ARTICLES BY — CAPT. ROUND, J.H. REYNER & W. JAMES

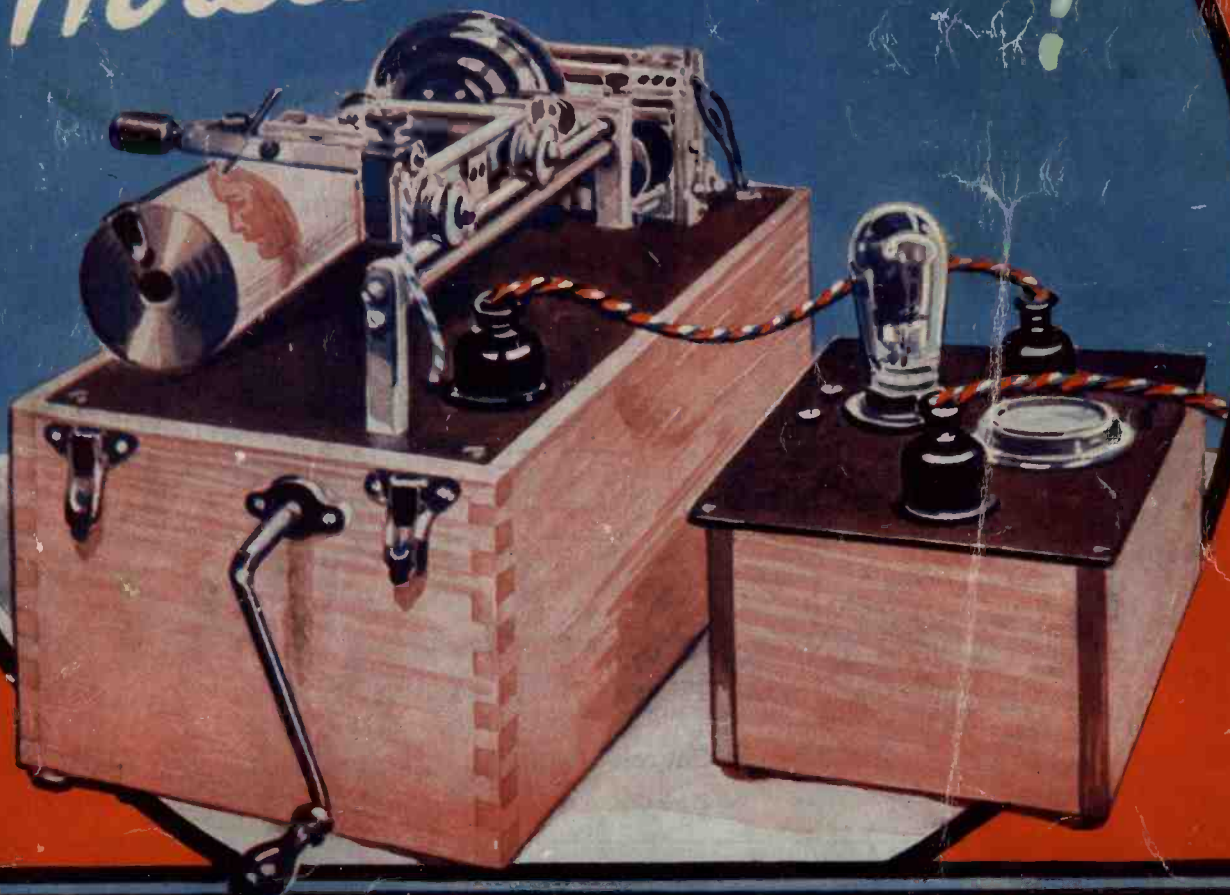
Wireless Magazine

VOL. 8. No. 47.

DECEMBER 1928

1/-

How to Receive Wireless Pictures!



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

Wireless Magazine

The Best Shillingsworth in Radio

Vol. VIII :: DECEMBER, 1928 :: No. 47

Research Consultant:
W. JAMES

Assistant Editor:
D. SISSON RELPH

SOME GREAT NAMES

CAPTAIN H. J. ROUND, Dr. N. W. McLachlan, Mr. J. H. Reyner, and Mr. W. James contribute to this issue, besides a host of other authors, every one of them with something to say. The electrical reproduction of gramophone records is Captain Round's subject this month, and, as always, he is able to impart considerable information drawn from his own practical experience. Dr. McLachlan writes on a little-known phase of loud-speaker performance and provides a common-sense explanation of how lag introduces itself between the application of the driving force and the production of the corresponding sound.

FIVE NEW SETS *Mr. Reyner this month is represented by a set into which he has put a very great deal of thought and experiment—his Furzehill Four—in which he applies the principle of matched-reactance ganging to amplification with screened-grid valves. I invite you to look at the test report of the Furzehill Four appearing on page 416 and to realise that, in passing from long waves to short waves, the dial and switch are the only controls touched.*

In this receiver we have a complementary set to Mr. James' Touchstone described last month, a set that was immediately successful and has already occasioned a great deal of discussion in radio circles. Mr. James has something more to say about his Touchstone in the pages of this present issue, and in still another article is discussing the gramophone pick-up and its use from a new and revealing angle.

WIRELESS PICTURES *Apart from the four or five special sets described in this issue, every one representative of last-moment practice, only possible because of the facilities cheerfully given us by manufacturers for test and experiment, weeks, and even months, before their new season's products are offered to the public—the big feature of this, the December issue, is undoubtedly the article, "How to Receive Wireless Pictures," the most practical and the best-informed that has yet appeared on the subject.*

SPECIAL FACILITIES *We have been very fortunate, and almost, if not quite, alone in being given opportunities of fully acquainting ourselves with the construction and actual operation of the Fultograph, and the illustrations of this apparatus appearing in this issue, especially made by our own staff, are the most detailed that have yet appeared in any publication whatsoever. With this article as their guide, readers will be able quite cheerfully to undertake the operation of the Fultograph and add a novel pleasure to their wireless reception.*

Do Not Overlook the Half-price Blueprint Coupon on page iii of the Cover.

Bernard E. Jones

YOU CAN BUY A FULL-SIZE BLUEPRINT DRILLING GUIDE, LAYOUT AND WIRING DIAGRAM OF ANY ONE OF THE FIVE SETS CONSTRUCTIONALLY DESCRIBED IN THIS ISSUE FOR HALF-PRICE BY USING THE COUPON ON PAGE iii OF THE COVER

CONTENTS

Published by BERNARD JONES PUBLICATIONS, LTD., publishers of "Wireless Magazine" and "Amateur Wireless." Editorial and Advertisement Offices: 58/61 Fetter Lane, London, E.C.4. Telephone: City 3733, 3734. Telegrams: "Beejapee, Fleet, London." Published about the 25th day of the month and bears the date of the month following. Subscription: Great Britain and Abroad, 15s. 6d. a year, post free (Canada only, 13s. 6d.). Contributions are invited and will be promptly considered.

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FERRANTI

endorses "Wireless Magazine" article on a subject of vital importance.

The following extracts from the article in the November "Wireless Magazine" are worthy of this extra publicity, emphasizing, as they do, the Ferranti doctrine of "safety first" in the choice of H.T. supply units.

Ask your dealer, or write to us direct for Constructional and other H.T. Unit leaflets.

This generation has grown so familiar with the convenience of electric light and power for domestic purposes, and the safety of the apparatus available, that it accepts almost without question all apparatus offered for a specific purpose. . . . .

Nevertheless, dangers exist in the use of improperly designed, inadequately insulated, or otherwise unsuitable apparatus on the electric-light mains. . . . . .

I was recently shown by one of the large supply undertakings in this country an eliminator which has been in use on their mains, and the resistances consisted of lines made very crudely with what appeared to be Indian ink on strips of cardboard. . .

The choke and the condensers—equally necessary components in an eliminator—were very little better, being of crude and inferior construction. . . . . .

The object of this article is to draw the attention of the great wireless public to the manner in which they are being exploited by unscrupulous "manufacturers" who, quick to take advantage of the popularity of radio, are seizing the opportunity to turn out huge quantities of "junk" apparatus at very attractive prices; prices probably lower than the labour and material costs of properly-constructed units. . . . . .

One, if not more, prominent manufacturer is already taking steps to submit his apparatus to the principal supply authorities throughout the country with a view to having it approved by them and, concurrently, the supply authorities are taking steps to prohibit the use on their mains of apparatus which does not comply with certain specified requirements.

Sooner or later, definite legislation will come. Meantime, the owner of a wireless receiver contemplating the use of a battery eliminator should consider *firstly*, the safety of himself, his family, and his servants; *secondly*, the performance of which the eliminator is capable, its efficiency and reliability; and *thirdly*, and then only, its price.

