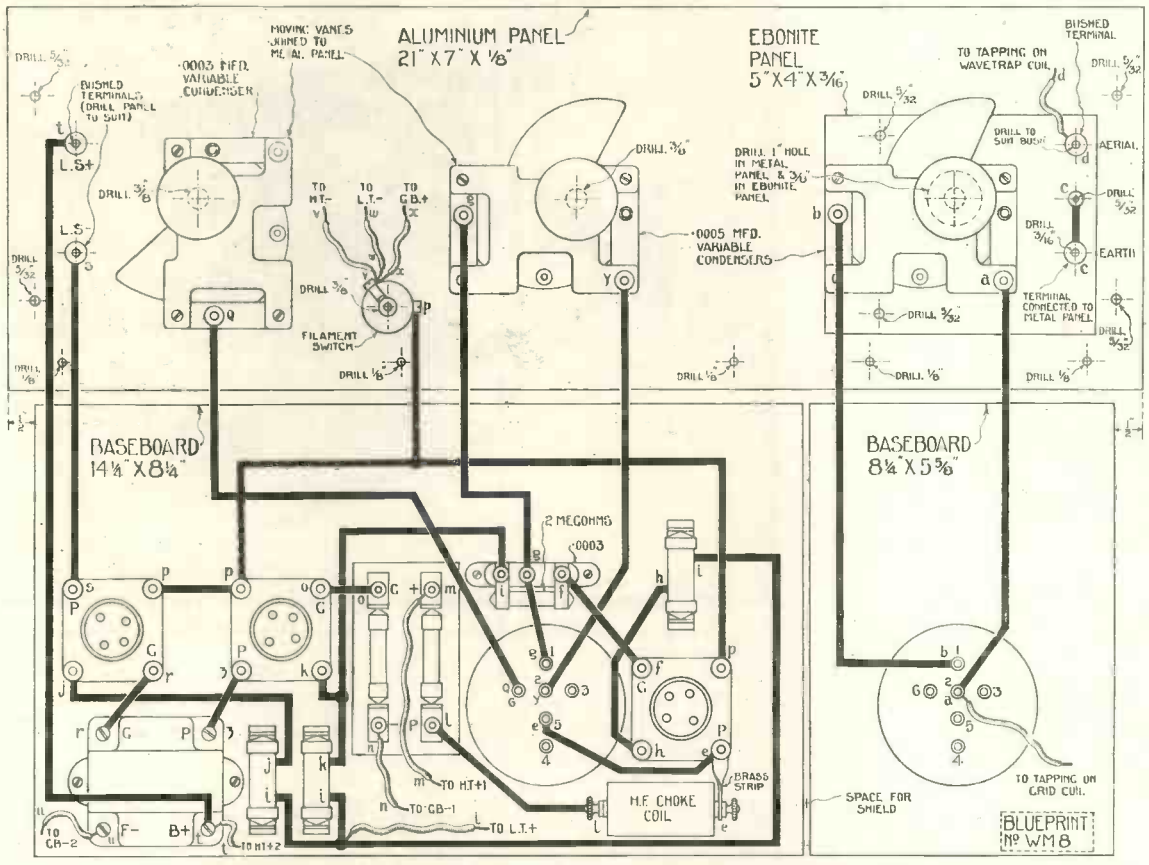
The efficiency of the simple detector valve operating under satisfactory conditions is well known, but trouble is experienced if the receiver is to be operated close to a local station

The introduction of a simple trap will go far towards eliminating the



Panel-drilling Details of Back of Front Metal Panel.

The Shielded Searcher *(Continued)*



Layout and Wiring Diagram of the Shielded Searcher. Full-size Blueprints (No. WM 8) can be obtained at 1s. each from Blueprint Dept., "Wireless Magazine," La Belle Sauvage, E.C.4.

near-by stations, and as this can be done effectively without upsetting the sensitivity of the remainder of the circuit, the receiver becomes one suitable for very good reception on distant stations. For this reason, therefore, the receiver has been called the Shielded Searcher.

Components Required

The following components will be needed in making up this receiver :—

Kit for aluminium cabinet, 21 in. by 7 in. by 9 in. (Burne-Jones).
2 .0005-microfarad square-law variable condensers (Ormond or Dubilier).
.0003-microfarad square-law variable condenser (Ormond or Dubilier).
2 6-pin bases (Collinson).
Trap coil (Collinson).
Aerial coil (Collinson).
[Alternatively, the formers may be obtained from the Collinson Co., and the coils wound in accordance with the details given later.]
.0003-microfarad fixed condenser (T.C.C. or Dubilier, Lissen).
2-megohm grid leak (Lissen or Dubilier).
Ebonite panel, 5 in. by 4 in. (Becol).
Resistance-capacity unit (Ediswan).
H.F. choke (Wright & Weaire or Success).
L.F. transformer (Igranic-Pacent 3 : 1 or B.T.H., R.I.).
3 resistors to suit valves (Temprytes or Peerless).
On-off switch (Lissen or Lotus).
3 valve holders (Benjamin or Lotus).
4 terminals, marked Aerial, Earth, L.S. + and L.S. — (Belling-Lee).
8-way battery cord (Lewcos).

The construction of the receiver requires a little thought, but will present no real difficulty when the principle has been grasped. The first operation is the fixing of the ebonite panel behind the front metal panel of the cabinet.

Metal-panel Holes

Clearing holes for the four fixing screws will be found already drilled on the metal panel (if the parts are bought from the firm mentioned in the list above). The ebonite panel should be placed in position on the left-hand side of the panel, as shown on the layout.

The positions for the fixing holes can then be marked out on the ebonite panel with a scriber through the holes of the metal panel. These holes should then be drilled out, and the ebonite panel clamped into position by inserting countersunk screws through the holes in both panels and locking them up with nuts at the back.

Mounting the Components

The various holes can now be drilled for the trap condenser, and aerial and earth terminals. These holes should be drilled exactly in the centre of the holes in the metal panel, and subsequently enlarged up to the required size. The holes for the terminals are made 2 B.A. clearing size (assuming that 2 B.A. terminals are used), the holes in the metal panel being already large enough to clear the terminals.

A Special J. H. Reyner Receiver

The same remark applies to the hole for the trap condenser. This should be drilled out to the necessary ⅜ in. for the one-hole fixing condenser. The hole in the metal panel will be found to be large enough to clear the nut when the condenser is fixed in position, so that the condenser is completely isolated from the screen.

Direct on Metal Panel

The remaining two condensers and the on-off switch are mounted in direct contact with the metal panel, through the holes already provided.

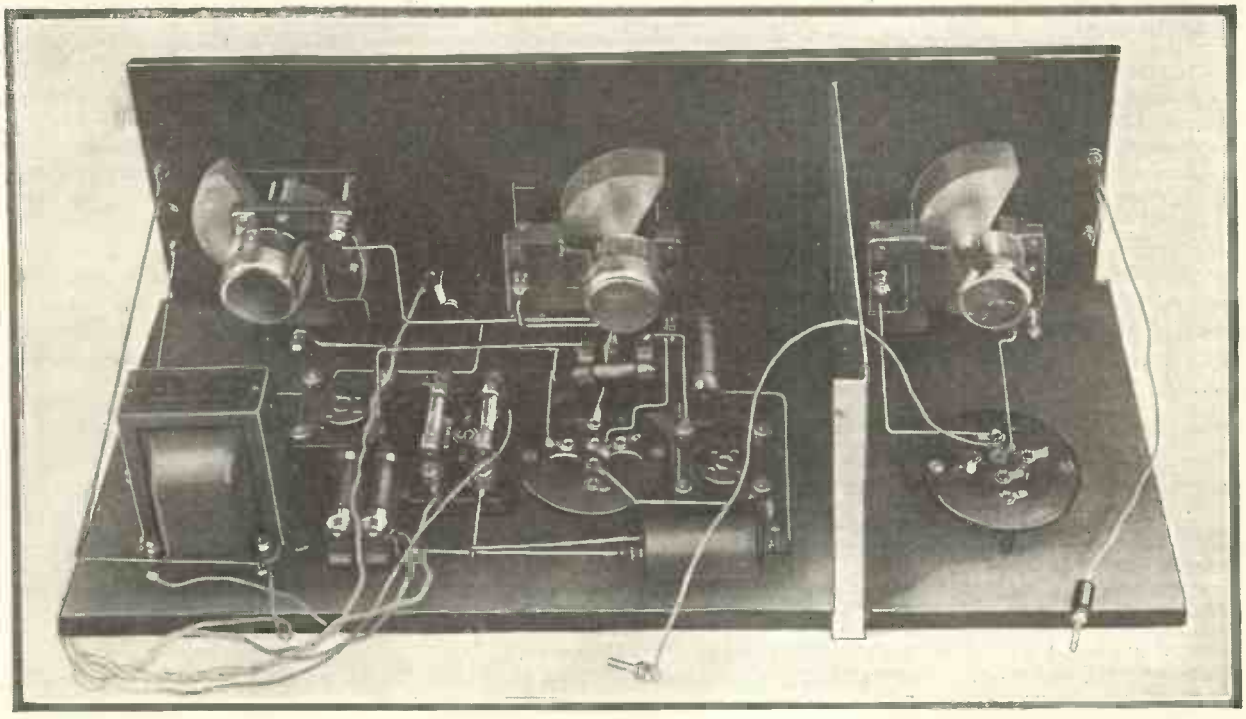
The two baseboards are next screwed into position, being held in position by screws inserted through the front of the panel. Aluminium angle brackets can be used for strengthening purposes if desired, but they were not used in the original model actually built.

Baseboard Components

The baseboard components can then be laid out in the positions shown. Although a little space has been wasted, there is really plenty of room and the exact layout is not very critical, so that as long as the general disposition of the parts is as shown in the diagram satisfactory results will be obtained. The only important point is that the coils must be kept well clear of all metal work, and should not be nearer than 1 in. at any point.

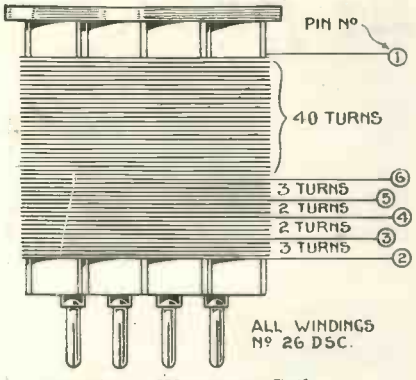
View of the Shielded Searcher Complete in Metal Box.

The wiring of the trap can be carried out independently of the remainder of the receiver. A six-pin base is used for the coil, the ends of



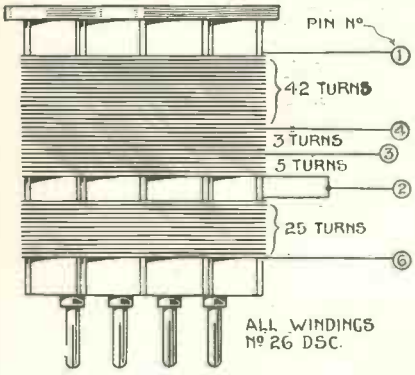
Baseboard View of the Shielded Searcher—a Completely-screened Three-valver.

The Shielded Searcher *(Continued)*



Details of Wavetrap Coil.

The details of the coils are given in the accompanying diagram. The feather-weight formers, which are manufactured by the Collinson's Precision Screw Co., are used for winding the coils, and these are provided not only with six pins, but with sockets inside the coil. These sockets serve for making the connections to the various tapping points required. The plugs therefore from the aerial and from the trap respectively may simply be plugged into the appropriate sockets inside the coil.



Details of Grid and Reaction Coil.

which are connected to pins 1 and 2. The taps are taken to 3, 4, 5 and 6. Sockets are fitted inside the former so that connection to the taps is made by merely plugging into these sockets. One connection only comes from the trap circuit, which is taken through a hole in the screen on to the tapping point on the tuning coil.

The rest of the receiver is wired up in a straightforward manner, and no comment is necessary for this portion of the operation. The L.T.– and H.T.– connections are both common and taken from the screen.

H.T.– to L.T.–

Some readers may wonder why H.T.– and L.T.– have been connected together instead of taking H.T.– to L.T.+, as is often done in modern practice. The disadvantage of this latter practice is that if an inadvertent short-circuit is made from the H.T.+ to the L.T.– this will probably burn out the valves.

In the present case, if any short-circuit occurs, the only effect is that the high-tension battery is short-circuited, but the valves will be left intact.

The method of using the receiver is very simple. First of all set the trap condenser at zero, and plug the flex lead from the aerial terminal into the lowest tapping on the trap (No. 3). Plug the lead from the trap into one or other of the tapping points of the grid coil. Set the reaction condenser at zero, and tune-in the local station.

This will be found without any difficulty, and may be brought in as strongly as required by judicious use of reaction. Remember that any oscillation on this receiver will cause radiation and interference to the neighbours.

Now tune the trap condenser slowly. At one particular point the signal will be found to vanish almost completely. Tune-in carefully to this point, when the trap will be correctly adjusted. This will now remove the local station almost completely, without affecting the other stations, and numbers of distant stations may be received without difficulty by operating the circuit as a plain Reinartz receiver.

If the elimination of the local station is not complete enough repeat the process with a slightly larger tap. The greater the tap the heavier the trapping action, but if the tap is too large the receiver is dead over some little distance, and also the tuning of the trap and the set itself are not independent.

Use of the Wavetrap

When the use of the receiver has been mastered some very interesting results can be obtained by careful use of the trap. It will be found that this particular type of trap exercises a form of boosting action on the signals just before the trapping action begins. When it is desired to receive stations which are not close to the local station, therefore, so that the tap itself is not required so much, it will often be found that after a station has been tuned-in on the normal circuit, a careful tuning on the trap circuit will often bring up the strength quite appreciably.

This, however, is a matter of only secondary importance, the principle effect being that of tuning out the local transmission so that the distant stations can be received without trouble.

SOME DIAL READINGS FOR THE SHIELDED SEARCHER

Station.	Wavelength.	Second Dial Reading.	Station.	Wavelength.	Second Dial Reading.
Brussels	508.5	168	Birmingham	326.1	80
Bournemouth	491.8	167	Breslau	322.6	77
Langenburg	468.8	152	Newcastle	312.5	71
Frankfort	428.6	136	Nuremburg	303.0	64
Berne	410.0	127	Hanover	297.0	60
Glasgow	405.4	125	Dresden	294.1	56
Hamburg	394.7	118	Dortmund	283.0	45
London	361.4	102			

An Exclusive Article by J. GODCHAUX ABRAHAMS

Broadcast Anarchy in France!

FROM chaos to anarchy is but a short step; from anarchy may possibly arise order. But for the present, the divergent policies adopted by the associations operating broadcasting transmitters prevent the establishment of an organised service in France. For the past three years many attempts have been made to pass a Bill which would enable the State to assume control of all broadcasting interests in that country, but the rapid changing of Cabinets, and the antagonism displayed by political opponents until the end of 1926 precluded the inception of such a measure.

A Three-cornered War

To-day, France finds herself in the throes of a three-cornered wireless war, in which each of the separate combatants is marshalling its forces to secure a transmitting monopoly, and thereby obtain special benefits for the individual groups it represents.

The history of French broadcasting dates back to 1921, when short concerts for experimental purposes were put out by the Eiffel Tower, and about one year later, by a small station erected at Levallois-Perret by the Compagnie Française de Radiophonie.

Since that date, although it was deemed by the authorities that the first paragraph of the French Telegraphy Bill voted on December 27, 1851, by its wording: "The State possesses the sole right to the telegraphic transmission of messages, or to a concession thereof," implied a State monopoly covering all broadcasting activities, it was not so interpreted by the wireless world; the French Governments have found themselves unable either to control or to check the installation of private radio telephony transmitters in that country.

Benefits Ignored?

Notwithstanding the appeal made by the broadcasting of news bulletins and entertainments to the peoples of other nations, the French Government appears to have ignored the benefits of an organised service as adopted by its neighbours. Owing to internal dissensions, it has followed a policy of drift, with the result that, with or without official authority, transmitting stations have been erected in various parts of France, some of them operated by small groups of local associations, others established as private or commercial undertakings.

As a sop to its nationals, and with a view to curtailing possible greater developments on the part of private enterprise, the French Government,

In this article our contributor discloses the chaotic state of broadcasting in France and discloses how our neighbour may put its house in order in this respect. Whatever developments may take place, they will be watched with especial interest by British listeners generally.

or at least that branch of it in control of the Posts and Telegraphs, through its technical college, L'Ecole des PTT, opened a station on January 1, 1923, followed, as rapidly as its financial resources would permit, by a small chain of stations in the provinces to relay its Paris transmissions.

Even then it was found impossible to operate these stations without local assistance; in fact, although the actual transmitting plant is State property, the programmes in most instances are provided by private clubs or associations, who find the wherewithal for the running costs of the transmitters.

It must be borne in mind that the French listener does not pay a licence fee proper; all he is asked to do is to register at the local post office as owner of a wireless receiver; the cost of this registration has been one *franc* per annum.

The broadcasting stations, whether official, authorised, or pirate, can secure no income from their listeners; although it is not quite clear whether radio publicity is or is not allowed, they are compelled to resort largely to this method for a precarious income, or to voluntary pecuniary gifts on the part of their well-wishers.

Twenty-four Stations

What do we find in France? Twenty-four stations, of which some broadcast daily, others but two to three times a week, on various wavelengths, mostly chosen at random to suit themselves and irrespective of any interference which may be caused either to their own compatriots or to friendly neighbouring transmitters.

Of official stations there are but few, namely PTT, Paris, the mother of a small brood in the provinces, still semi-dependent for their programmes on the capital transmissions relayed by land-line; Marseilles; Lyons; Toulouse; and Bordeaux-Lafayette (Croix d'Hirs), the latter only reverting to Paris for its Saturday evening entertainment. To these must be added Strassburg, of which much is said, but little heard, and Lille, which will be on the air by the middle of the summer.

Although promises have been made at odd times to the inhabitants of Bourges, Rennes, Fécamp, Nice Montpellier, and many other centres, for the present for their wireless distractions these towns are compelled to rely on either Radio-Paris, Eiffel Tower, or, better still, on foreign transmissions.

Eiffel Tower

Eiffel Tower, Paris, whilst run by the military authorities, has been drawn into the PTT net of relays, and is also leased to a private association for a number of hours daily.

At the top of the tree we may place Radio-Paris, operated by the Compagnie Française, which ranks amongst the stations giving the most extensive programmes. Further, in the French capital, we find a station owned by *Le Petit Parisien*, a daily paper, and Radio Vitus and Radio LL, both erected by private wireless concerns for advertising purposes.

Broadcast Anarchy in France! *(Continued)*

Generally speaking, in the provinces the transmitters are entirely run by local enterprise, and of these, without doubt, Toulouse (Radiophonie du Midi) is in the forefront for its broadcasting activities.

But dotted over the country there are small individual transmitters erected for the benefit of local listeners. Of such are : Biarritz, Radio Lyon, Agen, Montpellier, Beziers, Juan les Pins (an offspring of Radio LL, Paris), Angers, Radio Sud-Ouest (Bordeaux), Mont de Marsan, and Forez St. Etienne.

Skeleton Programmes

With the exception of Toulouse and Radio Lyon it may be definitely stated that the majority of these provincial stations supply a mere skeleton programme of entertainment, and their existence is but barely justified; in most instances the broadcasting studio has become the *rendezvous* of local wireless fans, and acts as headquarters and general experimental laboratory to the radio association of the district!

In a speech made in December, 1926, to the French Chamber of Deputies, M. Bokanowski, Minister of Commerce, Industry and Posts and Telegraphs, freely admitted that his Department was powerless to deal with broadcasting in France unless a new bill, giving him a controlling power, was brought into operation.

> " There exists no official authority to deal with the matter, and in order to secure peace it has been found necessary to grant transmitting permits to private organisations. Some individual transmitters are actually broadcasting without official authority, and as no measures can be legally adopted, the right to act in the same manner is claimed by competitive concerns. The French wireless industry is greatly suffering from this state of chaos."

Basis for the Future

As a result of this public statement, the new decree drafted by the Minister of Commerce, which was to act as a basis for all future wireless broadcasting in France, was passed by the Cabinet, but still awaits the sanction of the French Chamber before it can come into force. Ultimately, if adopted, it will bring the radio industry under Government Control, as within five years of its adoption the stations will be automatically nationalised; they will be operated and administered by the State.

There is little doubt that considerable impetus was given to a Departmental move in the matter by a Gilbertian situation which arose in Toulouse, during the latter months of 1926, and over which the Post Office authorities were severely criticised. Since May, 1925, this Government Department had persistently refused the facilities of a land-line to

A VIOLINIST

Mr. Albert Sammons

the Toulouse broadcasting station, which, taking measures in its own hands, for the purposes of re-transmission of interesting local events added to its plant a portable short-wave transmitter.

On various occasions it was taken to a theatre or other place of entertainment. Anxious to relay services from the cathedral of St. Etienne, of which the Toulouse inhabitants are inordinately proud, permission was obtained from the Archbishop to install a microphone and transmitter within the precincts of the building.

But the postal authorities, who possess a station of their own, forbade the transmission, asserting that the Radiophonie du Midi had no authority to broadcast services from a State-owned cathedral. The Prelate, however, put forward as an argument that as the broadcaster had already relayed performances from the State-owned Capitol Theatre, to which no objection had been raised, he could not possibly withhold his permission to a relay, of which, as a matter of fact, he was entirely in favour.

Nothing daunted, the authorities retaliated by bringing their own microphone, amplification panel and land-line to the cathedral, and broadcast the service through the PTT station of Toulouse. In this manner the religious ceremony was simultaneously relayed to two different transmitters, from two separate microphones.

Acme of Ridicule

The acme of ridicule was reached when the Post Office, invoking numerous acts, brought an action against the Arch-Priest, a suit which the Court promptly threw out. An impossible situation, by no means to the credit of the authorities, had thus been brought about, the out come of which, as is often the case with trivial incidents, will distinctly influence the broadcasting organisation of the country.

Now, the new Bill stipulates that the entertainments are to be arranged by a National Programme Board, which will include representatives of the public services, the most important associations, such as those acting for composers, playwrights, authors, artists and musicians, the wireless industries and traders, as well as elected members of the listening public. Although it contains a large number of statutory clauses, regulating the installations of a central and regional station, but little thought has been given to the sources from which an income is to be derived for the upkeep of the transmitters.

Revenue from Publicity

So far as can be ascertained, the stations, for a period of five years, will be compelled to subsist on such revenue as they can collect from publicity charges, or at least from that portion which they will be allowed to retain. In certain circumstances from ten per cent. to fifty per

An Exclusive "Wireless Magazine" Article

cent. of this income is returnable to the State.

Compensation

Moreover, in 1933, at the time the broadcasting stations fall under State control, payment in compensation by the Government can be spread over a period of five years. In the meantime, of course, the Bill would empower the authorities to close down, or to authorise the installation of any broadcasters, as it may desire.

Generally speaking, far from allaying the anxieties to which most of the transmitting organisations have been subject, the new proposals, in the opinion of many, will in no way assist the programme organisations to run their entertainments, and it is thought that the State control and ultimate State monopoly of broadcasting will inevitably hamper the development of the wireless industry in France.

Public opinion generally favours individual effort, although it is openly admitted that some concerted scheme should be put forward for the regularisation of an organised service.

It is due to divergence of interests that there exists in France to-day at least three groups intent on securing full broadcasting freedom and its inherent benefits. On the one hand, we find Radio-Paris, a pioneer station; on the other, groups of independent manufacturers, antagonistic to a monopoly scheme; and in the background the Posts and Telegraphs Department, desirous of possessing the upper hand. La Société Nationale de Radiodiffusion is the title of an association launched by the Syndicat Professionel des Industries Electrotechniques (the Wireless Industries Syndicate), to which almost daily reference is now made in the French Press as the S.P.I.E.

Its object is to raise a capital of some ten million francs for the purpose of erecting or of taking over one high-power central transmitter in or near Paris, and various regional broadcasting stations in the provinces.

It is suggested that an income could be derived firstly from publicity and secondly by a series of taxes, collected on the sales of all wireless components, from both manufacturers and dealers. Of a two per cent. tax paid by all buyers of components and receivers, seventy-five per cent. would be distributed to the national or high-power station, and the balance to the provincial transmitters.

Radio-Paris in the Combine

It is reported that Radio-Paris has been willingly roped into this combine, and failing agreement to the utilisation of its high-power transmitter at Clichy, has suggested the taking over of St. Assise as a site for the national station. In view of the taxation scheme put forward by the Wireless Industries Syndicate, the dissemination of this news has caused considerable excitement throughout France.

Those provincial stations which up to the present have been solely supported by local funds have put forward a plea to the effect that such an arrangement would constitute a veritable *private* monopoly, and as such should be frustrated at all costs. Without doubt, the suggested division of the receipts is the source of the trouble.

Threat of Boycott

In a very tactless manner, before even the association was placed on a firm footing, some of its members intimated that all traders showing hostility to the scheme would be boycotted by the syndicated manufacturers; and further that certain stations, such as those existing at Toulouse, Agen, Mont de Marsan and Béziers, would be closed down. These unguarded statements have been the subject of considerable discussion in local newspapers, and have been keenly resented by all districts served by those transmitters; they have done much to prevent an amicable understanding between the conflicting groups.

From the day the French Ministry of Commerce fathered a Bill, which to a great degree would eventually place broadcasting in France on a national basis, letters and petitions from all sources have been addressed to that government department. Notwithstanding the fact that most parties are agreed on the advantages of a Radiodiffusion Nationale, to which all possible revenues may be diverted for the purpose of furthering the development of wireless in the country, numerous protests have been made against the possibility of a monopoly in private hands. It is felt that power should be only granted to a public association enjoying absolute independence, and entirely free from trade or industrial interests.

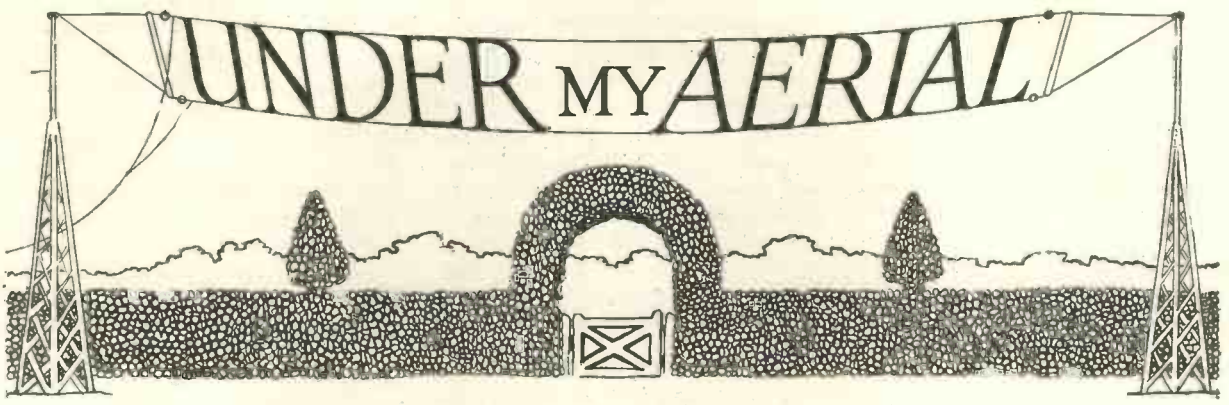
It is pointed out that the monopoly aimed at by any of the competing groups would result in the possession by France of, perhaps, one useful broadcasting station, situated in or near the capital; all other existing transmitters in the provinces would be reduced to abject poverty.

The French nation, generally, refuses to look solely to Paris for its broadcast entertainments. Such, to-day, is the position of broadcasting in France; it is not a happy one. In what way can it be reorganised and placed on a sound footing now that chaos has merged into anarchy?

FISHING UP-TO-DATE.

You may gain a convert to broadcasting by introducing the All-broadcast Two. Read about it on p. 225.

HALYARD'S Chat on the Month's Topics — **Sketches by GLOSSOP**



Alternative Programmes

IT would be a wonderful thing indeed if the whole of our listening public were completely satisfied with our wireless programmes. From the very nature of people and things there is bound to be some dissatisfaction over the choice of such programmes, and I think that the best that can be hoped for is that such dissatisfaction should be a minimum.

Suppose you were given the task of building up the broadcast programmes for a week, what method would you employ in order to ensure a minimum amount of dissatisfaction over your efforts?

Would you not try to give every listener the choice of at least two alternatives? I think I should aim at *three* alternative programmes for every locality. One of my programmes would be high-brow in character, the second would be middle-brow, and the third would be low-brow.

Do you think it would ever be wise, though, to style alternative programmes as high-, middle- and low-brow? Would anyone in the world of

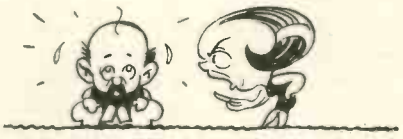
Long overdue.

wireless openly and shamelessly confess to being a hundred per cent. low-brow? Even George calls himself a low-to-middle-brow with a cheese-like tendency to become high with age and exposure.

Call them what you will, I am certain that you will agree with me when I say that our promised alternative programmes are long overdue.

The Two Daventries

Are you on the look-out for, or should I say on the listen-in for, Daventry X, the new experimental station which is to transmit from Daventry on a wavelength somewhere round about four hundred metres?



The habit of talking.

There has been an unusually large number of rumours about this new station, but it seems fairly certain that the object of the experimental transmissions from Daventry X is to find out how high a power can be satisfactorily used when transmitting on a wavelength within the broadcast band.

The experimental work to be carried out at this new Daventry station is expected to lead to a determination of the best type of transmitting apparatus for the new regional broadcasting stations which are ultimately to take the place of our present main broadcasting stations. It looks to me as if the work of the junior member of the Daventry family will be well worth following.

How are we going to distinguish between these two Daventry stations in our ordinary wireless conversations with each other? Shall we get into the way of referring to Big Daventry and Little Daventry, or to Daventry Senior and Daventry Junior? We can scarcely be expected to talk about Daventry on 1,600 metres and Daventry on 400 metres, can we?

If the authorities persist in calling the new Daventry experimental station Daventry X, perhaps we shall find ourselves falling into the habit of talking about Daventry X and Daventry double X.

Prehistoric Wireless

I had just taken off my phones in that state of exasperation which comes from a complete lack of results when George opened the door and walked into the room.

"Well! Well! Well! Whoever would a-thought-it, a-thought-it, a-thought-it?" sang George in a series of distorted harmonics and falsettos.

"If you will insist on singing, I wish you would do it *sotto voce,*" I said with some asperity.

"Crystal set with slider," said George in his normal manner of speaking. "Mister Halyard, you ought to be wearing low-loss sandals, bare legs, and a loosely-coupled garment of skins secured by a leathern girdle around the waist."

"Whatever are you raving about, George?"

"And you ought to have long hair and wild eyes set in a flowing beard.

"Crystal set with slider."

In your hand you should have a club of the one-for-his-knob pattern."

"What is the reason for this foolish outburst, George?"

"Your old slider crystal set. It takes me back to prehistoric times. I am merely suggesting that you should dress the part when using that old set. You would look fine in the garb of a man of the Slider Age or

Glacial Period to give it its scientific designation."

"Listen, George, it's like this. I have been hearing so much about long-distance crystal reception lately that I thought I would have a shot at it myself. This old slider set used to give splendid results years ago. I was rather hoping to pick up one or two German stations with it to-night. You know it is quite a common thing for a German station to be heard on a simple crystal set these days."

"In Germany?"

"No, in England."

"Any luck so far?"

"Not a sound."

"Perhaps you would get on a bit better if you put the earthing switch over."

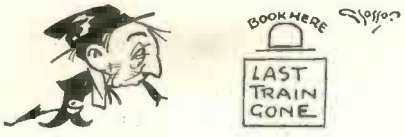
And I did.

Transformer Luck

It is strange how luck seems to vary with low-frequency transformers. One of my wireless friends has had the same two L.F. transformers in use in his three-valve set for over three years. Another of my wireless friends has had to replace his two L.F. transformers on an average every six months during the same three years.

As far as I can tell, there is no difference in the way these two friends of mine treat their sets. My first friend thinks he is lucky over his transformers and my second friend merely thinks he is unlucky. He says he had just the same bad luck over his gramophone, and that it is no use grumbling when the luck is against you.

A peculiar thing about these two friends of mine is that, although they have such different luck over trans-



No use grumbling.

formers, they both enjoy extraordinarily good luck over valves.

Are you lucky or unlucky over your low-frequency transformers? How long have your present transformers been in use?

My luck over transformers is very variable. In my oldest valve set I have two L.F. transformers which I bought over four years ago, and yet on my junk shelf there are no fewer than six broken-down transformers of later date and design than the two in the old set.

Some day I shall wind a low-frequency transformer myself in such a way and of such wire that it will last a lifetime.

Those Foreign Names

A contributor to a recent number of an American wireless periodical takes exception to the practice of cer-

Those foreign names.

tain American announcers who attempt foreign pronunciations of the names of foreign composers when those names come into the programme announcements.

He says it is not necessary to call Wagner "Vargner" and Chopin "Showpan" to be correct, but that

FREE BLUEPRINT OF A SPECIAL RESISTANCE-CAPACITY THREE-VALVER NEXT MONTH

it is perfectly proper to pronounce foreign words and proper names as if they were English. What we need in our broadcasting, he goes on to say, is more and better English, and less high-school French, German, Spanish, and Italian.

How does all this strike you? When you hear an announcer refer to "Vargner" or "Showpan," do you go into ecstasies or do you feel as if you want to get up and kick somebody?

Personally, I am inclined to favour the foreign pronunciation of a foreign name for the reason that an English pronunciation would be an utter impossibility with some such names. For example, how could you possibly attempt an English pronunciation with such names as Dvorak, Moszkowski and Tchaikovsy?

Then, again, there is always the chance with me that I may hear a new pronunciation of an awkward foreign word before George, and work it off on that old scoundrel to my intense satisfaction.

Cheaper Wireless

Have you noticed any increase in the relative amount of cheap Continental wireless material in your favourite wireless shop? One small wireless shop to which I occasionally go for component parts seemed to me the other day to be half full of Continental goods, chiefly German.

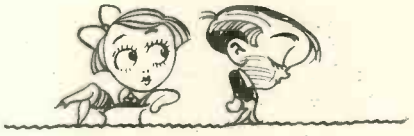
When I entered the shop there was a loud-speaker going full blast on a three-valve set. The neck of this loud-speaker was of unfamiliar shape to me, so I asked the man in charge of the shop what make the loud-speaker was. In reply he gave me a German name, or rather word, which is as familiar to the German wireless listener as the name Marconi is to the British wireless listener.

Glancing round the shop, I saw in one corner a pile of German high-tension batteries, the tops of which were filled in with some red substance instead of with the familiar wax or pitch.

I could not help asking the man in the shop why he was carrying so much German stock.

"It's like this," he said. "There's a great demand here for cheaper wireless, and by getting German goods direct I can offer some very cheap lines to my customers. The cheaper wireless goods are, the more wireless trade there will be, you know."

There may be some element of truth in what this wireless dealer said to me about cheaper wireless, but I, for one, am far too shy of foreign wireless apparatus to try to make *my* wireless cheaper than the British



Far too shy.

wireless manufacturer can make it for me.

A Backward Step

My latest wireless receiver is a one-valver built for distance work. In wiring up this set I made use of No. 18-gauge square-section tinned-copper wire.

Under My Aerial *(Continued)*

For a long, long while I have used nothing but No. 16-gauge square-section tinned-copper wire for wiring up, and I have been wondering if my use of No. 18-gauge wire instead of No. 16-gauge is my first backward step in the matter of wiring up my home-made sets.

When I first began home-construction work I wired up my sets with ordinary No. 22-gauge d.c.c. wire. From this wire I progressed to No. 22-gauge round tinned-copper wire. Square-section wire next came into fashion, and I began with No. 18-gauge of this wire. Later, I took to the thicker No. 16-gauge square-section wire, and I really can make most beautiful right-angle bends

A backward step.

with this No. 16-gauge square-section wire.

In the old days I used to cover all my wiring-up wire with yellow systoflex, and for awkward joints—well, I found bicycle-valve tubing would stretch over and cover the most clumsy soldered joint I ever made. They were grand old days, though, and I sometimes wish we could go back to them.

By the way, how is it that the American method of wiring-up with strips of metal has never caught on in our country?

The Diseases of Wireless

When George was lowering himself into the depths of his favourite armchair in my reception room last night I remarked that I had some very interesting and new wireless information to put before him.

"How exciting! Whatever is it?" asked George.

"A list of diseases caused by wireless in America."

"Dear, dear! How disappointing! I thought you were at least going to tell me that the man who fills up the depressions over Iceland had discovered the cold valve of the future."

"Please be serious, George. I think you ought to know all about these American wireless diseases."

"Possibly I do; go on with the list, though."

"The first on my list of American

Man who fills up the depressions.

wireless diseases, George, is distomania. The name explains itself."

"Nothing new in that, old man. The original name for that disease was distance itch. Easily cured by Keating's Eliminator, you know."

"Next we have phonal hallucinations."

"The first symptom of which is the picking up and identification of the station that was not. Go on."

"The next on the list sounds very dreadful, George. Listen: microphobia, fear of the mike."

"Not so dreadful as hydrophobia, fear of the tyke."

"The last on my list of diseases is audio-toxication. Whatever can that be, George?"

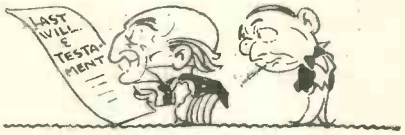
"Hiccups, of course, old man, usually caused by a kink in the down-lead."

Relative Importance

"Opinion seems to be very divided as to which is the most important part of a wireless installation, George," I said the other evening to my ever-ready counsellor.

"On most subjects opinion is more often divided than shared, you know," said George, with one of his looks of concentrated wisdom.

"Some wireless experts think that the aerial is the most important part of a receiving installation," I said.



Relative importance.

"And some the earth," said George.

"Some experts consider the condenser to be the all-important part, George."

"And some the grid leak."

"What do you think, George?"

"In my opinion there can be no two opinions. The valve is the most important part of a wireless installation."

"How do you make that out, George?"

"Well, I've heard of a valve set working without an aerial, and I've heard of a valve set working without an earth. I've heard of a valve set working without grid condenser and leak, but I've never heard of a valve set working without a valve. The valve, therefore, is obviously the most important part of a valve-receiving installation."

"Pursuing your argument, then, George, the most important part of a crystal-receiving installation is the crystal."

"Yes; though, on the face of it, the whisker is of almost equal importance."

A School Report

My schoolmaster friend tells me that we need have no fear for the future of wireless, the new science having taken such a firm hold on our schools. He says that it is quite the thing now for a school to run a wireless society and carry out really good

A school report.

experimental work in reception.

I am very interested in what my schoolmaster friend says, for I had myself noticed how some of our schools were taking up wireless with great enthusiasm. For example, here is an extract taken from a recent number of a school magazine I generally see:—

"The Wireless Fiend has the school in his grasp. Every Friday at four o'clock about twenty boys invade either the physics lab. or the woodwork shop to experiment with wireless. Useful work has been accomplished this term in mounting components so that they can be wired up easily and rapidly," and so on in the same strain.

HALYARD.

Resistance-capacity couplings for low-frequency amplifiers are attracting widespread interest in all quarters and in this special article Captain H. J. Round, M.I.E.E., well known as a pioneer worker in the wireless field, discloses some points that will be new to many amateurs.

CAPTAIN ROUND'S CAUSERIE

Whys and Wherefores of Resistance-capacity Amplifiers

SO many authorities seem to me to be at variance as to the best values of the resistances and condensers for use in resistance-coupled amplifiers that it is perhaps worth while trying to elucidate the meaning of the differences of opinions between them.

The subject is rather difficult because in our receivers we are not dealing entirely with the low-frequency amplifier and also because we are attempting to compete with the transformer which, undoubtedly, over a large proportion of the frequency range, gives more amplification.

Troubles in a Complete Receiver

A receiver consists of a high-frequency circuit of some type connected to a rectifier, which is followed by one or two stages of low-frequency amplification. In the ideal receiver we must separate all these three parts very carefully; thus if we do not definitely prevent high-frequency currents carrying on into the low-frequency circuit two actions will take place, both of which may cause serious trouble.

Unwanted Reaction

First, high frequency in the low-frequency side is liable to get back to our aerial system by induction, very often from the loud-speaker leads, and give unwanted and perhaps uncontrollable reaction, and it may —particularly on the longer waves— use up part of our L.F. valve characteristics so that blasting will occur sooner than it should.

Secondly, the fact that high-frequency currents are getting into the low-frequency amplifier may easily mean that the last tuning unit of the high-frequency stage is being damped, because any drawing away of energy gives damping.

In Fig. 1 I show a tuned circuit, a plate-bend rectifier, and a resistance-capacity-coupled low-frequency valve.

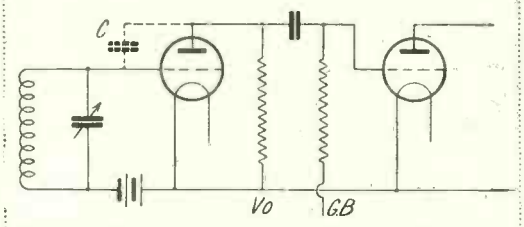


Fig. 1.—H.F. energy can "run off" from the tuned circuit through the capacity C into the L.F. circuits and be wasted. Incidentally it can get into the loud-speaker leads and cause unwanted reaction effects.

With modern valves there is a considerable capacity between the grid and plate (represented by the dotted condenser), and high-frequency current can go from the tuned circuit directly into the low-frequency amplifier and be wasted. One cure for these troubles is well known, and consists in inserting a by-pass condenser and a radio-frequency choke as shown in Fig. 2. This by-pass condenser is really necessary even for anode-bend rectification with the present valves, and brings attendant tone troubles with it, which I will go into later.

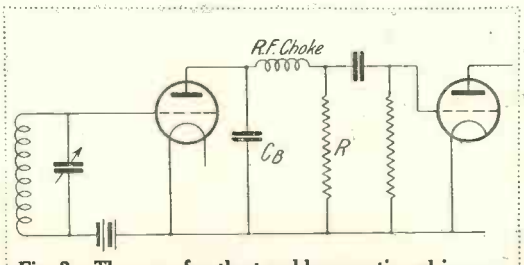


Fig. 2.—The cure for the troubles mentioned in connection with Fig. 1, the condenser C_B and the H.F. choke; but C_B will introduce tone troubles unless R is kept fairly small in value.

Now let us consider a valve connected to a resistance as illustrated in Fig. 3. Any change towards positive of the valve-grid potential increases the current through the resistance R, and, of course, through the valve. This increased current gives more potential drop down the resistance R, and thus the point P falls in potential. This fall can go on until grid current just starts flowing, beyond which condition we must not go because of distortion.

Then, again, if we make the grid more negative, the current through R decreases until it becomes zero, when the potential of P becomes Vo, the maximum voltage of the battery, because with no current flowing there is no voltage drop in R.

If we put alternating current on to the grid, the limits of our swing are decided by :—

(1) Grid current when P is of lowest potential.

(2) Zero plate current when P is at voltage Vo.

Grid-bias Setting

As is well known, we set ourselves with grid bias to the centre of the swing. There is obviously no reason whatever for this circuit to behave in any way differently at one frequency than at another if the valve is considered only as a resistance and, of course, this is the ideal condition that is being aimed at in the resistance-coupled amplifier, but unfortunately for us, the valve is a condenser as well as a resistance, and this fact has to be taken into consideration.

Resistance of a Valve

Again, the valve cannot be assumed as being a constant resistance under different circumstances; it has a

Captain Round's Causerie *(Continued)*

resistance which is controlled by the current flowing in the anode circuit. The table below shows the operating resistance of a particular valve with a

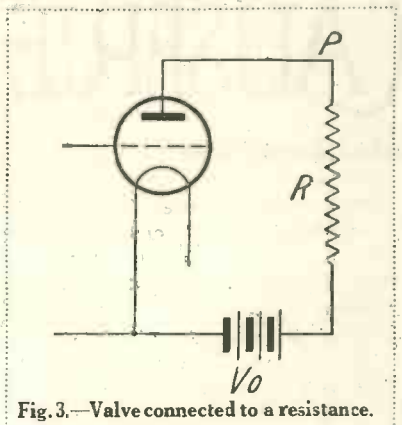


Fig. 3.—Valve connected to a resistance.

high amplification factor at various anode-current readings :—

Anode Current	*Resistance*
0.1	400,000
0.25	200,000
0.5	100,000
1.0	70,000
2.0	50,000

Obviously our anode current will depend largely upon the resistance R inserted in the plate circuit, and in this table I give the valve anode currents at the correct grid bias setting for the same valve on 120 volts with 50,000, 70,000, 100,000, 200,000 and 400,000 ohms in series with the valve and the high-tension battery. As the plate resistance goes up so the valve resistance goes up unless one raises the high-tension battery voltage.

Valve Capacity

The valve capacity, if we require to get a level frequency curve, must never have an impedance of the order of these two resistances (that is the plate resistance and the valve resistance) in parallel. At any impedance of valve capacity equal to the resistances in parallel, the magnification will be reduced considerably, and, of course, impedance steadily decreases with the increase of frequency (see Fig. 4).

The capacity of an ordinary valve is probably about .00002 microfarad counting lead capacities, and two valves in parallel have a capacity of .00004 microfarad. The impedance of this capacity at different frequencies is as follows :—

Frequency	*Impedance*
1,000	4 megohm
2,000	2 ,,
4,000	1 ,,
8,000	0.5 ,,

Use of High Plate Resistances

It is a very inviting idea, which seems to be checked out by the characteristic, that by raising the plate resistances we raise the voltage magnification and save anode current. Thus, considering the same valve as before, if the magnification with 50,000 ohms is ten, then with 1 megohm it is about twenty, and the anode current reduced from .5 to .06 milliampere, but if we go too far the valve capacity (and there are two valves on each coupling link) will begin to pull down the higher speech and music frequencies.

Level Curve

The question of value of plate resistance seems to be answered if one can stipulate less than a certain drop of the higher frequencies. The whole point is that as we raise the plate series resistance the valve resistance becomes higher, but as long as these two resistances in parallel are much lower than the stray capacity impedance at the highest frequencies we are using our amplifier curve will be level.

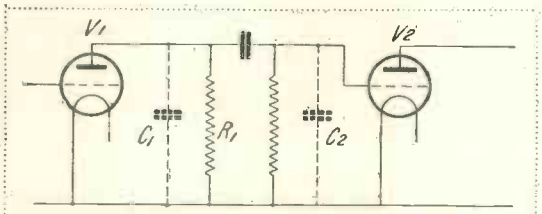


Fig. 4.—If the impedance of the two valve capacities C_1 and C_2 approaches the value of the resistance of V_1 and R_1 in parallel, then there will be a lowering of the magnification.

As we raise our plate resistance the amplification is going up, but more on the low frequencies than on the high ones, and it must not be forgotten that as valve anode current and consequently valve resistance are controlled by the high-tension volts and grid bias, these factors must be taken into account if one is working at a limit where valve capacity is of importance.

Lower Tone

Thus if we lower our high tension and increase our grid bias, the higher voice frequencies will be represented less than before in proportion to the lower frequencies — that is, the general tone will be lower. The only case that is quite certain is when the plate resistances by themselves are quite low enough to compete with the valve capacities by themselves.

The problem of the rectifier introduces a further difficulty and I propose here only to discuss plate-bend rectification. As we are working at the plate bend where the current is almost zero and the valve is of high resistance, the plate resistance must alone be low enough to contend with the two valve capacities and with the by-pass condenser capacity.

Reduced Efficiency

This considerably reduces the possible efficiency of such a rectifier, which instead of having 1 megohm in series with it will only get about 100,000 ohms at the best, and for a dead level curve will want a lower resistance than this if the by-pass condenser is set for the longer range of broadcast waves.

Thus with a by-pass condenser of .00006 microfarad capacity—and this is barely enough — and a combined valve capacity of .00004 microfarad, we have a total of .00001 microfarad. The impedance of this at 5,000 cycles is 300,000 ohms, which gives more than a 10 per cent. drop at the 5,000 cycles with a 100,000-ohm plate resistance. By itself a 10 per cent. drop may not be much, but the second stage of amplification will drop still more, and as one's tuning tends to lose still more of the higher frequencies the cumulative result may be bad.

My measurements nearly always

Whys and Wherefores of Resistance-capacity Amplifiers

give slightly greater drops at the higher frequencies than the calculated ones, probably owing to a wrong estimate of the capacities of the circuits.

Amplification Curves

In Fig. 5 I give the actual measured curves of several arrangements showing the effect of two extreme values of plate resistance. If by any chance you are running on your rectifier with a, say, .5 megohm resistance, as I often do myself, it is quite easy to notice the change of tone as one alters the grid bias to different values round the rectifying point, thus illustrating the effect of the valve resistances.

Grid Condenser and Leak

High insulation of the grid condenser is absolutely essential, otherwise the high-tension battery is liable to put the grid potential of the next valve positive instead of negative. Suppose we stipulate that the grid voltage of the second valve must not be disturbed more than 1 volt. A current of half a microampere will give 1 volt across 2 megohms, and 100 volts will need 200 megohms in series with it to give this small current—that is, the condenser must have an insulation of 200 megohms.

This is a very high insulation indeed, and I rather fancy the failure to attend to this point is at the bottom of lots of the troubles with the resistance-capacity amplifier.

Countering Leakage

If the leakage is constant and not variable it can be countered by more grid bias; a 100-megohm leak would mean an extra 1½ volts, but if you have a fine-mesh valve, such as a DE5B, and you find you can put more grid bias on than you should be able to, then suspect the condenser and get it tested on a 500-volt megger.

On account of this insulation trouble I think it advisable to keep the size of the condenser down to the value I have stated, unless of course one decides to use lower values of leaks, which lower values will have to be considered as a resistance in parallel with the plate resistance and valve. If they are too low there will be no advantage in raising the plate-resistance values.

Summary

In making a decision as to what curves we want a very troublesome point arises. We are more or less at sea as to what our loud-speaker wants, for even if we supply it with current from a power valve driven from a perfect amplifier, the current through the loud-speaker will not be constant at different frequencies, and the law of the current at different frequencies will vary with different power-valve arrangements. For instance, four valves in parallel will give more bass than one valve, although the high notes will hardly be altered. What are we to do?

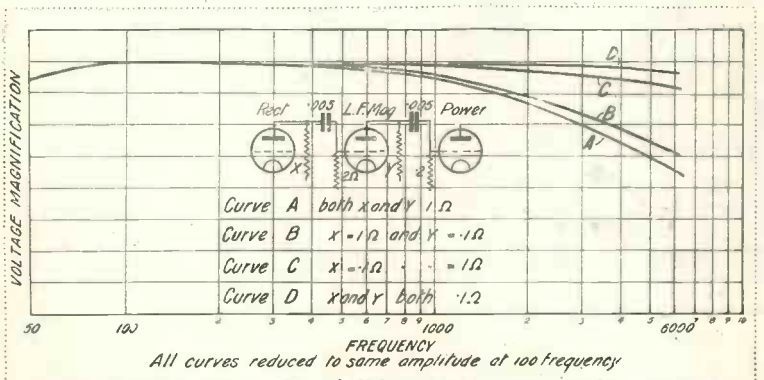


Fig. 5.—Amplification curves of different resistance-capacity couplings.

I really cannot do more than discuss the question: a full answer is impossible at the present stage, so that first of all we will consider the highest part of the frequency curve, where we have a bad tendency to lose our strength, due to capacity effects. I have found by experiment that on, say, a cone loud-speaker one can hardly notice any difference between the different curves in Fig. 5, and apparently frequencies above 3,000 cycles, although they should be there, need not be fully represented to give a pleasing effect.

Some people actually prefer them absent, particularly with music, but I cannot go as far as that. Certainly, however, a reduction at 4,000 cycles to half full intensity is not serious, which gives us a lot of licence in increasing our plate-resistance value.

How to Start Experiments

My advice to experimenters is to start with a circuit which you know will give a level amplification, that is with about 50,000-ohm plate resistances everywhere, and then steadily increase their value (the cheap graphite leaks are quite good enough) until you begin to lose brilliancy and intelligibility, and as you increase resistance your strength will, of course, rise. So much will depend upon your loud-speaker that I cannot say more than to advise a judicious balance between strength and quality, but I hope I have given you a clear idea of what you are doing as you make the changes.

This attention to the top part of the resistance - capacity-amplifier curve is very necessary; but the real point of the R.-C. amplifier is its delivery of plenty of bass, giving a warmth which one cannot get when several transformers are in cascade. Fortunately the bottom part of the curve is not troublesome, except that I think it wise to keep the coupling condensers sufficiently small so that under 50 cycles very little comes through.

Coupling Condenser

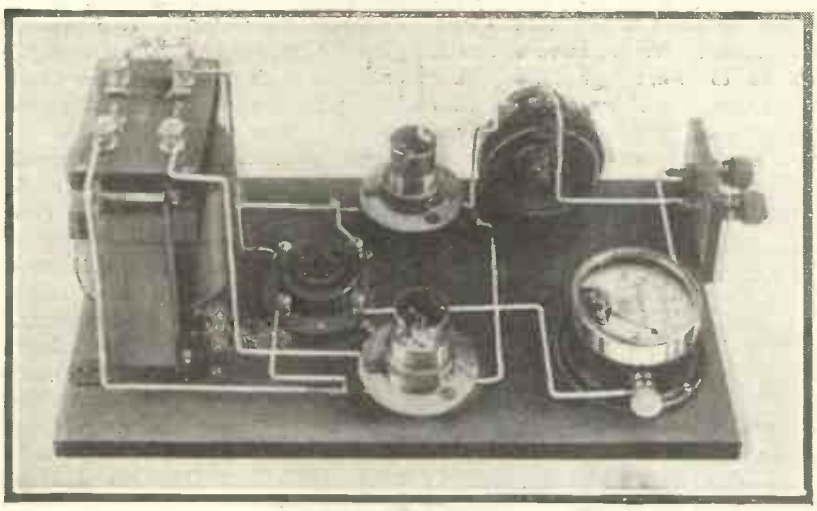
The grid-plate coupling condenser is not a very difficult point to settle, and, roughly, one may say the coupling condenser value is decided by the grid leak in this way:—

Taking the lowest frequency of any importance as 70 cycles, then the impedance of a .005-microfarad condenser is .5 megohm at this frequency. This impedance can be considered as in series with the 2-megohm leak, and reduces the A.C. current through the 2-megohm leak, thus giving less volts across it than if the condenser were much larger. But the drop is less than 10 per cent. at this lowest frequency,

(*Continued on page 220.*)

Intended for use in conjunction with A.C. lighting mains this unit will be of particular value to many amateurs who use accumulators for their H.T. supply. It ensures that the battery is kept in good condition at all times—and that without the trouble of carrying it to and from a charging station.

A Home-charger for H.T. Accumulators



Layout of the Home charger for H.T. Accumulators.

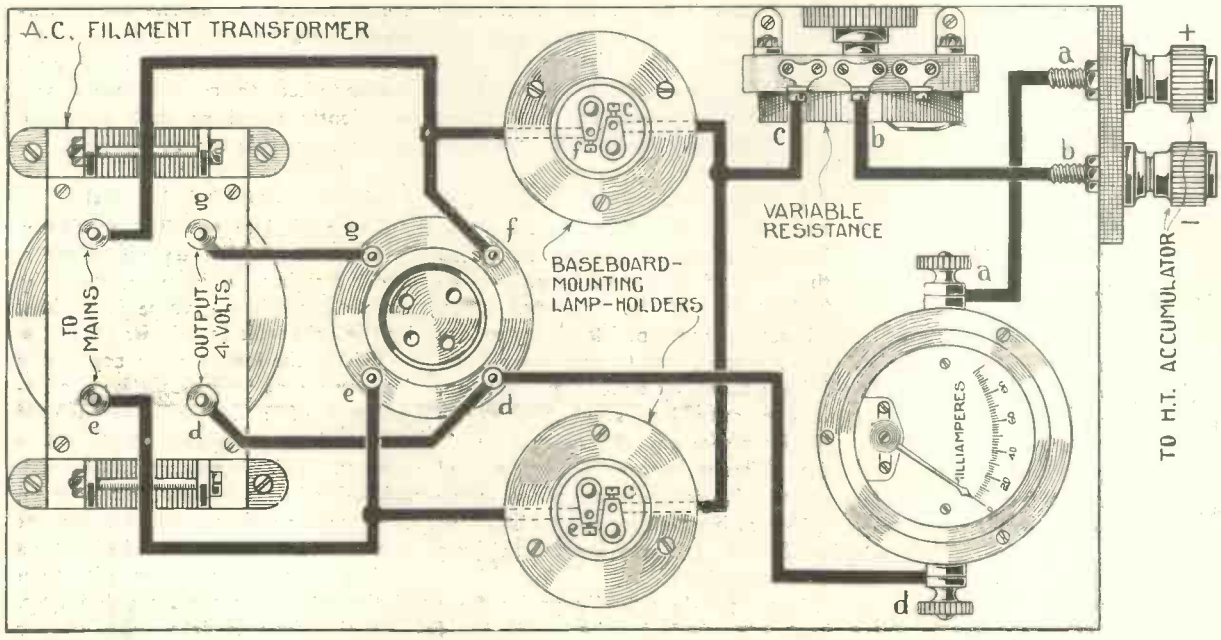
MANY people who realise the advantages of using high-tension accumulators in place of dry batteries are deterred from changing over to the more permanent form of current supply by the thought of having to carry heavy 20-volt units to the charging station every two months or so.

But why not charge the units at home? Where the electric-light mains are D.C. (direct current) no difficulty presents itself, and for the use of those who have A.C. (alternating current) mains, the Technical Staff of the WIRELESS MAGAZINE has designed a simple home-charger that will do the job satisfactorily.

What It Is For

This charger is not intended for batteries of *less* than 20 volts, but as the output voltage is almost the same as that of the mains, a number of units can be charged in series. For instance, with 120-volt mains four 20-volt H.T. units could be charged in series.

Everything about this home-charger is simple and there is nothing to go wrong. It will be seen from the circuit diagram that a double-plate full-wave rectifying valve is employed, and that the filament of this is heated from the mains through a step-down transformer. Many firms are now



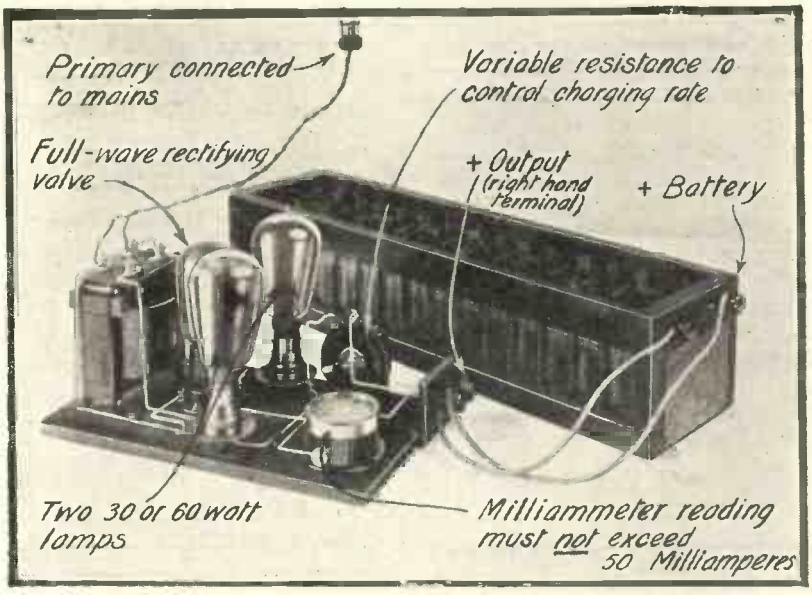
Layout and Wiring Diagram of the Home-charger for H.T. Accumulators. The small letters show the sequence in which wiring should be carried out.

supplying a transformer of which the secondary will give a continuous output of 2 amperes at 4 volts; this is just right for a Mullard DU2 rectifying valve, which takes 1.1 amperes at 4 volts and has an emission of 50 milliamperes.

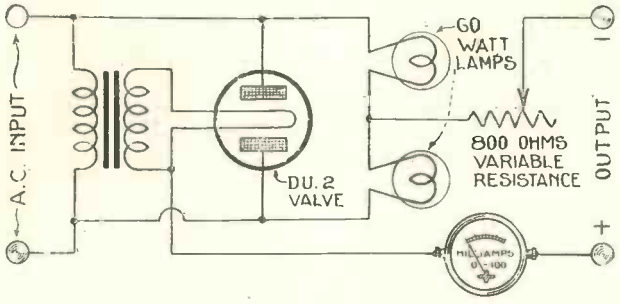
It will be noticed that two 30- or 60-watt lamps are placed across the valve plates, and one output lead is taken from the mid-point between these through a variable resistance. The other output lead is taken from the filament of the valve and included in it is a milliammeter, which can be a cheap model of the moving-iron type if it is desired to cut down expense.

For the construction of this home-charger the following materials are required :—

Baseboard, 12 in. by 6½ in. (Hobbies).
Transformer (suitable for supply voltage and frequency) with secondary output of 2 amperes at 4 volts (R.I.).



Photograph showing how the Home-charger is connected up for use.



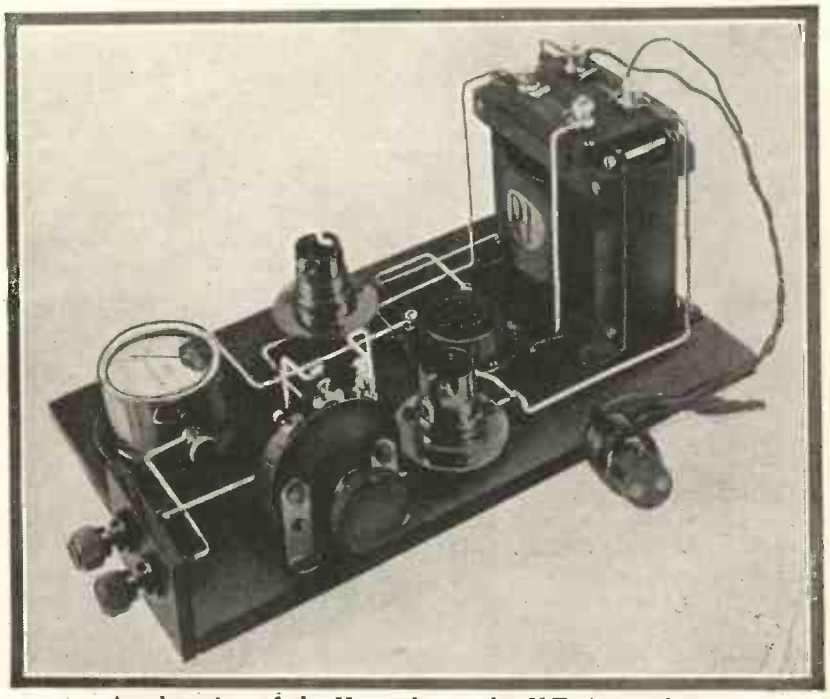
Circuit Diagram of the Home-charger for H.T. Accumulators.

Full-wave rectifying valve (Mullard DU2).
Anti-microphonic valve holder (Precision).
2 30- or 60-watt lamps (Mazda).
800-ohm potentiometer (Ericsson).
Milliammeter (Sifam).
2 terminals (Belling-Lee).
Ebonite strip, 2½ in. by 2 in. (Becol).
2 electric-lamp sockets (Economic Electric).
Mains plug with length of flex (Economic Electric).

There is no need to say much about the construction of the unit, the layout and wiring being clear from the photographs and diagram. It is recommended that *insulated* wire such as Glazite should be used for connecting up to prevent dangerous short-circuits occurring if other leads should be dropped accidentally across the charger.

When the wiring has been completely and *most carefully checked*, the charger is ready for use. Put the rectifying valve in the holder and insert the plug connected to the primary of the transformer into the nearest mains socket. See that the variable resistance is *all in*, and connect the battery to be charged across the output terminals so that the negative end of the battery goes to the negative output terminal of the charger (that connected to the resistance tapping arm) and the positive end goes to the positive output terminal (that connected to one side of the milliammeter).

Now turn the resistance control until the milliammeter reading is approximately 50 milliamperes (or as much less as is desired). On no



Another view of the Home-charger for H.T. Accumulators.

account allow the milliammeter reading to exceed 50 milliamperes, even for a short period, or the rectifying valve may be damaged.

As has been mentioned before, the charger can be used for any battery the voltage of which is 20 to 25 volts lower than the mains voltage.

Turn the charger off by removing the primary lead from the mains socket. Rotating the variable resistance will *not* turn the charger off. Indeed, the control should never be touched unless the milliammeter reading is watched very carefully indeed. It is recommended that a red line should be placed on the glass above the 50-milliampere mark to act as a reminder that this value must not be exceeded.

A Nutshell Novel

The End

IT was only a pet, but to some people the loss of a pet is worse than the loss of a friend. George Hammerston was such a man.

Only a few minutes ago the little thing had given a last despairing choke and had been still. Its master pushed his chair back and gazed very sorrowfully at it.

It was so lonely at night down in this little town, and without his little friend, life—well, things would be pretty bad. Excelsior he had named it, because it was never tired; while he was awake, so was Excelsior.

Half-forgotten memories crowded in upon him. He had taken to it from the first. How he brightened up when he had first seen it.

They had been good friends. Why, one night he could have sworn it had winked at him. It often seemed to enjoy the fun as much as he did when they had listened to the wireless together. . . . But, of course, how could it understand? It was all only make-believe.

A fit of despondency seemed to creep over him. He sank lower in his chair and slowly, very slowly, his hand crept out towards the drawer of the table in front of him. He would make an end of it.

Very softly he opened the drawer and dropped in his oldest valve, which had just burnt out.

J. A. D.

WHEN YOU ARE IN TROUBLE—

do not forget that the Technical Staff of the "Wireless Magazine" is always at your service to help you out of your difficulty and put you on the right path.

If you want advice on buying a set, address your query to the Buyers' Advice Bureau, not forgetting to mention how much, roughly, you wish to spend, where you are situated, what stations you wish to receive, and whether you intend to use phones or a loud-speaker.

In all other cases, address your letters to The Editor, and not to the Buyers' Advice Bureau. Our address is:— "Wireless Magazine," La Belle Sauvage, E.C.4.

When sending a query, write on one side of the paper only, and do not forget to enclose the coupon on page iii of the cover and a fee of 1s. (postal order or stamps).

A Country Problem

"HOW are things looking in the country, George?" I asked my good wireless friend the evening after his return from a short holiday.

"About the same as they usually do at this time of the year," he replied. "There are no leaves on the trees yet, but I believe the sap is rising uncommonly well this year, and ——"

"Any wireless adventures during your little holiday, George?"

"No adventures, but plenty of the usual questions, you know."

"And you were never once at a loss for an answer, George?"

"Perhaps not, but one lady questioner puzzled me a little. Wanted to know if I could tell her how to make a crystal set to work from a frame aerial."

"Why a frame aerial, George? There's always plenty of room for an outdoor aerial in the country."

"The lady was of the opinion that an aerial mast and wire were as great an eyesore as a clothes post and line. To avoid the latter she sends her washing out. To avoid the former she wanted to take her wireless in, so to speak. Hence the request for a frame-aerial crystal set and that at a distance of a hundred miles from Daventry as the wireless waves wave, and fifty miles from the nearest main broadcasting station."

"Did you advise her to go in for the America Seven, George?"

"No, that I didn't. I suggested a cucumber-frame aerial, so that she would be able to force the crystal set a bit, if necessary."

AERIAL.

Whys and Wherefores of Resistance-capacity Amplifiers

(*Continued from page 217.*)

so that actually .005 microfarad should be quite big enough. Any decrease of leak resistance should be accompanied with a proportionate increase in grid-condenser value.

Resistance-capacity amplifiers give some trouble when working off batteries which have a high resistance, as back coupling through the resistance starts up a very low-frequency oscillation, impossible to stop by blocking condensers, although they will help if the valve-coupling condensers are kept as small as possible.

Mains working off a potentiometer should be avoided for the same reason, the only satisfactory way with the mains being to feed each valve separately through chokes and resistances with the necessary smoothing condensers.

Canada Calling

IN these days when we hear so frequently that wireless has rendered geography a negligible factor in the world's affairs, it will perhaps surprise some to find that geographical features have had a great effect on broadcasting in Canada.

Americanisation

In the first place, the proximity of a nation so prominent in the wireless world as the United States has led to the almost complete Americanisation of Canadian radio. In the design of apparatus and receiving sets, the organisation and operating of broadcasting stations, even in the nomenclature used, American methods predominate.

Again, the vast distance from one coast to the other (a distance as great as that from England to the frontiers of India) has given rise to a series of stations unique in the broadcasting world — the system operated by the Canadian National Railways to beguile the tedious hours and days of transcontinental travelling.

Two Types of Station

There are two types of broadcasting station in the country: the chain referred to above, and those run on American lines. The latter kind, usually owned by newspapers or electrical manufacturing concerns and operated partly with an altruistic idea of service and partly for purposes of advertising and propaganda, must be familiar to all readers, but the former deserve fuller notice.

They are run by the railway under control of the Government, and approximate somewhat to the English system of national broadcasting, although their primary function is that of supplying the transcontinental trains with wireless entertainment.

Ten Railway Broadcasting Stations

Situated at Moncton, Montreal, Ottawa, Toronto, Winnipeg, Regina, Saskatoon, Edmonton, Calgary, and Vancouver are stations operated by the railway. In all but three, transmitters belonging to some local broadcaster are utilised, but CNRA, CNRO, and CNRV at Moncton, Ottawa, and Vancouver respectively, possess their own studio and plant. To all transcontinental and most other important expresses radio cars are attached, and passengers can now while away by wireless the weary hours of travelling in this land of great distances.

Some difficulty was experienced with interference from batteries on trains and from fading owing to the car's change of direction, but these have now been successfully overcome. Apart from supplying programmes to trains, use is made of the Canadian National Railways' stations by the Government for sending market reports to the farming West, and much "boosting" of the Dominion to attract settlers and visitors from the States is sent over the ether.

Total of Forty Stations

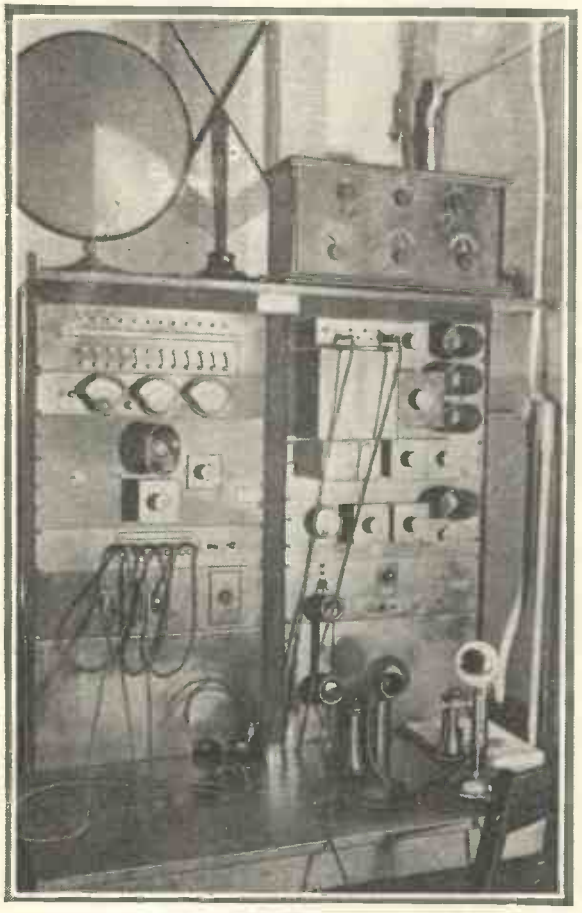
All told there are only forty stations in the country, and contrasted with the seven hundred odd in the U.S.A. this seems little enough, but when one takes into account the fact that the population of the latter country is fourteen times as great as that of Canada the discrepancy does not seem quite so large.

Thirteen channels in the broadcast wavelength band have been assigned to Canada for the operation of its forty stations. The system is arranged somewhat peculiarly. All the stations in one city are given the same wavelength, and are prevented from broadcasting simultaneously. This excludes the advantage obtained in the States of a number of alternative programmes in one city, but since the majority of receiving sets are powerful enough to reach many outside stations this is no very great hardship.

Varying Powers

The power employed by the stations varies considerably, and many have adopted the plan of placing their

Canada Calling *(Continued)*



CNRV—the Canadian National Railways station at Vancouver, British Columbia.

transmitter on the outskirts of the city, with remote control from a central office.

The United States stations play a large part in the radio life of the country, for their power is usually greater and their programmes often better than the home product, and consequently they have a large number of listeners among Canadian "fans."

Diversity of Programmes

The diversity of programmes is as great as in England. There is a considerable amount of outside broadcast, chiefly in the form of meal-time and dance music from hotels. Studio concerts naturally predominate, and these fall into two categories. There is the usual concert staged by the broadcasting concern in question, and there is the system by which some commercial company finds it profitable to supply a programme and reap its reward in indirect advertising.

Let it be said here that direct advertising is barred, but that a company can derive considerable publicity by the mere announcement that it is providing the entertainment.

Fewer Talks than in England

Talks do not feature in broadcasting to nearly the extent they do in England, and news, with the occasional exception of sporting items of great interest and market reports, is never broadcast.

S.B., or, as they call it in the States, chain-broadcasting, has not made much progress owing to the diversity of operating interests, but occasionally CNRM, CNRO, and CNRT, at Montreal, Ottawa, and Toronto respectively, transmit simultaneous programmes.

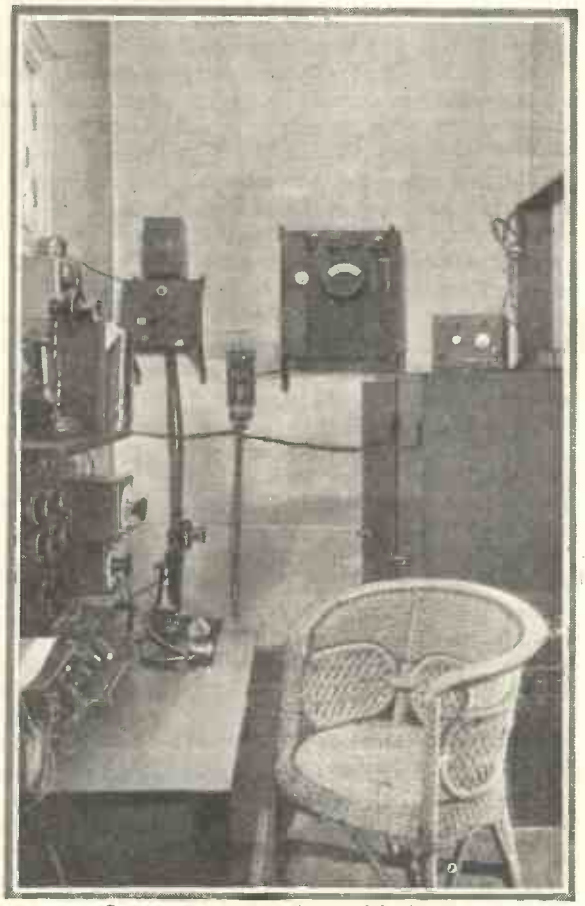
Good Announcing Side

The announcing side is usually good, and in this connection it is interesting to note that Montreal's situation in the centre of French-speaking Canada necessitates all announcements from its four stations being made in both French and English.

The most popular type of receiver seems to be a five-valve set employing two neutrodyned stages of high-frequency amplification, while the super-het with seven or eight valves is a close runner-up. A peculiar feature noticeable here, and indeed in the whole of North America, is the great preponderance of factory-made receivers over those constructed at home. This is largely due to the mass-production methods of American manufacturers, whereby it is often cheaper to buy a set than build it.

Simplicity of Control Essential

Now that the wireless set has become a necessary article



Control room at CKAC, owned by La Presse.

A Special "Wireless Magazine" Article

of furniture in all the larger Canadian homes simplicity of control is demanded, and the one-dial receiver is gaining a very great popularity.

It has been frequently stated that sets employing reaction are obsolete in the States. This should not be taken to apply to its northern neighbour, for, judging by the howls accompanying most distant programmes, there are still many people who utilise it. Nevertheless, it is certainly a fact that oscillation shows a marked decrease with the progress of time.

Peculiar Feature

A feature peculiar to the North American continent is that most people prefer installing an alternating-current rectifier to having their accumulators charged at a charging station. The widespread use of H.T. accumulators undoubtedly contributes to this.

Like the little boy in the poem, reception conditions in Canada, when they are good "are very, very good, but when they are bad they are 'orrid."

When conditions are very bad, or when the blanketing effect of the Aurora Borealis is felt, it is often impossible to receive any stations more than a few miles distant. But there is the other side of the picture. On good nights the reception of stations a thousand miles away without any high-frequency amplification is by no means phenomenal, while, of course, every winter claims crop up in the East of receiving the Pacific coast on one valve.

Less Morse Interference

Interference by morse stations is much less pronounced than in Europe, but at present much trouble is being caused by United States "wavelength pirates." These gentry, since the recent judgment that the Government cannot regulate the distribution of wavelengths, have been transmitting on any frequency which seemed best for local reception, regardless of the effect on other broadcasters.

Good Apparatus Used

The apparatus with which amateurs in Canada construct their sets is usually good, usually American, and usually dear. The last fact is caused by the heavy import duty—35 per cent.—on imported radio goods. (What wireless manufacture there is in Canada is nearly all done by American firms, who have no motive for lowering the price to the consumer.)

The tariff, indeed, is preferential to British imports, but as yet very few firms seem to have availed themselves of this benefit.

Government control of radio is exercised through the Department of Marine and Fisheries, the duty devolving on them because in the early days before broadcasting they had control, naturally enough, of the coastal stations. The Department exacts a licence fee of one dollar from each listener, and the proceeds are used, among other things, to equip motors with direction-finding apparatus. These cars do much good work in tracking down interference from power cables, oscillators, and the like.

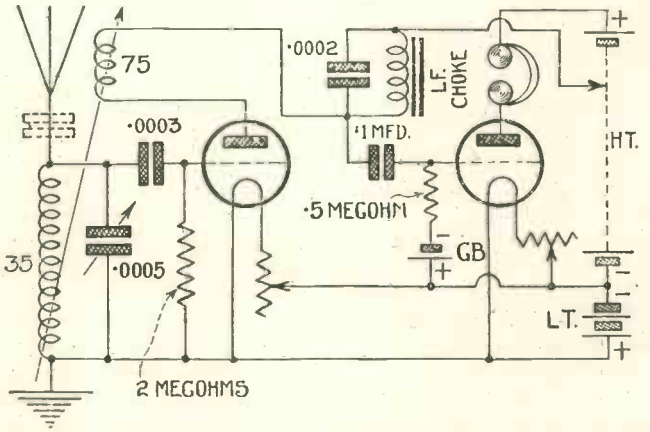
It can be seen from this brief outline that in some respects the Canadian listener is in a better position than his European confrère. He has many stations to select from, and he is not troubled by the language difficulty. Conditions are often very suitable for D.X. work, and interference, though greater than in the States, is not considerable.

How the Listener Suffers

On the other hand, he suffers from the tariff barrier set up against his southern neighbour, and must often look longingly across the border to the land where a "tube" costs a dollar less. On this side of the scale must be placed, too, the poorness of some of the programmes from the smaller stations, the lack of news, and now, in addition, the heterodyning trouble.

E. S. F.

A Useful Two-valve Circuit To Try



In this circuit the first valve detects, while the second acts as a low-frequency amplifier.

The choke coil used should preferably be one sold especially for low-frequency amplifying purposes, although good results may sometimes be obtained by using the secondary coil of a burnt-out transformer.

The fixed condenser of .0002 microfarad shown dotted in the aerial lead will sometimes be found to improve results.

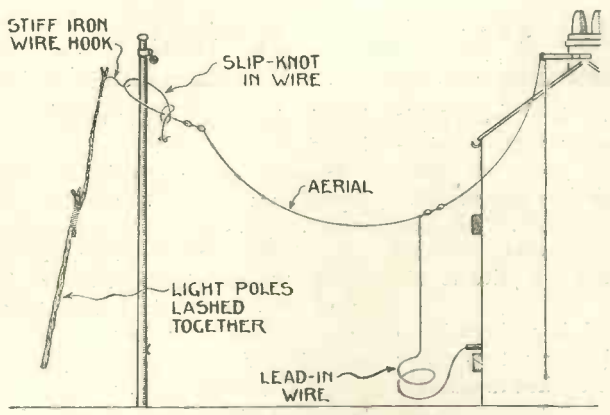


Fig. 1.—Method of Re-erecting Fallen Aerial.

When Your Aerial Comes Down!

IF you have not renewed the halyards of your aerial since it was first erected some two or three years ago, you must not be surprised if this spring's storms should find a weak spot in one of the ropes and let you —and the aerial—down.

Wise Course

The wise course, needless to say, is to take steps at once to prevent this by replacing any doubtful rope, but in case a sudden storm should get the better of you, a few notes on possible remedies may be useful.