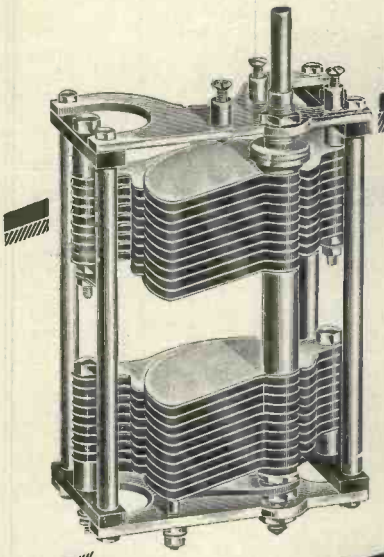
POW-CHO.

FERRANTI LTD., HOLLINWOOD, LANCASHIRE

CYLDON

Specified by the Designer of the "FURZEHILL 4"

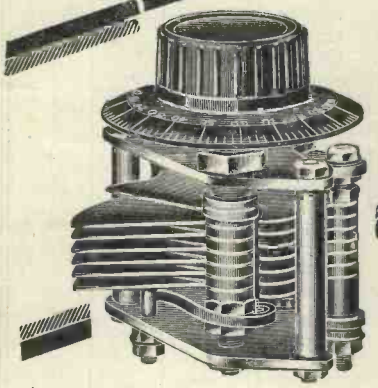
VARIABLE CONDENSERS



Log Mid-line Dual Condenser

A typical example of Cyldon Excellence. Mr. J. H. Reyner (Designer of this Receiver) chose and definitely specified the Cyldon Dual Condenser because of the extremely accurate matching of each section, which is absolutely necessary for the "Furzehill 4." Polished aluminium end plates, 3-screw fixing, sturdy bearings, nickel-chrome steel-spindle. two sets of aluminium vanes on one spindle, "radion" insulation.

Prices: .0005, Each Section, 25/6 **(4" Knob Dial, 2/- extra)**



Cyldon Bébé Condenser

This Condenser is also specified for the "Furzehill 4." The vanes are shaped true square law, which is the proved best law for this type of condenser. The di-electric is outside the electrostatic field. A small graduated Bakelite knob-dial, 2 in. in diameter, is supplied with each condenser.

.0002 ... 8/6

Do you Know SYNCHRATUNE?

Cyldon's latest & Greatest Success

The Synchratune system provides gang control with the added advantage of individual adjustment of the aerial and H.F. stages from the front of the panel. The condensers are mounted on a strong aluminium chassis, which requires two holes only for panel mounting. The bakelite drums protrude through a beautifully finished bakelite escutcheon plate with recessed window, through which is shown scales reading 0 to 180 degrees. Specified for the "Inceptor 3." Suitable for all receivers using two or more condensers.

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Goodall Ad.

VALVES TO USE IN THIS MONTH'S SETS

TWO-VOLT VALVES: Three-electrode Types

Make.	Type.	Impedance.	Amp. Factor.	Fil. Volt.	Fil. Cur.
Ediswan	RC2	150,000	30	2	.1
Mazda ...	RC210	86,000	40	2	.1
Mullard...	PM1A	72,000	36	2	.1
Cosmos ...	SP16B	70,000	35	1.8	.09
Six-Sixty	210RC	68,000	35	2	.1
Ediswan	RC210	67,000	40	2	.1
Cossor ...	210RC	60,000	40	2	.1
Marconi...	DEH210	50,000	35	2	.1
Osram ...	DEH210		35	2	.1
Mazda ...	HF210	28,000	20	2	.1
Six-Sixty	210HF	27,000	13	2	.1
Ediswan	HF210	25,000	20	2	.1
Mullard...	PM1HF		14	2	.1
Marconi...	HL210	23,000	20	2	.1
Osram ...	HL210		20	2	.1
Cossor ...	210HF	20,000	15	2	.1
Six-Sixty	210LF	18,000	8.5	2	.1
Cosmos ...	SP16G	17,000	16	1.8	.09
Mullard...	PM1LF		8.5	2	.1
Mazda ...	GP210	14,000	13	2	.1
Ediswan	LF210	13,000	13	2	.1
Cossor ...	210LF	12,000	10	2	.1
Marconi...	DEL210		11	2	.1
Osram ...	DEL210		11	2	.1
Mullard...	PM2DX	10,700	13.5	2	.25
Cosmos ..	SP16R	10,000	9	1.8	.09
Six-Sixty	215P	7,300	6.4	2	.15
Mazda ...	LF215	7,000	7	2	.15
Mullard...	PM2		6.2	2	.15
Ediswan	PV215	6,600	8	2	.15
Cossor ...	220P	5,000	5	2	.2
Marconi...	DEP215		7	2	.15
Osram ...	DEP215		7	2	.15
Cosmos ...	SP18RR	4,500	6.5	2	.3
Cossor ...	220P	4,000	8	2	.2
Six-Sixty	230SP		3.9	2	.3
Mullard...	PM252	3,800	3.8	2	.3
Mazda ...	P227	2,900	4	2	.27
Ediswan	PV225	2,700	3	2	.25
Marconi...	DEP240	2,500	4	2	.4
Osram ...	DEP240		4	2	.4
Cossor ...	230XP	2,000	4	2	.3

FOUR-VOLT VALVES: Three-electrode Types

Make.	Type.	Impedance.	Amp. Factor.	Fil. Volt.	Fil. Cur.
Mazda ...	RC407	100,000	40	4	.075
Six-Sixty	4075RC	64,000	34	4	.075
Mullard...	PM3A	63,000	35	4	.075
Ediswan	RC410	61,000	40	4	.1
Cossor ...	410RC	60,000	40	4	.1
Marconi...	DEH410		40	4	.1
Osram ...	DEH410		40	4	.1
Ediswan	HF410	22,000	25	4	.1
Mazda ...	HF407	21,000	18	4	.075
Cossor ...	410HF	20,000	20	4	.1
Six-Sixty	4075HF	16,500	13	4	.075
Mullard...	PM3	16,000	13.5	4	.075
Mazda ...	GP407	14,000	14	4	.075
Ediswan	LF410	10,500	13	4	.1
Cossor ...	410LF	8,500	15	4	.1
Marconi...	DEL410		15	4	.1
Osram ...	DEL410		15	4	.1
Six-Sixty	410P	8,000	7.3	4	.1

FOUR-VOLT VALVES—*Continued*

Make.	Type.	Impedance.	Amp. Factor	Fil. Volt.	Fil. Cur.
Mullard...	PM4DX	7,500	15	4	.1
Mullard...	PM4	7,000	7	4	.1
Mazda ...	LF407	5,700	8	4	.075
Ediswan	PV410	5,500	5.5	4	.1
Marconi...	DEP410	5,000	7.5	4	.1
Osram ...	DEP410		7.5	4	.1
Ediswan	LF410a	4,500	9	4	.1
Cossor ...	410P	4,000	8	4	.1
Six-Sixty	425SP	3,600	3.2	4	.25
Mullard...	PM254	3,500	3.15	4	.25
Mazda ...	P415	2,900	5.5	4	.15
Marconi...	P425	2,250	4.5	4	.25
Osram ...	P425		4.5	4	.25
Cossor ...	415XP	2,000	4	4	1.5
Ediswan	PV425		3	4	.25

SIX-VOLT VALVES: Three-electrode Types

Make.	Type.	Impedance.	Amp. Factor	Fil. Volt.	Fil. Cur.
Mazda ...	RC607	90,000	40	6	.075
Mullard...	PM5B	74,000	37	6	.075
Six-Sixty	6075RC		37	6	.075
Cossor ...	610RC	60,000	50	6	.1
Marconi...	DEH610		40	6	.1
Osram ...	DEH610		40	6	.1
Ediswan	RC610	50,000	40	6	.1
Marconi...	HL610	30,000	30	6	.1
Osram ...	HL610		30	6	.1
Marconi...	LS5B	25,000	20	5.25	.8
Osram ...	LS5B		20	5.25	.8
Ediswan	HF610	21,000	25	6	.1
Mazda ...	HF607	20,000	20	6	.075
Cosmos ...	DE50		9	6	.09
Cossor ...	610HF		20	6	.1
Six-Sixty	6075HF		20	6	.075
Mullard...	PM5X	19,000	17.5	6	.075
Mazda ...	GP607	12,500	14	6	.075
Ediswan	LF610	10,000	15	6	.1
Mullard...	PM6D	9,000	18	6	.1
Cossor ...	610LF	7,500	15	6	.1
Marconi...	DEL610		15	6	.1
Osram ...	DEL610		15	6	.1
Marconi...	LS5	6,000	5	5.25	.8
Osram ...	LS5		5	5.25	.8
Six-Sixty	610P		7.2	6	.1
Mazda ...	LF607	5,300	9	6	.075
Mullard	PM6	5,200	7.1	6	.1
Ediswan	PV610	4,200	5	6	.1
Six-Sixty	625SP	3,600	3.2	6	.25
Cossor ...	610P	3,500	8	6	.1
Marconi...	DEP610		8	6	.1
Mullard...	PM256		3.15	6	.25
Osram ...	DEP610		8	6	.1
Ediswan	PV625	3,000	3	6	.25
Marconi...	LS5A	2,750	2.5	5.25	.8
Osram ...	LS5A		2.5	5.25	.8
Mazda ...	P615	2,600	6	6	.15
Marconi...	P625	2,400	6	6	.25
Osram ...	P625		6	6	.25
Cossor ...	610XP	2,000	5	6	.1
Mullard...	DFA9		5	6	.6
Mazda ...	PX650	1,750	3.5	6	.5
Ediswan	PV625A	1,600	4	6	.25
Marconi...	P625A		3.7	6	.25
Osram ...	P625A		3.7	6	.25

FOUR-ELECTRODE VALVES: Screened-grid

Make.	Type.	Impedance.	Amp. Factor.	Fil. Volt.	Fil. Cur.
Mullard...	PM12	230,000	200	2	.15
Six-Sixty	215SG	220,000	190	2	.15
Cossor ...	220SG		200	2	.2
Marconi...	S215	200,000	170	2	.15
Osram ...	S215		170	2	.15
Ediswan	SG215	140,000	140	2	.15
Mullard...	PM14	230,000	200	4	.075
Six Sixty	4075SG	220,000	190	4	.075
Cossor ...	410SG	200,000	200	4	.1
Ediswan	SG410	115,000	140	4	.1
Marconi...	S625	175,000	110	6	.25
Osram ...	S625		110	6	.25
Ediswan	SG610	100,000	140	6	.1

FIVE-ELECTRODE VALVES: Pentodes

Make.	Type.	Impedance.	Amp. Factor.	Fil. Volt.	Fil. Cur.
Ediswan	5E225	65,000	80	2	.25
Six-Sixty	230PP	64,000	80	2	.3
Mullard...	PM22	62,500	82	2	.3
Marconi...	PT235	55,000	90	2	.35
Osram ...	PT235		90	2	.35
Cossor ...	230QT	20,000	40		.3
Mullard...	PM24	28,600	62		.15
Six-Sixty	415PP	27,000	60	4	.15
Cossor ...	415QT	20,000	40	4	.15

MAINS VALVES: Three- and Four-electrode

Make.	Type.	Impedance.	Amp. Factor.	Fil. Volt.	Fil. Cur.
Marconi...	S Point 8	200,000	160	.8	.8
Osram ...	S Point 8		160	.8	.8
Marconi...	H Point 8	55,000	40	.8	.8
Osram ...	H Point 8		40	.8	.8
Marconi...	HLPoint8	17,000	17	.8	.8
Osram ...	HLPoint8		17	.8	.8
Marconi...	P Point 8	6,000	6	.8	.8
Osram ...	P Point 8		6	.8	.8
Marconi...	KH1	30,000	40	3.5	2.0
Osram ...	KH1		40	3.5	2.0
Marconi...	KL1	3,750	7.5	3.5	2.0
Osram ...	KL1		7.5	3.5	2.0
Cossor ...	MRC	80,000	50	4	1.0
Ediswan	MI41RC	50,000	45	4	1.0
Cossor ...	MHF	20,000	20	4	1.0
Cosmos ...	AC/G	17,500	35	4	1.0
Ediswan	MI41	9,000	16	4	1.0
Cossor ...	MLF	8,000	8	4	1.0
Cossor ...	MP	6,500	5.5	4	1.0
Cosmos ...	AC/R	3,000	10	4	1.0
Cossor ...	MXP		3.5	4	1.0

A glance through the constructional articles in this issue will give the novice some hints regarding the best valves for the various types of circuits

Is your H.T. down?

B T-H

DOES this question ever worry you? It need not if you have alternati g current mains in your home. The new B.T.H. H.T. Eliminators provide a constant H.T. current. They are free from all "hum" and are definitely guaranteed to deliver the milliamperes specified.

The 5 m.a. ype is intended for use with the average 1 or 2 valve set working at present from a small capacity dry battery. For larger receivers, the 10 m.a. type should be used. Instal a B.T.H. Elimin tor today, and have a constant, unfailing, trouble-free and inexpe sive supply of H.T. from now on.

Ask your dealer to tell you all about these eliminators.

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200/250 volts, 40/100 cycles.
Price £4 10 0, including valve

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The British Thomson-Houston Co. Ltd.

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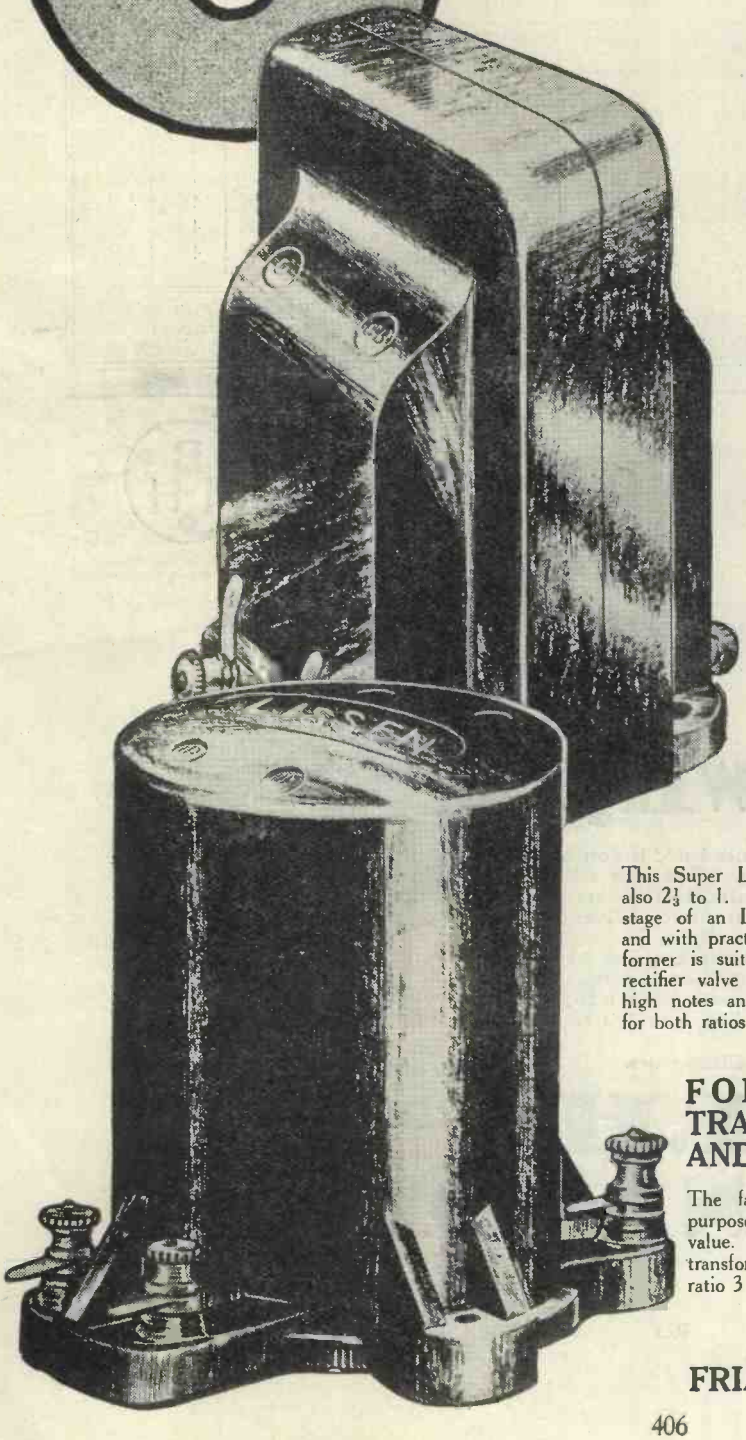
6 REASONS WHY LISSEN ADDED *the* SUPER TRANSFORMER



1 SECTIONALISED WINDINGS

There are three separate bobbins. Each is split up into a number of slots. This construction gives a very low capacity between windings and an extremely low self-capacity in each separate winding. The bobbins are very large, with an immense number of turns wound on each.

2 ENCLOSED PRIMARY

The primary bobbin is in between the two secondary bobbins, giving the tightest possible inter-winding coupling with the consequent elimination of any chance of distortion.

3 CORE of SILICON STEEL

The generous iron circuit is so arranged that every available fraction of appropriate core space is filled. The well laminated core of individually paper-insulated stampings prevents eddy current losses. The stampings, too, are made from a special Silicon steel with negligible hysteresis loss, and with high permeability to resist saturation. So much so, that even in the anode circuit of a large power valve it would be impossible to produce saturation and consequent loss of primary inductance.

4 BAKELITE CASE

Non-porous, unaffected by heat or damp or electrical conditions. Will not lose colour or become distorted in any climate. Non-metallic, non-conducting, cannot short circuit loose or uncovered wiring, yet the transformer is for all practical purposes sufficiently shielded by the arrangement of the iron core inside.

5 HERMETIC SEALING

After the transformer is in its case the whole is hermetically sealed, thereby excluding moisture and dust, making the windings immune to all atmospheric changes.

6 CURVE AND PERFORMANCE

A curve has been taken by the National Physical Laboratory, and the Certificate proves it to reproduce radio and gramophone music with an even amplification at all frequencies.