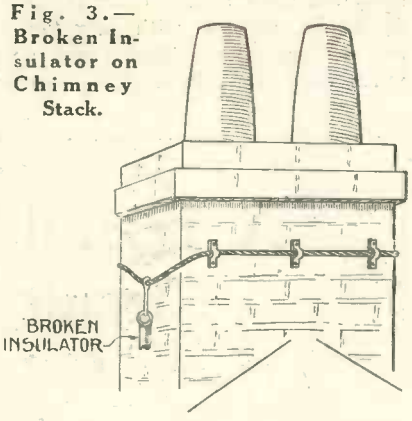
Perhaps the most difficult situation arises when the broken rope is that which passed through a pulley at the top of a mast. It will almost certainly be impossible to insert a new rope through the pulley without taking the mast down, and this is a task which cannot be lightly undertaken.

A possible way out is suggested by Fig. 1. A short length of stiff flexible wire is passed round the mast and tied into a loose slip-knot in such a way that slight tension will not prevent it from being pushed up the mast to the top, but a steady tug will tighten it and cause it to grip. The free end of this length of wire is attached to the insulators at the end of the aerial.

Two light poles are then lashed together (clothes props will probably serve), and a short piece of thick iron wire is secured at one end and bent so as to form a finger which will lift the slip knot high up the mast.

With the help of the light poles one person must work the slip knot as nearly as possible to the top of the mast, while another person, at the other end of the aerial, will be ready to give a sharp pull when it is apparent that the aerial is as high as it will go.

Fig. 3.—Broken Insulator on Chimney Stack.



It will probably be found best to pull from a convenient upstairs window, but otherwise the pulling must be done by means of the rope at the house end of the aerial. It is obvious that it would be useless to pull from the ground level.

Until recently one end of the writer's own aerial (which had been taken over with the house) was attached to an insulator which in turn was attached by wire to a chimney stack. There was no pulley or rope.

A storm caused the insulator to snap, and at first it seemed as though it would be necessary to obtain a ladder from the village, a mile away, in order to re-erect the aerial.

The same device of two light poles and a piece of stiff wire, however, was brought into play. A pulley through which a halyard had been passed (Fig. 2) was balanced on the stiff wire, and with a little patience it was found possible to hook the pulley over the wire which was attached to the chimney stack (Fig. 3) at a point where the pull of the aerial had caused this to sag a little.

Value of Ingenuity

These suggestions may not meet every case of a broken halyard or aerial, but they will indicate that ingenuity may save a good deal of expense, and that more may be done with a couple of clothes props than the washerwoman ever dreamed of.

Nevertheless, it is worth while fixing new ropes as soon as the old ones fall under suspicion.

H. P.

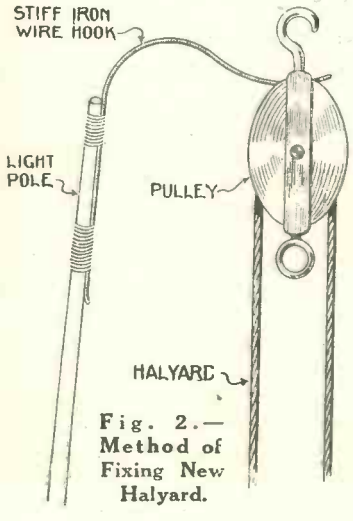


Fig. 2.—Method of Fixing New Halyard.

When you are in trouble do not forget that the Technical Staff of the WIRELESS MAGAZINE *is always at your service.*

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In all other cases, address your letters to The Editor, and not to the Buyers' Advice Bureau. Our address is the WIRELESS MAGAZINE, *La Belle Sauvage, E.C.4.*

When sending a query, write on one side of the paper only, and do not forget to enclose the coupon on page iii of the cover, and a fee of 1s. *(postal order or stamps).*

Capable of receiving several stations on the loud-speaker and having an almost unlimited range when used with headphones, the All-broadcast Two is a set that will appeal to all those who desire an efficient yet simple receiver. Construction of this set is facilitated by the full-size blueprint layout, drilling guide and wiring diagram given free with this issue. Designed and built by the "W.M." Technical Staff.

THE ALL-BROADCAST TWO

Wave-length Range—200 to 2,800 Metres.

Push-pull Filament Switch

Ease in Tuning

No Variable Filament Rheostats

Reversible Reaction Coupling

Separate H.T. Supply to Each Valve

Compact Layout

Unlimited Choice of Valves

TWO most desirable features of any radio receiver are simplicity and adaptability—qualities that are the keynotes of the design of the special WIRELESS MAGAZINE set to be described in these pages. The All-broadcast Two combines ease of operation with adaptability for various purposes—a happy combination that will appeal alike to the man who listens solely for amusement and the searcher for distant stations.

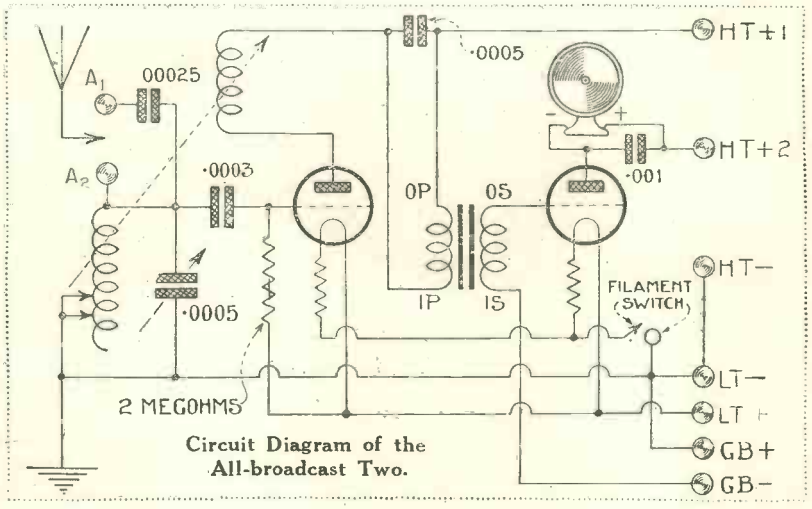
Wavelength Range

The set is adaptable in two respects. It will receive on any wavelength from approximately 200 to 2,800 metres; and it is suited for use with almost any type of valve, whether dull- or bright-emitters.

A glance at the photographs will show that there are four knobs on the set. Those on the left are reaction and aerial-tuner controls, that in the centre is a push-pull switch for the valve filaments, and that on the right is the vernier dial of the aerial-tuning condenser.

As it stands the set is an extremely useful unit. In most places with an average aerial-earth system it can be relied upon to bring in several stations at loud-speaker strength, while with a pair of headphones the range is almost unlimited. It has the great advantage of covering the higher and lower bands of broadcasting wavelengths without the need of changing coils. This is accomplished by using a special tapped tuner.

Because of this some people may think that tuning is very flat, but tested at two places respectively 8 and 12 miles distant from the London transmitter it was found that the set was no less selective than the average two-valver, and that other stations could be received without difficulty when 2LO was working.



Circuit Diagram of the All-broadcast Two.

Straight Circuit

It will be seen from the diagram that there is nothing unusual about the circuit employed—it is a perfectly "straight" two-valve set with direct aerial tuning and aerial reaction. A series condenser is provided in the aerial lead, and terminals are included so that this is in circuit or not as desired.

For the benefit of beginners, to whom this set will especially appeal, it may be explained that the inclusion

The All-Broadcast Two (Cont.)

During one evening's test several stations were received at good loud-speaker strength on this two-valver at a distance of 12 miles from London. Transmissions definitely identified were those from London, Hamburg, Birmingham, Bournemouth, Langenburg, Radio-Paris and Daventry. A number of other unidentified stations were also picked up.

With headphones the number of stations that can be received with this set is almost legion. Write and tell us what results you can get with the All-broadcast Two.

of a small series condenser in the aerial lead makes oscillation easier on poor aerial-earth systems, and also makes the tuning more constant on different aerials.

Components Required

The components used in the construction of this set are all of standard design, and can be obtained without difficulty from most wireless dealers. Here is a list of the apparatus required :—

Ebonite panel, 8 in. by 10 in. (Resiston or Becol, Trelleborgs).

Tapped aerial tuner with reaction (R.I.).

.0005-microfarad variable condenser (Eureka Orthocyclic or Igranic-Pacent, Formo).

Vernier dial for above (Igranic Indigraph or Formo).

2 dial indicators :— Tuner and Aerial (Belling-Lee).

2 valve holders (Lotus or Benjamin).

2 filament resistances with baseboard mounts (Amperites or Burne-Jones resistors).

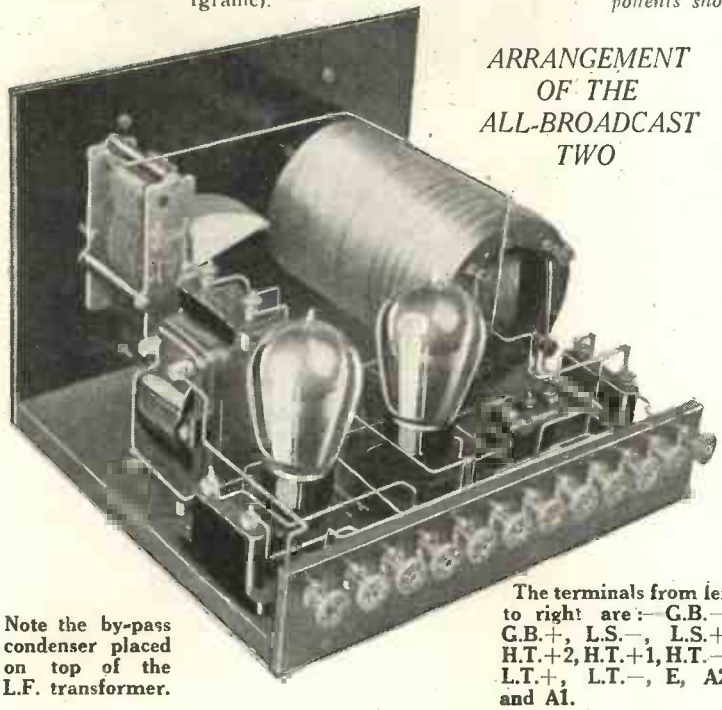
.0003-microfarad grid condenser (T.C.C. or Dubilier, Mullard).

2-megohm grid leak (Dubilier or Mullard).

.0002-microfarad fixed condenser (T.C.C. or Dubilier, Cosmos).

.0005-microfarad fixed condenser (Dubilier or Cosmos, Mullard).

Push-pull switch (Benjamin or Igranic).



Note the by-pass condenser placed on top of the L.F. transformer.

ARRANGEMENT OF THE ALL-BROADCAST TWO

The terminals from left to right are :— G.B.—, G.B.+, L.S.—, L.S.+, H.T.+2, H.T.+1, H.T.—, L.T.+, L.T.—, E, A2, and A1.

L.F. transformer (B.T.H., ratio 4-1, or Gecophone).

Terminal strip, 10 in. by 2 in. (Becol or Resiston).

12 engraved terminals :—2 Aerial, Earth, L.T.+, L.T.—, 2 H.T.+, H.T.—, L.S.+, L.S.—, G.B+ and G.B.— Eastick

.001-microfarad fixed condenser (T.C.C. or Dubilier, Mullard).

Cabinet and baseboard (Enterprise Manufacturing Co.).

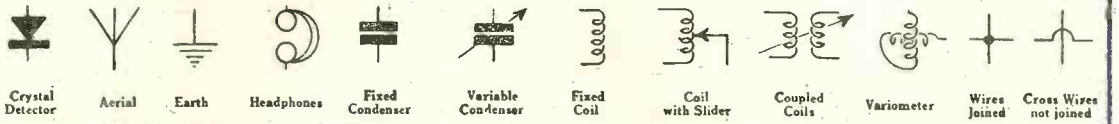
NOTE :—The particular components shown in the photographs and allowed for in the dimensioned layout are in each case mentioned first.

When all the components have been obtained the construction of the set can be started. This should present no difficulty to even the most inexperienced constructor if full use is made of the full-size blueprint layout, drilling guide, and wiring diagram given free with this issue of the WIRELESS MAGAZINE.

Using the Blueprint

Take the panel and lay the top part of the blueprint over it squarely and prick through all the drilling centres (there are seventeen). Remove the blueprint and drill holes of the sizes indicated, taking particular care to see that the panel is lying perfectly flat over the whole of its surface.

MEMORISE THESE SYMBOLS



Blueprint Given Free With This Issue

When the holes are all drilled and cleaned out place and screw in position the tuner, push-pull switch, variable condenser, vernier dial and dial indicators. Should other components than those specified be used it will be necessary for the constructor to arrange different drilling centres and sizes.

Baseboard Components

Screw the panel with its components and the terminal strip, complete with terminals, to the baseboard, and then arrange the rest of the components as shown on the blueprint. The apparatus on the baseboard need not follow the blueprint layout exactly, of course. For convenience in wiring the .0005-microfarad condenser across the primary of the low-frequency transformer is placed on top of that instrument, as can be seen from the photographs (in the blueprint this condenser is shown at the side of the transformer for clearness).

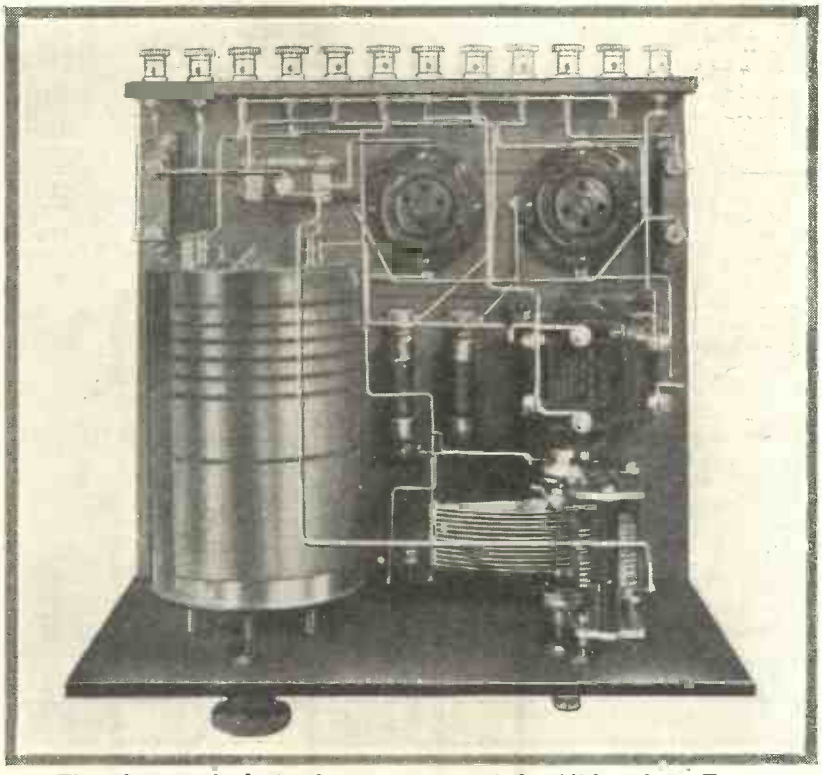
Wiring Up

Now that all the components are fixed in position wiring can be started. Again there will be no difficulty if the blueprint diagram is followed. A glance at the blueprint will show that each terminal and terminal point on all the components is marked by a letter of the alphabet. This system should be followed in wiring the receiver: First connect together all those points marked A with one wire or as few wires as possible; then all those points marked B; and so on, through the alphabet. It is important that the wiring should be carried out in alphabetical order.

Soldered Joints

For wiring up it is recommended that Glazite should be used. As many joints as possible should be soldered, care being taken that flux does not run where it is not wanted and make the set "messy."

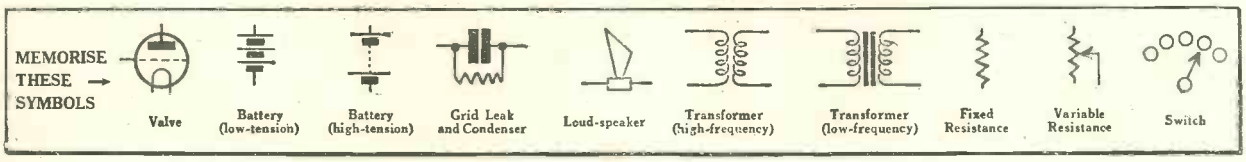
When the set is completely wired it is almost—but not quite—ready for testing. Suitable Amperites for the valves to be used must first be in-



This photograph shows the neat layout of the All-broadcast Two.

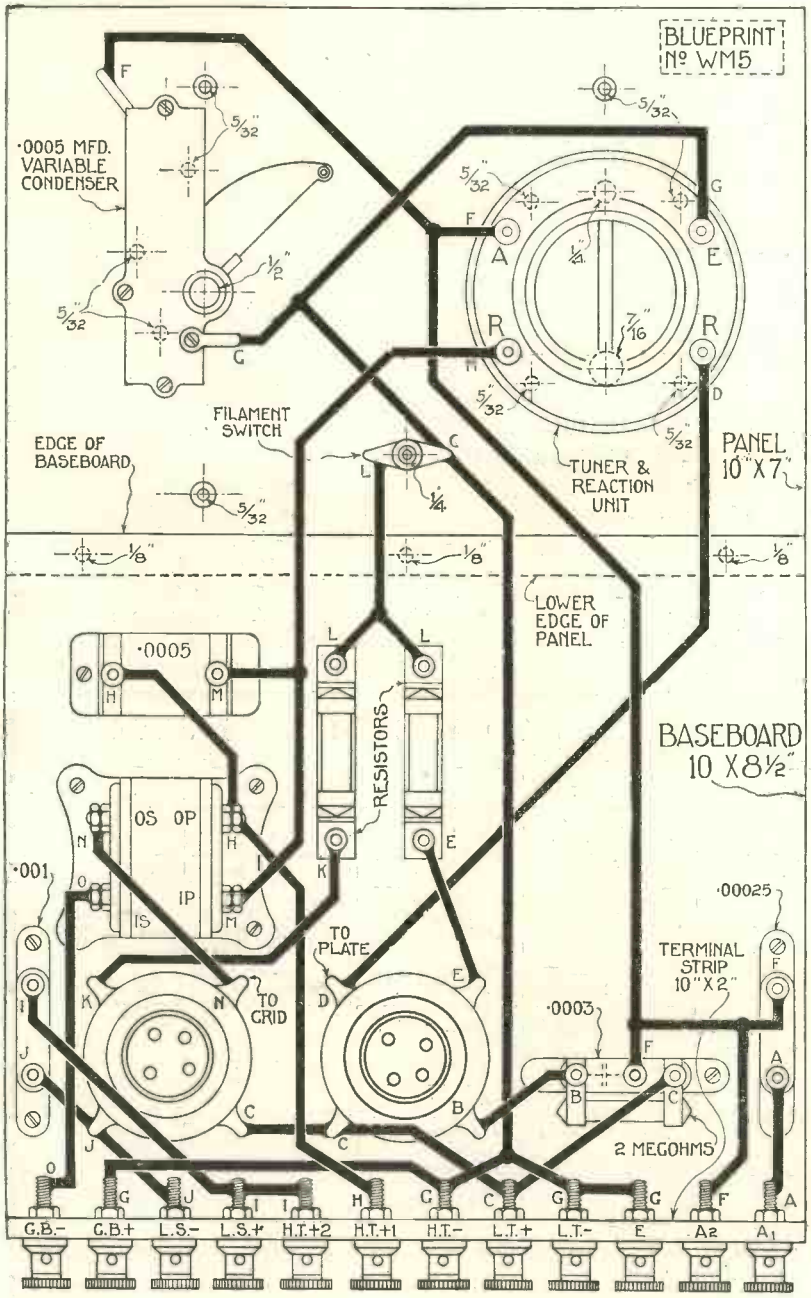
VALVES TO USE IN THIS SET

	Detector.	Amplifier.	Detector.	Amplifier.
For 2-volt Battery	B.T.H. B3	B.T.H. B9	Marconi or Osram DE2 H.F.	Marconi or Osram DE6
	Cossor Point One (Black Band)	Cossor Stentor Two	Sportpath SP18 Green	Shortpath SP18 Red
	Ediswan DR2	Ediswan PV2	Mullard PM1 H.F.	Mullard PM2
	Six Sixty 2, Red Disc	Six Sixty 2, Green Disc	Burndept HL213	Burndept L240
For 4-volt Battery.	B.T.H. R	B.T.H. R.	Mullard PM4	Mullard PM254
	Cossor Point One (Black Band)	Cossor Stentor Four		
	Ediswan GP4	Ediswan PV4		
	Six Sixty 8	Six Sixty 7		
	Marconi or Osram R	Marconi or Osram R		
For 6-volt Battery	B.T.H. B4H	B.T.H. B4	Shortpath DE55	Shortpath SP55 Red
	Cossor Point One (Black Band)	Cossor Stentor Six	Mullard PM5X	Mullard PM 6
	Six Sixty 6	Six Sixty 11	Burndept HL 512	Burndept LL 525
	Marconi or Osram DE 5B	Marconi or Osram DE 5		



The All-broadcast Two *(Continued)*

REDUCED REPRODUCTION OF THE BLUEPRINT GIVEN FREE WITH THIS ISSUE



When using this blueprint (a full-size one is given free with this issue) for wiring follow the letters shown at the terminal points. First connect together all those points marked A with one wire or as few wires as possible; then connect all those points marked B, and so on through the alphabet until the wiring is completed. It is important that wiring should be carried out in alphabetical sequence.

serted in the clips. As to suitable valves, the choice is almost legion. In the original set a B.T.H. B4H and a B4 were found to give excellent results with a 6-volt accumulator; equally good results were obtained with a Cossor Point One (black band), and a Stentor Four worked from a 4-volt accumulator.

Types of Valve

Whatever valves are used it is recommended that the L.F. amplifier (on the right from the front of the set) should be of the power type. It is important that the voltages recommended by the makers for both filament and anode should be used. A 120-volt H.T. battery and a 9-volt grid-bias battery will be found suitable for use with almost any valves.

Connecting Up

When the valves and the correct Amperites have been inserted in position the rest of the apparatus can be connected up. To start with place the aerial lead on the right-hand aerial terminal (viewed from the back). Apply about 60 volts to the detector valve (the right-hand H.T.+ terminal seen from the back), and the maximum recommended by the makers to the last valve. It is important that sufficient grid-bias voltage should be applied, and the manufacturers' instructions should be observed in this connection.

Tuner Tappings

A table is included in these pages giving the approximate wavelength ranges of the tappings on the tuner. Note the wavelength of the local station and move the bottom left-hand knob until the pointer is over the correct letter. Pull out the push-pull switch to light the valves and turn the top left-hand knob (reaction) until a slight rustling sound is heard.

This indicates that the set is oscillating and is in a sensitive condition to pick up signals. If the components are connected exactly as shown on the blueprint it will be found that the set oscillates when the pointer is between 0° and 90° on the right-hand side of the scale.

Picking Up Signals

With the set in this condition slowly turn the right-hand knob until signals are heard. When something

An Adaptable Two-valver: Easy to Build

is picked up withdraw the reaction control as much as possible (that is, turn the knob so that the pointer moves towards the zero mark), and adjust the H.T. and grid-bias voltages until the best and clearest signals are obtained.

Largest Tuner Section

Other stations can be tuned-in in a similar way with the bottom left-hand knob in a different position. It will be found that the same stations can be heard, with different condenser settings, on more than one section of the tuner. When this is the case use the largest tuner section and the smallest condenser reading. 2LO will be received, in most cases, on sections C and D, and Daventry on sections G and H (with the aerial series condenser in circuit). As has been mentioned before, selectivity is surprisingly good and the volume is better than that obtained from the average two-valver. A gratifying number of stations can be received on the loud-speaker at a distance of approximately ten miles from London; many more, of course, can be received with a pair of headphones.

Special Amplifier

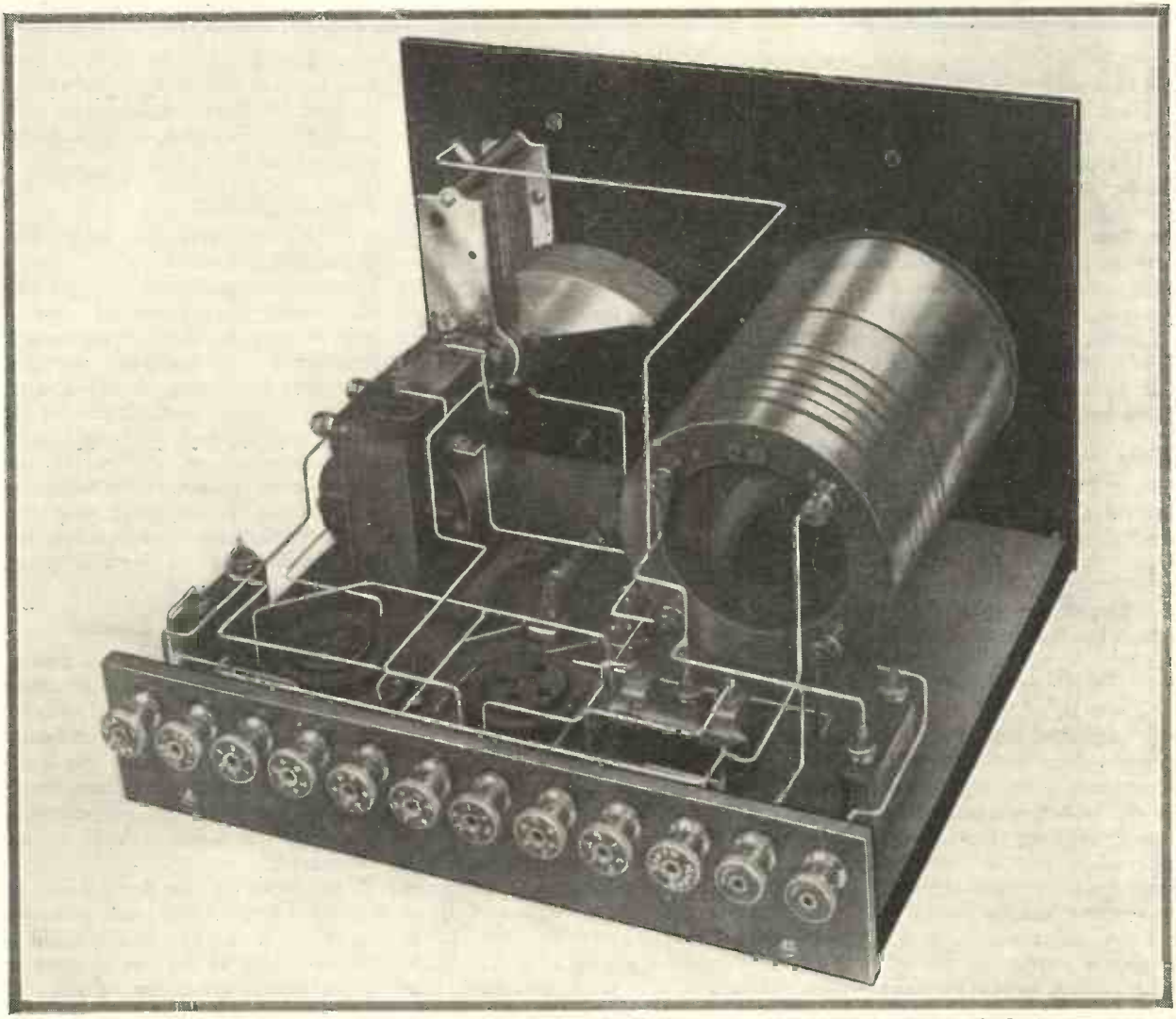
This set is eminently suitable for anybody who wants to hear several stations on the loud-speaker without going to great expense, and who wants to be able to cover the whole of the broadcasting wavelengths. For those who desire really powerful loud-speaker results from more distant stations a special power amplifier (with H.T. supply from A.C. mains) that can be connected to this receiver will be described next month.

WAVELENGTH RANGES

Approximate wavelength ranges of the tuner tappings with the series condenser out of circuit are as follows:—

Stud.	Range in Metres.
A	200—290
B	290—450
C	400—670
D	540—900
E	700—1,000
F	820—1,200
G	1,200—1,800
H	1,800—2,800

It will be seen that some tappings overlap. In these cases the larger tapping should be used.



Photograph showing layout and wiring of the All-broadcast Two. From left to right the terminals are:— G.B.—, G.B.+, L.S.—, L.S.+, H.T.+2, H.T.+1, H T.—, L.T.+, L.T.—, E, A2 and A1.

Free Blueprint Supplement to the "Wireless Magazine", April, 1927.

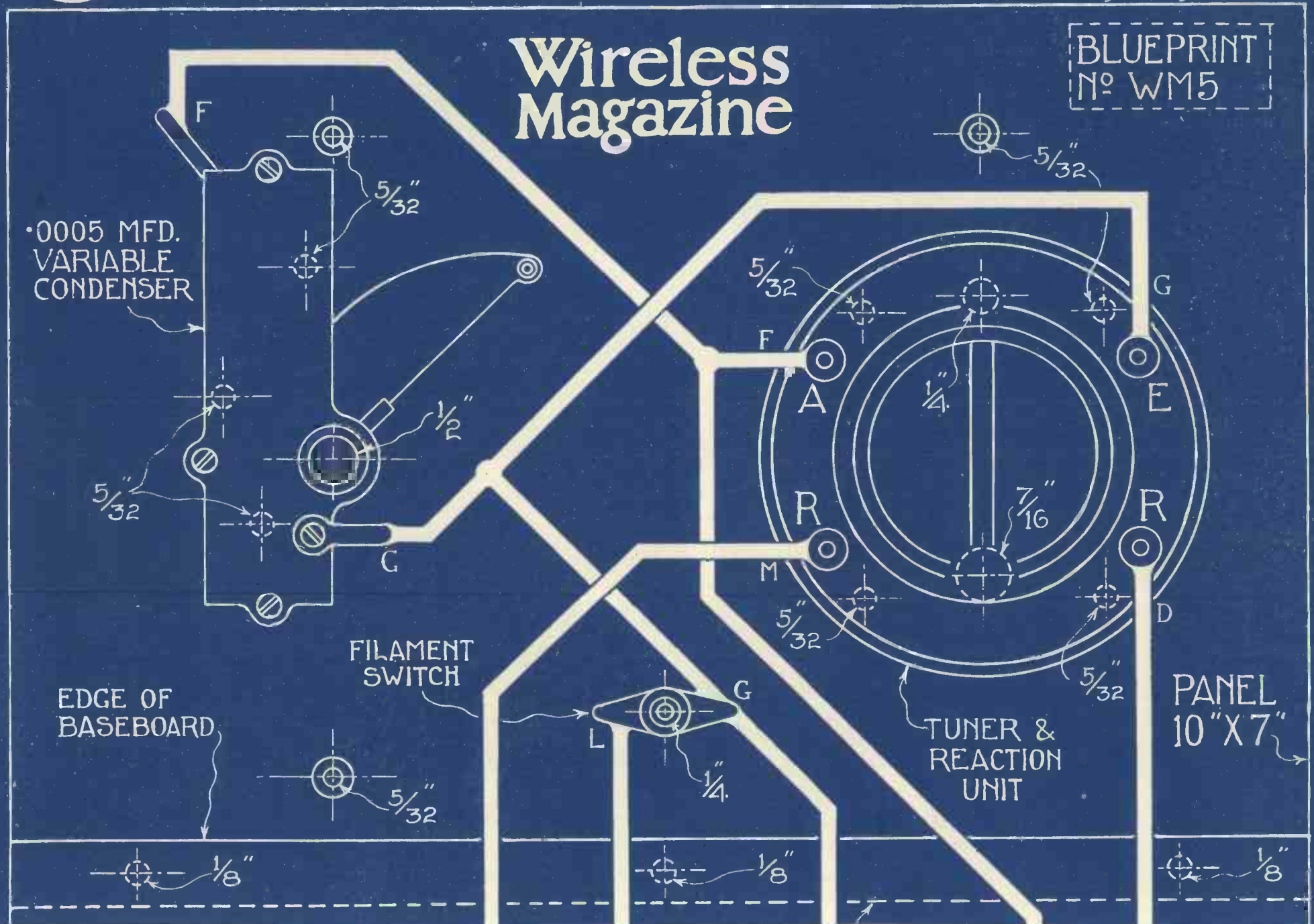
WM 5

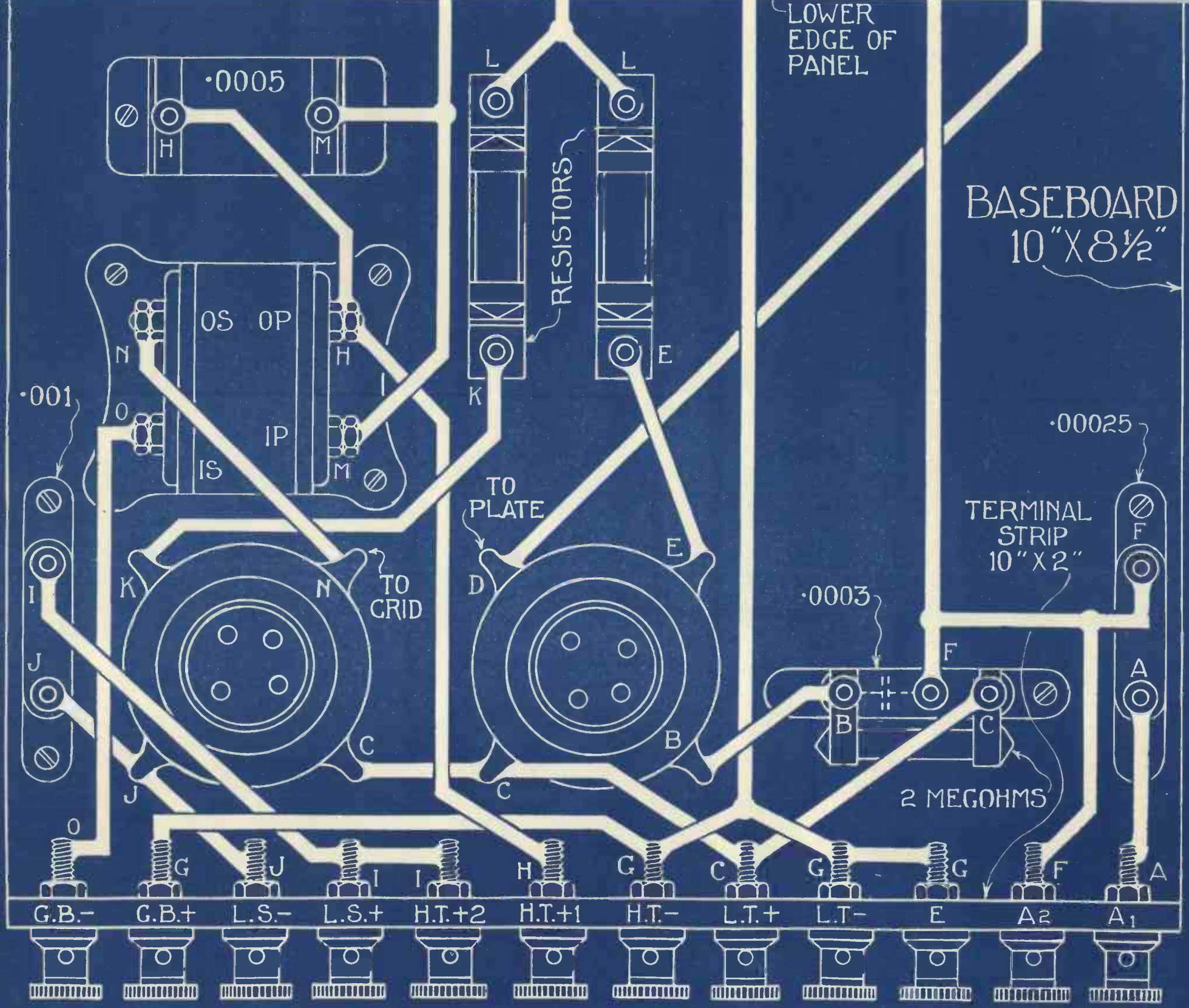
THE ALL-BROADCAST TWO

Full-size Layout Drilling Guide & Wiring Diagram

Wireless Magazine

BLUEPRINT No. WM5





Published by the "Wireless Magazine", La Belle Sauvage, London, E.C.4.

An Article on Public-address Work by an Experienced Engineer.

SPEECH and music amplification is becoming an increasingly important factor on great public occasions. Every political leader has used and is using it to address the thousands who attend party rallies or election meetings. At Wembley Stadium the speeches at the opening and closing ceremonies of the Exhibition were made audible to everyone present, while at the Hendon Aerial Pageant, the Lympne and Aldershot Tattoo, the spectators were kept informed of the events by means of great public-address installations.

Used by the Church

The Church has not hesitated to use this new force, for at St. Martin's-in-the-Fields, Westminster Congregational Church, and elsewhere, thousands have been able to assist at services in which they would otherwise have had no part.

General Principle Described

There is, of course, a variety of apparatus, capable of a varying degree of output and accuracy of reproduction, and a proper treatment of the subject would require a large book. We are therefore giving a description of the best-known and most generally used big set to illustrate the principles involved.

Public address may be regarded to a certain extent as an offshoot of broadcasting, in that the microphones and initial amplifiers are identical with those developed for the latter.

The microphone most generally used for large-scale work is the Round-Sykes magnetophone, which consists essentially of a flat coil of aluminium wire suspended in a powerful magnetic field (see Fig. 1). When sound waves strike the coil it moves in accordance with the varying air pressure, and has generated

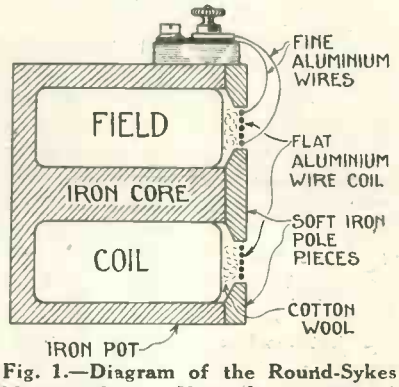


Fig. 1.—Diagram of the Round-Sykes Magnetophone. Note the position of the coil in the powerful magnetic field.

in it varying voltages, which are an exact record of the original sounds.

The coil is actually suspended on three small tufts of cotton-wool, so that it has no resonant point, and is connected by means of a twin lead-covered wire to the input transformer of the microphone or A amplifier (see Fig. 2). The covering of this wire is earthed, and it is as short as possible to avoid picking up any electrical interference from neighbouring telephone wires, switches, or lighting and power circuits.

Five Amplifiers

The coil voltage is thus transferred to the grid of the first valve in the A unit, which amplifies it through five resistance-capacity coupled stages and delivers it through an output transformer at medium telephone strength. Each stage is shielded in a separate copper box, all bonded together and earthed, and the valves are suspended on elaborate anti-microphonic holders, as the following amplification is so great that the slightest vibration would otherwise be reproduced as a loud booming sound.

Volume and Tone Control

There is a volume control and a special device for reducing or accentuating the bass or treble at will, to correct any defects in the acoustics of the hall or to overcome the tone-lowering effects of long telephone lines, such as are used for long-distance relays, both in public address and in broadcasting.

The output of the A amplifier is connected to the input transformer of the B amplifier. The link is again a twin wire, but if the run is short it is not always necessary to have it lead covered, as the "sound voltages" are now great enough to over-

come any interference which might normally be picked up. On the other hand, it is necessary in certain cases (one of which will be described) to have the A and B units as much as a mile apart, and then every precaution against interference must be taken.

The B Unit

The B unit consists of three resistance-coupled amplifying stages, screened as before, and employs LS5 power valves with 240 volts high tension and 24 volts grid bias. It is fitted with a double-strength control by means of which the overall amplification may be reduced from its full value of over 100 to less than 1! The normal output intensity, when working at average strength, is sufficient to overload any ordinary loud-speaker with ease.

But we have not yet reached the end. The B output is passed through a 6-to-1 step-up transformer on to the final power bank, or C unit.

Eight Valves in Parallel

This is a single stage employing eight LS5a power valves in parallel, with anything up to 500 volts high tension and 180 volts grid bias, the high-tension current being between 200 and 250 milliamperes. The energy available is therefore over one hundred and twenty times that used in the last stage of an average four-valve receiver! Large H.T. accumulators or special motor-generator sets are used for the supply.

We have now picked up the sounds to be amplified, recorded them as voltage variations, corrected these for any distorting influences in long lines or defective acoustics and amplified them to telephone strength, carried them as far as is necessary, amplified again, and finally used them to control the power available in the high-tension circuit of the power bank.

The final step is to convert this controlled power back into sound, and it is quite clear that no ordinary loud-speaker can be used if full justice is to be done to the capabilities of the amplifiers. The type actually employed was specially designed for the work, and its principle is illustrated in Fig. 3.