This Super LISSEN Transformer is made in two ratios, 3½ to 1 and also 2⅔ to 1. The 3½ to 1 is suitable for use in either the first or the second stage of an L.F. amplifier, or can be used in cascade for both stages, and with practically any valve. The 2⅔ to 1 transformer is suitable for use after a high impedance rectifier valve without fear of distortion or loss of high notes and overtones. The price is the same for both ratios .. ..

19/-

FOR GENERAL USE THE 8/6 TRANSFORMER IS STILL SUPREME AND WILL NEVER BREAK DOWN

The famous 8/6 Lissen Transformer is suitable for all ordinary purposes, and its huge sale proves it still supreme value. It continues to earn high praise as "the transformer that never breaks down." Turns ratio 3 to 1. Resistance ratio 4 to 1.

8/6

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(Managing Director: Thos. N. Cole.)

How to Receive Wireless Pictures

An Exclusive "Wireless Magazine" Article by D. SISSON RELPH

SINCE the B.B.C. started the irregular broadcasts of wireless pictures, extraordinary interest has been taken in the new system wherever it has been possible to give public demonstrations. Everybody is asking what the apparatus is like and how it works; it is my purpose in this article to explain how simple is the reception of wireless pictures.

Exclusive "Wireless Magazine" Photographs

Except for a brief outline of the bare principles of the Fultograph system, my remarks will therefore be confined to the purely practical part of reception; they are based on experiences actually gained in the B.B.C. Control Room, where the transmitter and two check receivers are installed. With the aid of the exclusive WIRELESS MAGAZINE photographs reproduced in these pages, the reader is not likely to have any difficulty in understanding the arrangement of the apparatus.

First of all, you will want to know where to buy a picture receiver and then how to work it—so let's get together.

In the first place, as transmissions are being made only from Daventry 5XX, it is essential that you should have some kind of broadcast receiver capable of picking up this station at reasonably good loud-speaker strength. Provided you are within range, a portable receiver is quite suitable for this purpose.

Prices of Fultograph Picture Receivers

Next, it will be necessary to order a Fultograph machine, as the wireless-picture receivers developed by Otho Fulton, of Wireless Pictures (1928), Ltd., are called.

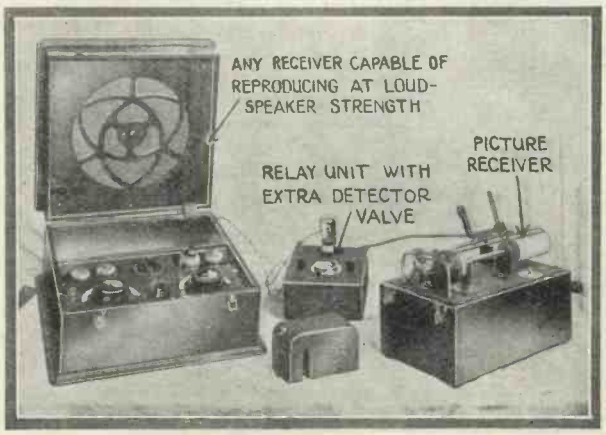


Fig. 2.—Complete apparatus for receiving wireless pictures. The cost is just over £20, exclusive of the ordinary radio set. Two models of the Fultograph are made, one in oak and the other in mahogany; each requires an extra rectifying value

Two models are available, one in an oak cabinet at £22 15s. and the other in a mahogany cabinet at £24 15s. Each Fultograph also requires an extra rectifying valve, which will cost another 10s. 6d. A complete wireless picture receiver, therefore, provided you already have a suitable radio set from which to operate it, will cost either £23 5s. 6d. or £25 5s. 6d. complete.

From the photographs reproduced here you will see

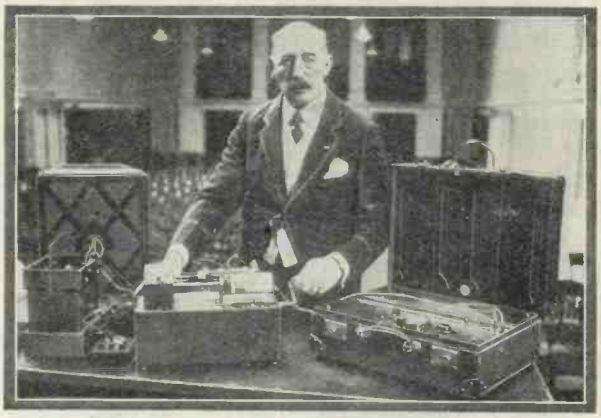


Fig. 1.—Otho Fulton, who has so successfully developed the system of picture broadcasting that bears his name, operating a receiver. This photograph was taken at the Berlin Radio Exhibition

that the picture receiver is made up in two parts, the receiver proper and a small relay panel. In Fig. 1 you will see Otho Fulton, who has developed the system to its present stage of perfection, operating one of his machines.

Arrangement of Complete Installation

On the right is a portable radio set. In the centre is the wireless-picture receiver, while the small box between this and the accumulator on the extreme left is the relay unit. Since this photograph was taken the design of the Fultograph has been changed somewhat, and the latest pattern is illustrated in Fig. 2, where it is shown connected to a Burndept Screened Portable.

From this photograph, and also from Fig. 3, it will be quite clear how the units are connected up. The loud-speaker terminals of the radio set are connected to two sockets on the relay panel, which are placed just behind the extra detector valve.

Two Simple Connecting Rods

The relay unit is also provided with two connecting cords; one of these is a five-way battery cord supplying current for the operation of the anode-bend detector, and comprises leads for H.T. positive, L.T. positive, G.B.

How to Receive Wireless Pictures (Continued)

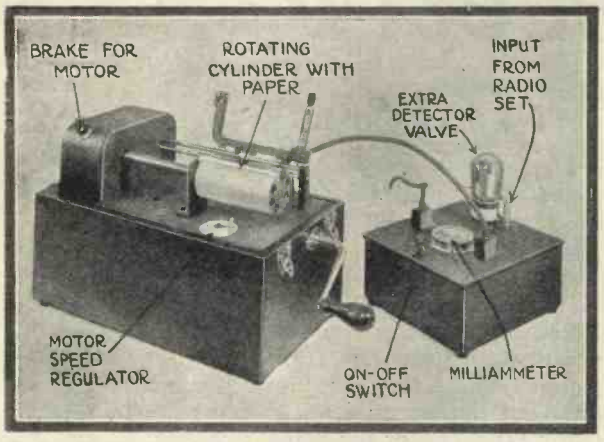


Fig. 3.—On the left is the picture receiver proper, while on the right is the relay unit. Round the cylinder is placed a piece of special absorbent paper which has been damped with a chemical solution. The picture is formed on this paper by varying currents passing from the needle point to the metal cylinder

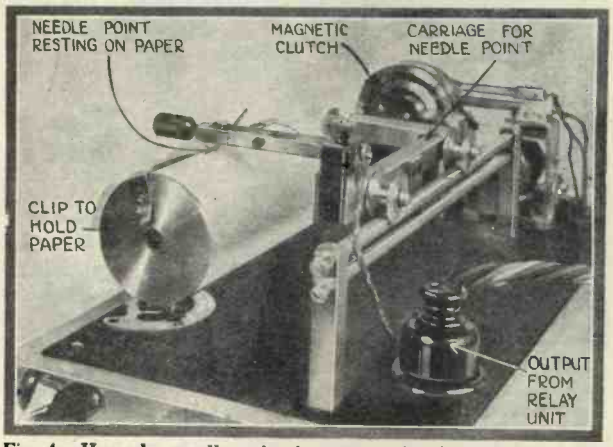


Fig. 4.—Here the needle point is seen resting in position on the paper; it is moved over the cylinder by means of a threaded rod (approximately 64 threads to the inch). The needle should be wiped after each picture has been received

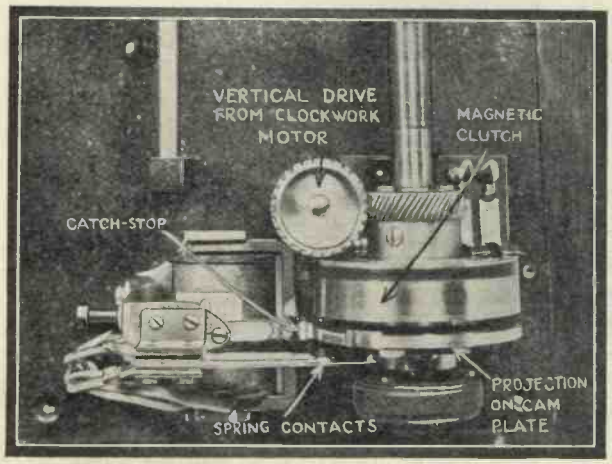


Fig. 5.—The catch-stop stops the cylinder from rotating when required and the clutch is withdrawn at the same time, thus allowing the motor to run continuously at the same speed

positive, G.B. negative, and L.T. negative (and H.T. negative if separate batteries are used for the Fultograph.)