Connecting up a loud-speaker for public-address work.

The diaphragm is of the finest rubber, stretched between two cardboard rings, and supports a light coil of wire between the poles of a powerful electromagnet which forms the loud-speaker base. It is clamped between the base and the horn, round the edge and in the centre, and to obtain the correct rate of opening for the sound channel the centre pin is tapered off into the flare of the horn.

This design gives freedom from metallic harshness and remarkable penetrating power, so that the ordinary range for speech is about half a mile. Under favourable conditions these loud-speakers have been heard clearly at three miles and more!

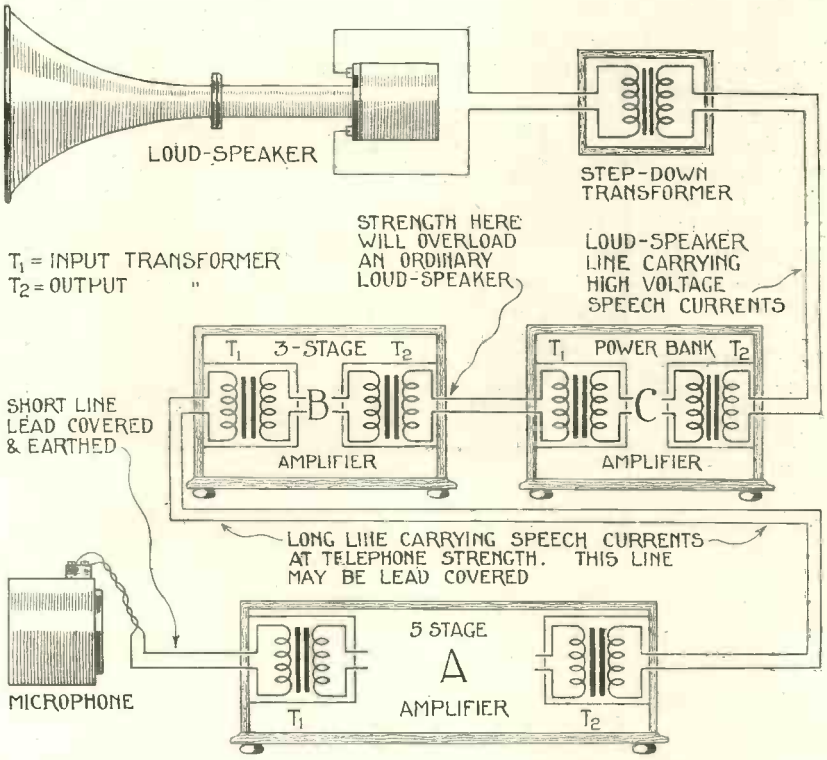


Fig. 2.—Schematic Diagram of Public-address Loud-speaker System.

No Steady H.T.

When working at normal strength the speech currents in the line between the C unit and the loud-speakers are often at a very high voltage. It will be seen from the diagram that the C output is through a transformer, so that there is no H.T. on the lines at all. The currents are purely those caused by the controlling voltage variations passed on to the C input from the B unit, and yet if the ends of the line are held a varying tingling sensation is experienced as the speaker talks.

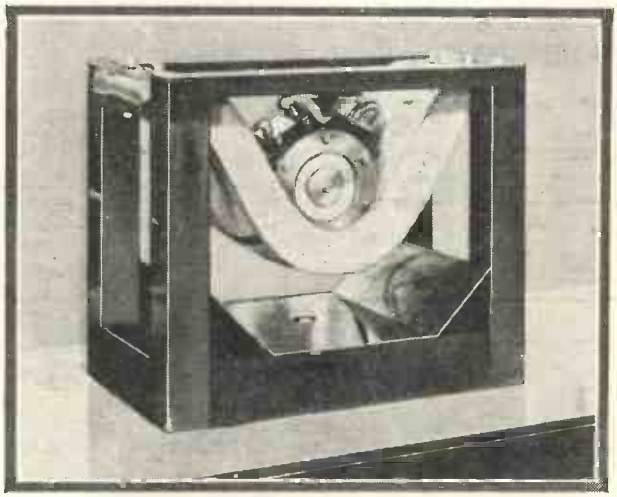
But woe betide the experimenter if the orator suddenly raises his voice, for the voltage of the speech currents may then jump up to two hundred or more, and the victim generally jumps two feet or more in sympathy!

The line voltages are stepped down

Telling the World — with Loud-speakers! *(Continued)*

again considerably through a final transformer to the loud-speaker coils, and the currents in these may be as much as one ampere. The diaphragm will then be moving as much as a quarter of an inch to and fro, hundreds of times a second. Compare this with the average home receiver, where the loud-speaker diaphragm moves a few thousandths of an inch!

To complete the picture, let us take a look at a typical installation; the one used for amplifying speeches and relaying the Royal Air Force band from the large to the small hall at the Ideal Home Exhibition, Olympia.



Photograph of the Round-Sykes Magnetophone for Public-address Work.

Position of Microphone

The microphone is slung in front of the bandstand, to obtain a good balance between the various instruments, and the A amplifier is on the balcony, connected to the microphone by a twin lead-covered cable. A member of the band switches on before each session.

Four Loud-speakers

From the A output a twin lead-covered wire runs up over the roof and down to a room in the gallery between the halls. Here are the B and C amplifiers and their batteries, and two sets are in use. On the left are two A instruments, for announcing from the room itself and acting as spares for the bandstand one. In the top row there is then a B unit and a C unit, working a bank of four loud-speakers which are suspended in the small hall, while the second B and C units provide power for three more loud-speakers at the lower end of the main hall itself. The batteries are below, and the main output switches are conveniently placed in the centre, where the engineer in charge listens to the progress of events and watches the H.T. current and L.T. voltage of every amplifier from time to time.

In an installation of this kind special arrangements have to be made for charging, as there will be about fifty 24-volt high-tension accumulators and thirty 6-volt car-type L.T. batteries, of which half are in use and half on charge, the two banks being changed over each morning.

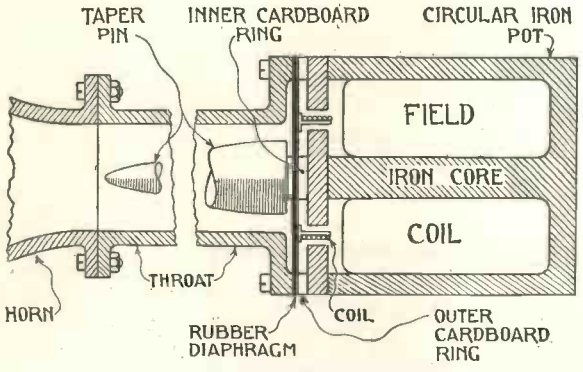


Fig. 3.—Details of Loud-speaker for Public-address Work.

Finally, it is interesting to know that public address calls for strength as well as skill, for the total weight of the apparatus such as used at Olympia is well over a ton, the amplifiers averaging 100 pounds each, the loud-speakers 35 pounds, the microphone 30 pounds, and the L.T. batteries 50 pounds. It is no easy matter to climb a forty-foot ladder with a loud-speaker in one hand and make it fast to a girder at arms' length. The smaller apparatus is, of course, much lighter; but the "big stuff" is apt to feel like real heavy engineering at times!

Omissions

In this very brief description of some aspects of public-address work much has necessarily been omitted; but the main details of the theoretical and the practical principles have been set out, and the reader will be able to fill in some of the gaps, thus realising what it means, what it does, and how it is erected and adapted to its various uses. F.Y.

"What is a component in wireless?"

"A part apart."

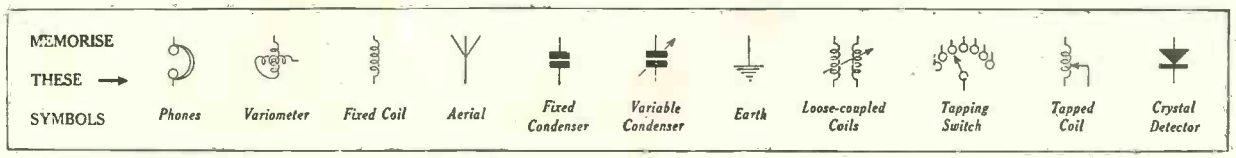
"How did Chelmsford get its call-sign?"

"The big barrel switch in use there suggested it."

"And why is it so easy for a ship to get the right time when at sea?"

"Because each wireless operator keeps a wireless watch."

The Post Office has issued a special form of licence for listeners who are at sea. So far only about fifty listeners have owned up to the need for this kind of licence.



More About the Paradyne

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

THE Paradyne Four, which was described in our last issue, has excited a good deal of comment owing to the model principle on which it works. As will be remembered, this receiver incorporates special high-frequency transformers having a variable coupling between the primary and secondary. This enables the receiver to be maintained in a state of constant sensitivity over the whole of the tuning range, so that quite a number of stations can be picked up without any use of the reaction control whatever.

Solving a Problem

With a receiver which will do this the operations involved in the finding of distant stations are considerably simplified, a fact that brings the problem of the alternative programme a little nearer solution.

At a recent demonstration before the Mersey and N. Wales Centre of the Institution of Electrical Engineers the practicability of obtaining a substantially constant sensibility was demonstrated to a large audience, and a number of stations were tuned-in simply by setting the tuning dials to predetermined figures.

This, then, is the feature which one will find particularly in the Paradyne receiver. In the present state of development it is not particularly selective, but there are many people who consider that a set so simple to operate and only moderately selective is worth more than one which is razor-sharp in tuning and correspondingly critical to operate. Any doubts as to the performance of the receiver are, of course, dispelled by the test report which was given last month—a list of some thirty-five stations received at satisfactory loud-speaker strength.

In my last article on this receiver I suggested that when the set was used fairly close to a local station there might be a trace of background of this station, but this would disappear when the station was properly tuned-in. This, unfortunately, appears to have conveyed the impression that the receiver is not selective, which, of course, is entirely erroneous.

Cutting Out the Local Station

At the recent lecture in Liverpool, which was referred to previously, no difficulty was experienced in cutting out the local station and receiving a large number of distant stations, although the building where the demonstration was held was only one mile from the Liverpool station.

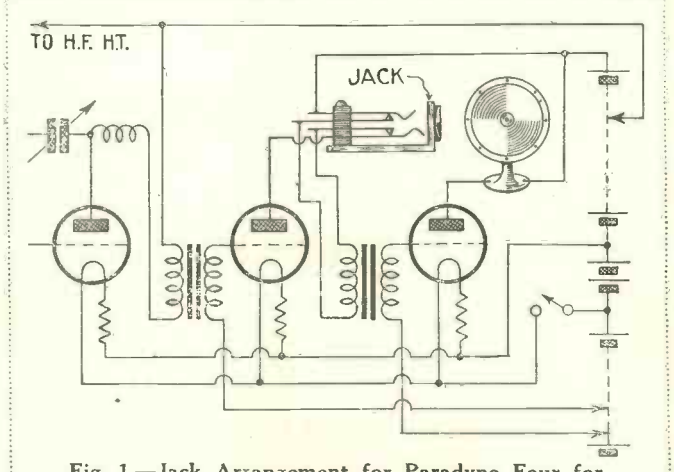


Fig. 1.—Jack Arrangement for Paradyne Four for Plugging-in Phones.

"Background"

What I wanted to convey was that unless both the tuning condensers are correctly adjusted to the distant station which is being received, then a background of the local station may be present, but this, after all, is a state of affairs which applies to any ordinary type of unscreened receiver, and when the station has been correctly tuned-in the signal strength rises so remarkably as to give a vivid impression of a near-by station having just started up.

Many readers have raised the point of reception on the longer waves ranging from 1,000 to 2,000 metres with this receiver. There is an undoubted demand for reception on the long waves, particularly in the case of coast dwellers who are rather troubled with spark interference. It will be appreciated, of course, that it is a somewhat difficult matter to devise an interchangeable system with a variably-coupled transformer such as is employed in this receiver.

Advantage with the Americans

This is, indeed, one of the occasions on which the American designer is at a considerable advantage, for he has not to cater for two different wavelength ranges, and he can therefore concentrate on obtaining the maximum efficiency on one more or less limited band of wavelengths only.

The original Paradyne units were designed to cover the 250-to-600-metre band of wavelengths only, and particular attention was paid to obtaining a high degree of efficiency in this connection. Fortunately, however, further experiment has shown it is possible to provide, in a comparatively simple manner, for the reception of the longer wavelength.

The use of any form of plug-in connection tends to introduce inefficiency, and in making the necessary arrangements for the longer wavelength, therefore, plugging-in has not been adopted. Reference to the circuit diagram shows that on each of the combined transformer and condenser units there are three connections which go to a common point so that there are only two connections which require alteration on the aerial unit and three on the H.F. unit.

More About the Paradyne *(Continued)*

S. S. Bird and Son have therefore introduced a long-wave Paradyne unit which can be interchanged with the short-wave unit in a comparatively simple manner. It is simply necessary to make the actual connection to the transformers with flexible wire at the end of the stiff wire. These can then be undone, the transformer unit removed bodily and replaced with a unit covering the different wavelength band. The connections are then replaced, and the receiver will then be in a condition to receive signals, the method of adjustment being as on the shorter waves.

Marked Advance

There is no doubt that this will considerably alter the effectiveness of the new arrangement. I suggested in the previous article that in producing this Paradyne unit we had definitely obtained a system superior to any of the American devices.

There are two main systems in America operating on a somewhat similar principle. In one of these stability is obtained by reducing the coupling with the primary and secondary windings of the transformer to such an extent that the receiver is stable over the wavelength range to be covered. This, however, is obtained at the expense of overall amplification. The other system utilises a neutralised circuit in combination with the principle of the variable rotor.

Full Amplification

The Paradyne system, of course, owing to the principle of phasal stabilisation which is employed, not only remains stable without the necessity for neutralising, but also enables the full amplification to be obtained from the valves. It is possible to change the high-frequency valve from a high-impedance high-μ valve to a low-impedance power valve, or *vice versa*, without producing any instability. The stabilising arrangements are independent of the valve in use for the high-frequency stage, so that the arrangement marks a considerable advance in the science of high-frequency amplification.

L. F. Switching

In the last article describing the actual construction of the Paradyne Four, I suggested that readers might like to incorporate some form of L.F. switching arrangement in order to cut out one of the note-magnifying valves. This, of course, can be done by the usual form of jack switching. Readers who wish to adopt this method will find ample space on the panel for them to include a jack in the anode circuit of the third valve. Telephones may then be inserted into this jack and tuning carried out on the telephones.

When any station has been tuned-in at telephone strength the jack can be removed, when the stations will automatically be put on the loud-speaker. A circuit incorporating such an arrangement is given in Fig. 1.

This method of jack switching is quite satisfactory as long as the telephones are used in the third stage. It is not a satisfactory solution of the problem of loud-speaker reception of the local stations. Many people find that the volume on four valves is much too great for the local station. In fact, this is almost inevitable if one is within 50 miles of a main station.

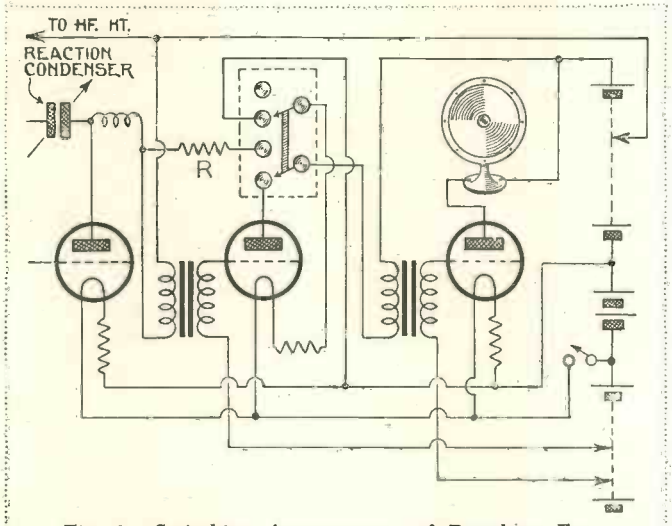


Fig. 2.—Switching Arrangement of Paradyne Four for Three or Four Valves.

At first sight, therefore, it would appear that the loud-speaker could also be fitted to a plug and plugged in a jack after the third valve when local station reception was desired. This, however, is not satisfactory, because, in order to handle the volume of sound from the local station, it is necessary to have a power valve or preferably a super-power valve. The grid swing on a loud soprano note may rise to as high a value as twelve or fifteen volts, and unless the valve is capable of handling such a grid swing, blasting will result.

Last Valve

It is not necessary to employ a super-power valve of this nature in the third stage (first L.F.), because the signals with which this valve has normally to deal are only comparatively small, but if a normal L.F. valve is employed it will be overloaded when dealing with the abnormal volume from the local station. Therefore, if the loud-speaker is plugged in after the third valve, the reception from the local station cannot be as good as it might be.

The best method to adopt in this case is to switch out the third valve instead of the last valve. There are minor difficulties in the way of such an accomplishment, but these can readily be overcome. Fig. 2 shows a simple circuit for cutting out the third valve when it is desired to receive the local station or very strong stations.

Valve Switching

Here, as will be seen, the last valve, complete with the transformer preceding it, is switched either on to the third valve or the second valve as required. A two-pole switch is employed, one pole serving to switch the anode circuit, and the other pole operating in the filament circuit of the first L.F. valve, so that this can be switched out when not required.

(*Continued on p.* 242.)

Well known to listeners-in as an actor, Mr. Michael Hogan is also a playwright. His adaptation of "The Idiot" from the novel by Dostoieffsky aroused considerable interest when it was produced in London recently, and the B.B.C. have on hand a number of his plays which will be broadcast shortly.

The Art of the Radio Play

An Impression of Michael Hogan.

"TO talk or not to talk" seems to be the question occupying the thoughts of everyone interested in wireless at the present time. Does the future of wireless lie in the broadcasting of speeches and plays, or will radio eventually become a medium (like the gramophone) for the reproduction of music only?

Speeches and Talks

With the question of after-dinner speeches and "talks" I am not concerned. Many people think that they occupy too large a part of the programmes. It must be borne in mind, however, that it is not everyone who is interested in music—even syncopated music. For millions, wireless would have no interest at all if music alone were broadcast. Non-musical entertainment of some kind must be provided for these listeners, and I think that the future of the radio play is, therefore, a very pressing subject.

That the radio play has a future, and that the critics who say its demands on the imagination become unbearable are wrong is recognised by those who know broadcasting from within. The enthusiastic praise given by countless listeners to the Sunday afternoon Shakespeare recitals and to the broadcasts of many other plays is the proof.

Future to be Decided

The future of the radio play will have to be decided in the next few months. The producers and authors are at the cross roads—will they continue to produce short plays, relying on "noises off" for their effects, or will they turn to plays whose chief merit is beauty of language?

Personally, I think that the future of the radio play lies in the charm of the spoken word.

When producers of radio plays realised the possibilities of "noises off" it was only natural that they should be tempted to exploit them for scenic effects, instead of relying on imaginative language. In this they have been, to some extent, supported by listeners. There is a novelty in being transported to a boat on a river by wireless and realising that the rustle of water against the keel is being made by a box of matches.

Novelty Worn Off

It is the same appeal that the double-exposure ghost made to early cinema-goers. Now that the novelty has worn off such trick photography is used only when it helps the unfolding of the story and never for its own sake.

The same evolutionary process will take place, I think, in the broadcast play. The novelty of the slammed door, feet crunching in the sand, and a dozen other noises will wear off. Eventually only sounds that inspire the imagination and do not clog it will be used.

I can think of a perfect example of the inspiring sound. One of the most successful broadcasts ever made was that of Flecker's *Hassan*. The letters received afterwards proved that it had been enjoyed by thousands of listeners. Some went so far as to say it appealed to them even more than when they saw it on the stage. Yet Flecker's language is so full of colour and beauty that only one sound was used during the course of the play—the sound of the fountain playing after the death of Yasmine and her lover. Never has a sound seemed so full of thought. If "noises off" had been used as frequently as they are in other plays, the whole effect would have been spoilt.

Need for Special Plays

The need for writing special plays for broadcasting is often emphasised. That is only right. But it is a mistake to think that the play specially written for broadcasing should be a musical scena with "noises off" all the while, and occasional scraps of conversation. The play written for broadcasting should differ from the

The Art of the Radio Play *(Continued)*

stage play in being more picturesque.

Work of Merit

I am convinced that the future of the radio play lies in the production of work of literary merit. The charm of the spoken word is much greater than the charm of "noises off," and gives much greater opportunity to the imagination. The average man—poets call him "the man near the soil"—has a wonderful imagination. He does not *try* to imagine, but simply takes what he hears and gives it its ordinary meaning—and the ordinary meaning of Shakespeare, Barrie, Pinero, and a score of other writers is often a very wonderful meaning.

Not a Highbrow

Please do not think I am a highbrow. I detest highbrows as much as I dislike lowbrows. I think that there is a real danger of broadcasting being strangled by the highbrows and the lowbrows. It was the average man who filled the theatres in Shakespeare's day, and it is the average man who supports the best modern plays. It is to the average man that the radio play appeals.

When I speak of plays with beautiful language I do not necessarily mean plays written in blank verse, or with page-long orations. Nor because I support established playwrights do I suggest that the radio play will not have to be specially written.

Writers of radio plays are not handicapped by the conventions of the stage—the unity of place and time or the exits and entrances of actors. Nor is the radio play bounded by the conventions which have spoilt the picture play.

Shakespearean Conditions

Conditions for the production of radio plays are not dissimilar to those in the theatre when Shakespeare was writing—which explains, perhaps, why Shakespeare is the most successful radio playwright so far! There was no scenery or attempt at crude realism—the words painted the scenery and the voices of the actors took the place of spot lights.

That age produced a wealth of fine dramatic literature, and I feel that the opportunities offered by wireless will encourage playwrights to pay more attention to the charm of their words and less to scenic directions. Radio may yet produce a golden age of literature in England.

To actors and actresses, too, the wireless play offers unbounded opportunities. The finest actors have always put voice first—even Kean, who was reputed to have a bad voice, used it with great effect in emotional scenes. After all, conveying emotion by flexion of the voice is better than conveying it by distortion of the face—as picture-goers who have tired of "close-ups" are beginning to realise.

One can never become tired of a beautiful voice. On the stage actors and actresses grow old and lose their physical attraction—but on the wireless never.

Radio Play Influences

Most important of all is the influence that radio plays will have on the average listener. They will do more than enable him to enjoy the finest writing of our time—they will awaken his interest in his own language. Without setting out to thrust "education" down the throats of listeners, the producers and authors of radio plays have a great opportunity of adding to the pleasure and culture of the average man—the man for whom broadcasting exists.

Broadcast Lessons in School

The Best Position for the Loud-speaker

DURING a recent visit to the Manchester district I had an opportunity of seeing a class of boys and girls receive a wireless lesson in botany from the Manchester broadcasting station.

Details of the Room

The room in which the lesson was received was not exactly a good one for wireless reception. Its length must have been nearly 40 ft., its breadth 18 ft., and its height 15 ft. The south and the north sides of the room were the long ones. On the south side were three large and one small windows. On the north side was the door. There were no other breaks in the walls of the room, so that there was a considerable echo effect even when the room was full.

I was most interested in the attempts of the science master who had charge of the set to find the best position for the loud-speaker, a large one of the horn type. He tried the loud-speaker facing down the length of the room, and he tried it facing across the width of the room. He also tried it in the corner where they usually put the naughty boy. The first position seemed by far the best.

With the loud-speaker facing down the length of the room, this science master tried it at various height levels, finally deciding on a level about that of the pupils' heads as they sat at their desks looking towards the loud-speaker in the front of the class.

Pencil and Notebook

Each member of the class had pencil and notebook, and before the lesson began each pupil made copies of a number of coloured drawings done on the blackboards in front of them.

I had no difficulty whatever in following the broadcast lesson. My only trouble was that I knew practically nothing of the subject of the lesson.

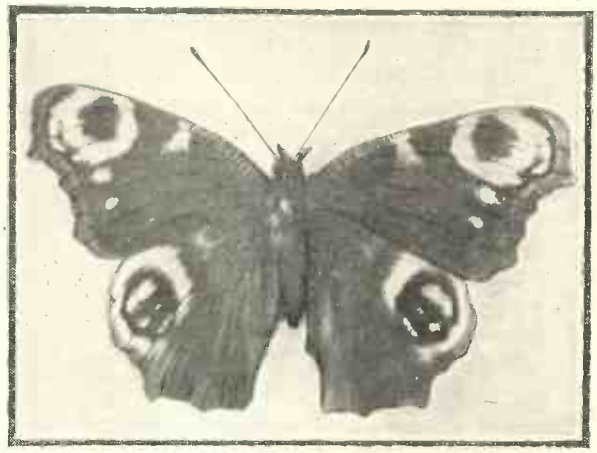
A Three-valver

The set, by the way, was a three-valver, detector valve followed by two ordinary low-frequency amplifying valves.

I came away from that broadcast lesson with the impression that wireless was destined to play an important part in the education of the child of the future. HALYARD.

The Butterfly That Sang

A Fable for Kiddies, Involving the Making of a Crystal Set



The Butterfly *before* the Charm worked.

TO tell the truth this story, and the butterfly that belongs to it, lie at the door of my daughter, Melusina Mops.

Mops stole a feather . . . to titillate the bald spot on my head.

I appeal to those uncles and aunts whose good humour shines forth with such unfailing regularity from 5.15 p.m. to 6 p.m. If you had a daughter, named Mops, who came into your sanctum at all hours, danced, bounced, jazzed all over the room, sat on your desk, lightly brushing aside your carefully-arranged papers, leapt from it to pick up and rearrange—upside-down—your pipes on the mantelpiece, stole a feather from among them and used it to titillate the bald spot on your head, closed your typewriter, or forced you to surrender your pen, and then inserted herself between you and your desk, how long would that good humour of yours last?

"*Melusina,*" I began on such an occasion, "you're too volatile. You're a mere insect, a mosquito, a moth, a may-fly, fluttering here, there and everywhere, dilly-dallying with life; you don't know how to concentrate, how to fix that little brain of yours—if you have one under these mad curls—on any single subject for more than a few seconds."

Mops yawned. "Daddy," she said, "this isn't Sunday, and this isn't church. Mother will be coming in in a minute to say it's bedtime. Tell me a story, like a really truly week-day daddy."

So saying, she put her small hand inside my collar, grasped it firmly, and pulled herself still further over my person. I had to release her hand, being on the verge of suffocation, and to put an arm round her to prevent her from slipping off.

"I will, Melusina," I said, "I will tell you the tale of the Butterfly That Sang."

Mops emitted a long sigh, whether of content or boredom I cannot say, but that's how it began. . . .

* * * * *

Waking from his winter sleep, in a corner of the roof of the old church, Mr. Vanessa Io was lucky enough to find the sun streaming in at one of the south windows, and flickered down to it, to find the window—for a wonder—open. He shot out into the lovely, fresh, spring air.

"Oh! honey and nectar! this is simply gorgeous," he said, and he took in deep breaths with every spiracle.

Late last autumn he had emerged from a chrysalis among the nettles to find it too cold and too flowerless to stay outside, and the last thing he remembered of that old life was crawling into the building for shelter and warmth.

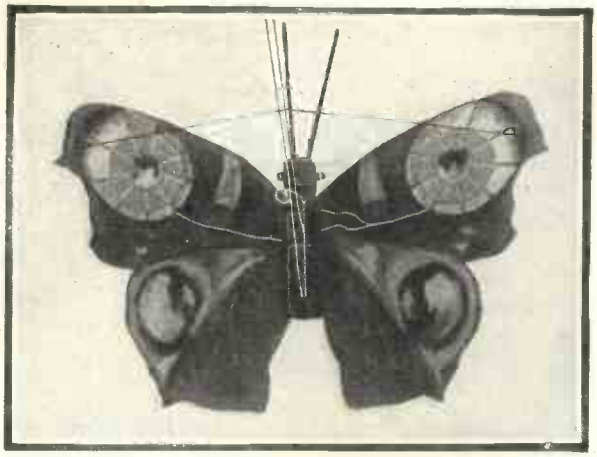
But now, here was glorious April sunshine, and new green grass and clear blue sky, and primroses, dandelions and daffodils nodding their heads, or turning their faces to him as he hovered over them, and life was just brimming over in him—life and sunshine, and *exooberant* high spirits.

For the first five minutes he surrendered himself to the sheer joy of feeling alive. Like a living aeroplane, he went through every flying stunt he could think of, and at least a dozen new ones by accident. He side-slipped, he cavorted, he imitated a falling leaf, he spun, he nose-dived; in the course of which he found himself over a bit of lush meadow on the edge of a copse, rich with bluebells, cowslips and cuckoo-flowers.

The colour caught his eye, and he spent the next five minutes flitting madly from flower to flower, trying to make up his mind which he would taste first. Then he decided that he was not thirsty—yet; so he rose for another giddy aerial dance, and then came to anchor on the trunk of a willow overhanging a duck-pond.

There he perched, opening his wings to their fullest width and

I had to release her hand, being on the point of suffocation (collars are not meant for handles).



The Butterfly *after* the Charm worked.

letting the brilliant sunlight play on them, and suddenly closing them again, to make sure that he really was alive, and that this was not just a beautiful dream. Then he jerked himself a few steps nearer the water, and opening his wings again caught sight of his reflection below.

It was so exquisite a sight that, though he had a fair opinion of himself, he could scarcely believe that he was as beautiful as that. He leapt from his perch and fluttered to and fro over the water to convince himself.

It was true! That lovely image with its lilac and blue, its black and white, its russet and yellow and crimson, was himself, the most perfect thing alive!

"Swanker!" said a coarse voice below him.

Mr. Io paid no attention; he did not realise that the remark was addressed to him.

"Swanker!" said the voice in a rougher tone; "Swanker!" repeated another in a higher key; "Swanker—swanker—swanker!" said half-a-dozen more; and at last Mr. Io discovered a score of ugly heads protruding from the water, with whacking wide mouths, all apparently grinning at him.

He almost dropped into the pond out of sheer surprise, and indeed fell so near to one of the frogs' heads—(*Snap!*)—that the story very nearly ended then and there.

Recovering himself, however, he protested, pouting:

"I'm not a swanker; I'm the beautifullest creature in existence, that's all. Look at me." And he executed some astonishing gyrations and corkscrews that made him almost forget what he was protesting about.

"Showing off!" said Frog No. 1. "Knut!" said Frog No. 2; and as that was an easy word in froggy lingo, the pond echoed with it from all the other frogs.

"I'm not, I'm not, I'm not," Vanessa replied angrily. "You ought to be pleased to look at me. You ought to be grateful to me for letting you see how fair a thing I am. Wasting my sweetness over your dirty, stagnant mud, when I might be sipping nectar from the meadow flowers."

"Pah!" said Frog No. 1, followed by all his brothers in chorus. "You're only an outward show, all paint and puff. What can you do? Come and show us how you can swim. Come and croak—if you can. Pah! Useless parasite."

Mr. Io was too hurt to reply. He retreated in a dignified silence, and he had scarcely got a yard from the

"Swanker," said a coarse voice below him. (This is one of those puzzley sort of pictures. The butterfly is drawn very large, because he thought such a great deal of himself. The frogs are drawn contemshus on purpose).

pond when the sun and the air intoxicated him again, and he went off on another wild career.

"Rude, ignorant creatures!" he said, when he had recovered his *amour propre*, and had a drink out of a golden marsh-marigold.

But—horror!—at that precise moment his story again nearly ended; for a pair of cockney sparrows pounced at him, and if he had not ducked and shut his wings so that his bright colours were instantaneously hidden, one of them would have finished him.

He hid behind a leaf, listening.

"Where did it go, old dear," said Mr. Sparrow. (*It* indeed!)

"Goodness knows," said the other, "but never mind. I'm sure it has a bad taste; no good for food; too bright to last; all wings and whiffles."

"I can't think what the good of such things is," the gentleman replied, extracting a fat lethargic grub from a grass root. "Reminds me of the old song:

Bees hum,
Birds sing,
Sparrows chirp,
Wopses sting.
But, live or dead,
A butterfly—
When all's said—
Is *but a fly*.

"I wish I could sting," thought Vanessa Io, as the sparrows flew away, "I'd show 'em."

But a minute or two later, when he darted out into the sunlight again, he forgot all the rhyme except the first two lines; he was too giddy-pated to remember much; but those two lines stuck in his head and repeated themselves so often that, without knowing it, he made up two more to complete them:

"Bees hum,
Birds sing—
I can't
Do no such thing."

You know how a tune sticks in your head, or a line or two of poetry. In just such a way these lines stuck in Vanessa's head, till he got them on the brain. They haunted him, and when night came, and he found a nodding bluebell stalk to sleep on, he couldn't sleep. He was annoyed—he was worried. "Why can't I hum? Why can't I sing?" he thought. "Why should a bird or a bee do it, and not Me?"

"Who? Who?" An aged, slow voice came through the darkness from the century-old oak above Vanessa's head.

He was so startled that he answered without thinking, "Me—Me."

"You—You?" said the voice. "I suspect you mean 'I,' 'I,' but you are so small that I can't see you."

"I'm a poor miserable butterfly, sitting on a bluebell stalk, and I can't hum and I can't sing, and everybody laughs at me or despises me."

"I know," said the Owl (as, of course, you have guessed), the wisest of birds. "Come a little nearer and I'll talk to you for the good of your—peace-of-mind. No, I won't eat you; I'm not one of those miserable aliens, the Noctua-noctuas; I don't eat butterflies or beetles. Come along."

As it was a moonlight night, Vanessa managed to approach the hole where the Owl sat, his enormous eyes blinking in the bright light.

"So you want to learn to sing, eh?"

"Yes, sir."

"Can you sit still or keep still?"

"Not when I'm awake, sir, and it's daylight."

"Then, understand this—you'll never learn anything at all till you can."

"But—but I'm so full of exooberant sp-spirits, sir."

"Then you must learn to control them, my little one, if you want to achieve anything."

"I'll try, sir," said Vanessa timidly. "How do I begin?"

The Owl scratched his head. "Can you concentrate?" he asked.

"You—You," said the voice. (Here you see the wisest of birds, and the butterfly; this time he is drawn very small to show his feelings).

"I don't know, sir; but I can oscillate, and—and—vibrate, and—and——"

"And vacillate, and scintillate, and hesitate, and stop-out-late, but you can't modulate or cantillate. Do you want to sing very badly?"

Vanessa said it was the thing he wanted to do most in the world—or croak. Then he would show the frogs and the birds a thing or two.

"Are you prepared to sacrifice anything to attain your desire?"

Vanessa said he humbly hoped he was.

"Come a little closer, then," said the Owl. "This moon dazzles me. I wish it was a dull-emitter."

He inspected the butterfly closely.

"You can oscillate," he said; "well, that counts for something, but don't overdo it. You can vibrate; well, that's good. You have a pair of antennæ—they may come in useful. You have also four wings, two upper and two lower. I think you could develop a pair of coils on the former"—he chuckled at his awful pun. "I note your crystalline eyes, erubescite or cerussite, I fancy. I wish one had been zincite."

"I'm sorry, sir," said Vanessa, "but they have *good sight*. Will that do?"

"So many crystals end in *ite*," said the Owl, with a sigh, "that I don't suppose it will matter much. But what about terminals? You'll need terminals, you know."

Vanessa had not the least idea what they were talking about, but he did his best to sustain his part of the conversation. "I—I have two ends, please sir," he hesitated, "if they could be put to any use."

"Good, good. You are really showing some intelligence. I think that with patience and care something can be made of you."

"Yes, but what, sir?" asked Vanessa eagerly. "Can I learn to croak or to sing, or even to sting?"

"Not to sting," said the Owl severely, "but to sing, yes, or to croak, or chirp, or twitter, or hum, or crackle. But on no account whatever to howl."

"Oh, won't it be lovely!" Vanessa clapped his—wings. "When can I begin?"

"It's a long business," said the Owl, ruffling up his feathers and giving himself a shake, "a long business, and you must be prepared to work hard, and to give up jazzing all over the place. You must begin by practising sitting still, with your hands — wings, I mean — neatly folded; *and* you must not fidget, *and* you must not interrupt; *and* you must not grumble if it takes a long time, *and*, above all else, learn to sit still."

"Oh, I will, I will!" Vanessa said ecstatically, jumping up and down with joy.

"Sit still now, then," said the Owl dourly, "bobbling up and down as if you were on wires. Are you on wires?"

"No, sir, I don't think so."

"If you are, it's no use. You have to be wireless if you are to become a singer."

The butterfly became rigid at once.

"Finally, you must learn to concentrate," said the Owl, holding up a monitory claw. "Concentrate on one-thing-at-a-time—in fact, on the one thing that remains to complete the recipe."

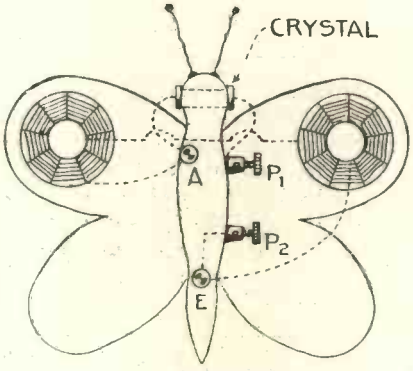


Fig. 1.—How to Connect up the Wires.

Vanessa with difficulty restrained himself from wriggling with excitement.

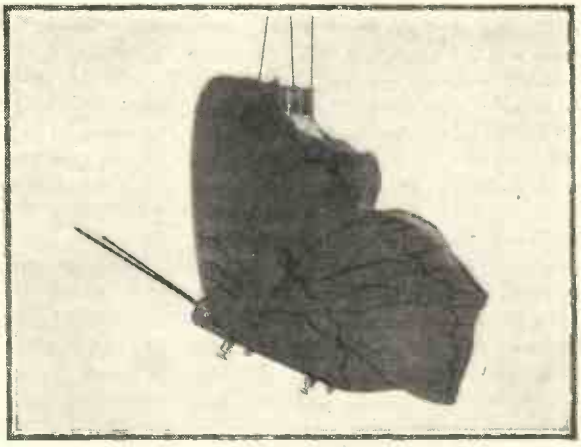
"The *charm!*" said the Owl. "The magic charm that will eventually make you what you will become. I will say it to you slowly for an hour or two, and then *you* will say it, or what you can remember of it, during the day, or week, or month, or year that it takes to work."

Vanessa held his breath to hear.

"Are you ready?" asked the Owl. "Then listen:

Take some yards of copper wire,
Six-and-twenty, d.c.c.
Upper eye-spots next require—
'Each a three-inch former be.'
There a coil of forty turns
In and out you patient weave,
In each centre empty space—
A florin's area—you leave.
Inner end of Number One
Join to outer end of Two.
Then four terminals it boots
In the body firm to screw."

Here the Owl stopped a moment



The Butterfly sitting still to sing.

The Butterfly that Sang *(Continued)*

and looked at Vanessa, sitting with folded wings. Then he went on in a different tone :

" One for A and one for E,
And the others, I' and P.
Next a fixed detector get,
Lyndin, Fellows, or Valette,
Fix it through each crystal eye,
That it there may rectify,
Now . . . . "

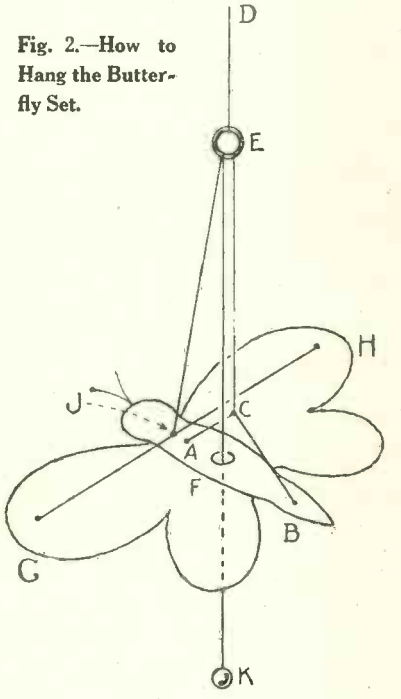


Fig. 2.—How to Hang the Butterfly Set.

But that was all Vanessa heard; the monotonous chant had sent him fast asleep.

* * * * *

And so it did with Mops; so no one ever heard the end of the story. But if you or your big brother, or possibly a good-natured uncle or father, will work out the charm, I will guarantee that the butterfly will sing. Provided —but only provided—that it sits still.

This is how it is done :

Having cut out the butterfly's wings from three-ply wood or strong cardboard, and his body out of a broomhandle or blind rod, and hinged them together, you make two cardboard formers, as the charm indicates, with 40 turns of wire on each. The crystal detector can be placed in a hole drilled through the head, and the four terminals—for aerial, phones, and earth—set in the body.

The wiring is quite simple, the connecting wires being fixed down on the wings or body so as not to be visible (*See* Fig. 1).