Between the relay unit and the picture receiver is a six-way cord, provided with a multiple plug at each end, which can be inserted only one way round in the sockets.

The relay unit is provided with an on-off switch and a milliammeter. When the switch is off the whole picture receiver is put out of action.

How a Picture is Actually Transmitted

At the transmitting end, a picture is prepared on copper foil with an insulating substance and the foil placed round a cylinder similar to that illustrated in Fig. 4. At the top of the cylinder there is a small arm carrying a needle point which rests on the copper foil; this travels over the copper in a straight line as the cylinder rotates, sometimes touching bare copper and sometimes a film of insulating substance. In this way a current of constant frequency which passes from the cylinder to the needle is vaned in intensity according to the light and shade of the picture and then transmitted by radio in the ordinary way.

Now it is important to understand that at the transmitting end the cylinder runs constantly at the same speed. You will have already seen from the photographs that at the receiving end there is a similar cylinder and needle point, but obviously a clock-work motor cannot be set simply by means of a speed regulator to run at *exactly* the same number of revolutions per minute as a similar motor in the transmitter. It is therefore arranged that at the end of each revolution the receiving cylinder stops for a brief period and then starts off again for another revolution.

Receiver Synchronised at Every Revolution

In this way, therefore, however many receivers are in use, they all start their revolutions at exactly the same time, although they may not all finish together, owing to slight variations in the running speeds. However, when they have all completed one revolution they will

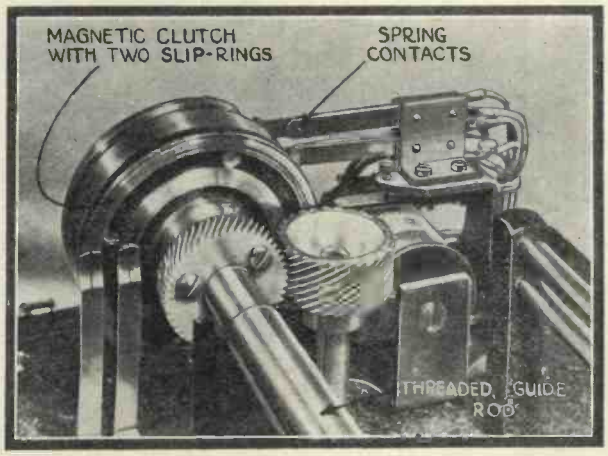


Fig. 6.—The catch-stop, magnetic clutch, and relay are actuated by projections on the cam plate, behind the magnetic clutch, which engage with the spring contacts on the right

An Exclusive "Wireless Magazine" Article

automatically stop and, by means of the special synchronising method employed, they will all start again at exactly the same time. It will therefore be seen that each receiver is sychronised with the transmitter at every revolution.

What the Magnetic Clutch Does

This starting and stopping of the cylinder at the receiving end is brought about by means of the relay unit and a special catch-stop on the reproducing-cylinder axle itself. In the Fultograph machine things are so arranged that the motor runs continuously when the brake shown in Fig. 3 is pulled up. But between the vertical drive from the motor (inside the cabinet) to the cylinder on which the prepared paper is fixed is a magnetic clutch, which allows the motor to go on running all the time and only takes up the drive to the cylinder when the releasing signal is transmitted.

It will be understood, then, that at the end of each revolution the clutch is withdrawn and the cylinder ceases to rotate for a brief period. Then as soon as the release signal is given for the next revolution the drive is taken up again, and so on. The receiver cylinder, therefore, performs one revolution, stops for a moment, performs another revolution, and so on until the whole surface of the paper has been covered by the needle carriage being moved along 1/64 in. each revolution by means of a threaded rod; it takes four minutes to receive each picture.

How the Cylinder Is Stopped

Fig. 5 shows a plain view of the magnetic clutch and catch-stop, which are normally protected by a metal cover. It will be seen from this illustration that the magnetic clutch is placed between the threaded rod which drives the cylinder and a cam plate attached to it, which is provided with a slot into which a stop on the end of an armature fits once every revolution.

At the same time that the stop engages in the slot so is the magnetic clutch withdrawn, thus allowing the motor

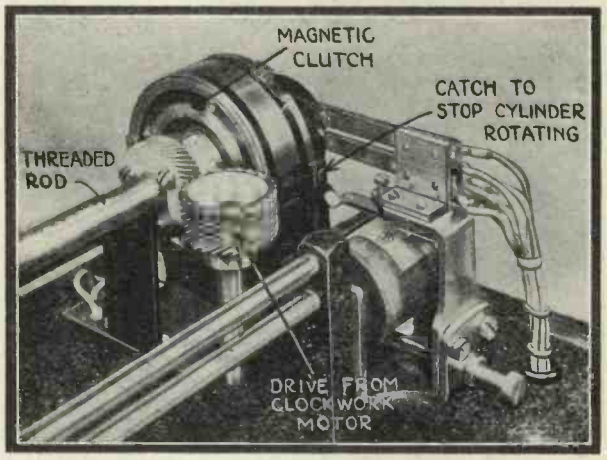


Fig. 7.—On the right can be seen the armature with its catch-stop and the winding which actuates it. The threaded rod drives the cylinder and, at the same time, moves the needle carriage over the paper 1/64 in. at a time

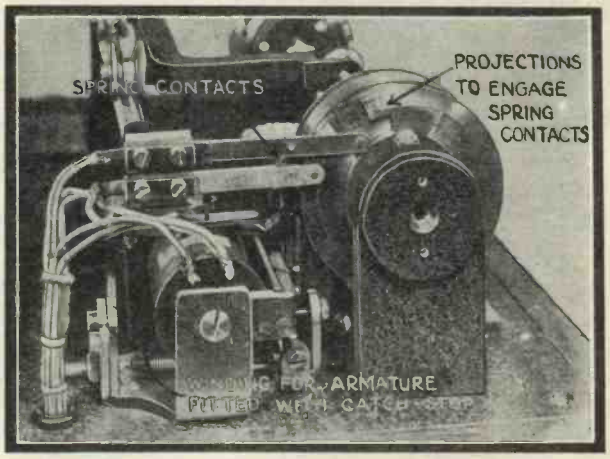


Fig. 8.—This photograph clearly shows the projections on the cam plate for actuating the spring contacts which control the catch-stop and magnetic clutch for stopping and starting the cylinder. This mechanism is protected by a metal cover

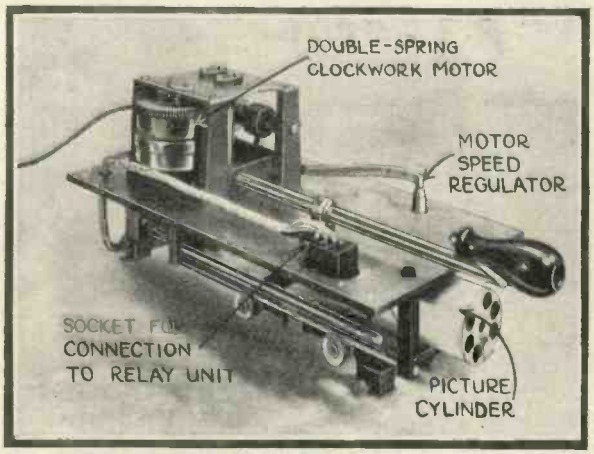


Fig. 9.—Here is the picture receiver removed from its case. The double-spring motor must be wound up for the reception of each picture, which takes four minutes to come through

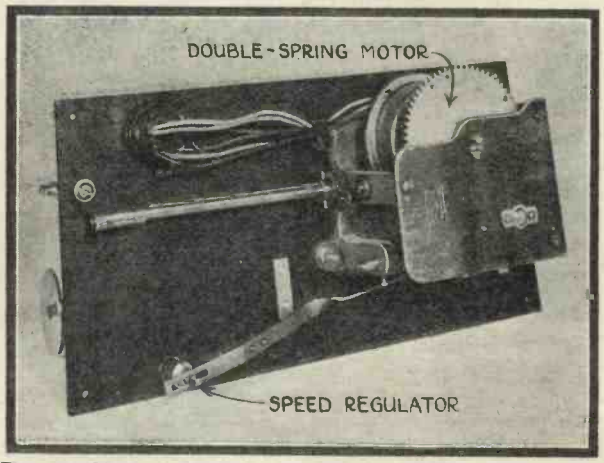


Fig. 10.—Here is another view of the double-spring motor, which is of the gramophone type. It is necessary to adjust the speed regulator so that the cylinder synchronises properly at each revolution

How to Receive Wireless Pictures *(Continued)*

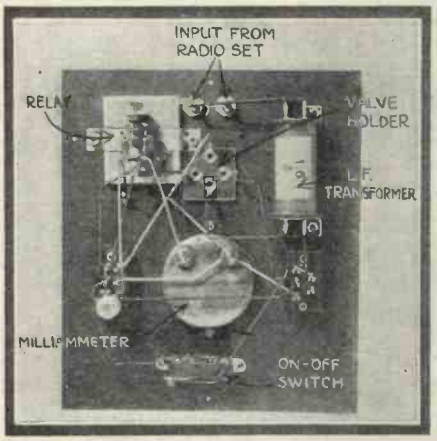


Fig. 11.—Underneath view of the relay unit, showing the arrangement of the various parts. The relay is short-circuited while the actual picture signals are being received and comes into use to release the catch-stop at the beginning of each revolution of the receiving cylinder

to go on running. When the next release signal is sent out the catch-stop is withdrawn and the clutch takes up the drive again for another revolution.