Join inner end of one coil to outer end of the other. Outer end of coil No. 1 to aerial terminal. Aerial terminal to one end of crystal detector. Other end of detector to first phone terminal. Second phone terminal to earth terminal. Earth terminal to inner end of coil No. 2.

The next thing is to make the insect work (Fig. 2). (1) Drill a hole through the middle of his body at F. (2) Hang him from the ceiling by a string, ABCD. (3) On the string, about 12in. or 14in. up, tie a small ring, E. (4) Fix a second string, GH, on the tips of his wings, so that it is straight when they are expanded. (5) From the centre of this string, at J, take another string, pass it through the ring, E, bring it down through the hole, F, and tie a bead on the end of it at K.

That's all. Join him up to your aerial and earth leads, put on the phones, and pull the bead. The wings will immediately close together. When they are at exactly the right distance from one another, you will hear the signals coming through. Fix the insect—in other words, make him sit still—and he will perform to your pleasure. Release the bead, and the wings open again.

The coils of 40 turns will serve for stations working up to a wavelength of 350 or thereabouts. For those using a higher wavelength, make coils of 40-50 turns.

And for 5XX use two ordinary Daventry basket coils, obtainable at any shop.

Lastly, the moral is—but ask your father.

Wireless Privileges

LAST week I met a little girl who told me of the people she had heard on the wireless. She mentioned the King, the Prince of Wales, Prince George, and three other members of the Royal Family. She knew the names of the world's greatest scientists, statesmen, musicians, and clergymen, and she had heard them all.

It had never occurred to me before then that we are blessed in this generation with the privilege of not only reading of, and seeing the photographs of, our biggest men, but we are hearing their voices again and again.

Some of us would know our statesmen and scientists if we met them on the road, for we have seen their photographs so often. Now we ought to know the voices of some of these great men if they passed us in the dark and merely said " Good-night."

Half a century ago the average man would go anywhere within his means to hear a big statesman speak or hear a great preacher preach. Wireless has brought within the reach of us all the privilege of hearing these men and getting acquainted with their mannerisms and modes of speech. Most of us would never have heard our King speak were it not for radio.

The unusual has become ordinary; the big men and women of our age have entered our homes; the world has become one great neighbourhood in which the voices of many speakers are well known.

When the writer was a boy he had one great ambition, and that was to hear Sir Harry Lauder sing, hear Sir Oliver Lodge speak, and listen to Paderewski play his piano. Had it not been for radio he would not yet have heard any of these.

The boys and girls of to-day have the opportunity of hearing explorers and adventurers tell their tales of discovery; they hear the great comedians of our age singing the songs some of us knew twenty years ago and would have liked to hear rendered by their composers; the children now hear the author of a great novel or play speak about his work and say how he came to write it.

The educational value of wireless in the privileges it brings is a tremendous boon to the nation of to-morrow.

E. E. R.

Half Hours with the Professor

2.—A Chat on Neutralising.

YOUNG Amp was feeling pleased with himself. He was conscious of a thrill of achievement: had he not wrestled for many hours with Henry's neutralised circuit and at last got it to work?

Hit and Miss

True, he had found it somewhat tricky—rather a hit-and-miss business—but there had been no doubt of the results. So here he was bursting with enthusiasm, on his way to tell Professor Megohm all about it.

He found the Professor working with a strained and almost furtive expression on his face. The great man was tuning-in a receiver with a strangely hesitating air, as if expecting something unpleasant to happen.

"Good evening, Professor," cried Young Amp, hardly able to contain himself, and wondering just how to tell him of his wonderful achievement. "I've been putting Henry's set right," he added, with an attempted air of mingled casualness and modesty.

The Professor looked at Young Amp for a long time without speaking. "Do you mean Henry next door?" he asked at length.

Young Amp nodded, wondering why the Professor did not enter into the spirit of his enthusiasm to a greater extent.

"H'm," was the caustic comment; "I thought you knew better!" He did not seem to be very pleased.

Amp's Bewilderment

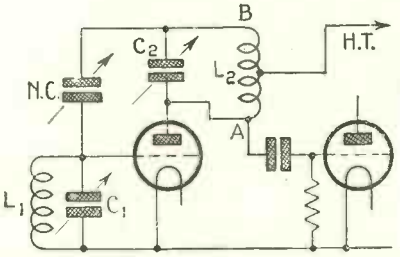
Young Amp's face was a picture of bewilderment. In some inexplicable manner he had called on his head Professor Megohm's displeasure, but he could not for the life of him understand why. His puzzled air was plain to see, for the Professor continued his remarks:

"So you have been responsible for the weird and uncouth noises with which the ether has been flooded for the last two hours or more! You, of all people, whom I fondly imagined knew something about the elements of wireless! Yet you pervade the ether with cat-calls like the veriest tyro. I'm ashamed of you!"

"But," stammered poor Amp, nearly in tears at this unexpected attack, "I thought a neutralised circuit could not cause howling."

The other looked at him. Perhaps, after all, he had been a little scathing, for this was, verily, a common fallacy.

"No, my boy," he remarked in a more kindly tone, "that is only true when the circuit is properly adjusted.



Prof. Megohm's sketch of a neutralised circuit.

All the time you have been struggling to stabilise the set you have been causing no end of interference. In fact, I have been able to do nothing all the evening. But perhaps you did not know that?"

"No, I didn't," replied the erstwhile set repairer, now in a much sobered frame of mind. He wondered if he dare ask for more information.

"Would you like me to discuss the matter with you?" asked Professor Megohm with a twinkle in his eye, for he saw how disconsolate his young friend had become. The Amp nodded.

"Right," resumed the other. "Now look at it in this way. Suppose we consider a simple neutralised H.F. circuit" (here the Professor drew the circuit given above. "We have here a tuned circuit L_1 C_1 connected across the grid and filament of the first valve.

"This circuit is energised by being coupled in some manner to a source of electrical oscillations—such as the aerial circuit or a preceding valve.

"The voltages produced across the grid and filament are amplified by the valve and are transferred to the next valve—in this case through a tuned-anode coupling.

Straying Energy

"Now all the energy is not handed on to the next valve. Some of it strays about, producing what are known as stray fields or leakage effects."

"That is why screened coils are used, isn't it, sir?" asked the Amp, now fully himself again.

"Yes," smiled the Professor, "that is correct; and even complete screening of the whole circuit is often adopted.

"There is, however, another source of leakage, and that is through the valve itself, due to the small capacity effect which must inevitably exist between the anode and grid of the valve. This results in a certain amount of energy being transferred back to the grid circuit."

"But," interrupted the Amp, "won't that produce a reaction effect?"

Coupling the Circuits

"Exactly," was the reply. "If you wish to produce deliberate reaction, you couple the anode circuit to the grid circuit in some manner. If the coupling is in the right direction an increase in the signal strength will result, and if this reaction effect is increased beyond a certain limit continuous oscillations will set in.

"If, on the other hand, the coupling is in the wrong direction, then the signals are damped out instead of increased.

Half Hours with the Professor *(Continued)*

"In the case of the valve, we can obtain either of these two effects, but in the ordinary transformer circuit the reaction effect is positive, and with reasonably low-loss circuits actually produces continuous self-oscillation.

"We could stop this by decreasing the efficiency of the circuits or by reducing the effective amplification of the valve so that the feed-back was much smaller; but both these methods are retrograde, and mean that we cannot obtain the full effect from the circuit. Is that clear?"

"Yes, thank you," said Young Amp, thoroughly absorbed.

Opposite Potentials

"Good. Well, one method of overcoming the trouble," resumed the Professor, "is to use a neutralised circuit. Let us look at our sketch again. You will see that the tuned-anode winding is centre-tapped, the H.T. connection going to the middle point. At any instant, therefore, the two ends A and B will be at opposite potentials."

"Half a minute," interrupted the Amp, "I don't get that."

The Professor thought for a moment as to how best to explain. Then he continued: "Look at it this way. There is a certain voltage between A and B. Let us say this is one volt. Then if A were at zero potential B would be at a potential of one volt."

Here the Amp nodded to himself, so the Professor continued:

"The middle point will thus be at a potential of ½ volt."

Again Young Amp nodded.

"Consequently A is ½ volt below the middle point and B is ½ volt above it; so if we connect the middle point to H.T. we have + or − ½ volt at each end."

"I see now," said the other, nodding vigorously, "so that if at any instant the point A is ½ volt positive then B is ½ volt negative."

Currents to the Grid

"Exactly," said the Professor. "Now remember what I said about the valve capacity. The voltages at A cause currents to flow through the valve which affect the grid and cause reaction. If we connect the point B through a small condenser NC to the grid as well we shall get currents flowing from B to the grid."

"I get it," cried the Amp, upsetting a pile of papers on the floor in his excitement. "Because B is opposite to A, the two currents wash out."

Megohm smiled. "Very lucidly put," he remarked, "if not exactly in scientific language. Provided the capacity NC is adjusted to equal that of the valve the circuit is balanced and the full amplification can be obtained without oscillation. Specially small condensers known as ——"

"Neuts," said the Amp, with a grin.

"Vulgarly, yes," agreed the other. "You will see, however, that all the time the circuit is being adjusted it is likely to oscillate, and often does so very heavily."

"I suppose one ought to take the aerial off, then, when 'neuting'?" said the Amp.

"You can either do that," was the reply, "or you can use the silent-spot method. If you are within 20 miles of a main station you can use this latter method. Tune-in approximately and then switch out the H.F. valve. Now retune very carefully and adjust the neutralising condenser until no signals are heard.

Equal and Opposite

"This will occur when the feed of energy through the valve and that through the neutralising condenser are equal and opposite. The circuit is then stable, and on switching on the valve again it will tune without any danger of oscillation."

"Does that always work?" said the Amp.

"There are occasions when the silent spot is not silent; but in general the method works. We will discuss some of the cases when it fails on another occasion."

More About the Paradyne

(Continued from page 234)

When this arrangement is switched over to the three-valve circuit, however, we have the full H.T. voltage applied to the detector instead of only a portion as was previously the case. In order to allow for this, therefore, a resistance should be incorporated in the lead to the switch, as shown at R. The value of this resistance will be of the order of 10,000 to 50,000 ohms, according to the difference between the detector voltage and the full voltage and the type of valve used in the detector stage.

It should preferably be of such a value that the detector voltage is reduced slightly below the normal. Then, when the receiver is switched from four to three valves, there will be no danger of the receiver oscillating.

There is another purpose which is served by this resistance—this concerns the relative impedances of the detector valve and the L.F. transformer succeeding it. We normally have a high-impedance detector valve, followed by a first-stage transformer having a high-primary inductance.

Low Tones Lost

When we switch to the three-valve position with the arrangement just given we use the second-stage transformer to follow the detector. Such a transformer, however, would have a lower primary inductance, and some of the low tones would be lost.

The inclusion of the resistance in series, however, increases the impedance of the anode circuit, and since the value of the resistance is independent of the frequency a certain amplification of the low tones is assured. In practice the arrangement makes a considerable difference to the quality.

The system is, of course, only partially efficient, since the voltage developed across the resistance is not transferred to the next valve.

THE MAN WHO HEARD CHINA!

THE new alternating-current valve recently marketed by the Marconiphone people under the designation of KL1 is of particular interest to those who desire to see the accumulator finally relegated to the limbo of forgotten worries.

So far as convenience is concerned the new valve is an advance even on the standard type of battery-eliminator unit, as it requires no rectifier for the filament.

Current from the Mains

Alternating current from the house mains is stepped down by means of a transformer, and applied directly to a separate heating element mounted in the bulb and designed to take a supply of two amperes at a pressure of 3.5 volts.

The heat so generated radiates outwards and raises the temperature of a specially-coated cylinder, which closely surrounds the filament although it is electrically insulated from the latter. As soon as it is warmed up the coated cylinder liberates a stream of electrons which pass through a spiral grid on to the plate in the ordinary manner.

The volume of electron emission depends wholly upon the heat radiated from the "false" filament, and as the latter is made sufficiently robust not to fluctuate in temperature with the applied alternating-current supply there is no noise or hum to get through into the phones or loud-speaker.

Why Not the H.T. Too?

The next accessory one would gladly see the end of is that expensive item, the high-tension battery. Although the modern re-chargeable unit is an improvement upon the older dry-cell variety, the initial cost of the former is a heavy handicap to the man of moderate purse, particularly where it is a case of providing 120 volts for power amplification.

High-tension direct from the mains is a still more convenient alternative, though here again the necessary rectifier or reducing unit represents a heavy outlay, and does not always completely shut out generator noise. Possibly the ultimate remedy will be found in the further development of four-electrode valve circuits suitably designed to produce a large overall amplification from a comparatively low voltage applied to the space-charge grid.

A Licensing Decision

In response to an enquiry as to whether it was necessary under certain conditions for a broadcast listener to hold more than one licence, the Postmaster-General has made the following official statement :—

> A wireless receiving licence entitles the licensee to use wireless apparatus in the premises occupied by him. One licence will cover any number of sets installed in the same premises for the use of the licensee, his family, or his servants; but any other person occupying a portion of the same house under a separate tenancy and desiring to install wireless receiving apparatus must take out a separate licence. When a licensee runs telephone leads from his set to the house of a neighbour, or to any premises other than those in his own occupation for the purpose of conveying broadcast programmes there, a separate wireless licence is necessary for such premises.

Atomic Energy

Dealing with the question of the world's natural resources, and the danger of gradually exhausting our supplies of energy, Professor Norris of the Massachusetts Institute of Technology points out the potentialities of the nimble electron. It provides a new agent or tool consisting of matter travelling with the speed of light and is daily becoming more and more amenable in the hands of scientists.

At present the discharge from radium can be used to form a combustible liquid, similar to petrol, from methane, which in turn can be synthesised from carbon and hydrogen. It is but a short step to replace radium by the discharge from an X-ray or electronic tube, both types of energy being practically identical.

Once the electrons from a thermionic discharge tube can be made available for manipulating molecular or atomic changes, the limitations of expense imposed by the use of radium will disappear, and artificial fuel can be manufactured in bulk, and at low cost.

Development

In support of his argument, the Professor points out that when electric light was first obtained from a primary battery no one imagined that it would ever become so cheap as to serve for railway transport.

Incidentally, if ever a cheap substitute for radium is discovered, the necessity for valve accumulators will at once disappear. A filament made of radium substitute would emit a continual stream of electrons without the application of any heat. In other words, the long-sought-for cold-emitter valve will have been achieved.

B. A. R.

An Article That No Listener Should Omit to Read

Picking up the Distant Stations

LONG-DISTANCE reception has a charm all its own. It is sometimes said that, purely from the point of view of entertainment, only two or three of the nearer stations can be really worth listening to.

Allowances for Imperfections

This may be so as far as perfect reproduction is concerned, but one is usually prepared to make some allowance for slight imperfections in the quality provided that reasonably good reception can be obtained from Berlin, Madrid, New York, or some even more distant station.

It may be argued that if half a dozen stations can be picked up at will there are sufficient alternative programmes available without going further afield. But this is not the point. There is a special fascination in listening to an entertainment provided by someone hundreds or thousands of miles away and to know that one hears each word or note almost at the same instant that it is spoken or played before the distant microphone.

There are three main essentials for successful long-distance reception. These are a good aerial system, a suitable set, and skilful operation. Without any one of these failure is inevitable. The first two essentials should present little difficulty to anyone who reads good wireless literature, but when we come to the operation of the set the human element presents itself.

Naturally Good Operators

Some people are naturally good operators just as some people have a natural aptitude for the piano, while others seem never able to learn how to handle a wireless set properly. The very great majority of people, however, can vastly improve their playing of the piano or the operation of their wireless sets by study and practice.

But before dealing with the difficult subject of operation let us see that the first two essentials for long-distance reception are fulfilled. The aerial system, it must be remembered, does not merely mean the overhead wire, but also the earth connection and the tuning coil which connects the two.

OUR AMERICAN COUSINS

A boy-scout patrol listening-in.

The aerial system must be a good collector of energy, which means that the overhead wire must be high. But the aerial system must also have a low resistance or, more scientifically, must be but lightly damped, if far-distant stations are to be received clearly and well. A highly-damped aerial may pick up the signals from a distant station, but if it picks up "mush" and atmospheric interference equally well the station itself may be lost in a background of irritating noises.

A suitable set for long-distance reception should, if it is intended for use above 250 metres, have at least one stage of H.F. amplification and preferably two. The actual amount of amplification which can be obtained from even the most efficient H.F. stage is very small compared with what can be done on the L.F. side. But what amplification can be obtained is far more useful than might at first sight be imagined.

Detector Efficiency

This is because a detector valve deals far more efficiently with signals above a certain minimum strength than it does with those below that strength.

Besides the obvious fact that all components in a long-distance set should be of the best obtainable quality all those components with moving parts should be in first-class working order, and certain in their action. The moving arms of the filament resistances and the potentiometer should make firm and certain contact with the resistances over which they move, and this throughout their entire ranges.

The variable condensers, when once set, should "stay put." This implies that the bearings must be reasonably tight so that the weight of the moving plates cannot cause them to slip round a little after the condenser knob has been released.

Different Tuning Operations

So much for the aerial system and the receiver. The operation of a wireless set is an extremely difficult thing to deal with in print, as there are so very many different wireless circuits in use that the drafting of definite rules for tuning is no easy task.

As an exhaustive treatise on the subject is impossible here we shall have to content ourselves with touching on those operating points which apply to long-distance receivers in general. It should be realised that experience is the best teacher of the

Picking Up the Distant Stations *(Continued)*

subject and that once two or three really distant stations have been picked up it will be comparatively easy to pick up many more.

A Set with Good Range

Starting at the very beginning we will assume that one is in possession of a set which should have a very good range, but that so far only the local station has been received. Before trying to tune-in WGY the other British stations should be picked up and practised on until they can be brought in at will. After that the nearer and more powerful foreign stations can be found, and by this time sufficient experience will have been gained to give the operator a reasonable chance of success when attempting to "roam the world."

Circuits "in Tune"

The first thing to remember is that to get a station any distance away all the oscillatory circuits of the set must be exactly in tune. Provided that a distant station can finally be brought in at really good strength the harder it is to get that station the more suitable is the set for long-distance work. This sounds like a paradox, but if each station could be received over a good portion of the condenser scales it would be impossible to separate one from another.

First of all tune-in the local station until it comes in at its best possible strength. The different circuits of the set are then exactly in tune with each other and with the local station. Now the tuning of the circuits must be altered bit by bit, keeping them all in tune with one another, throughout the whole tuning range of the receiver.

A Difficult Matter

This is a difficult matter as a movement of, say, ten degrees of the aerial condenser will alter the wavelength to which the aerial circuit is tuned by a different amount from that by which the wavelength of the H.F. coupling will be altered by ten degrees movement of the H.F. condenser.

However, if the set has been well designed the same movement of any of the H.F. condensers should vary the wavelength of its respective coupling by the same amount.

For the purpose of illustration we need only consider one H.F. coupling here. Starting from the point at which all the circuits are tuned to the local station the aerial condenser can be advanced by a few degrees. The H.F. condenser can then be slowly turned until it is at its minimum capacity. (If there are two H.F. stages the two H.F. condensers are, of course, varied simultaneously.)

This procedure will ensure that the H.F. circuit will, at one point of the condenser's movement, be exactly in tune with the aerial circuit. If a station happens to be working on this particular wavelength it will then be heard. If not, the aerial condenser can be advanced a little more and the H.F. condenser again turned between its setting for the local station and its maximum capacity. When the aerial condenser reaches its maximum the same procedure can be carried out between the condenser settings for the local station and the minimum capacities of the condensers.

Once a station is heard both aerial and H.F. condensers can be re-adjusted until the station comes in at greater strength. When this has been done a great step forward has been made, for we now know how the condensers can be set so that the circuits are exactly in tune with each other for two different wavelengths. It will be an easy matter now to vary both aerial and H.F. condensers so that they are exactly in tune with each other on every wavelength between that of the local station and the new station.

Tuning Two Circuits

For instance, if the amount of movement to alter the tuning of the aerial condenser from the wavelength of the local station to that of the other station is twenty degrees, while that of the H.F. condenser is thirty degrees, the two circuits will be exactly in tune when the aerial condenser is set at five degrees above the local station setting and the H.F. condenser advanced $7\frac{1}{2}$ degrees; also, when the aerial condenser has been advanced ten degrees and the H.F. condenser fifteen degrees, or the aerial condenser fifteen degrees and the H.F. condenser twenty-two and a half degrees.

Picking Up a Particular Station

When half a dozen stations can be picked up at will an attempt may be made to pick up a *particular* station previously unheard. Choose some fairly powerful foreign station and ascertain its wavelength and hours of working. Compare the wavelength of the station chosen with those which can be received at will and notice between which two known ones it lies. In order to pick up the chosen station it will then only be necessary to vary each of the condensers through a few degrees—between the settings for the two previously-heard stations whose wavelengths lie immediately above and below its own.

We have not yet mentioned reaction. When searching for a distant station the set must be kept as near as possible to the oscillation point unless two or more H.F. stages are employed. In order to do this it will be necessary to alter the reaction coupling slightly each time the tuning is altered and each time the reaction coupling is altered the tuning will be slightly affected.

Slight Re-adjustments Only

However, if the reaction coupling is first adjusted when the local station has been tuned-in and the procedure mentioned above is carried out, subsequent alterations of the reaction adjustment need be only slight.

J. F. JOHNSTON.

This set has been specially designed by the "Wireless Magazine" Technical Staff to show that broadcast reception with a loud-speaker need not be an expensive undertaking and that a three-valver for moderately long-range work can be built for a sum within the limits of anybody's purse. Components of the best quality are used throughout.

The Continental Three

A Three-valve (H.F., Detector and L.F.) Set for £5 only

Easy to Construct

Photograph of the Completed Continental Three.

Designed, Built of the Best British Components and Tested by the "Wireless Magazine"

IT will come as a surprise to a large number of home constructors to learn that a three-valve set, using the highest-grade British components, can be made for as little as £5. Of course, *any* three-valver cannot be made for this sum, and the set to be described in this article is the result of some special work of the WIRELESS MAGAZINE Technical Staff.

Long Range

As its name implies, the Continental Three is intended for moderately long-range work. It will receive many of the European stations at loud-speaker strength—will, indeed, enable anyone who builds it to tour Europe for £5.

Best Components Only

It is desirable to emphasise the point that all components used in this set are made by some of the best-known British manufacturers. By substituting parts of a slightly lower standard of quality the price of the set can be still further reduced. However, if it is desired to obtain the good results given by the original, it is desirable to follow the specification as closely as possible.

From the circuit diagram it will be seen that the combination of valves employed is a high-frequency amplifier, a detector and a low-frequency amplifier. The high-frequency amplifier is neutralised and a transformer is used to couple it to the detector, which in turn is coupled to the low-frequency amplifier by a resistance-capacity unit. This combination gives both reasonable range and reasonable volume.

In order to make the set as selective as possible when used in close proximity to a local station, an aperiodic aerial-coupling coil is used, but at distances greater than approximately ten miles from the local station this can be dispensed with, and the aerial lead taken *via* a series condenser of .0002-microfarad capacity direct to the grid end of an ordinary aerial coil instead of to the tapping point of an aperiodic coil.

Fine Adjustments

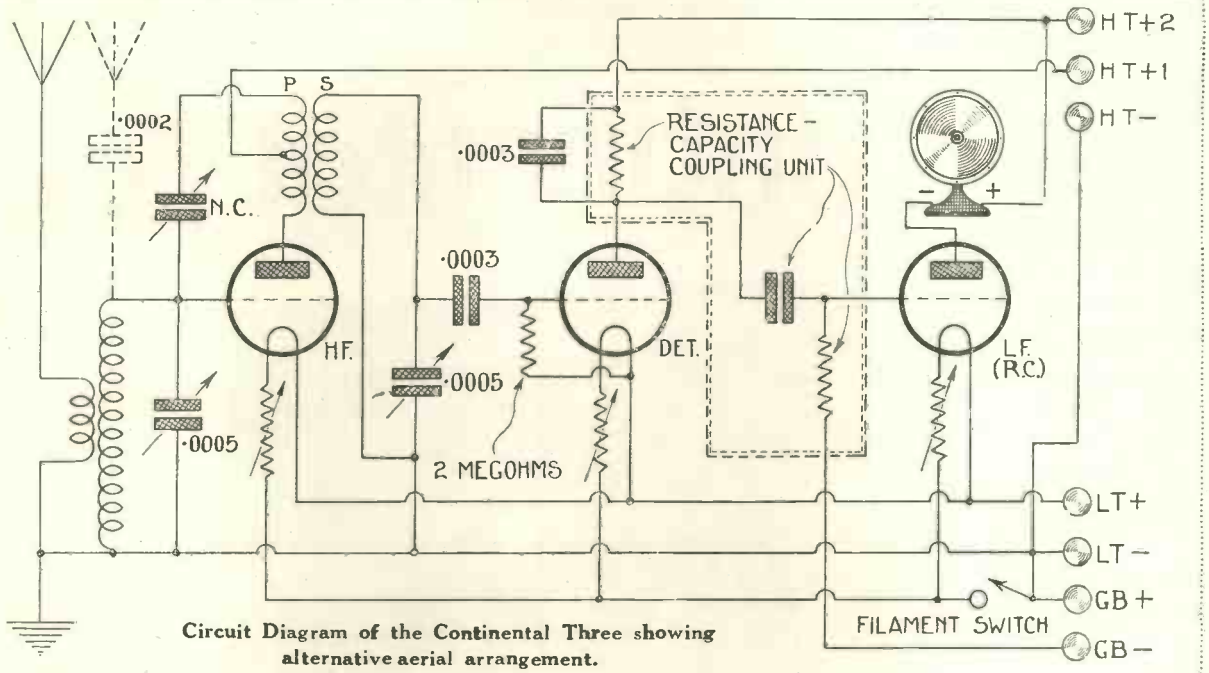
Points of interest regarding the rest of the components are the fact that the variable condensers, by means of a special pulley drive, can be adjusted within fine limits, and that the resistance-coupling unit is combined with the valve holder for the low-frequency amplifier.

Components Required

The components required to construct the Continental Three are mentioned in the following list. Substitution of parts other than those

Construction of this set is facilitated by using the full-size blueprint drilling guide, layout and wiring diagram that is available at a cost of 1s. (post free). Send a postal order to Blueprint Dept., "Wireless Magazine," La Belle Sauvage, E.C.4., and ask for blueprint No. W.M.7. Blueprints are also available of all other sets described in this issue.

The Continental Three *(Continued)*



Circuit Diagram of the Continental Three showing alternative aerial arrangement.

used in the original receiver may make the set dearer or less expensive to build. The actual cost of building the original set was a few shillings short of £5 :—

Ebonite panel, 16 in. by 8 in. (Becol or Resiston).

2 terminal strips, 9 in. by 2 in. and 3 in. by 2 in. (Becol).

2 .0005-microfarad variable condensers (Cosmos).

3 30-ohm filament resistors (Igranic - Pacent Pre Set).

Anti-microphonic valve holder (Lotus).

Combined anti-microphonic valve holder and 2-megohm grid leak (Lotus).

.0003 - microfarad fixed condenser (Dubilier).

Push-pull filament switch (Bulgin or Trix).

Combined resistance-coupling unit and valve holder (Cosmos).

Ordinary valve holder for H.F. transformer (Peto-Scott).

Neutralising condenser (McMichael).

Centre-tapped H.F. transformer for broadcast wavelengths (Igranic).

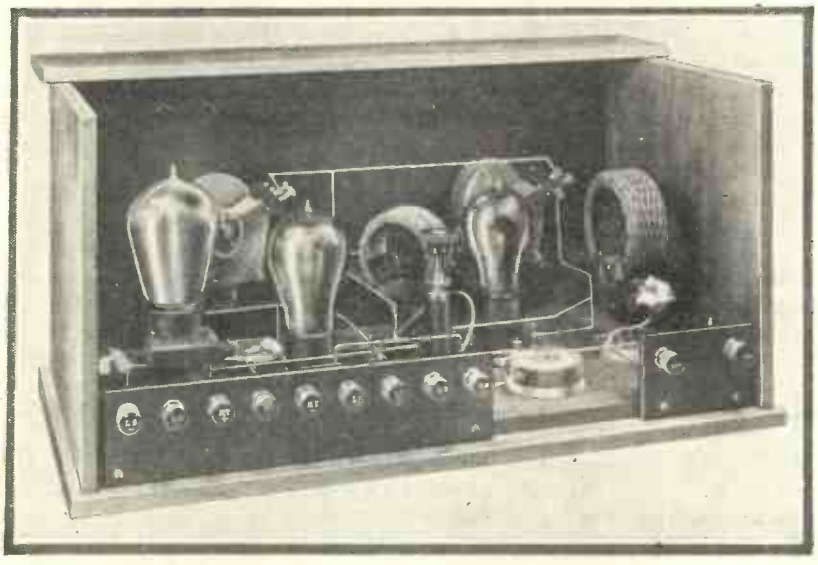
Single-coil holder (Athol).

Unitune aperiodic-coupling aerial coil (Igranic).

11 engraved terminals :—Aerial, Earth, L.S.+, L.S.−, L.T.+, L.T.−, G.B.+, G.B.−, H.T.+1, H.T.+2, H.T.− (Belling-Lee, type M).

Knockdown mahogany cabinet (Hobbies).

It should be clearly understood, of course, that only those components mentioned in the preceding list are included in the £5 estimate, and that valves, batteries, and loud-speaker are extra items, which will cost another few pounds, the actual amount depending chiefly on the particular types of valves used.



This photograph shows the neat appearance of the Continental Three.

Blueprint

Once all the components have been obtained, the actual construction of the set can be started. In this connection it is recommended that the constructor obtains from the WIRELESS MAGAZINE a full-size blueprint layout, drilling guide and wiring diagram. The cost is 1s., and it is necessary only to send a postal order for this amount and mention Blueprint No. W.M.7 to obtain a copy of the right print.

The first thing to do in constructing the set is to drill the panel. This can be done without difficulty if a blueprint is used. Just lay the print

A Set That Costs No More than £5 to Build

over the panel, mark through all the drilling centres, and make holes of the sizes indicated. Those who do not require a full-size drilling guide will find a reduced panel layout reproduced below.

Fixing Components

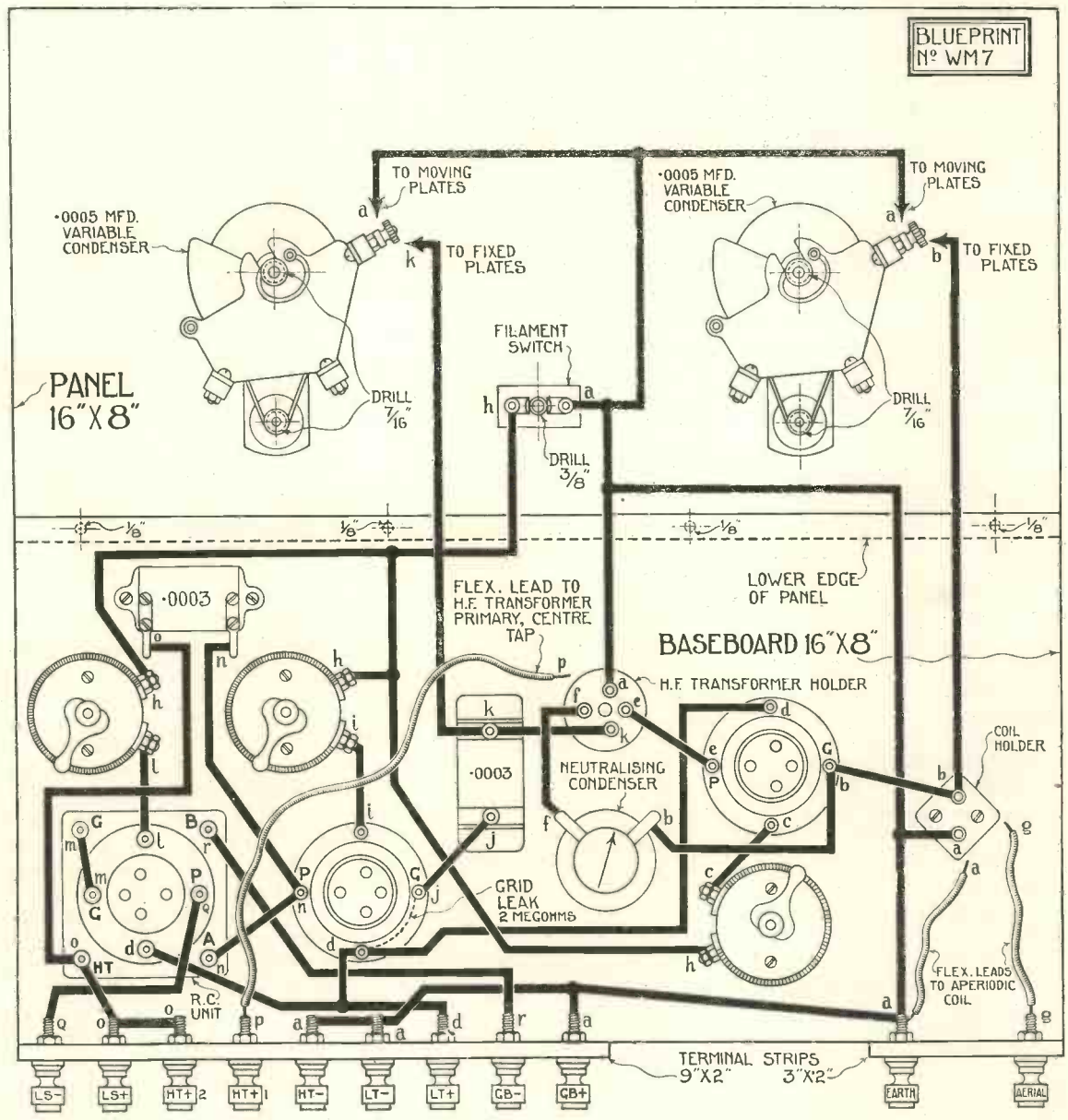
When all the holes have been drilled and cleaned out the components should be fixed in position on the panel and baseboard. There will be no difficulty about this if full use is made of the photographs and diagrams reproduced in these and the following pages.

As soon as all the components have been fixed into position, the panel and baseboard can be screwed together and wiring can be started. It is recommended that this be done with some coloured insulated wire such as Glazite.

Wiring will be found to be quite a simple job if the blueprint or reduced reproduction is carefully followed. It will be seen that each terminal point is marked with a small letter of the alphabet; these indicate the order in which wiring should be carried out.

Following the Letters

For instance, all those points marked *a* should first be connected together with one wire or as few wires as possible; then all those points marked *b*; and so on through the alphabet. It is important that wiring



Layout and Wiring Diagram of the Continental Three. This can be obtained as a full-size blueprint (No. W.M. 7) at a cost of 1s.

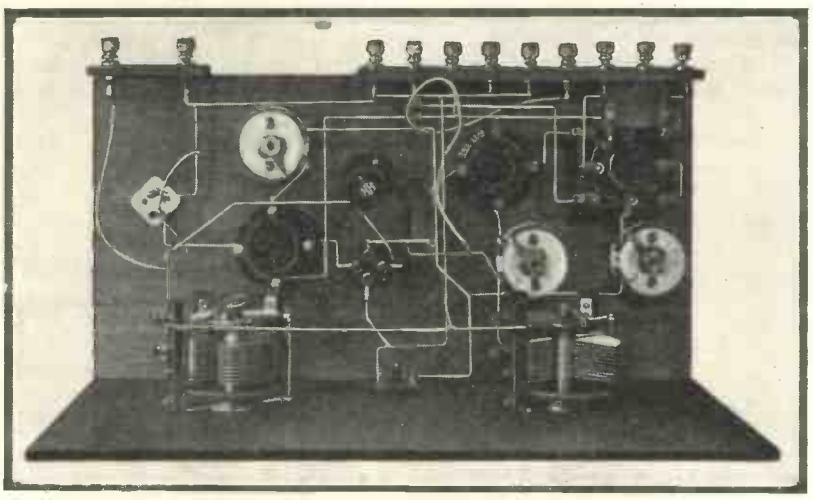
The Continental Three *(Continued)*

should be carried out in the correct alphabetical sequence.

Flexible Leads

During the course of wiring it will be found that there are three flexible leads to be taken to different points—one to the centre tap of the high frequency transformer, and two to terminals on the aperiodic aerial coil. When the set is in operation the last two leads can be reversed as better results may be thus obtained.

As soon as the wiring is completed the set can be prepared for testing. But first of all, it is necessary to say a few words about the choice of valves.



Baseboard Layout of the Continental Three.

It is desirable that the first valve should be a high-frequency amplifier of moderately high impedance; the detector *must* be a valve of very high impedance *specially designed for resistance-capacity amplification;* while the last valve can be a low-impedance model of the power type.

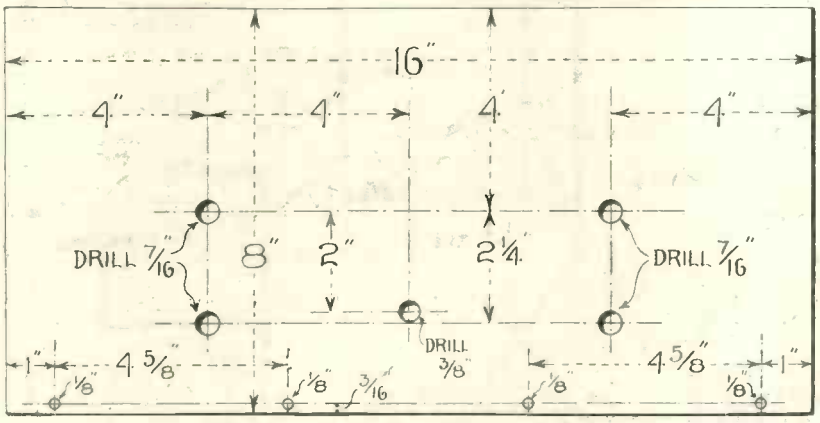
Suitable Valves

We can recommend the following combinations: For a six-volt accumulator, Shortpath SP_{55} Redspot, SP_{55} Bluespot, and SP_{55} Redspot; Cossor Point One (Red Band), Point One R.C. (Blue Band), and Stentor Six; Mullard PM_5X, PM_5B, and PM6. For four-volt and two-volt accumulators the corresponding Cossor valves are suitable.

To test the set place the valves, aperiodic coil, and high-frequency transformer in the correct positions, and connect up the batteries, aerial, earth and loud-speaker. Now turn both condenser dials until signals are heard. Once the local station has been picked up at maximum volume the high-frequency valve should be neutralised. This is done in the following way:—

Turn the resistor of the first valve to the off position and adjust the neutralising condenser until the signal becomes inaudible, or nearly so. This shows that the valve capacity has been neutralised and the resistor can be switched on again.

Once the set has been neutralised volume can be adjusted by varying the anode and grid-bias voltages. It is desirable in this respect to follow the manufacturers' instructions as closely as possible. One word of warning: Disconnect H.T.+ before changing the H.F. transformer for one suitable for a different wavelength band. If the flexible tapping lead is dropped on to the holder accidentally, the H.T. supply may be short-circuited through the filament leads, and three valves will suffer a premature death unless this precaution is taken. This lead should be handled with great care.



Panel Layout of the Continental Three.

Battery Voltages

In the matter of high-tension and grid-bias voltages it is desirable to follow closely the valve manufacturer's recommendations. Generally the voltage required for the anode of the first valve will be round about 90, that for the second about 80, and as much as possible is desirable for the last valve (certainly not below 120 volts), with appropriate grid bias.

Test Report

On test the set gave excellent results. Many stations were heard at *full* loud-speaker strength during the course of an evening. Stations received at full volume a mile or so from 2LO and which could be identified without any doubt were Dortmund, Langenburg, Paris (PTT), Brussels, Berlin, Bournemouth, Kiel, Glasgow and Newcastle.

The right-hand dial reading for these stations were respectively 27°, 79°, 76°, 90°, 88°, 86°, 21°, 65°, and 29°, and these should remain constant for any set.

Anybody who builds this set will undoubtedly find that it will give them many pleasurable evenings—and that at no great trouble or expense.

(*See also photograph on next page*)

Fireside Football

DON'T you think that we ought to record a very big mark in favour of the new B.B.C. for its intiative in broadcasting running commentaries on important football matches during the second half of the present football season?

A 1927 *Innovation*

I have most thoroughly enjoyed my broadcast football to date, and I consider the broadcasting of football matches one of our 1927 wireless innovations.

My reception of these Saturday afternoon football broadcasts has involved the use of the following component parts: one wireless receiving set with phones, one armchair of large capacity, and one cheery fire with a high radiation coefficient, special attention being paid to the correct spacing of the last two components.

Look Out Next Month for the All-broadcast Amplifier (with H.T. from the Mains)

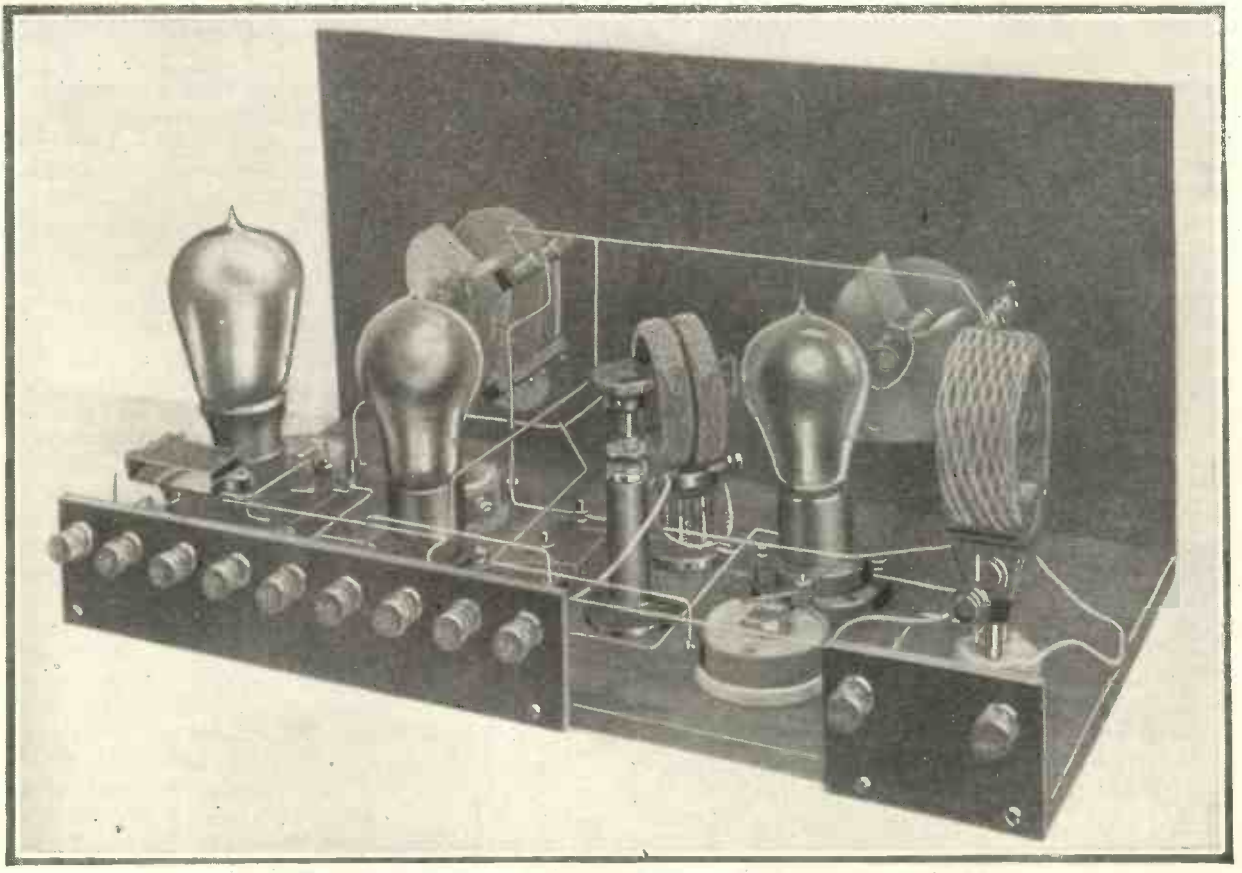
I have tried both loud-speaker and phones for my fireside football reception, and I prefer the phones for this particular type of reception, since you can get a better degree of concentration and a better "atmosphere" with them than with the loud-speaker.

"*Atmosphere*"

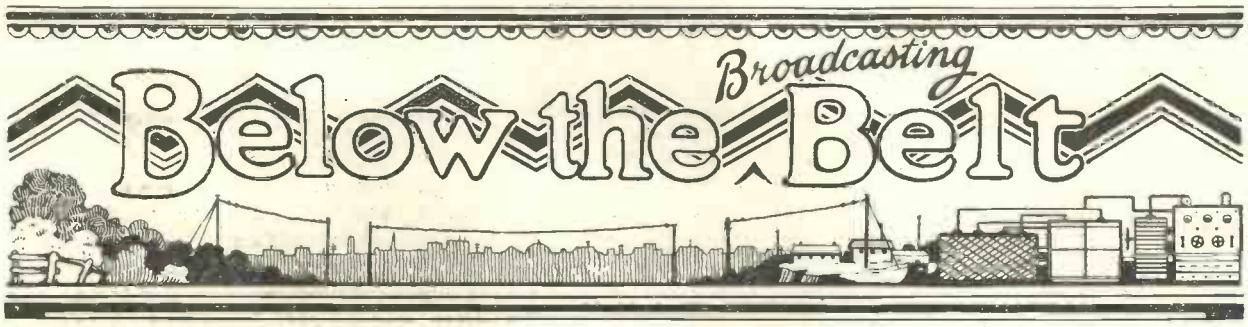
The eye-witnesses who have spoken the broadcast narratives at the football matches I have followed by wireless have certainly managed to send over to us the "atmosphere" of the crowded football ground and the intense excitement of the game. Why, on one occasion I actually found myself going cold all over with excitement, and that in front of a blazing fire! Has your fireside football "warmed" you up in like manner?

HALYARD.

The Continental Three *(Continued)*



Another photograph of the Continental Three, showing layout and wiring.



THE greatest difficulty which most beginners in short-wave reception come up against is the fact that the average aerial, as erected for broadcast reception, has a harmonic somewhere in the neighbourhood of 40-45 metres. Looking at the thing from the viewpoint of pure reason, one would suppose that such a harmonic would interfere with reception on one sharply defined part of the tuning scale only.

Preventing Oscillation

But it doesn't. Usually its effect is to prevent the receiver from oscillating over a wavelength band of many metres. In an extreme case I came across a short while ago the load of the aerial prevented any " life " in the set over a band extending from about 35 to about 50 metres.

The usual remedies are to " loose-couple " the aerial by means of a few turns of wire, the aerial coil being placed several inches from the grid coil, or to interpose a small condenser in the aerial lead. Personally I find that the latter expedient results in a serious loss of signal strength, in most cases. The former is not really efficient unless the coupling is so loose that we are again up against the difficulty that signal strength falls off badly.

After experiments and experience with every possible sort of set and every possible sort of coupling, I have arrived at something like finality. I use an aerial coupling coil, fairly tightly coupled. This coil is of a few turns, built bigger than the grid coil and placed round it, so that there is about ¼in. clearance.

In addition there is an aerial-loading coil. This is well removed from the actual receiver, and is built of 20 turns of wire, " low loss " wound, 6in. in diameter. It is provided with clips, so that just the right amount of loading can be put on the aerial to shift the harmonic right out of the band that is to be received.

By this means I find that I get no loss of signal strength and the set can be kept just on or just off the point of oscillation over the whole condenser scale.

Of course, unless the set can be made to oscillate it is no use at all, even for the reception of short-wave telephony, because it is when the receiver is almost on the oscillation point that it is in its most delicate state for telephony reception. There is some amount of distortion, of course, but provided speech is readable this does not matter in short-wave work. The thing that must not be done is to attempt to receive telephony on the " silent point "—that is where the beat note of the hetrodyne disappears.

There is more and more excellent amateur telephony on the 45-metre band every Sunday I listen. Many of us who use the key only would like to see a separate band allotted to the telephony enthusiasts, because it does occupy a great deal of our very restricted band, and the QRM is quite severe enough at week-ends without the telephony merchants.

There are even some D.X. merchants who contend that telephony work by amateurs is useless, and that anybody can do it if they only put in enough power. I do not hold quite that view.

Amateurs' Useful Work

It is quite true that the professionals have so much experience, and so many chances of experimenting, that the amateurs are left far behind, and that the problems of telephony on 45 metres or thereabouts are not much greater than those on 300-600 metres; but many of our amateurs are finding out very useful things about short-wave telephony with comparatively low power and very simple equipment. Such experimental work is very useful in the development of equipment for boat work, and expeditions.

The only people I really object to are those who grind out gramophone records. There really does not seem to be any excuse for that form of amusement. It is a " hang over " from the old days when there was no broadcasting, and we were all feeling about in the dark, and were very grateful to the amateurs who could give even a passable rendering of a music item from a record. We have long passed the time when such stuff is either useful or entertaining.

Better D.X. Working

Long-distance work has been looking up lately. After the bad patch in January, we have had an almost continuous run of good or medium nights and though transmission from this side to the United States has not always been easy, there has been very little difficulty in receiving a goodly number of U.S.A. and South American stations from 10.30 p.m. onwards. The immediate cause of changing conditions is still unknown, though we are beginning to arrive at a glimmering of understanding.

The moon does not seem to have much to do with it, though, at one time, it was thought that the tidal pull of the moon on the Heavyside layer might be a cause of changing conditions. Clouds do certainly seem to affect short-wave transmissions. They probably absorb and bend the waves.

Atmospheric pressure ridges, changing the height and condition of the Heavyside layer, seem to have a great effect on transmission. It seems that the best conditions are when the lines of equal pressure lie along the path of the transmission. But even about that we are not quite sure.

That fading in short-wave signals is caused by the fact that there may be several paths by which the waves arrive at the receiver has been triumphantly proved by means of picture-receiving apparatus used on short waves. 5YM.

"Hullo, New York!"

An Account of the Transatlantic Telephone Service by "Technical Officier"

Soon after its inauguration the Rugby telephone service was used for greetings between American and English churches. This photograph shows the Rev. G. H. McNeal, of London, talking to a New York colleague.

IT is common knowledge that private messages handled by the new Transatlantic Telephone Service are not radiated in the same way as ordinary broadcast programmes. In the latter case the full modulated carrier-wave leaves the transmitting aerial, whilst in the former only one side-band is radiated.

Side-band Method

The side-band method of transmission was not adopted, as many people think, solely because it affords a certain measure of secrecy. It is true that radio messages sent in this way can only be received by means of a "local" oscillator, tuned to the same frequency as the missing carrier-wave, so that an ordinary crystal set will not serve the purpose.

A single back-coupled valve can, however, be adapted to give successful reception at fairly close range, which shows that the privacy of side-band telephony is not inviolable.

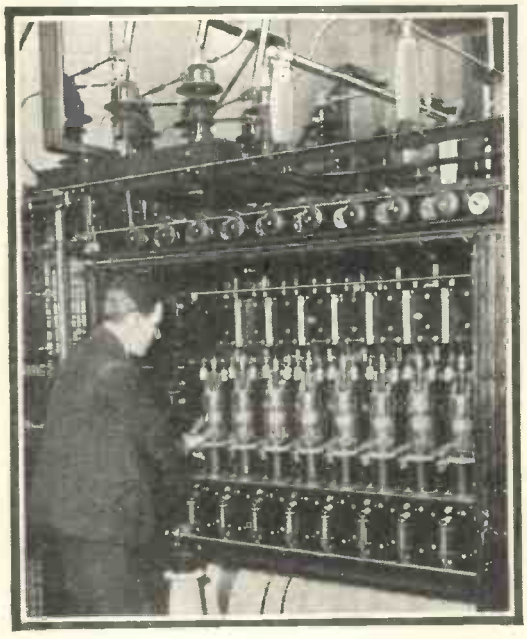
Apart from the question of secrecy there are, however, certain other advantages of carrier-free telephony to be considered. In the first place the pure carrier-wave component accounts for at least two thirds of the total power radiated in ordinary broadcasting, although it does not actually contain any of the low-frequency energy essential to reproduce the transmitted speech or music. Accordingly, so much energy is saved by suppressing it.

To a large extent the carrier-wave is merely a tribute to the crystal user. If the carrier is abstracted at the transmitting station it must be restored at the receiving end, and, as previously stated, it is not possible to do this with a crystal set.

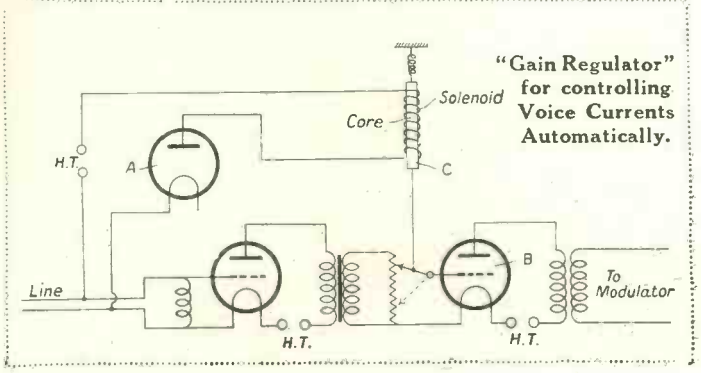
Matter of Circuit Design

It must also be admitted that considerable skill is, at present, necessary to receive side-band telephony on a standard valve set, but this is merely a matter of circuit design. It is, in fact, quite possible that broadcasting will in the future be developed on these lines. Certain stations might, for instance, be limited to side-band transmission for the benefit of subscribers provided with specially designed receiving sets, whilst other stations would continue as before to cater for crystal users.

Such an arrangement would go far to minimise existing interference, be-



A valve unit at the Rugby station with the safety gate open. Rugby, which is the most powerful transmitting station in the world, is forty times as powerful as Daventry.



"Gain Regulator" for controlling Voice Currents Automatically.

"Hullo, New York!" By "Technical Officier" *(Cont.)*

cause, in addition to saving power at the transmitting end, the elimination of the carrier-wave means a considerable reduction in the width of the frequency band necessary to transmit speech or music through the ether.

In other words, congestion is lessened and selectivity is increased. If, for instance, all broadcasting were carried out in this fashion, the existing number of stations could at least be doubled without causing any increase in overlap.

Narrow Frequency Band

Returning, however, to the Transatlantic service, the narrowing of the effective frequency band is useful, apart from considerations of selectivity, because it is found to reduce the exposure of the transmitted message to "static" or atmospheric noises. That is to say, the ratio of signal strength to "static" is increased when the frequency band is narrow, a point of very considerable importance in ensuring "clear" speech over the two thousand-mile radio link.

Further, the strength of the received signal is proportional to the product of the "local" oscillations (supplied by the special valve receiver) and the incoming wave. Regarding the first component as a constant quantity, the result is that the signals vary only *directly* as the absorption losses suffered in transit through the ether, and not as the *square* of these losses, as is the case in full carrier-wave transmission.

In short, a few *milliwatts* of power applied in the form of local oscillations at the receiving end replace the same number of *kilowatts* in transmitting the full carrier-wave.

The actual channel taken by the voice of a telephone subscriber speaking in London is confined to the telephone trunk line until it reaches the Rugby aerial. Here it is radiated into the ether to be picked up by the Hulton station in the State of Maine. After rectification, it passes into the telephone trunk line connecting that station with the New York Exchange.

The return message leaves New York by a trunk line feeding the wireless transmitter on Long Island, and after passing across the Atlantic is received upon an aerial of the Beverage type located at Wroughton, near Swindon, from which it is "trunked" through to the London Exchange.

As the Wroughton aerial is much nearer to Rugby than the American receiving aerial, and as it is tuned to the same wavelength, some of the outgoing wireless signals from Rugby are bound to be short-circuited, so to speak, by the "home" receiving station.

Special balancing circuits are therefore provided at the Trunk Exchange to prevent these "short-circuited" signals from being fed back again to the Rugby transmitter. Otherwise the Wroughton and Rugby stations would tend to "react" on each other in the same way as the microphone and earpiece of a telephone receiver when held close together.

This curious effect is sometimes called "singing round the loop," and unless it is prevented by inserting a balanced bridge coupling, in addition to special voice-operated cut-off devices, would render ordinary speech impossible.

Another difficult problem of control is that due to the fluctuating strength of messages received from different quarters. This may arise partly from the quality of the telephone trunk lines, partly from the varying sensitiveness of the telephone microphones, and partly from the strength or loudness of voice used by individual subscribers.

Eliminating Variations

When it is a question of modulating the output from a powerful station like Rugby, it is obviously very desirable that all such variations should be eliminated.

It is usual, of course, to interpose amplifying valves at intervals along any telephone trunk line in order to compensate for attenuation and similar transmission losses along the line itself. A listening operator or supervisor can then be employed to control the amplification "gain" of the valves, and so secure a uniform output of the voice currents feeding the modulator.

An ingenious method has, however, been devised for regulating the voice currents automatically, without the intervention of an operator or supervisor. An automatic "gain regulator" of this type is illustrated in the diagram.

A shunt circuit is taken from the incoming telephone line before the voice currents reach the modulating valve. Any suitable rectifying device, such as a two-electrode valve A, is interposed in this shunt circuit so that the signals are converted into a direct current, the strength of which fluctuates in accordance with the incoming speech.

The resultant plate current from the rectifier is passed, as shown, through a solenoid winding fitted with a movable iron core or plunger C.

The latter is flexibly anchored at one end by a spring, and is directly connected at its other end to a rod which controls the position of an adjustable potentiometer tapping on the grid of the final amplifying valve B.

Movement of Plunger

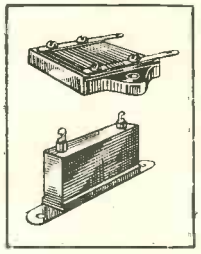
If the incoming speech currents are below standard strength, the solenoid plunger moves so as to make the grid voltage of the amplifier B more positive. If the signals are too strong the solenoid moves in the opposite direction so as to cut down the operative grid bias.

The net result is that, whatever the strength of the incoming currents may be, the automatic "gain regulator" maintains the output of the amplifier B at a definite average value, and so ensures a steady percentage modulation of the outgoing radiation.

The voice-operated cut-off device previously referred to is located in a similar shunt circuit to that shown in the figure. Here, however, the rectified speech currents are applied so as to "paralyse" the receiving amplifiers connected to the Wroughton aerial, and thus prevent them from amplifying the speech "echoes." Directly the out-going speech ceases, the paralysing grid-bias is removed, and the valve is ready to amplify the incoming waves received from the distant American station.

The power house of the Rugby station is fitted with an elaborate system of automatic switches and cut-outs, which simplifies the safe working of the telephone service across the Atlantic. "TECHNICAL OFFICIER."

THE IMPORTANCE OF FIXED CONDENSERS



BY THE STAFF OF THE INFORMATION BUREAU

Series Aerial Condensers: L.F. Transformer By-pass Condensers: Potentiometer By-pass Condensers: Loud-speaker Condensers: Reservoir Condensers: Filter-circuit Condensers: Earth-lead Condensers.

DURING the course of two years the staff of the Information Bureau of this journal have received many thousands of letters from constructors and are able thus to tell just what are the little things that sometimes cause amateurs disappointment when building receivers.

Departure from Instructions

It cannot, of course, be said that all correspondents suffer from similar troubles, but it has been apparent time and time again that most of those having difficulty with a home-constructed set have departed from the WIRELESS MAGAZINE instructions in some way or another.

In making this statement it is not intended to decry the value of modifications made by the constructor to meet certain particular circumstances, but whilst one amateur may use different makes of components from those specified and get good results there is always the chance that they may be unsuitable and cause disappointment in the end.

Yet other constructors will omit some unimportant looking component with equally disappointing results. It may be only a small fixed condenser or a choke, but whatever it is the amateur may rest assured that it was included in the original design to have some desired effect.

Rash Assumptions

Constructors should not assume that such and such a component or value is *near enough* to that recommended, because such assumptions are very often quite wrong. In thus attempting to change values constructors are not being fair to the designer and very often he is blamed for poor results that could have been avoided had his instructions been followed properly.

The purpose of these notes, however, is not to "bully" the constructor but rather to assist him, and on this occasion it is intended to deal with the use of fixed condensers. It is really surprising how many constructors regard these components as so much unnecessary expense and omit to insert condensers in quite important positions.

THE HELPING HAND of the "Wireless Magazine" is ever ready to come to your aid when you are in difficulty over any wireless trouble, whether practical or theoretical.

Just write your query out on a piece of paper (write on one side only, please!) and send it, together with the coupon on page iii of the cover, a stamped addressed envelope and a fee of 1s. (postal order or stamps) to:

The Editor,
"Wireless Magazine,"
La Belle Sauvage,
E.C.4.

In the ordinary way a reply will be posted to you the same day that we receive your question.

Series Aerial Condenser

Many readers will be aware of the advantages to be gained by the use of a small fixed condenser in series with the aerial lead-in wire, but for those not quite so certain it will be as well to explain just what its purpose is.

In connecting a condenser in series with the aerial the effective capacity of the aerial system is considerably reduced. Selectivity is immediately improved and at the same time a means of increasing the volume of reception is obtained.

By reducing the capacity the wavelength range of the whole system is naturally reduced also and to counteract this it is necessary to increase the inductance. In other words a larger coil is needed and a larger coil means greater voltage variations. As the valve is a voltage-operated device greater signal strength results.

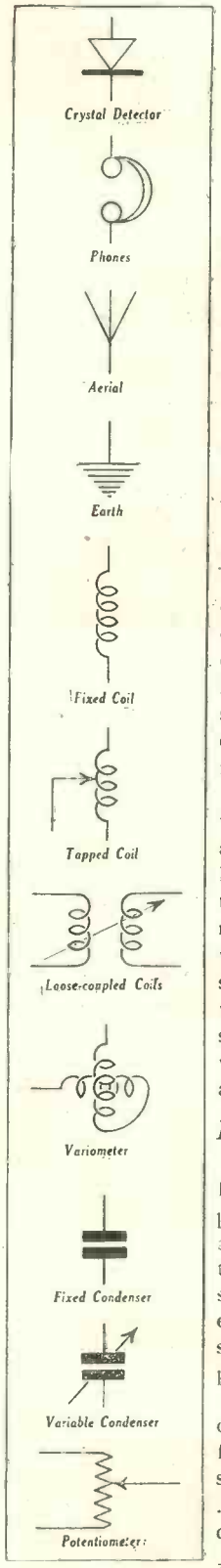
L.F. Transformer By-pass Condenser

Having reviewed the merits of the first "extra" fixed condenser let us turn our attention to the second (we will assume that the grid condenser is not an "extra" condenser in that its inclusion is essential for cumulative grid rectification), which is that usually shown connected across the primary winding of the first L.F. transformer.

Now this condenser performs many duties, that most commonly known being the by-passing of H.F. currents that have found their way through the detector valve across the transformer winding. In accomplishing this much distortion is obviated.

Another point in its favour is that it assists in obtaining oscillation, but more important still is the fact that it lowers the band of audible frequencies to which the primary of the L.F. transformer will respond and therefore over-amplification of the higher audible frequencies is minimised.

It is surprising what a difference a suitable value of condenser makes in this position. If you have not one in your present set try it for yourself and observe the improvement in reproduction that results. Do not, however, use a condenser in this position if the circuit used is a Reinartz or a similar type unless you have a very efficient H.F. choke between the plate of the valve and the primary of the L.F. transformer. Even then it is not always a success to use this condenser in such a receiver.



MEMORISE THESE SYMBOLS

The Importance of Fixed Condensers *(Cont.)*

Some designers arrange this by-pass condenser between the transformer primary and the filament lead, but this method does not give the advantages that are to be obtained from the older and more usual method. The value for this transformer by-pass condenser can be varied between .0003 and .002 microfarad.

Potentiometer By-pass Condenser

Although the condenser usually connected between the slider of the potentiometer and negative L.T. is often omitted, this is not always a disadvantage, but such an omission can only be approved of when it is found that oscillation is found to be so persistent that it is impossible to control it except by using the potentiometer as a damping resistance.

This, of course, is assuming that the receiver is efficiently designed and constructed. Generally speaking, however, if it is found to be difficult to control self-oscillation in such a receiver, then something is radically wrong, possibly with the design, and steps should be taken to re-space the wiring in the H.F. circuits, or to re-space the components. Incorrect valves for H.F. amplification will also cause similar difficulties.

Loud-speaker Condensers

Fixed condensers can often be satisfactorily omitted from across the phone or loud-speaker terminals of a receiver. If, however, the pitch of the loud-speaker seems to be high, it shows that a condenser is needed, and experiments with various values should be tried until satisfactory reproduction is obtained.

The value of the ordinary phone condenser should be about .002 microfarad, whilst the value for the loud-speaker condenser will be between .002 and .008 microfarad. Larger capacities are sometimes used.

Reservoir Condensers

Although not quite so important as those condensers previously mentioned, reservoir condensers placed across the H.T. battery have another duty to perform besides that of smoothing out any irregularities in the H.T. current supply, and that is the by-passing of H.F. currents which would otherwise have to make a difficult journey through the H.T. battery in order to reach earth potential.

The capacity of such condensers should be fairly large, values of 1 microfarad and 2 microfarads being suitable.

Filter-circuit Condensers

Wherever filter circuits are used for loud-speaker work, care should be taken in the selection of suitable condensers. The reason for this may not at first be apparent, but when it is realised that with some filter circuits a complete short-circuit of the H.T. battery may occur, due to a breakdown of the insulation of the condenser, then it will be appreciated that a condenser of undoubted repute must be employed.

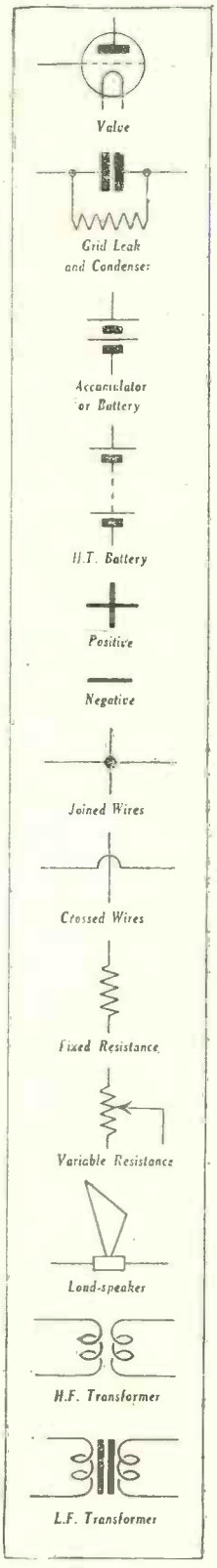
Not only this, but the insulation of the particular condenser chosen must be rated to withstand a greater voltage than that derived from the H.T. battery usually employed with the receiver.

The capacity is the only other consideration, and, provided that the value is such that it presents little or no impedance to the audible frequencies it has to pass, there is little else about which to worry. A value of 2 microfarads is recommended.

Earth-lead Condensers

A large-capacity fixed condenser of, say, .5 or 1 microfarad connected in the earth lead of a receiver should be treated with respect and connected up before any other portion of the set is wired. In many cases a receiver having such a condenser in its earth lead is intended for use with a mains H.T. unit, and by omitting this condenser there is a possibility of all of the valves being burnt out or else the house being plunged into darkness!

By now you will appreciate that a condenser properly employed will solve many apparently baffling faults. Above all, remember that a condenser is incorporated in a set to perform some definite duty, and its omission may mar the functioning of a whole receiver.



MEMORISE THESE SYMBOLS

Broadcast Music of the Month

Reviewed by STUDIUS

Mr. Isadore Godowsky.

Mr. John Collinson.

Mr. Leslie Page.

Miss Eda Bennie.

MUSICALLY the month has been one of experiments, many of which, in regard to the variety section, have proved successful. It only remains for the B.B.C. to accept the proof that the public requires amusement and not education (for which they already pay heavily in their local rates) to keep the attraction of wireless going.

Royal Command Performance

One has only to look back at the Royal Command performance at the Victoria Palace on February 24 to realise what the power of variety means. The artists chosen were all of reputation gained most recently; the songs were of a very average type, many of which had been heard on the gramophone for the last year; the fox-trots played are heard at every picture palace; yet if there was to be found an evening when so much laughter was to be heard in every home as well as in the theatre itself, it would entail much work.

Let the talks and the classics be heard on one aerial, either from 2LO or Daventry, and popular music as played by the municipal bands and entertainments on the other aerial, and a rush of converts would ensue.

Good Attempts at Variety

But, apart from this, there have been some good attempts to give variety, and famous music-hall and theatrical stars have been heard. A welcome visit was paid to Bournemouth by the Scottish humorist, Hector Gordon. One of the best known of our early broadcasters, Mr. Gordon began, as have so many now distinguished artists, on the amateur stage, being a member of the Greenock Operatic Society.

Since 1911, when he first came to London, he has become one of the foremost entertainers on the variety stage, making songs, stories, and whistling solos his speciality. Here is a story told me by himself:—

An Aberdonian running after a tramcar shouted to the conductor, "How much to the Cross?" "Tuppence," was the reply. The man ran on for another mile and a half, and then shouted, "What's the fare now?" "Thruppence," shouted the conductor; "you're going the wrong way!"

Welcome Over the Ether

Mr. Gordon doesn't say what the economist said after that; but his stories are witty, his delivery good, and he is always a welcome name over the ether.

Another welcome entertainer was proved in Morland Hay, known at all the provincial halls and the London National Sunday League concerts. Mr. Hay is an ideal broadcaster.

Mr. Robert Parker.

Mr. Morland Hay.

Mr. Charles True.

Mr. Leonard Hirsch.

Broadcast Music of the Month *(Continued)*

Mr. Leonard Gowings.

Three famous members of the stage have been heard in Miss Ethel Irving, Miss Lottie Venne (one of the finest comedy actresses on the stage), and Miss Christine Silver. In the way of making appeals we must give the palm for originality to Sir Gerald Du Maurier.

Film World Represented

This month, too, has seen the film world represented with Estelle Brodie, the young actress who took part in the big Gaumont films, *Mademoiselle from Armentieres* and *Hindle Wakes*, the film adaptation of the play. A unique experiment also was made when Fay Compton made a broadcast from the actual studio at Shepherd's Bush with the film, *London Love*.

In Plays and Films

Miss Compton, with her husband, Leon Quatermaine, has acted in both plays and films at the same time, and she will always be remembered as one of the original band of *Follies*, the pioneer of all good pierrot entertainments on the London stage.

Well-known Musicians

In a long list of well-known musicians the names of many old favourites have figured prominently, such as Carl Fuchs and Sandler; in the provinces a frequent broadcaster is the violinist, Isadore Godowsky. He is brother of Louis Godowsky, the prodigy violinist, who has also been heard before the microphone. Mr. Isadore Godowsky is stationed at Bournemouth, and is heard, therefore, most frequently from that station.

In addition to the numerous pianists (far too many, in fact, for some of them suffer from an "in-

Mr. Joseph Slater.

audible touch," an affliction which must irritate crystal users particularly to desperation) we have had the harpsichord playing of Mrs. Gordon Woodhouse, and the flute of Mr. Joseph Slater, another early broadcaster; while a special recital was given by Manchester's early broadcaster, Leonard Hirsch, a member of the Hallé Orchestra, and now of the Catterall String Quartet.

Melsa to Broadcast

For the 24th of the month Melsa, the famous violinist, was announced, playing with the Wireless Symphony Orchestra, conducted by John Ansell. The banjoist, Mario de Pietro, who broadcast recently, will be remembered best for his work at the Princes Restaurant, with the vocal assistance of Joan Revel.

Debroy Somers

Another interesting band recital was that of Debroy Somers, whose performance was so thoroughly enjoyed at the Royal Command performance at the Victoria Palace. He has broadcast several times from Daventry, but on the 15th played from 2LO.

There is room for considerable improvement amongst the singers. Far too many do not grasp the art of broadcasting, and though probably

Miss Estelle Brodie, the film actress.

Reviewed for the "Wireless Magazine" by Studius

their songs would be rendered perfectly if heard on the concert platform, possibly their movements or lack of microphone experience make listening very difficult.

Mr. Hector Gordon.

There are, of course, what I might term "seasoned" singers, who carry over their songs as successfully before the microphone as from the concert platform.

Two Good Singers

Amongst them must be mentioned Mr. Leonard Gowings, a perfect singer, aided, perhaps, by his gramophone experience as well, and Rex Palmer, who joined forces on the 24th with Melsa. Everyone welcomes "Uncle Rex" when he joins the list of artists as well as announcers, and his songs, especially "The Vulcan's Song," constitute a fine piece of work.

Polish Tenor

Interest, of course, was attached to the singing of Jan Kiepura, the young Polish tenor whose name figured in the B.B.C.'s national concert programme at the Albert Hall.

Other welcome singers are Walter Widdup, Parry Jones, Eda Bennie, Kathleen Hilliard (all members of the B.N.O.C., by the way), and Dorothy Bennett, a fine coloratura singer. The opera *Fidelio*, announced for the 22nd, included many great artists, amongst them being Mr. Widdup and Mr. Gowings, Roy Henderson, Phillip Bertram (B.N.O.C.), Norman Allin (B.N.O.C.), and Mesdames Carrie Tubb and Elsie Suddaby.

Two favourite singers are Robert Parker (another great operatic singer who has over forty *rôles* to his credit, and who has sung all over the world with every big opera company) and John Collinson, a favourite provincial broadcaster. The names of Ethel Hook, Frank Mullings, Denis Noble, Charles True, and Clara Butterworth all stand out prominently in the list of the month's good singers.

Gone from 6BM

Many listeners in the Bournemouth district will regret the departure of Mr. Leslie Page, who was assistant director there for some time. He has left to take up an important post at the Indian broadcasting station at Calcutta.

An "American" Concert

A recent concert at Bournemouth, by the way, might have led listeners to imagine that they were listening to KDKA, for it became entirely American. Music of Sousa and MacDowell, Mark Twain readings, Red Indian songs by a Californian singer, and Dorothea Johnston all helped to create this impression.

STUDIUS.

Mr. Herbert Menges.

A crystal set built on a toothbrush was recently shown in New York. Although on the small side, this ingenious set fairly bristled with good points.

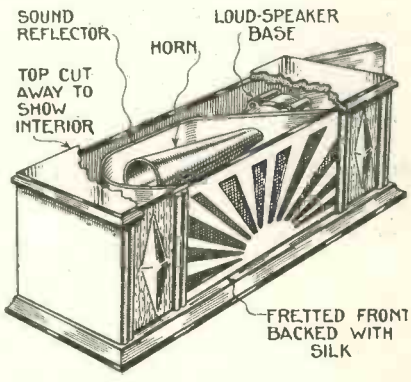
Miss Fay Compton before the microphone.

Novelties and New Apparatus

TESTED BY THE TECHNICAL EDITOR, J.H.REYNER, B.Sc.(Hons), A.M.I.E.E.

A CORNER OF THE ELSTREE LABORATORY

NEW TYPE OF AMPLION LOUD-SPEAKER



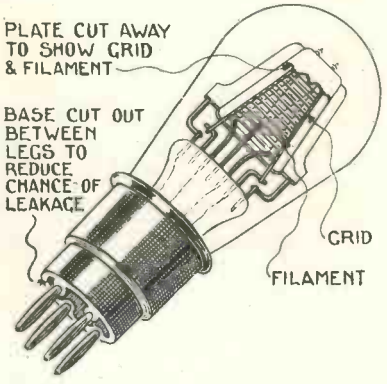
THIS Amplion Cabinette loud-speaker takes the form of a neat and well-made cabinet, which measures 16 in. by 5½ in. by 5½ in. The sound is conveyed from this loud-speaker by an opening in the front covered by a green cloth. It has a very pleasing appearance.

The operating mechanism consists of a standard Amplion base, attached to which is a small straight horn. This horn causes the sound to impinge on a metal reflector, which reflects it towards the opening in the cabinet. The connecting wires are taken through a small hole in the cabinet on to two Amplion terminals.

On test this loud-speaker gave very good reproduction when used in conjunction with a good-class transformer. It was found that the low notes were specially prominent, and in consequence the tone was very good. Although it is possible to obtain sufficient volume for a large room without any evidence of distortion, it is advisable not to overload the speaker. Horn resonance is eliminated by the use of felt pads in the cabinet itself. The resistance of this speaker is 2,000 ohms, and is therefore suitable for use in any wireless receiving set.

We can thoroughly recommend this loud-speaker for use where purity of reproduction is required rather than volume. The address of Graham Amplion, Ltd., is 25, Savile Row, W.1.

COSSOR SIX-VOLT VALVES



THE new Cossor 6-volt valves retain the special Cossor features, including the kalenised filament (which is particularly robust and non-microphonic, and in this case double-looped with two central supports), and the usual hooded shape of anode and grid.

The three types which we tested are listed as H.F. and detector, L.F., and Super Power. The current consumption in each case is .1 ampere at 5.5 volts.

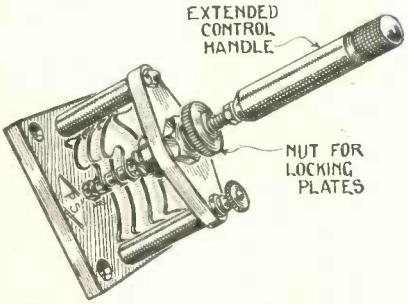
On test the valves all gave a high figure of merit, and compare very favourably with the most efficient of their type on the market. The Stentor Six (Super-Power) is undoubtedly in the forefront, the results obtained, both as regards characteristics and performance, being very good indeed, an achievement which is all the more noteworthy when one takes into consideration the low current consumption of .1 ampere.

The figures obtained were:—

Type.	Fil. Voltage.	Fil. Current.	Anode Voltage.	Impedance.	Amplification Factor
H.F. & Det.	5.5	0.1	80	18500	17.8
L.F. ..	5.5	0.1	110	7000	8.2
	5.5	0.1	80	8100	7.5
Stentor Six (Super power)	5.5	0.1	110	2550	3.7
	5.5	0.1	80	2980	3.43

Microphonic noise was conspicuous by its absence, and we can thoroughly recommend these valves. The address of A. C. Cossor, Ltd., is Highbury Grove, N.1.

PETO-SCOTT NEUTRALISING CONDENSER



THIS condenser carries three moving plates and four fixed plates, these being specially shaped to give an exceptionally low minimum capacity. The fixed plates are carried on two pillars

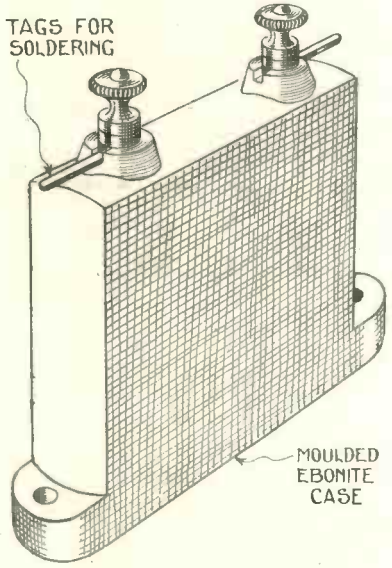
and also are provided with terminal nuts and soldering tags. The moving plates are carried on a special bearing bracket of ebonite, carried on two ebonite side pillars. A small bearing is provided at the bottom in order to maintain the whole rigid.

The actual bearing in the cross-piece is long and firm, and is also provided with a locking ring, so that the condenser may be fixed in position once its correct adjustment has been found. A long extension handle is provided for avoiding hand-capacity effects when operating this condenser, and we have found this of value in actual practical use.

On test the condenser was found to have a minimum capacity of less than 2 micro-microfarads, with a maximum capacity of 25 micro-microfarads. This is a very good range and will serve to neutralise every normal type of valve. The component is soundly constructed.

It is made by the Peto-Scott Co., Ltd., of 77, City Road, E.C.1.

LISSEN MANSBRIDGE-TYPE CONDENSER



THIS Lissen Mansbridge-type condenser is of the usual "tea-paper" construction, and is housed in a very neat case of black moulded insulating material.

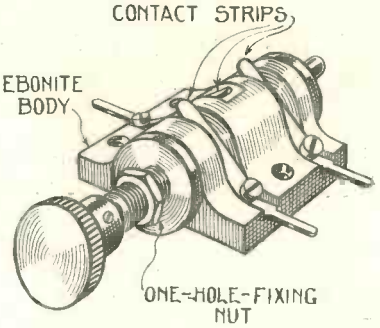
Two terminals (see sketch) complete with soldering tags, are mounted on the top of the case, and there are two flanges at the base, in which holes are drilled for mounting purposes.

The capacity of this condenser is rated at 1 microfarad; on test it proved to have approximately this value.

This type of condenser is very useful for a number of purposes in a wireless receiving set; it may be shunted across the H.T. battery for the purpose of smoothing the H.T. supply, or it may be used in a filter circuit for protecting the windings of phones or loud-speakers. A particular feature is the use of an insulating container, so that there is no danger of short-circuits occurring to the case.

The address of Lissen, Ltd., is Friars Road, Richmond, Surrey.