Machine Details

Fig. 6 shows clearly the slip rings on the clutch with their spring contacts; these are inter-connected with the contacts on the right, which are actuated by the projections on the cam plate. Fig. 7 shows this portion of the receiver from the other side. Note here particularly the catch-stop just above the bobbin and the slot on the cam plate which can be seen just under the words "Magnetic Clutch." The projections on the cam plate which actuate the spring contacts are clearly shown in Fig. 8.

The drive is obtained from a double-spring clockwork motor of the gramophone type, which is arranged as shown in Figs. 9 and 10.

How to Work the Receiver

Fig. 11 shows an underneath view of the relay unit, as also does Fig. 12. It is not proposed in this article to go any further into the details of the arrangement, but to explain the actual operation of the receiver.

The detector valve used in the relay unit is of the Mullard PM4DX type and is provided with about 90 volts high-tension and 12½ volts negative bias, so adjusted that the milliameter normally gives a zero reading.

Before doing anything else, it is necessary to prepare the paper on which the picture is to be reproduced and fix it to the receiving cylinder. Special paper will be supplied with the machine, as also will a suitable chemical solution consisting of potassium iodide and starch in certain proportions. The paper is dipped in the solution and dried until it is only just damp between sheets of ordinary blotting paper.

The clip on the cylinder is lifted and the paper carefully stretched round so that it lies quite flat. The catch is then clamped in position again. While this is being done, of course, the needle carriage is lifted up (Fig. 3).

See that the brake catch on the metal cover is down and wind up the motor. When the B.B.C. announcer says that pictures are about to be transmitted a change-over is made from the loud-speaker to the input terminals on the relay unit. When first using the picture receiver it is advisable also to have in circuit a pair of phones, or a loud-speaker if the signals are strong enough to allow of this. A kind of tuning note will then be heard; this is a signal for putting over the switch on the relay unit. The milliammeter will then show a reading and the tuning of the broadcast set must be so adjusted that the milliammeter reads between 2.5 and 3.5 milliamperes. These points are marked on the milliammeter scale by red lines.

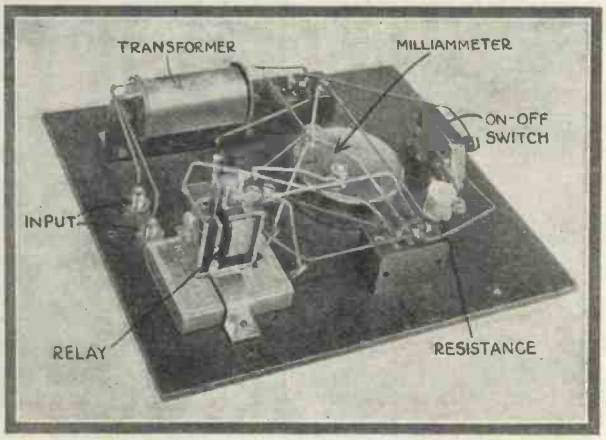


Fig. 12.—Another view of the relay unit. The transformer has a step-up ratio of 1 to 6 and is connected across the input terminals. The valve is adjusted to give a zero milliammeter reading before a connection is made to the input terminals

Starting the Picture Receiver

At the end of the tuning note a series of three V's (. . . —) are transmitted in morse. As soon as these signals cease, carefully place the needle point at the right-hand end of the cylinder, that is, the end remote from the magnetic clutch, and pull up the brake stop which controls the driving motor.

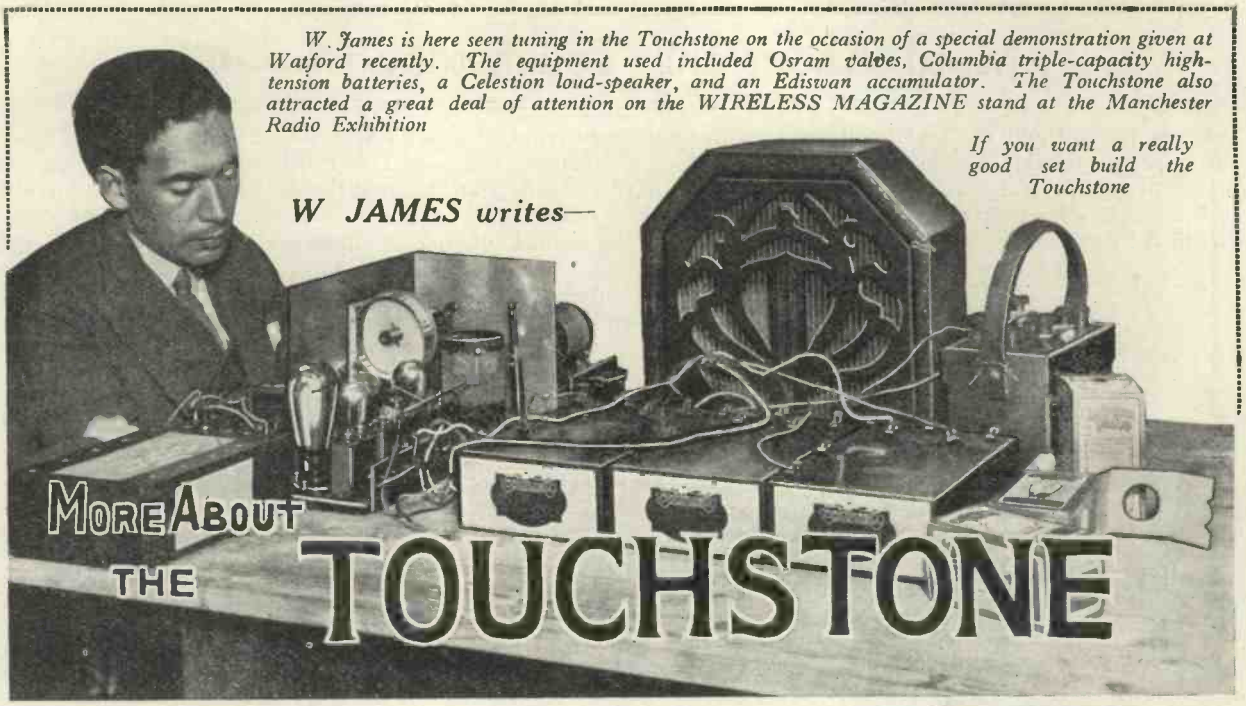
The cylinder will then start alternately rotating and stopping as already described. The period of stopping should be very brief indeed. If the cylinder stops too long the speed of the motor should be decreased by means of the ordinary speed regulator. If, on the other hand, the cylinder runs continuously without any appreciable stop the speed should be increased.

Coinciding with each stop of the cylinder the milliammeter needle, which is reading zero during rotation, will jump to the setting previously made.

Preparing More Paper

As soon as the picture is complete switch off the relay unit, lift the needle point from the cylinder and drop down the break stop to prevent the motor spring from running right out. While the first picture is being received a piece of paper should be prepared all ready for the second picture and this should be placed in position again as previously described.

[Next month a further article will explain the actual relationship between the various working parts, together with circuit diagrams.]



W. James is here seen tuning in the Touchstone on the occasion of a special demonstration given at Watford recently. The equipment used included Osram valves, Columbia triple-capacity high-tension batteries, a Celestion loud-speaker, and an Ediswan accumulator. The Touchstone also attracted a great deal of attention on the WIRELESS MAGAZINE stand at the Manchester Radio Exhibition

If you want a really good set build the Touchstone

W. JAMES writes—

MORE ABOUT THE TOUCHSTONE

ONE of the secrets of the success of the Touchstone is the effective high-frequency amplifying stage. This really comprises two separate parts. The first is the aerial-grid high-frequency transformer which is connected to the aerial circuit and to the grid and filament of the first valve of the receiver. The second part is the intervalve high-frequency transformer, and this is joined to the anode of the H.F. valve and to the grid and filament of the detector valve.

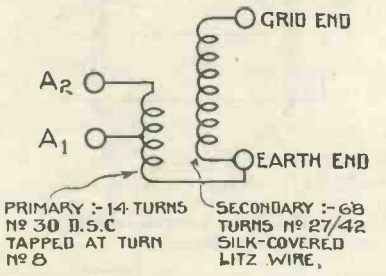


Fig. 1.—Showing variation of selectivity by tapping on the aerial-grid coil

These transformers were designed to provide great magnification and adequate selectivity, because it is the stage, as a whole, which is used to select the desired signals and to magnify them before they are detected.

The problem of how best to build the coils was rather more difficult than discovering what was necessary. It is evident from theoretical considerations that the secondary windings of the two transformers, which have the tuning condensers connected to them, must be of low resistance.

Correct Number of Turns

Given two low-resistance coils which will tune over the desired wavelength range, it is a fairly easy matter to determine the correct number of turns for the primary windings, provided the electrical values of the parts associated with them are known.

Let us take the case of the aerial-grid transformer first. This transformer has the aerial and earth connected to its primary winding, and the object is to so proportion the two windings that the biggest voltages will be developed across the ends of the secondary.

At the same time, selectivity must be considered, and therefore a tapped primary winding is provided. When a long outdoor aerial is used the best all-round results will probably be obtained when the aerial is connected to terminal A1 (see Fig. 1).

Step-up of Voltage

Between terminal A1 and earth there are eight turns of No. 30 d.s.c. wire, whilst the secondary has sixty-eight turns of high-frequency cable.

A considerable step-up in the voltage is therefore obtained in this transformer.

When a small aerial is employed it should be connected to terminal A2. The full primary winding of fourteen turns is then included in the aerial-earth circuit.

Even with a small aerial better results are often obtained when it is connected to terminal A1, particularly when tuning below 350 metres. Full advantage should be taken of the two aerial terminals, as they provide alternative degrees of selectivity and signal strength.

In the article which appeared last month the use of a third aerial connection was described. This comprised an ordinary terminal fastened to the cabinet just above the terminal marked A1. A piece of copper foil about 2 in. in diameter is held in position against the inner surface of the cabinet by the nuts on the terminal. It is not wired to the receiver, but there is sufficient capacity

Full constructional details and illustrations of the Touchstone will be found on pages 295 to 301 of the November issue of "Wireless Magazine." This is the first set designed for us by W. James, and is a four-valver, comprising H.F., detector, and two L.F. stages.

Back copies can be obtained from these offices at 1s. 3d., post free.

More About the Touchstone (Continued)

between the foil and the aerial coil in order to provide ample signal strength from several stations, and, of course, the selectivity of the aerial circuit is improved.

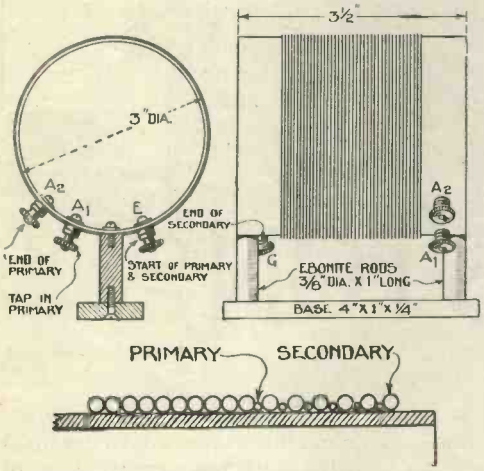


Fig. 2.—Details of aerial-grid transformer used in the Touchstone

In order that the aerial-grid transformer may provide a maximum of amplification and selectivity, it is necessary not only to employ a low-resistance secondary winding, but also to connect it in such a way that its working resistance is not effectually increased.

There are really three points to be considered. The first of these concerns the ratio of the inductance to the capacity. You will notice the tuning condenser used has a maximum value of .0003 microfarad, whilst in many circuits a maximum value of .0005 microfarad is employed.

Stronger Signals

This is because with a .0003-microfarad tuning condenser a larger coil has to be used in order to cover the necessary wavelength band, and with the larger coil stronger signals are obtained. Further, owing to the manner in which the high-frequency resistance of a tuned circuit varies over its tuning range, there is a great advantage in using the smaller value of tuning condenser.

Everything depends upon the design of the coils, and this statement does not necessarily apply to all circuits, because the size of the wire and the diameter and length of the coils are important factors. But my experiments have shown conclusively that the best results are to be obtained when the values of the parts are as described.

The secondary winding of the aerial-grid transformer actually has sixty-eight turns of No. 27/42 silk-covered Litzendraht wire, wound on a paxolin former 3 in. in diameter and 3½ in. long.

Paxolin was used because this material has very small losses at high frequency. Certain brands of ebonite tubes and mouldings have measurable losses, and are therefore unsuitable for the construction of a highly efficient coil.

The primary winding is wound at the earthed end of the secondary and comprises fourteen turns of No. 30 d.s.c., with a tap at the eighth turn from the earth end. This winding is inter-wound with the secondary, as illustrated (see Fig. 2).

Having constructed such an effective high-frequency aerial-grid transformer, it would be a pity partially to destroy its effectiveness by using it improperly.

Positions of Terminals

You will notice the grid terminal on the coil is at one end of the tube, whilst the earth terminal is at the opposite end with the two aerial terminals.

Valve damping is avoided by providing the high-frequency amplifying valve with a negative bias. This is obtained from the fall in voltage across a filament rheostat which is employed as the volume control. This resistance is connected in the negative side of the filament circuit, and as it is varied the amount of the grid bias is changed. When receiving a strong signal the volume control is adjusted to cut down the strength, and this automatically increases the grid bias when it is most required.

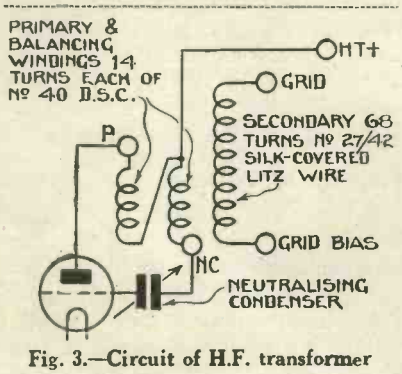


Fig. 3.—Circuit of H.F. transformer

Distinct Advantages

The filament-resistance type of volume control as used in the Touchstone, therefore, offers distinct advantages, and the method is to be preferred to a filament resistance

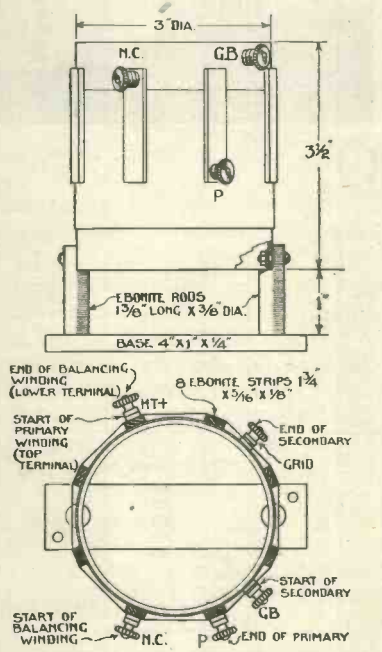


Fig. 4.—Details of intervalve H.F. transformer

joined in the positive side with a separate single dry cell to provide a definite grid bias of negative 1.5 volts.

It will be noticed that the aerial-grid coil is fitted some little distance away from the metal screen in order that its effective resistance shall not be increased. This screen is employed to avoid a capacity coupling between the two high-frequency transformers and the two tuning condensers. It is not intended to provide magnetic shielding.

The design of the intervalve high-frequency transformer is, if anything, rather more important than that of the aerial-grid transformer.

A Special Article by the Designer—W. James

Naturally, the same type of secondary winding is used in both parts, but the high-frequency intervalve transformer has to magnify and also be provided with means for stabilising the circuit. It therefore includes a primary winding and a balancing winding connected as shown in the diagrams, Figs. 3 and 4.

Proportioning the Windings

Given a low-resistance secondary winding, the problem is to fit a primary and balancing windings which will give the desired selectivity, magnification, and stability.

COPIES OF THE NOVEMBER ISSUE —IN WHICH THE TOUCHSTONE WAS ORIGINALLY DESCRIBED– CAN CAN BE OBTAINED FOR 1/3 EACH, POST FREE

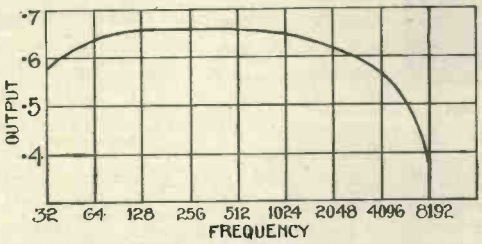


Fig. 6.—Amplification-frequency curve of Touchstone R.C. stage

Let us for a moment ignore the balancing circuit and confine our attention to the primary and secondary windings. We have a secondary winding of known resistance. At 400 metres the dynamic resistance of the circuit comprising the secondary coil and its tuning condenser is 350,000 ohms. This was determined by measuring the resistance of the tuned circuit at 400 metres and the inductance of the coil, and then putting the values in a simple formula which, when worked out, gives the dynamic resistance.

Good Modern Valves

Knowing this, it is an easy matter to determine the correct size of a primary winding to suit various valves. A list is therefore made of the characteristics of modern valves, and the amplification is worked out assuming the theoretically correct primary winding is fitted to each valve. From the results, the combinations which give the most magnification are assembled and measured in the receiver, and it is found that the highest magnification for equal selectivity is obtained from a valve in the moderate-impedance class having a mutual conductance of at least unity.

A further advantage of valves of this type is that they take much less high-tension current than a valve of the low-impedance type, and it so happens that the most economical arrangement is also the most satisfactory.