McMICHAEL PUSH-PULL SWITCHES



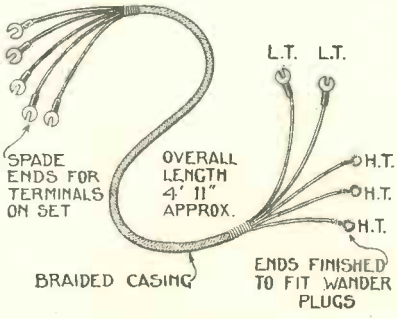
TWO patterns of new McMichael push-pull switches have been tested. One of these is equivalent to a double-pole change-over switch, whilst the other is of the single-pole change-over variety. They are robust in construction, well finished, and the design is both novel and practical.

The movement consists of an ebonite barrel, over which two separate brass sleeves are fitted. This barrel moves inside an ebonite casing having a number of slots cut therein. Nickelled strips of phosphor-bronze are attached to the outside case, and normally lie slightly in the path in which the barrel moves; the brass sleeves, which are tapered at each end, will therefore push them gradually out of the way, at the same time making a firm and efficient electrical contact with them.

An ebonite knob, attached to the end of a spindle running through the barrel, provided the necessary control. One-hole fixing is provided, but the component can be screwed down to the base-board if desired. The contact strips terminate in the form of soldering tags.

On test the action proved to be smooth and the electrical contact was efficient, and we have confidence in recommending this new arrival to our readers. The address of L. McMichael, Ltd., is Wexham Road, Slough, Bucks.

LEWCOS BATTERY LEADS



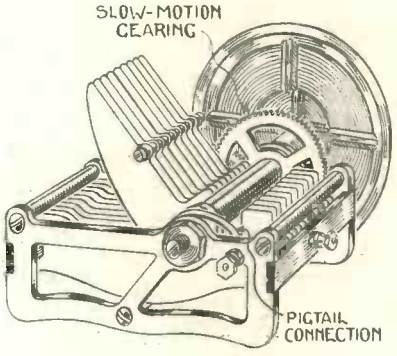
THESE Lewcos take the form of a number of separate rubber-covered leads bound together. Two of these leads, which consist of a heavier gauge wire, are fitted at each end with spade terminals having red and black insulated ends. These form the low-tension positive and negative connections. There are three other leads for connecting to the high-tension battery. Spade terminals with black leads and red ends are attached to the leads.

Owing to the fact that the rubber insulation on the wires has a different colour, corresponding to that on the end of the spade terminal, there is no likelihood of any mistake occurring, due to a wrong connection being made.

When it is desired to connect a receiving set to its battery in a neat manner these battery leads are ideal. The total length from end to end is about 5 ft., which should be ample for all purposes. It is also possible to obtain these terminals with extra leads for the grid-bias battery.

The manufacturers are The London Electric Wire Co. & Smiths, Ltd., 7, Playhouse Yard, Golden Lane, E.C.1.

RAYMOND S.L.F. CONDENSER



THIS slow-motion S.L.F. variable condenser is of more or less conventional construction, but has several points of outstanding interest. The moving plates are pressed into position in slots in the moving spindle, so that the usual system of spacing washers is unnecessary.

The moving plates are also held rigidly by a tie, as is often done with S.L.F. condensers, but this tie is placed halfway along the plates instead of at the extreme end, which is a good point.

The spacing of the fixed plates is also obtained by forcing the plates themselves into rectangular-sectioned rods, slotted in the appropriate positions. The whole is mounted in a substantial, although not too heavy, framework, the fixed plates being held in position on bakelite cross-members at each end.

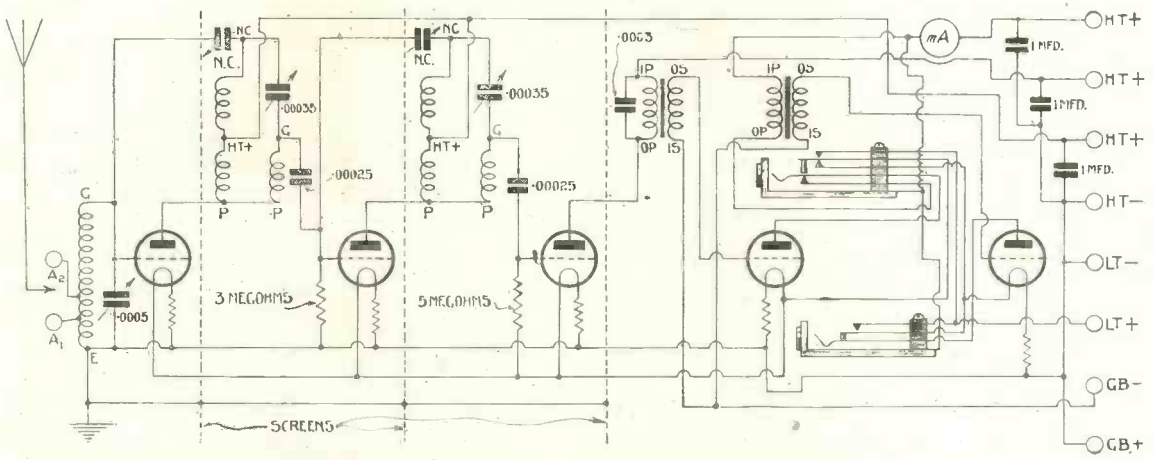
The moving plates are provided with a direct drive and also a slow-motion drive obtained by a combination of worm and pinion gearing. The main spindle is hollow and carries a concentric shaft which operates a pinion carried on the outside of the main spindle to a form of epicyclic gearing.

The manufacturer is K. Raymond, of Lisle Street, W.C.

Many amateurs who wished to do so have been unable to make up the 1927 Five because the issues in which it was described (October and November, 1926) went so rapidly out of print. But as blueprints of this set are now available we are, in response to numerous requests, republishing below the essential constructional details.

THE FAMOUS 1927 FIVE AGAIN!

Full-size Blueprints Now Available at Low Cost for Constructing This Excellent Five-valver



Circuit diagram of the 1927 Five—by means of the jacks either four or five valves can be used at will.

AS was announced in last month's issue of the WIRELESS MAGAZINE, a *full-size* blueprint layout, drilling guide and wiring diagram of the famous 1927 Five is now available. The price is only 1s. 6d. (post free), and copies can be obtained on application to the Blueprint Dept., WIRELESS MAGAZINE, Le Belle Sauvage, E.C.4.

In these pages will be found reproduced all the essential constructional details, and these, in conjunction with the blueprint, will enable any amateur to build up this popular receiver.

For the first two stages valves designed especially for high-frequency amplification should be used; for the third stage (detector) an H.F. type valve with lower impedance is suitable; while for the last two stages power-type valves, with low impedances, should be employed.

LIST OF COMPONENTS REQUIRED

Cabinet and baseboard (Caxton or Carrington).

Grained ebonite panel, 27½ in. by 7 in. (Becol or Trolite).

Terminal strips, 10 in. by 2 in. and 6 in. by 2 in. (Becol or Trolite).

12 engraved terminals (Eastick or Belling-Lee).

.0005-microfarad variable condenser (Igranic-Pacent S.L.F. or G.E.C.).

2 .00035-microfarad variable condensers (Igranic-Pacent S.L.F. type or G.E.C.).

3 4-in. mahoganite dials (Trolite).

Panel-mounting milliammeter, reading in 0-10 or 20 milliamperes (Sifam).

Set of special coils made to our specification complete with baseboard mounting (Burne-Jones), or home-made coils as shown herewith (with Becol formers).

4 aluminium shields (Burne-Jones).

2 neutralising condensers (McMichael or Peto-Scott).

5 baseboard-mounting anti-microphonic valve holders (Lotus or Benjamin).

5 fixed filament resistors (Temprytes or Peerless).

2 .00025-microfarad grid condensers (T.C.C., type S.P. or Dubilier).

3-megohm and 5-megohm grid leak (Dubilier or Lissen).

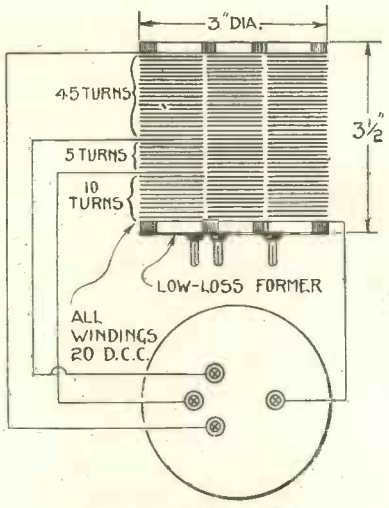
2 jacks (Igranic-Pacent types 65 and 66).

1 plug (Igranic-Pacent Autoplug).

3 1-microfarad fixed condensers (Dubilier-Mansbridge or Lissen).

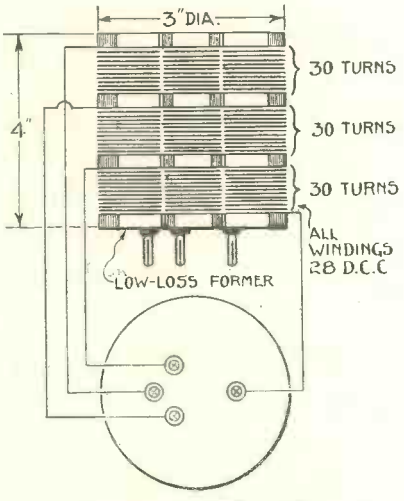
2 L.F. transformers, ratios 2.7 to 1 and 4 to 1 (Marconiphone or B.T.H.).

.0003-microfarad fixed condenser (Cosmos).

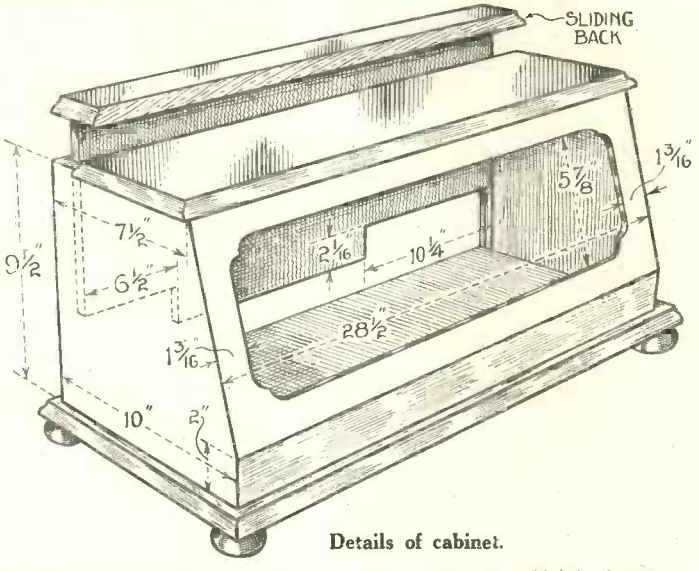


Short-wave Aerial Coil.

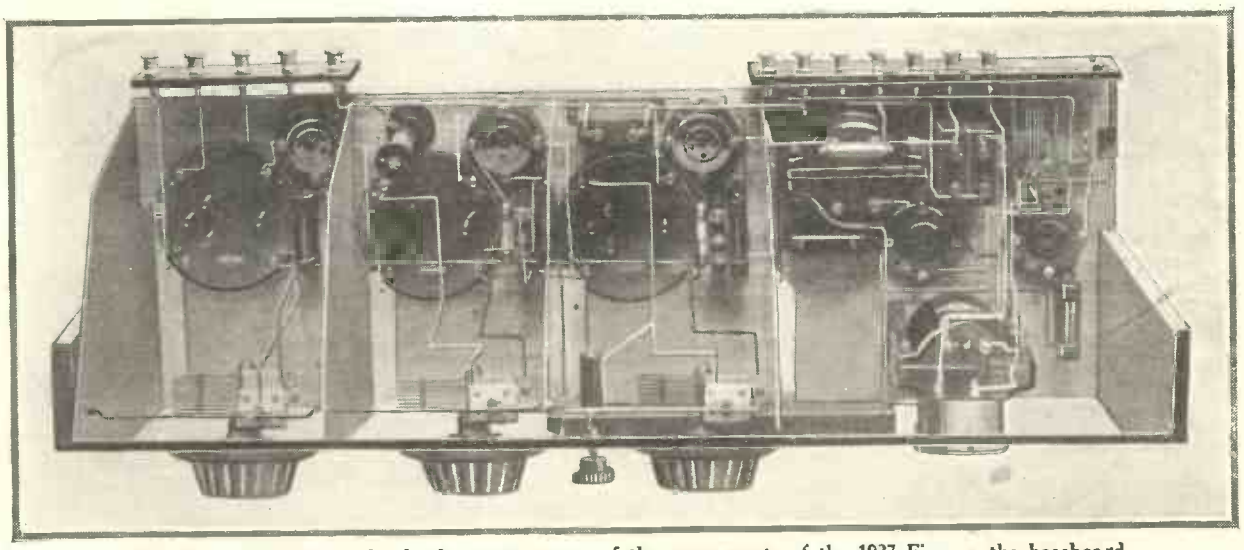
Front view of the completed 1927 Five. It should be noted that when tuned-in the dial readings of the second and third condensers are almost exactly identical. Grid bias should be adjusted so that the milliammeter needle remains quite steady.



Short-wave Anode Coil.

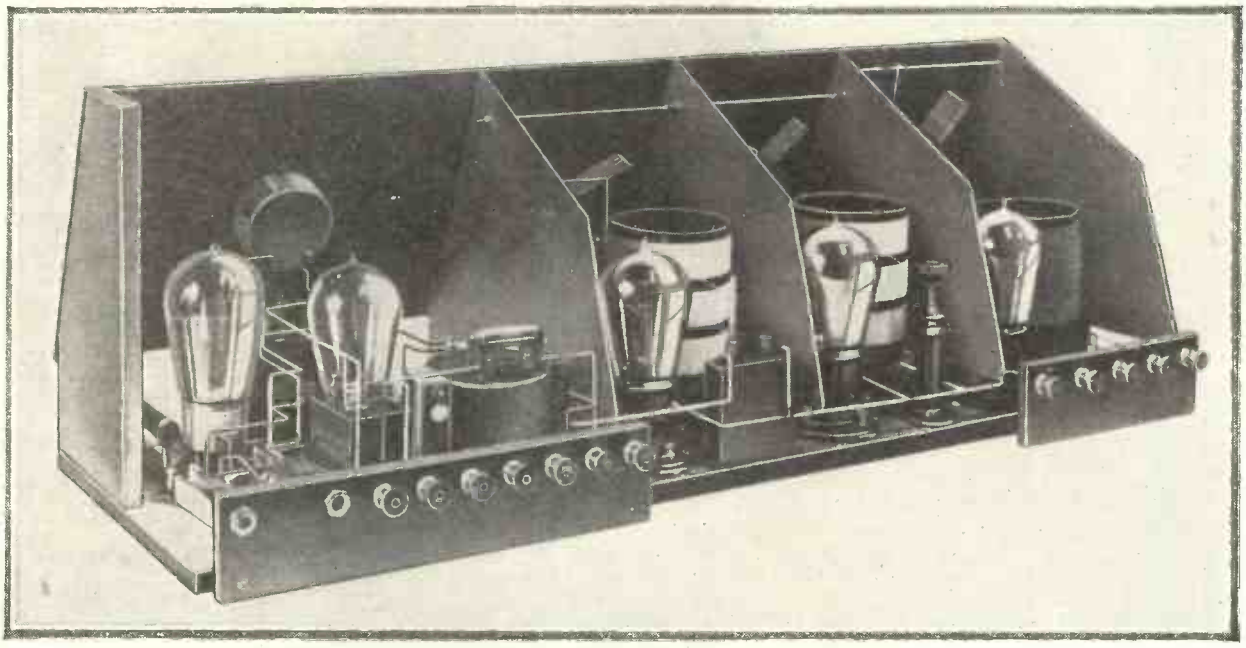


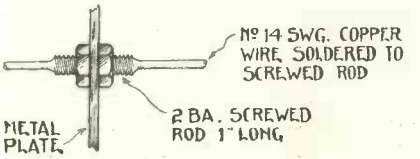
Details of cabinet.



This photograph shows clearly the arrangement of the components of the 1927 Five on the baseboard.

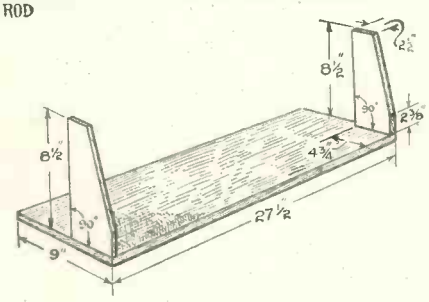
The Famous 1927 Five Again! *(Continued)*



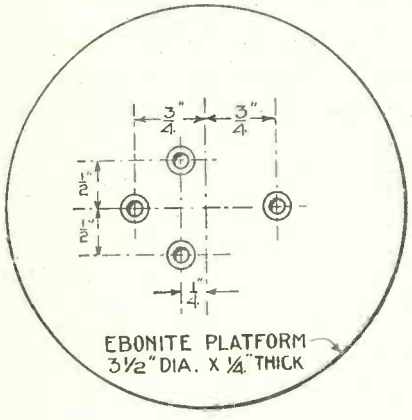


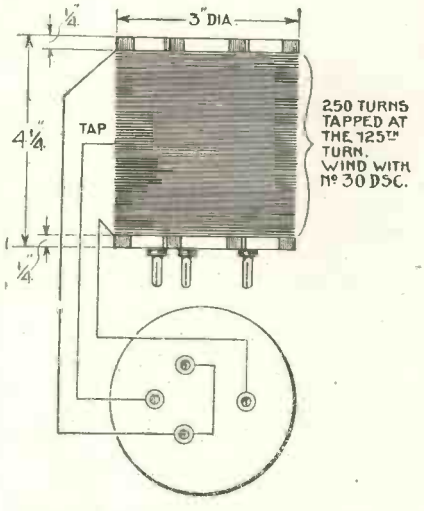
(Above) **Method of connecting screens together.**

(Right) **Details of baseboard and panel supports.**

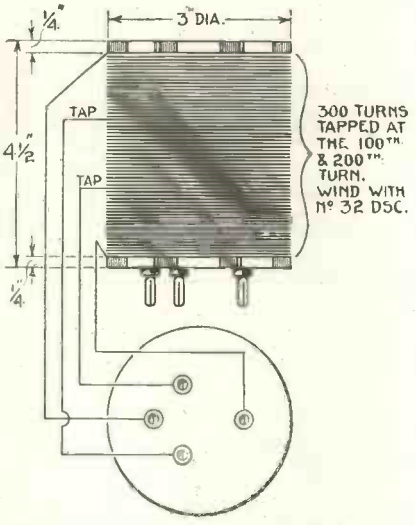


(Right) **Details of bases for Becol coil formers.**

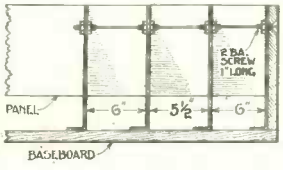




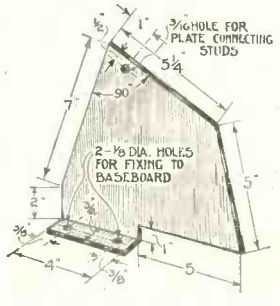
Details of the Long-wave Aerial Coil.



Details of the Long-wave Anode Coil.



Positions of Screens.



Details of Screen.

No more "lost" Chords

Cossor Valves — with the wonderful new Kalenised Filament—bring you the superb technique of the living Artiste

YEAR by year the barriers to perfect Radio reproduction are being broken down. No longer can it be said that Broadcasting suffers from mechanical limitations. With the vast improvement in the design of Loud Speakers and the development of choke or resistance capacity amplification, Radio enters upon a new phase. Every note in the harmonic scale can now be reproduced with the living naturalness of the concert hall or the studio. There are no more 'lost' chords.

But this method of amplification demands a valve specially designed for the purpose—the wonderful new Cossor 2-volt R.C. This new valve has an exceptionally high amplification factor of 40—higher than any other valve of similar type. Due to the prolific emission from its Kalenised filament it will give a richness of tone such as you have never heard before. From the deep fascinating rhythm of the lower octaves of the organ to the surprisingly sweet high notes of the violin. Every note is there, none is missing.

If your Receiving Set utilises the choke or resistance coupling method, use this superb new Cossor R.C. Valve at once—and hear Radio with a charming freshness and vitality which must amaze you.

The new Cossor 2-volt R.C.
Consuming 1 amp at 1·8 volts Impedence 70,000 ohms. Amplication factor 40 **14/-**

Other Cossor Valves

For 2-volt Accumulators

210H.F. (Red Band) H.F. use	14/-
210D (Black Band) Detector	14/-
215P (Stentor Two) Power Valve	18/6

For 4-volt Accumulators

410HD (Red Band) for H.F. or Detector	14/-
410RC (Blue Band) For Resistance or Choke Coupling	14/-
410P (Stentor Four) Power Valve	18/6

For 6-volt Accumulators

610P (Stentor Six) Power Valve	22.6

N.B. All above valves consume ·1 amp. except the 215P which consumes ·15 amp.

Cossor

— the valve which serves you longest

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

Gilbert Ad. 7911.

A CASUAL glance at my log book shows me that Sunday, of all days of the week, is the one on which I succeed in picking up not only most stations, but especially new-comers to the ether. It is not merely a question of devoting more time on that particular day to my wireless receiver, although no doubt most wicked radio fans turn to radio during their leisure hours on the Sabbath, but it is mainly due to the fact that there exists a greater interval between the local transmissions, and that the B.B.C. stations close down at the latest at 10.45 p.m.

Sixty Minutes in Advance

As Central European Time is at least sixty minutes in advance of G.M.T., this still leaves me roughly one-and-a-half hours to pick up German, Polish, Swedish, and Spanish concerts. As a rule, it is during this period that I succeed in effecting fresh loggings.

Then again, until about 3.30 p.m. the ether is free from the B.B.C. entertainments, and there is a regular plethora of stations to which we can tune-in in the morning and in the early afternoon hours.

Advantage Discounted

British Summer Time, unfortunately, with its one hour advance, somewhat discounts this advantage, inasmuch as it makes our time tally with that of Central Europe, and consequently both the home and foreign transmissions are given simultaneously. Fortunately, however, most European stations close later than do ours, so we are still given an interval during which we can "potter around" the ether.

In any case, Sunday to me remains a great boon, from a wireless point of view, as there are many transmissions going to which it is seldom I find an opportunity to listen during the week.

Take, for instance, the new Lithuanian station at Kovno; you are almost sure to find a concert broadcast on a wavelength of 2,000 metres at about 2 p.m. But remember the call: "Ah la, Ah la, Lietuve Kaunass." Sometimes it is also given out in French: "Kovno Radiophonie."

Hilversum's Relay

Then again, at that hour, you will find Hilversum with its relay from the Zoological Gardens at Amsterdam. In most instances, you will hear considerable applause; believe me, it is well deserved—the concerts are excellent. Further, both Leningrad (10 kw.) and the new Moscow Central 25 kilowatter on 1,250 metres are on the air during the earlier part of the afternoon, and whenever I have held these transmissions I have been struck with the excellence of their vocal recitals and male choirs.

From Russia you will always hear quite a number of items in the programme which consist of unaccompanied singing; these alternate with balalaika orchestras or dance music—of a Slavonic type—played on accordeons. Curiously enough, you will frequently pick up what *were* popular fox-trots on this side three years ago; presumably to the Russians they are still fresh!

Later, coming westwards, you should tune-in Warsaw. Its present power is sufficiently great to be heard in the British Isles on an ordinary two-valve receiver. Unless you know it, the call may mystify you: "Radio Polskie Warsawa" (pronounced Varschavva); usually it is given out by a female voice. During the earlier part of the evening a series of talks is given; you may skip these and return to the station towards 7.30 p.m. G.M.T. when you will strike the main programme.

Artistry of the Pole

The Pole does not lack artistry; he also possesses a great love for music, and, apart from very good studio concerts in which piano solo and vocal recitals are a great feature, the station connects up on Friday nights with the Warsaw Philharmonic Hall for symphony concerts which are second to none on the Continent.

On Saturdays until 10.30 or 11 p.m., you are usually taken over to the Café Wielka Ziemianski for the usual jazz-band demonstrations.

Two other stations thrice recently mentioned in my log book are Helsingfors, on 375 metres, and Riga, on 526 metres. If you pick up strains of music between 6.10 and 8.45 p.m. on a wavelength you may have associated with a Madrid transmitter, listen for the call. Should you hear "Suomio! Suomio! Radio Helsinki," log your condenser readings. It is Helsingfors (Finland).

As regards Riga, it may be more difficult to find, and when found, to hold, as from my experience on two occasions it was submerged in morse; at the third attempt I listened for fifteen minutes to a very clear transmission of an opera relayed from a Libau theatre. My patience had been rewarded!

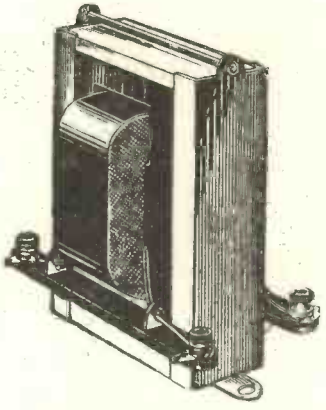
Lille Testing

At the moment of writing these notes I have twice heard this morning a test transmission from the new Lille (PTT) station. Possibly, when these notes are in print, Lille may be regularly on the air. Concerts from that city should reach us well on this side, as the distance is by no means a great one. Whether the station will remain on its present wavelength is doubtful, as it is in a very congested band (280-300 m.).

(*Continued on page* 268.)

Igranic-Pacent Super Audioformer recommended by Reyner

The "Wireless Magazine" Expert in building the "SHIELDED SEARCHER" set, described in this issue, chose the Igranic-Pacent Super Audioformer because the set is designed to give unusual clarity and volume under conditions where interference abounds.



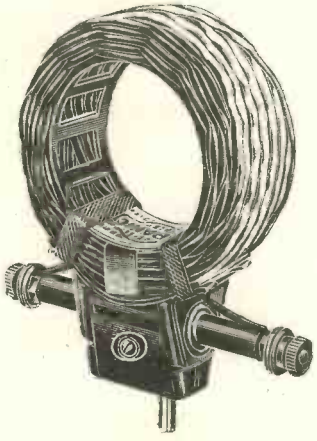
IGRANIC - PACENT
"Super Audioformer"

IGRANIC-PACENT SUPER "AUDIOFORMER"

The Igranic-Pacent Super "Audioformer" has a remarkable amplification curve, making it quite different from all other low-frequency transformers and giving uniformity of amplification which results in superlative tone qualities. A particular feature of the Igranic-Pacent Super "Audioformer" is the massive iron circuit built up with a special quality of iron. The ratio is 1:3 and the Igranic-Pacent Super "Audioformer" can be used for first or second stages.

Write for full particulars of this unique transformer.

Igranic in the Continental Three



IGRANIC UNITUNE APERIODIC COUPLER
as used in the Continental Three.
The most simple means of increasing selectivity.
250—500 metres.
Price 4/6.

Designed to demonstrate the possibility of building an inexpensive set capable of moderately long-range work, the Continental Three includes five typical Igranic components.

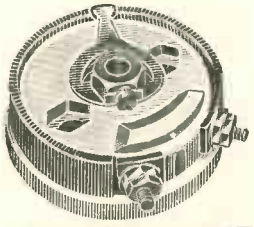
These are, three 30-ohm Igranic-Pacent Pre-Set Resistors, one Centre-Tapped H.F. Transformer, and one Unitune Aperiodic Coupler.

Igranic Radio Devices are particularly useful to the constructor who builds with an eye to economy.

They are high quality products sold at the lowest possible price consistent with the unusually fine materials used in their manufacture.

Write for List J. 229.

IGRANIC CENTRE-TAPPED H.F. TRANSFORMER.
Made in four sizes.



IGRANIC-PACENT PRE-SET RESISTOR.
Price 1/8 each.

IGRANIC ELECTRIC COMPANY LIMITED

149, Queen Victoria St., London. **Works - Elstow Road, Bedford.**

Mention of the "Wireless Magazine" will ensure prompt attention.

Continental Notes *(Continued)*

With the grouping of several Spanish broadcasting stations under the Union Radio banner, it is difficult to identify each individual one. Although, apparently, they conscientiously put out the call numbers, these are so often mumbled that you cannot distinguish them.

Serious Complication

A serious complication arises through the fact that all broadcasters of that family have also added the words "Union Radio" to the name of their city, and their wavelengths are far from stable.

It would appear that from time to time they are reshuffled and redistributed, and the transmission you have logged as sent by Bilbao may be Cadiz or Seville. You are not helped by the relay stunts, although you may take it there is a regular interchange of programmes between Barcelona (EAJ1) and Madrid (EAJ4 and EAJ7).

A newcomer to the ether is Radio Madrilena (Madrid EAJ12), which has been broadcasting on a wavelength around 306-308 metres and causing interference to one of our home stations. Our old friend Radio Iberica (Madrid EAJ6), to which we were wont to turn nightly, although reported to have died, is very much alive on 272.7 metres—a wavelength common to four European transmitters.

The number of Spanish stations does not diminish, although some have been either frozen out by competition or have more or less gracefully retired through lack of sustenance; it is difficult to live on publicly alone.

Czech Stations

It is seldom in the course of an evening that a Czecho-Slovakian concert is not heard—on this side of the Channel. Prague, during the last few months, has considerably developed its broadcasting system throughout the country, and now, by means of land-lines, taps entertainments from either Brünn or Bratislava. On some evenings, when either of these stations has a special attraction to offer to listeners, a simultaneous broadcast transmission from all three centres is the result.

Obviously, notwithstanding the fact that the other cities possess independent theatres in the way of opera houses or concert halls, the Czecho-Slovakian capital enjoys considerable advantages. You may hear concerts from the famous Smetana Hall in the Prague House of Representatives, from the Lucernasaal, from the German theatre, or from the Czech National Opera House. Moreover, the State itself takes considerable interest in the broadcast welfare of its nationals, and a special land-line has been laid from the transmitter to Hradcany, the former Royal Palace, where the Premier resides. In this manner special messages can be broadcast, a microphone having been permanently installed for this purpose.

But Prague possesses, in comparison with other cities, a powerful transmitter, and the listening public is claiming similar treatment for Brünn and Bratislava. In the latter city, so great has proved the financial support for the broadcasting service, that it is now proposed to increase the transmissions to about 3 kilowatts.

When this—a matter of a few months—has been achieved you will readily pick up the voice of Mara Holeczyova, who acts as lady announcer to that studio. Further, in Czecho-Slovakia, there exists a city named Pilsen. You may have only associated it with the brewing of lager beer, but its inhabitants want their voices to be heard.

Fifth Unit

At no distant date a transmitter will be installed there, thus adding a fifth unit to the Radio Journal broadcast net. Almost every month in some European land we register the arrival of a new broadcaster; is there room for all? I wonder.

JAY COOTE.

Artists Who Will Not Broadcast

CONSIDERABLE discussion has been taking place respecting the position created by stage artists and others who shrink from broadcasting, not because of any real hostility to the medium itself, but because they are impressed with the universality of wireless and feel that their material would be exhausted for good and all by one broadcast, especially a simultaneous broadcast.

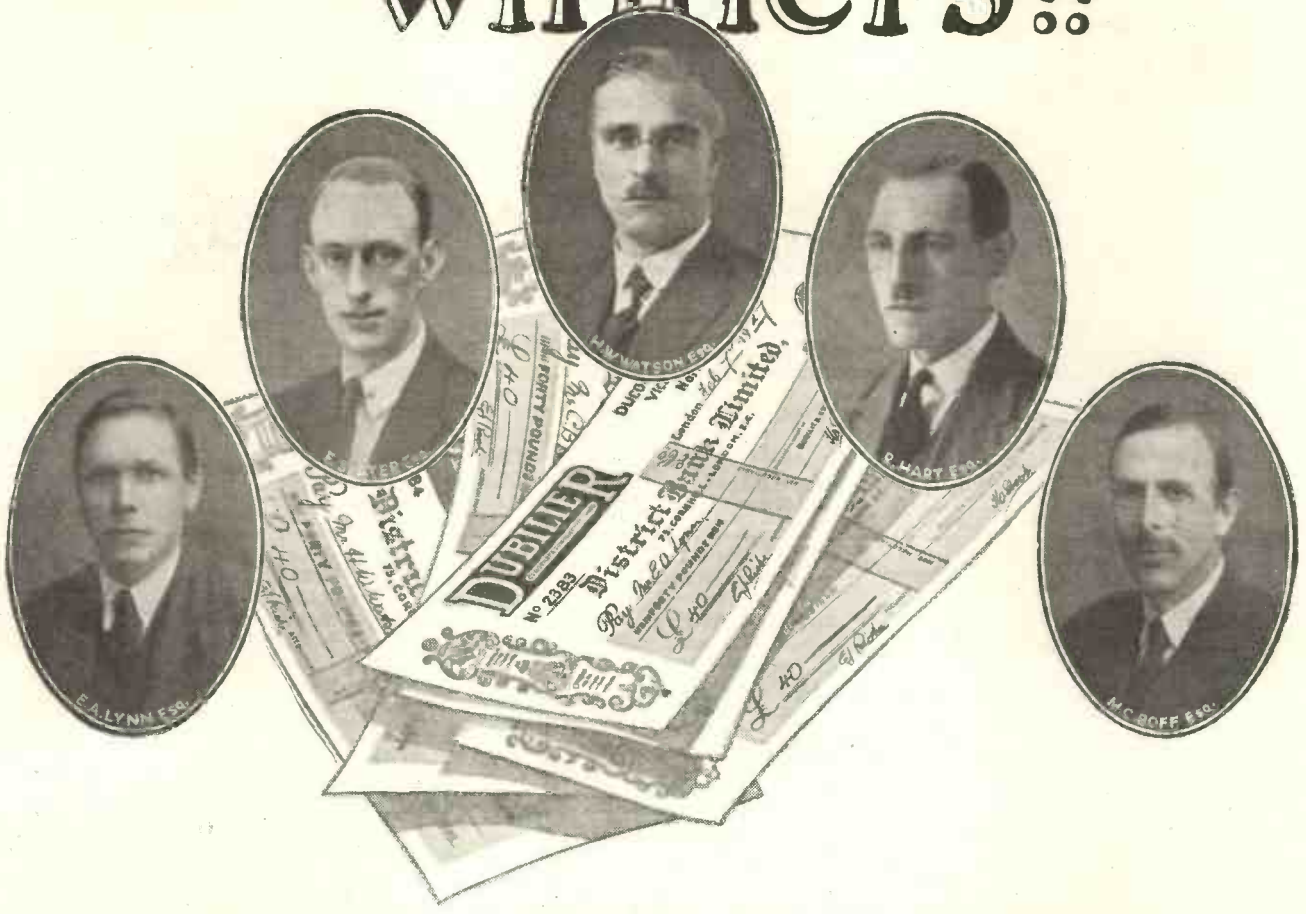
Some of the most eminent variety artists have broadcast their material and have proved their value in this new field without, so far as the available evidence shows, destroying the value of their abundant material. But the fact cannot be overlooked that a large number of turns have a limited appeal, for the reason that the repertoire is definitely circumscribed.

Where the inventive faculty is not greatly in evidence, it is, perhaps, only right that the artist should nurse his material to the best of his ability and not jeopardise his chances of future engagements on the stage by giving everything away to the wireless public.

One way out of the difficulty, it is realised, would be for the B.B.C. to secure the artist for the sake of his name and not invite him to supply the actual material which he would broadcast, but to provide him with his turn before the microphone. The fear that his own material would be killed, or would be unsuitable for subsequent use on the stage, could thus be neutralised. The suggested procedure would be on all fours with the usual system adopted by some artists of getting their material, or points for working up, from regular writers who make a living in this manner.

The B.B.C.'s sole desire is to secure the co-operation of all interests in any way that is mutually agreeable and they would willingly do their part, and more than their part, whenever the opportunity presented itself, of affording artists the benefit of their assistance and of giving listeners the fruits of artistic talent. B.B.C.

Winners!!



The Dubilicon Competition

The result of the highly successful Dubilicon Competition can now be announced.

Each of the five gentlemen whose portraits appear above correctly worked out the number of different capacities obtainable from various arrangements of the first five capacities of the Dubilicon Condenser.

The correct number was—475.

The Prize of £200 has accordingly been divided between the five winners, each of whom receives a cheque for £40 together with our hearty congratulations.

The Dubilicon.

An extremely useful condenser containing 8 separate capacities from which many hundreds of resultant capacities may be obtained. Indispensable for experimenters

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REGISTERED TRADE MARK

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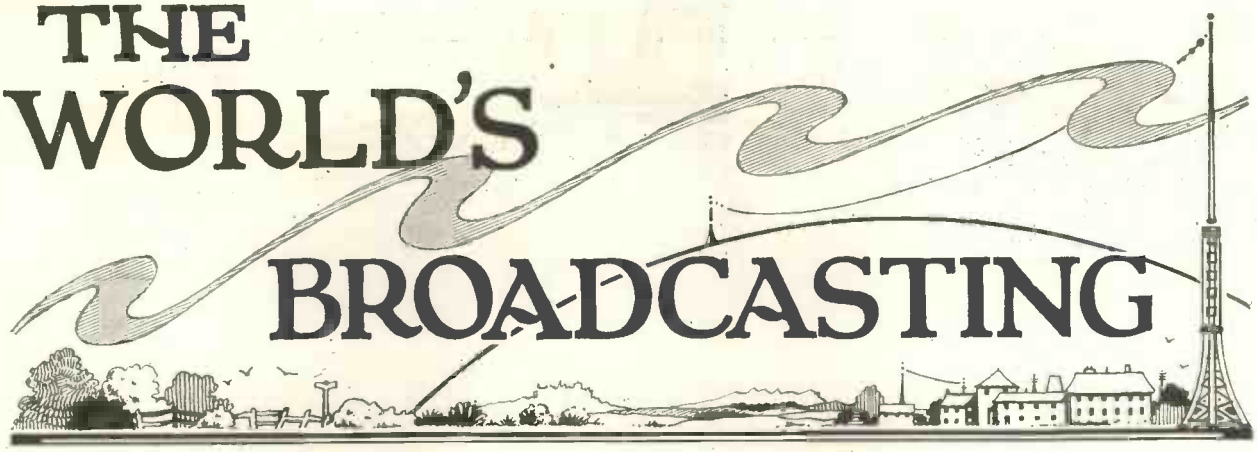
M.C. 268

THE WORLD'S BROADCASTING



Wave-length in Metres.	Station.	Call Sign.	Wave-length in Metres.	Station.	Call Sign	Wave-length in Metres.	Station.	Call Sign.
180	Beziers	—	307	Madrid	EAJ12	440	Reval	—
196	Karlscrona	SMSM	308	Paris	Radio Vitus	441.2	Brunn	—
200	Biarritz	—				449	Rome	1RO
200.1	Strassburg	—	309	Marseilles	—	454.5	Stockholm	SASA
201.3	Joenkoeping	SMZD	310	Zagreb	—	458	Paris	PTT
202.7	Kristinehamm	SMTY		Algiers	PTT	460	Barcelona	EAJ13
218	Orebro	—	312.5	Newcastle	5NO	461.5	Oslo	—
220	Karlstadt	SMXG	315	Upsala	—		Langenberg	—
	Juan-les-Pins	—	315.8	Milan	—	475	Lyons-la-Dona	—
222.2	Strassburg	8GT	319.1	Dublin	2RN	483.9	Berlin	—
229	Umea	—	322.6	Breslau	—	491.8	Bournemouth	6BM
238	Bordeaux	—	326.1	Birmingham	5H	494	Zurich	—
241.9	Münster	—	329.7	Konigsberg	—	500	Aberdeen	2BD
245	Toulouse	PTT	333.3	Naples	—		Linkoeping	—
250	Eskilstuna	—		Reykjavik	—	501	Helsingfors	—
	Gleiwitz	—	337	Copenhagen	Radio-raadet	504	Porsgrund	—
	Casablanca	—				508.5	Brussels	—
252.1	Bradford	2LS	340.9	Paris	Petit Parisien	517.2	Vienna	Radio Wien
	Montpellier	—						
	Saeffle	SMTS	343.9	Seville	EAJ17	526.3	Riga	—
	Stettin	—	344.8	Barcelona	EAJ1	535.7	Munich	—
	Kalmar	SMSN	346	San Sebastian	EAJ8	545.6	Sundsvall	SASD
260.9	Malmo	SASC	348.9	Prague	—	555.6	Budapest	Ssepel
263.2	Bratislava	—	350	Paris	RadioLL	566	Berlin	—
270.9	Posen	—	353	Cardiff	5WA		Hamar	—
272.7	Sheffield	6FL	357	Seville	EAJ5	577	Freiburg	—
	Klagenfurt	—	357.1	Graz	—	577	Vienna	—
	Madrid	EAJ6	361.4	London	2LO	720	Ostersund	—
	Cassel	—	362	Cadiz	EAJ3	760	Geneva	HB1
	Danzig	—	365.8	Leipzig	—	850	Lausanne	HB2
275.2	Angers	Radio Anjou	370.4	Bergen	—	1,010	Moscow	Popoff
			375	Madrid	EAJ7	1,060	Hilversum	HDO
	Norrkoeping	SMVV		Madrid	EAJ4	1,100	Basle	—
	Nottingham	5NG	379.7	Stuttgart	—		Norddeich	KAV
277.8	Leeds	2LS	384.6	Manchester	2ZY	1,110	Kbeley	—
	Trollaataan	SMXQ	389.6	Radio Toulouse	—	1,111	Warsaw	—
288.5	Edinburgh	2EH	394.7	Hamburg	—		Leningrad	—
291.3	Radio Lyon	—		Falun	SMZK	1,200	Boden	SASE
294	Dundee	2DE	400	Plymouth	5PY		Luxemburg	—
	Hull	6KH		Bremen	—	1,250	Königswusterhausen	LP
	Stoke-on-Trent	6ST	402	Salamanca	EAJ22		Moscow	New Central
	Swansea	5SX	405.4	Glasgow	5SC			
	Varborg	—	411	Berne	—	1,365	Karlsborg	SAJ
294.1	Innsbrück	—	416.7	Gothenburg	SASB	1,460	Moscow	RDW
	Udde Valla	—	419.5	Bordeaux	—	1,600	Daventry	5XX
297	Liverpool	6LV	420	Bilbao	EAJ11	1,750	Paris	CFR
	Cartagena	EAJ15	422	Cracow	—	1,800	Carthage	—
	Hanover	—	428.6	Frankfort-on-Main	—	1,950	Scheveningen	—
	Radio Agen	—	436	Bilbao	EAJ9	2,000	Kovno	—
300	Koszice	—	434.8	Fredriksstad	—	2,650	Paris	FL
306.1	Belfast	2BE						

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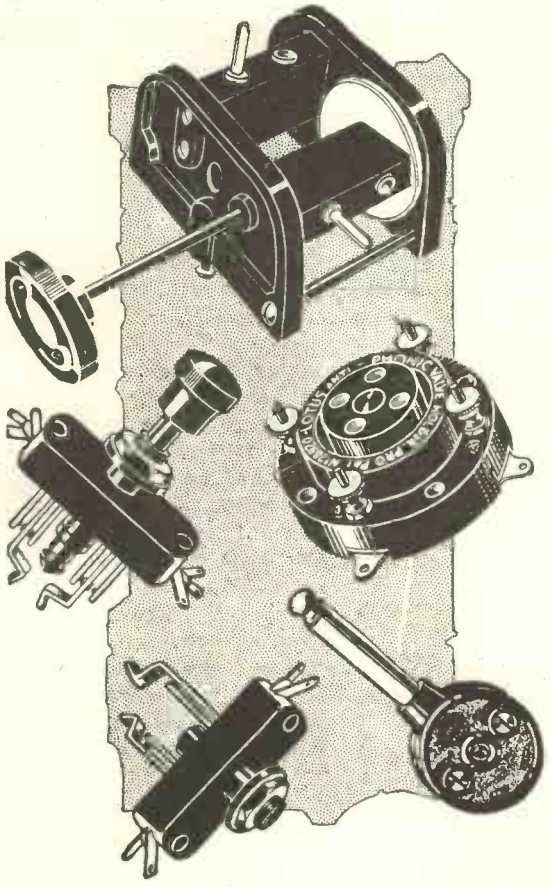
Improve the appearance and get the most out of YOUR set by using "Lotus" Components.



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The Moving Block CANNOT fall.

Holds the heaviest coil securely in position and prevents fading away of volume. Vernier movement reduces speed of moving coil block by eight times. Made for left or right hand.

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Do. do. do. 3-way	12/6

"LOTUS" BUOYANCY VALVE HOLDER

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Absorbs shock, protects valves.

Springs and valve sockets locked together to make definite and permanent connection. Made with terminals and without, also with Grid Leak enclosed in Bakelite base, which eliminates unnecessary wiring and soldering.

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Combination Grid Leak and Terminal Valve Holder ...	3/9
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All Anti-Microphonic Type.

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Designed to occupy the minimum space, being only 1¼ in. deep. Of the finest Bakelite, they have nickel-silver springs and contacts of pure silver. Soldering contacts can be made to suit any wiring. One-hole fixing.

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Jack Switch No. 9, as illustrated	4/-
Others from 2/9.	

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For use with "Lotus" Jacks, but can be adapted for use with any other type by means of spring sleeve fitment supplied with each. Best Bakelite mouldings and nickel-plated brass parts. To fix, the wires are placed in slots and gripped into position by a turn of the screw cams.

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LOTUS COMPONENTS

GARNETT, WHITELEY & CO., LTD.
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Speedy replies result from mention of the "Wireless Magazine."

Specially Written by the Officials at Savoy Hill

WHAT THE B.B.C. IS DOING

THE Prime Minister announced recently his decision not to appoint a Select Committee to consider the broadcasting of Front Bench speeches from the House of Commons, and so the suggestion which has been made on numerous occasions since broadcasting began in this country is again shelved. Captain Ian Fraser, the blind M.P., who was a member of the Crawford Committee, has worked assiduously to secure the inclusion of Parliamentary speeches in the B.B.C. programmes.

A Matter for the House

It is a matter for the House to settle for itself, and no one else can settle it; nor, for that matter, should anyone even venture upon criticism—with, perhaps, the exception of a minor point which is not one that affects policy.

It is this: The argument has sometimes been heard that the electorate would be disillusioned on hearing exactly how their M.P.s framed their views in words; but there are probably few M.P.s who would be deterred by such a fear from speaking in the House.

"Microphone Manner"

A surprisingly large number of persons are nowadays developing what has been called the "microphone manner." That may be because familiarity with broadcasting matters has removed the science from the realm of the uncanny, and public speakers who now have the distinction of speaking both to a visible audience and at the same time to an enormously larger, though invisible, body of listeners are becoming less conscious of the mystery which surrounds the transmission of their speech from one end of the country to the other.

So far as the technical aspect of broadcasting Parliamentary speeches is concerned, a microphone placed on the table of the House would be all that was necessary as regards the Front Bench speakers; but for the back benches elaborate wiring would be required. Each M.P. would have to be provided with a mouthpiece somewhat similar to that worn by the operators in a telephone exchange with cord and jack attached, so that he could plug in whenever he desired to do so, or could remain permanently connected throughout the time that the House was sitting.

In the former case the chances are that in the excitement of the moment a member would forget to plug in before speaking, with the result that listeners would be the losers, while the speaker himself might subsequently blame the apparatus for having failed him at the crucial moment.

Political Crises

Political crises might very well arise out of such a contretemps. And remember also the difficulty of getting the Speaker or the member on every occasion to announce his name as a preliminary measure. That, however, is not a matter which concerns the B.B.C., whose only business it would be to control the technical arrangements; and from that point of view the problems are assuredly not insurmountable.

Greater difficulties do, in fact, occur in connection with the broadcasting of such events as the Grand National Steeplechase and the Oxford and Cambridge Boat Race. The first-named event proved the first serious test for the B.B.C. in the broadcasting of a running commentary on an event where the movements of the participants were spread over a considerable stretch of ground, and were not confined to an area distinctly within the view of the one commentator.

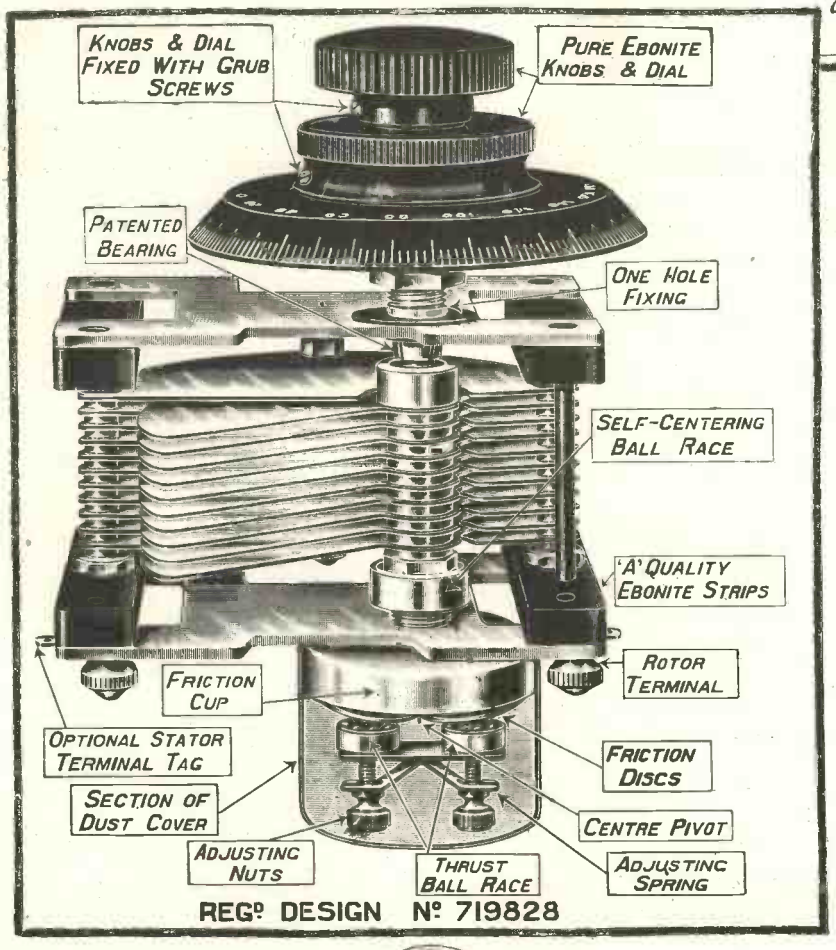
Special Telephone Lines

Special provision was necessary as regards telephone lines. Two pairs of trunk lines were provided between London and Liverpool, and two pairs of private lines between the Liverpool station of the B.B.C. and the point on the course behind the Press stand where the main control was carried out. In addition, two pairs of microphone extensions and five short microphone leads were used. Five microphones were necessary for

(*Continued on page 274.*)

ORMOND for "The Shielded Searcher"

as specified in this issue.



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Fit Ormond for preference. Once you have felt their liquid-like tuning movement and heard how sharply defined the signals are, you will use no other.

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Slow Motion Friction Control Movement is incorporated (ideal ratio 55 to 1). Ball bearings ensure smooth action. Rigid construction, the moving vanes being connected to the heavily nickelled and polished brass end plates. Negligible losses. Best quality ebonite strips support fixed vanes. No gears—absolutely silent action on shortest wave lengths. Ratio high enough for finest tuning; low enough for easy searching; direct drive used for rough setting. Every refinement — terminals, soldering tags, one hole fixing.

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When you send your order don't forget to say you "saw it in the 'W.M.'"

What the B.B.C. is Doing *(Continued)*

recording the commentary on the race, the sounds from the course, and the unsaddling enclosure, etc.

Lining Up at the Start

From the first microphone, on the balcony of the Press stand, the race-reader began with a description of the scene as the horses were lined up at the starting-post and continued right through the race—a period of 8½ minutes. When the first three horses had passed the winning-post an eye-witness took up the story from a second microphone over the unsaddling enclosure. A fourth microphone was suspended over the front rails of one of the stands to pick up the sounds at that point. A fifth microphone was carried by an official of the B.B.C. over a limited area.

In the case of the Boat Race, on April 2, the factor of safety is practically non-existent, and this is a serious matter, considering the importance of the occasion. It is impossible, owing to the limitations of space, to duplicate the apparatus on the launch which follows in the wake of the boats, and although there are two receiving points the B.B.C. officials are practically dependent on the one point, namely, the launch, from which in the ordinary course the whole of the work will be done. Keston will also be listening in order to cover the possibility of some local jamming occurring at the last moment; in such an event the B.B.C. receiving station will pick up the broadcast from the launch on a short wave and relay it to Savoy Hill. Should a fault develop, there will be very little time to correct it; hence the broadcast will give the engineers many anxious moments.

Programme Concentration

The policy of programme concentration initiated some time ago by the B.B.C. has proved successful and is therefore to be developed. The technical improvement of land-line relaying has made it possible to eliminate a great deal of the waste attendant upon unnecessary duplication of effort in different parts of the country. Thus the unique artistic resources of London can now be efficiently transmitted throughout the whole of the British broadcasting system.

Similarly, the considerable and distinctive artistic resources of Manchester, Glasgow, Cardiff, Birmingham, and the other chief centres can be made available to the whole body of listeners on appropriate occasions.

Judging from the evidence available, the sole object of this policy—the improvement of the service for all listeners—is being attained. An inevitable consequence of the application of this policy is that main stations do not transmit as many of their own programmes as has been the case in the past. For instance, at Manchester, Cardiff, and Glasgow the station director rarely puts on more than four of his own evening programmes in a week. He takes programmes for the remaining nights from London or other centres.

Despite this limitation of local broadcasts, in the interests of listeners generally, stations are still allowed ample facilities and latitude to reflect local artistic aspirations and characteristics.

Encouraging Local Activities

Station directors are encouraged to identify themselves with local activities and to see that the microphone takes its part in local affairs. Moreover, main stations such as Cardiff and Manchester are now making a much more extensive contribution to the general S.B. programmes than has been the case hitherto. B.B.C.

Tuning-up for Special Broadcasts

HAVE the excellent broadcasts of important sporting events caused you and your wireless friends to take more than the usual care and interest in your receiving sets?

Quite a number of my wireless friends have been so moved by en-

"Star" broadcasts.

thusiasm over these "star" broadcasts as to carry out minor improvements to their sets—improvements which I think they would not have otherwise made.

I have been as much moved as anybody by this enthusiasm for these really excellent Saturday afternoon sporting broadcasts.

You remember the England *v.* Ireland Rugby International at Twickenham a few weeks ago. I was most anxious to hear the broadcast account of this match, and I spent a couple of hours tinkering about with my receiving set and installation on the morning of the match. So determined was I to have everything as perfect as possible and to leave nothing to chance, that I disconnected my earthing switch for the occasion and took my aerial lead from the aerial lead-in direct to the set. I also took my earth lead from the set direct to earth and not *via* the switch.

Grave Doubts

I have had grave doubts of my earthing switch for some time. Winter dampness or inferior metal, or both, have caused the copper parts of the switch to turn a greenish colour in places.

Cutting out the earthing switch altogether certainly improved my reception. I am now wondering how I can tune up my set still further for the Boat Race, the English Cup Final, and the Derby. AERIAL.

IMPORTANT ANNOUNCEMENT!

The CYLDON Research Department have produced an entirely new type of Variable Condenser named :—

THE CYLDON LOG MID-LINE

This new condenser is a great advance over all others, and easily surpasses in performance the Square Law and Straight Line Frequency types.

It is designed on the

LOGARITHMIC PRINCIPLE

the shape of the vanes are approximately between square law and straight line frequency.

When multiple tuned circuits were first simplified by the ganging of condensers, the square law pattern was the nearest approach to perfection, but we realised that the tuning was limited to a portion of the scale. At each end was silence due to the lack of balance, owing to the shape of vanes following a straight line wavelength curve.

Our research department immediately tackled the problem, and after many months' extensive experiments, we produced a new shape vane, following a logarithmic law, which has very decided advantages over all other condensers

With these new condensers tuned circuits are balanced over the entire scale.

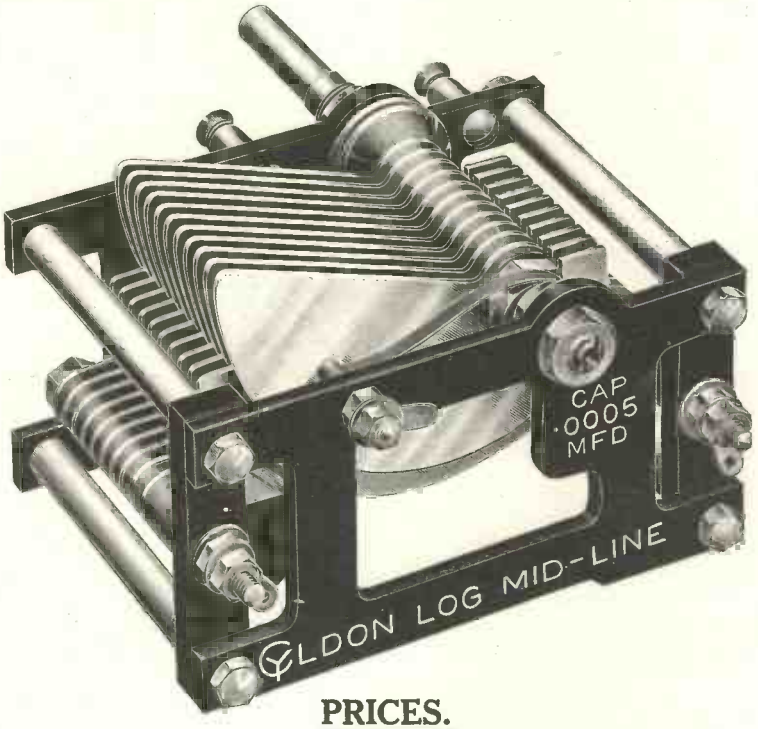
In multi-tuned circuits, all dial readings are identically the same when two or more condensers are in use.

Stations are much more evenly distributed over the whole scale.

THIS NEW CYLDON ACHIEVEMENT IS THE FIRST VARIABLE CONDENSER MADE IN THIS COUNTRY ON THE LOGARITHMIC PRINCIPLE.

Constructors who have gang condensers of the Square Law pattern will appreciate that this new advance in design was not foreshadowed until the advent of gang circuits, and we think they will appreciate that as the science of Radio progresses, new inventions must necessarily come.

This new condenser is such a great improvement that in future all our gang condensers will be built up with Log Mid-Line units. They are the latest and greatest advance in condenser design, and there is not the slightest doubt that the Condenser of the future will be the CYLDON Log Mid-Line.



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THE BEST MEANS OF VALVE CONTROL. PRICE 2'6 EACH. MOUNTING 1'6 EACH

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What the Reader Thinks

Our readers contribute items of interest to every listener

Without an Earth

To the Editor, "Wireless Magazine."

SIR,—For some reason my crystal set has not been working at all well for the last month or six weeks.

After reading the letters from readers in the January issue on "Dispensing with the Earth," I tried my set without an earth and could only get very faint signals. Seeing another letter in the February issue of your magazine, I again took off my earth wire, and at once got stronger signals than I have ever had before.

For the last two days, therefore, I have done without an earth connection, and, while the set goes on as at present I shall be quite content.

By the way, if I connect the earth wire to the aerial terminal and leave the aerial off the set altogether I get quite readable signals!

You will be pleased to know, as I am to tell you, that two of my friends, to whom you sent specimen copies of the WIRELESS MAGAZINE, are so pleased with it that they are giving an order for it monthly.

Best of luck to the magazine and to Bernard Jones Publication, Ltd., when formed.—J. Newing (Birmingham).

The 1927 Five

SIR,—I am another grateful reader of your "real radio magazine," and feel I would like to express my thanks to you for publishing that 1927 Five circuit. I have experimented considerably for the last six years, and had always fallen back on neutralised R.F. circuits, or that beauty of yours, As Good a Set As Money Can Buy, as most suitable for N.Z. conditions.

I am situated rather awkwardly, having interference from a power station 300 yards away, tram junction points outside my front door, several steel and concrete buildings either side of the house, and poor aerial space, too.

I always wished for better reception of Australian stations, but could not obtain them owing to the above, I suppose.

The 1927 Five fixed it! Yes, sir, I am like a cat or dog with two tails. As we say here, "It's the dingkum circuit," I feel I cannot thank you and praise it enough.

My log of stations previously was eight, four in Australia. Now my log is nine stations in Australia alone and five in N.Z.

I have only just completed the set per your instructions in time for the Christmas transmissions.

The outstanding feature to me is the wonderful regeneration control, so helpful in tuning-in the Aussies to me. Our time is an hour and a half ahead of the main Australian times, giving us radio transmissions up to 1.30 a.m. each morning if we wish it, which is a great boon at times.

I had little trouble to neutralise the set, in fact, it was so much easier than the usual neutrodyne set.—Walker J. Nye (Wellington, N.Z.).

Sulphated Accumulator

SIR,—I have a cure for sulphated accumulators which may be of use to readers of the WIRELESS MAGAZINE.

It is this: Make up a normal solution of caustic potash (about 2 sticks per litre of water). Into this add enough phenolphthalein to make a really *good* dark crimson-red colour (it will be found best to dissolve the phenolphthalein in a little alcohol before adding to caustic potash solution).

Write to the "Wireless Magazine" About It

Wash out the sulphated battery thoroughly, and then fill up with the prepared solution and leave for twelve hours or so, then empty and wash out again. The sulphate will be dissolved out by the solution.

If one filling of solution is not enough the process should be repeated.

Finally, fill up the battery with acid and give a good charge, and the battery will be once more in working order.

This was done to a badly sulphated 6-volt accumulator which had been left for nearly *nine* months with the acid in and in an uncharged condition. The solution described effectively removed all the sulphate, and the battery is now in first-class condition, and it *holds* its charge normally.

I may add that it is essential that there is plenty of phenolphthalein in the solution. Without this the solution will not work properly, neither will one of the ingredients work without the other being present—C. P. Fox (Tonbridge).

Good Valves

SIR,—We have had a three-valve set since September, 1924. The valves, which we have never had to replace, are to-day as good as new.

The other day, when I had the H.T. and L.T. wires disconnected from the set, I put the wires on again the wrong way about, thus putting the H.T. wires on the L.T. of the set. When I switched on the valves gave a flash. I took the wires off and put them on the right way.

I switched on again, and Daventry came through as well as ever. I tried all the other stations, which proved O.K. This speaks well for the valves, which are a well-known British make.—E. B. Willett (Bunbury).

As Good as Money Can Buy

SIR,—Re my set, As Good a Set as Money Can Buy, 2nd model. The results have been right above my expectations, and but for the matter of selectivity on the higher wavelengths it really makes me wonder why all the fuss is made about super sets of any kind, with their great expense of upkeep.

I have nearly 60 stations logged on the L.S., besides many more not identified, such as distant relays, etc., and the volume of some of those distant stations is remarkable.

It is not often I use the fourth valve except to boost up a weaker signal to good room strength. Vienna, Graz, Rome, and Milan come in with volume sufficient for a larger room.

It is not a bad performance to get five Swedish relays at good strength in one night—three on three valves and two on the four.

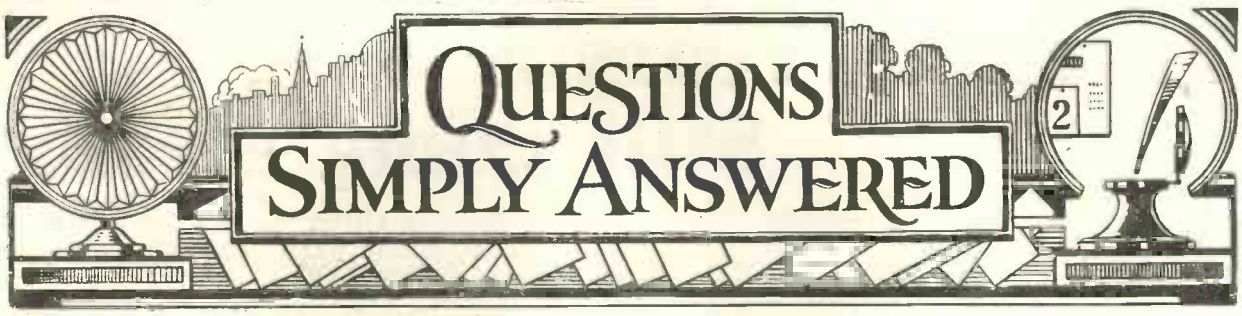
Some of my friends, who should know, pronounce it the best set they have heard. —Alban F. Moule (Kettering).

Wooden Panels

SIR,—Having occasion to rewire my set, the As Good as Money Can Buy four-valver (as described in your September, 1925, issue), I thought I would try a mahogany panel this time, and have done so with complete success.

My original ebonite panel is now at the back of the set, carrying all the panel components except the two variable condensers and the switch. After a thorough testing I must say the set answers as well as ever it did, and I shall not be tempted to alter the circuit again this year, although I see many tempting circuits in your magazine.

For the information of any of your readers who wish to try this wooden panel stunt, I would like to point out that I get absolutely no hand-capacity effects.—F. C. Hayes (Kingsland).



Condenser Capacity for Filter Circuits

Q.—I have attempted to construct a loud-speaker filter circuit, using a reliable make of L.F. choke and a 1-microfarad condenser. I find, however, that this arrangement considerably reduces the strength of signals reproduced by the loud-speaker, and would be glad of some further hints in this matter:—J. C. (Cornwall).

A.—The trouble you experience is due to the filter circuit fixed condenser having too small a capacity. The capacity for this condenser should not be less than 2 microfarads.—A. H.

Reinartz H.F. Choke

Q.—I have a Reinartz receiver which appears to work as well without the H.F. choke as with the choke in use. This appears to me to be very strange, especially as I do not seem to get the results that I should. Can you suggest what may be wrong?—F. R. (St. Albans).

A.—It is quite possible that your L.F. transformer primary has sufficiently great impedance to prevent the passage of H.F. currents through it so that an H.F. choke appears to be superfluous. In view of your unsatisfactory results, however, we are inclined to the opinion that you have some undesirable coupling between the various components that is by-passing the H.F. currents.

You are advised to respace your components and, if necessary, the wiring. In this way you will certainly improve the general efficiency of the set.—L. A. C.

A Standard-coil Two-valver

Q.—As I am about to build the Standard-coil Two-valver, would you be good enough to suggest suitable coils for the reception of Daventry?—T. W. (Sheffield).

A.—The following coils should be used for the reception of Daventry:—Two No. 150 coils for the aerial circuit and two No. 250 coils for the H.F. circuit. If you possess two No. 200 coils these may be used for H.F. tuning, but the larger coils will be found to give the best results.—L. A. C.

Resistance of Phones

Q.—Is there any advantage in using phones of 8,000 or 12,000 ohms resistance in preference to those of 2,000 or 4,000 ohms resistance with a crystal receiver?—F. J. (Clapham).

A.—Present-day crystal detectors are of a medium-resistance type, and as it is usually better to choose the phones to match the detector, there is no point in using exceptionally high-resistance phones with a medium-resistance crystal detector. In practice high-resistance phones are usually a little more sensitive than medium-resistance phones, but the latter very often give slightly louder signals than the former.—W. H.

Neutralising Condenser

Q.—In attempting to adjust the neutralising condenser on my receiver I find that practically no difference is experienced with the condenser adjusted to any position. Oscillation is apparent wherever the condenser is adjusted. Could you suggest a cause for this?—J. G. (Oldham).

A.—If you are sure that your neutralising condenser contacts are quite in order and that your circuit is correctly wired, then possibly there is too much undesirable capacity in the wiring of the set which it is impossible to neutralise.

You should take steps to respace the wiring and, if necessary, give more room to the various components.

Make sure that your valves are quite suitable for H.F. amplification, and if even then the inter-electrode capacity cannot be neutralised with your present neutralising condenser, we would advise you to try using a larger capacity condenser, or failing this, connect another neutralising condenser in parallel with your existing condenser.—C.

YOU CAN'T SOLVE IT?

You don't know to where that connection should go or why your set works well one day and badly the next?

Well, why worry? We keep a staff specially to solve such problems as yours. Let them have your queries.

Replies to queries of general interest are published each month, but every querist is answered direct by post.

Please observe the following conditions:

Ask one question at a time; write on one side of the paper only; attach to your query the coupon on cover iii; enclose a fee of 1s. (postal order or stamps); and send it with a stamped addressed reply envelope to: The Editor, WIRELESS MAGAZINE, La Belle Sauvage, E.C.4.

Aerial and Lead-in Wire

Q.—Is there any advantage to be gained by the use of an insulated lead-in wire attached to a bare-wire overhead aerial?—A. P. (Liverpool).

A.—It is a disadvantage, if anything, to attach an insulated down-lead to a bare-wire aerial, because a poor joint between the two wires will be a source of trouble and inefficiency. In any case, it is practically impossible to make a join as good as a jointless wire, so you are advised to use all insulated wire or all bare copper wire.

Copper wire or other low-resistance wire should be used for the aerial and lead-in wire in all cases.—S. J.

L.F. Transformer Defect

Q.—I have a well-known make of L.F. transformer that is giving me trouble and I should welcome any suggestions you can make regarding the cause. The symptoms are as follow:—Excessive crackling noises are experienced and the trouble has been traced to this transformer but, strangely enough, the windings are perfect as far as the continuity test is concerned. Replacing this component by another instrument puts an end to the noises.—G. W. (Paddington).

A.—We ourselves have experienced similar trouble with a good transformer, and the cause was eventually traced to a breakdown in the insulation of the primary winding. What happens is, the covering around the wire becomes impaired and the current from the H.T. battery jumps across the defective insulation between the wires and causes small sparks that make themselves heard in the form of crackling noises.

You are advised to return the instrument to the manufacturers for test and repair.—L. C.

The Gloria Four

Q.—Can I use Ediswan or Cosmos R.C. units in the construction of the Gloria Four receiver described in No. 25 of the WIRELESS MAGAZINE, and if so, will there be any need to alter the type of valves which are recommended for the original receiver?—E. K. (Fife).

A.—The coupling units you mention are quite suitable for use with the receiver as described, and there will be no necessity to change the type of valve to be used. Each of the makes of R.C. unit you mention is designed for use with the special high-impedance valves specified for use with the original receiver.—K. L. M.

(*Continued on page 280.*)

Questions Simply Answered *(Continued)*

Connections for Nodon Valve

Q.—I have made a Nodon-valve rectifier to charge my L.T. accumulator from the A.C. mains but am rather at a loss to know which side of the valve should be connected to the positive terminal of the L.T. battery. Can you assist me in this respect?—W. O'B. (Co. Cork).

A.—The positive terminal of the accumulator should be joined to the central aluminium rod or tantalum rod, whichever is used, whilst the negative terminal of the accumulator should be connected to the lead sheet which is placed round the central rod of the Nodon valve.—A. M. G.

Kilocycles and Wavelength

Q.—In American radio journals reference is made to a frequency of so many kilocycles instead of so many metres wavelength. Can you tell me how to convert wavelength to kilocycles and vice versa?—F. M. (Woking).

A.—The frequency of a wireless wave is determined by dividing the wavelength in metres into the velocity of these wireless waves. The result will be in cycles per second.

A kilocycle is a thousand cycles, so that by dividing the result by 1,000 the number of kilocycles frequency will be obtained. The velocity of wireless waves is 300,000,000 metres per second.

To reverse the calculation multiply the number of kilocycles by 1,000 and divide the result into the velocity and the final result will give the wavelength in metres.—L. A. C.

Tinning a Soldering-bit

Q.—I have attempted several times to tin a soldering-bit, but have never accomplished this to my own satisfaction. The tinning does not seem to last for any length of time, and constant renewal of tinning is required. Can you suggest a really good method of accomplishing this?—W. Y. (Saltash).

A.—Obtain a piece of sal-ammoniac from your nearest oil and colour stores (a suitable lump costs about a penny). File the end of your soldering-bit clean and to a suitable shape, and then heat in the fire or gas until it shows a blood-red heat.

Arrange some solder in a small tin lid and whilst dipping the hot bit into the solder rub the point of the bit and the sides with the sal-ammoniac. Provided that this is done speedily, before the bit becomes cold, a perfectly tinned bit will result.—L. C.

BLUEPRINTS AVAILABLE OF ALL SETS DESCRIBED IN THIS ISSUE

L.F. Amplifier

Q.—Please give a point-to-point connection scheme for a one-valve L.F. amplifier.—T. S. (London).

A.—Connect one input terminal to one terminal of the primary of the L.F. transformer and the other input terminal to the other transformer primary terminal. Join one terminal of the secondary winding to the grid of the valve and the other secondary terminal to the negative low-tension terminal. Another wire should connect the latter terminal to one side of the filament rheostat, the other side of the latter being connected to one of the filament sockets of the valve holder. The opposite filament socket should be connected to positive L.T. and also to negative H.T.

The positive H.T. terminal should be connected to one of the phone terminals whilst the other phone terminal should be connected direct to the plate of the valve.—L. A. C.

A Radio Engagement

Miss Isabel Jenkinson.

AN engagement is announced between Mr. Nevill Maskelyne, who co-operates with his brother in a "A Melange of Magic" at Maskelyne's Theatre, and who at one time was on the technical staff of the Mullard Company, and Miss Isabel Jenkinson, who holds an administrative post with the Mullard Wireless Service Co., Ltd.

Catalogues Received

VARIOUS types of connectors are the subject of a leaflet issued by the Lisenin Wireless Co., of 1a, Edgware Road, W.2.

The new P.M. loud-speaker is described in the latest edition of "Radio for the Million," copies of which can be obtained from the Mullard Wireless Service Co., Ltd., of Mullard House, Denmark Street, W.C.2.

Methods of using their new push-pull multiple switches are shown in a leaflet received from L. McMichael, Ltd., of Wexham Road, Slough, Bucks.

Amplion public-address loud-speaker equipment is the subject of a booklet sent us by Graham Amplion, Ltd., of 25-26, Savile Row, W.1. A leaflet describing new models of ordinary loud-speakers has also been received.

Loud-speakers for 1927

Ediswan Dulcivox Loud-speaker.

EXCELLENT for use in the average size of living-room the Ediswan Dulcivox loud-speaker has a height of 18¾ in. and a flare diameter of 9¾ in. It can be obtained in five different finishes—black, black and shaded gilt, warm shaded brown, imitation walnut, and imitation mahogany. A larger loud-speaker—the Televox—is also made by the Edison Swan Electric Co., Ltd., of 123-5, Queen Victoria Street, E.C.4.

Congratulations Across the Atlantic

Miss Edna Best, the "Tessa" of The Constant Nymph *at the New Theatre, London, phoning congratulations across the Atlantic by the new wireless service to Miss Beatrix Thomson, the "Tessa" of* The Constant Nymph *at the Selwyn Theatre, New York.*

Things Heard from Amateur Stations

On 23 Metres

A Sunday afternoon nap, including the snores.

A family feud about the nuisance of amateur transmitting. It's a pity 2LO did not broadcast this.

A medley of noises with no melody.

A well-known actor practising before the "mike."

Probably a modern wife entering the studio and asking her husband: "Did you see my matches anywhere?"

A boy's voice: "Any cigarette photos, dad?"

On 44 Metres

(This is a treat on Sunday afternoons between 2 and 4 o'clock.)

The word d—n more often than was really necessary, even if the set did not work properly.

Babel.

Still more Babel.

The Tower of Babel complete. (Are most amateurs mad?)

On 46 Metres

A lovely soprano singer 2LO would be glad of.

An instrument I have never heard before, nor do I want to hear again.

A long business conversation about the prices of sugar and tea.

A love transaction.

On 33 Metres

Betting information.

Much wisdom about horses.

Stocks and shares gossip of value.

The sound of glasses.

A voice: "Have a cigar——?"

On 100 Metres

"Are you there? Are you there?"

Another: "Are you there?"

Angrily: "This b—— thing's no good."

E. B. R.

Why Are Inventors So Slow?

THE number of patents in regard to wireless matters runs into the thousands each year. It is literally true that something fresh in regard to wireless transmission and reception is invented every day. And yet, despite this apparent progress, the wireless set which was constructed three or four years ago is very little different in its essentials from the 1927 models in the windows of the wireless dealers.

The old-fashioned straight circuit is still the most popular of all circuits. The old-fashioned plug-in coil is still first favourite with the multitude. The old-fashioned horn loud-speaker still holds its own. Components have been improved, but none of them have been improved out of recognition.

Getting a Hustle On

Why don't these inventors get a hustle on, and bring out something really fresh? It is all very well to keep on improving the design of variable condensers and fixed resistors, and to mount components on a baseboard instead of on the panel. These improvements undoubtedly represent progress—but not rapid progress. Inventors don't seem to get together enough, or to combine their ideas sufficiently.

To take one example: It is several years since a device was marketed which enables the electric wiring of a house to be used as an aerial. An excellent idea. And recently a valve has been made available which takes low-tension current direct from the mains. At the same time a German inventor has perfected a valve which contains within its one bulb the electrodes of three valves and the necessary couplings for either high-frequency or low-frequency amplification. We have also a loud-speaker which looks like, and actually is, an artistic shade for an electric lamp.

Surely it is not asking too much to suggest that the inventors of these clever and useful devices should co-operate and, by putting two and two together and adding a bit to make five, produce a combined bulb and shade which, when attached to a source of current, would bring in the broadcast programmes with adequate purity and volume. It would obviously be quite a simple matter to brighten up the filaments of the valve sufficiently to enable it to serve also as an electric light. Tuning would, of course, be controlled by raising or lowering the lamp.

Such a combination of ideas would represent material progress. Of course, it would not be the end. Having gone so far, these inventors, one imagines, would find it no more than an evening's work to complete their task on behalf of the listener. For if the current from the mains could be made to work a lamp-shade speaker merely by plugging-in a valve, it ought to be a trivial affair to arrange for the valve part of the business to be installed at the local electric-supply station, the rectified and amplified wireless signals being passed on to consumers as part and parcel of the ordinary lighting current.

Concert With the Light

Thus, whenever a light were switched on, a selected broadcast concert would be switched on also, unless the cut-off button on the loud-speaker had been depressed. At first the smaller supply stations might find it necessary to restrict their service to local and Daventry concerts, but later a world-wide service would be a matter of course.

There would still remain the question whether even a lamp-shade (harbouring dust and germs) is really essential. The drawing-room ceiling might be used as the basis for a large diaphragm speaker. But that point may perhaps be left for the moment.

H. P.

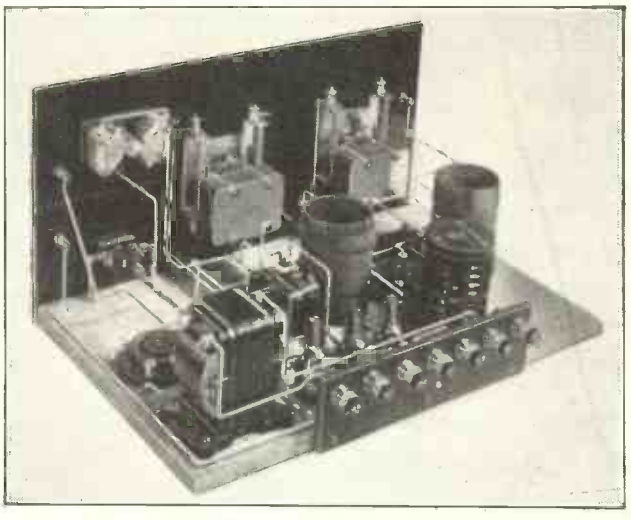
WE are told that the amateurs are toiling along with short-wave radio, making it one of the foremost advances of modern science. However, it is long-wave radio that *tells*.

An ingenious wireless amateur recently used a tennis ball in the construction of a loud-speaker. Is it to be wondered at that, when the instrument was first switched on, the set kicked up a deuce of a racket?

Further "M.C." Developments

J. H. Reyner, B.Sc., A.M.I.E.E., who evolved the "M.C. Three" circuit, which attracted so much attention recently, is now giving week by week in "AMATEUR WIRELESS" details of further developments of this new principle. One development, by the way, is the "M.C. FOUR."

For the beginner or the advanced amateur each issue of "AMATEUR WIRELESS" contains innumerable features, written in easily understandable form and authenticated by experts. "AMATEUR WIRELESS"—always interesting and reliable—is a live commentary on wireless matters week by week.



Layout of the Components of the "M.C. Three."

Amateur Wireless

On Sale every Thursday, 3d.

The "Wireless Magazine" Buyer's Guide

(Numbers in brackets indicate issue in which advertisement appeared.)

The Wonderful P.M. Filament

serves you a thousand times round the clock and continues its high performance long afterwards the same as when new

Even a year's broadcasting service will not impair the original perfect results given by Mullard P.M. Valves with the wonderful P.M. Filament.

This fact was convincingly proved by the test report of the National Physical Laboratory. After 1,000 hours' rigorous life test the operating characteristics of P.M. Valves with the unique P.M. Filament were the same as before the test.

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Enjoy the fullest possibilities of your radio receiver.

Bring in stations you have never heard before, and obtain really pure, musical reception by asking for valves that have an official Government Laboratory Test Report——

Ask for Mullard P.M. Valves with the wonderful P.M. Filament.

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