The particular transformer described last month is suitable for an amplifying valve having an impedance of 20,000 ohms or more. If a valve of lower impedance is used the tuning will be *broader* and *magnification will suffer.*

It is most important that the reader should understand that the high-frequency intervalve transformer was designed for valves having an impedance of between 20,000 and 30,000 ohms, and for the best results a valve of this type must be used.

A reader who has a valve of lower impedance and wishes to use it should remove three or four turns from the primary *and* balancing windings. This will improve magnification and selectivity, but the best results will only be obtained when a valve of the type recommended is employed.

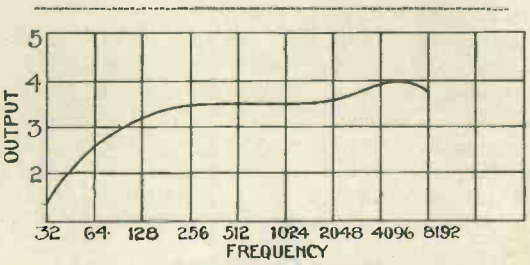


Fig. 7.—Amplification-frequency curve of Touchstone transformer stage

From the illustrations it will be seen that the primary winding is wound at one end of the secondary. It is wound on eight ebonite spacers, threaded thirty turns per inch, each of which is about 1⅜ in long.

A convenient way of making them is to thread a piece of ebonite tubing 3 in. in diameter and afterwards to cut strips. One strip is fitted with two small nuts and bolts, and two other strips have one nut and bolt each. The heads of the bolts must not project over the surface of the spacers, and should therefore be well counter-sunk.

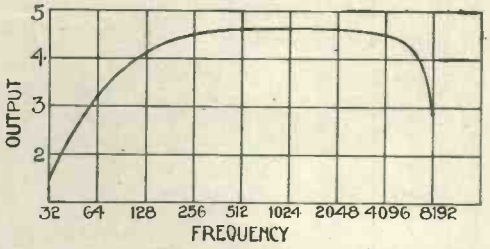


Fig. 5.—Amplification-frequency curve of the Touchstone

Size of Primary Winding

The primary winding is wound at the earthed end of the secondary and in the same direction as the secondary coil; it has fourteen turns of No. 40 d.s.c. wire and they are spaced 15 per inch.

Fine wire is used for the primary and balancing windings in order that a tight magnetic coupling may be obtained with a minimum of capacity between the windings. If a thicker wire is used the capacity is increased, and this has the effect of reducing the amplification and spoiling the selectivity.

The illustrations show the balancing winding to be inter-wound with the primary. As there are thirty threads per inch and the primary is wound 15 per inch, there is a slot between adjacent primary turns. When the balancing winding is started, the wire is laid in the slot between adjacent turns of the primary, and the finished winding is therefore tightly coupled to the primary.

The three windings are all in the same direction, but there is a special

(*Continued on page* 508)

Wireless Magazine. December 1928

John Logie Baird

THE STORY OF HIS TELEVISION SUCCESS

Jack Buchanan, the well-known actor, taking part in a daylight television test

JOHN LOGIE BAIRD, the television inventor, who has advanced from obscurity to world fame in two years, and whose recent demonstrations of daylight television, colour television, stereoscopic television, and the transmission of sight across the Atlantic are well remembered, is a 39-year-old Scotsman and the son of a Presbyterian minister.

Power to Hear and See

Thus Scotland in recent years has given us the power both to hear and to see over great distances—through Bell, the inventor of the telephone, and Baird, the inventor of television.

Baird was born near Glasgow and studied at that university. Right from boyhood his one hobby had been scientific research. It was while experimenting with selenium cells before the war in an effort to perfect a talking film that he first realised the possibilities of television, on which many experimenters had worked since the discovery of the light-sensitive properties of selenium in 1873.

His television experiments may be said to have dated from early in 1912, but when failing health compelled him to give up business he decided in 1922 to devote his whole time to a serious effort to master the problem of vision at a distance.

The *theory* of the subject did not appear to present any undue difficulty to him at that time. The problems on the synchronism side of the matter were partly solved in multiplex telegraphy. Numerous optical exploring devices were known, and the photo-electric cell and glow-discharge lamp appeared suitable as a light-sensitive device and light source. He quickly found the immense difference that existed between theory and practice.

Right from the first Baird's funds were very limited, his apparatus was home-made and he was obliged to reduce the problem to its simplest form. He worked in his attic laboratory in Soho, London, unaided either technically or financially and constantly hampered by ill-health.

Adverse Conditions

Considering the magnitude of the task he had set himself and the adverse conditions under which he worked no one but a genius could even hope for success. Time proved that Baird *was* a genius.

He first decided to approach the subject on the lines of "shadow transmission," believing that to be the first step in the right direction. In less than a year he had succeeded to the extent of transmitting coarse shadows, and he gave a demonstration of this at Hastings in 1923. I have a letter from the late William Le Queux in which he mentions that he was among those who witnessed this. At this time, however, three other workers, representing America, Austria and France, had achieved the same success.

True Television

Then Baird realised the great difference between shadow transmission and true television, for at this stage he experienced a most disheartening period of nearly a year without advancing a step, and always he was dogged with illness and lack of funds. Television is, of course, closely connected with optics, mechanics, physics, chemistry, and cinematography, and Baird frequently ran against unfamiliar problems connected with these, and had to study technical works in the public libraries before he could proceed.

Eventually, however, he left his international rivals behind by discarding the shadow-transmission system and getting ahead on new lines altogether. This was possible by improving the light-sensitive device, which was the main stumbling block throughout all his experiments.

Public Demonstration

By the end of 1924 he had advanced to the stage of sending outlines of simple objects in black and white, having taken the step from shadows to reflected light. In April, 1925, he gave a public demonstration with his apparatus and transmitted outlines by wireless between two separate machines in a well-known Oxford Street store, and the original machine he used can now be seen in the Science Museum, South Kensington, London.

Optical and mechanical improvements in this apparatus enabled him to achieve clearer outlines, but television in the true sense of the word was still a long way off, for it implied the transmission of all gradations of light and shade. For months he worked to improve the apparatus, but still the human face appeared as a vivid white oval, broken

by a black spot if the mouth were opened.

The hitch was essentially an electrical one, for the trouble lay in the light-sensitive cell, and Baird spared no pains in his efforts to improve matters. In the course of experiments he even tried a cell made with the visual purple out of a *human eye* supplied by a surgeon.

Whatever may be said about J. L. Baird's latest television achievements (on which we expressed our opinion in these pages last month), there can be no question regarding the effort and courage he has shown in his struggles to produce a workable system. We are sure that all "W.M." readers will be interested in this story of his early work told by *R. F. TILTMAN*

Then came the success this struggling young inventor so richly deserved.

Baird's "Only Real Thrill"

One Friday, near the end of October, 1925, Baird experienced what he described to me as "the only real thrill" which research work had brought him. On starting up his apparatus, after fitting the latest of his light-sensitive systems, instead of the usual black-and-white image there appeared on the receiving screen the true image of a face with half-tones and detail. His light-sensitive device, which to this day is a close secret, had proved to be the key to the fifty-year old problem, and television was achieved!

The first image seen by true television was of "Bill," a ventriloquist's doll Baird had used throughout his tests. The first human features to be "televised" were those of R. Taynton, an office boy hastily borrowed from an office downstairs and bribed with half a crown to sit before the apparatus.

Royal Institution

Baird's first public demonstration —and the *first* demonstration of true television to be given in the world— was before members of the Royal Institution who accepted his invitation. Owing to restrictions of laboratory space the visitors witnessed the tests from one room to the next in batches of half a dozen.

Immediately definite proof was forthcoming that television was an accomplished fact there was no difficulty in obtaining financial assistance and moving to larger premises. During 1926 many demonstrations were arranged for Press representatives and others, both in the building and also from London to Harrow. Results were, naturally, very crude and imperfect, but the vital principle was there. The British and American technical and daily Press acknowleged Mr. Baird's claims in very definite terms.

Since that date many improvements have been effected, and the lighting necessary has been reduced from an uncomfortable blaze to normal studio lighting. Experimental transmissions have taken place nightly from the inventor's two licensed stations.

The outstanding feature of 1927 was Baird's demonstration of television over the 438 miles separating London and Glasgow. One of those who witnessed this was Professor E. Taylor Jones, of Glasgow University, who afterwards wrote in *Nature*: "The image was perfectly steady in position, was remarkably free from distortion, and showed no sign of the 'streakiness' which was, I believe, in evidence in the earlier experiments. . . . The image was sufficiently bright to be seen vividly even when the electric light in the room was switched on, and I understand that there was no difficulty in enlarging the image to full size. . . . The amount of light and shade shown in the image was amply sufficient to secure recognisability of the person being televised, and movements of the face or features were clearly seen. . . . My impression after witnessing the demonstration is that the chief difficulties connected with television have been overcome by Mr. Baird, and that the improvements still to be effected are mainly matters of detail . . ."

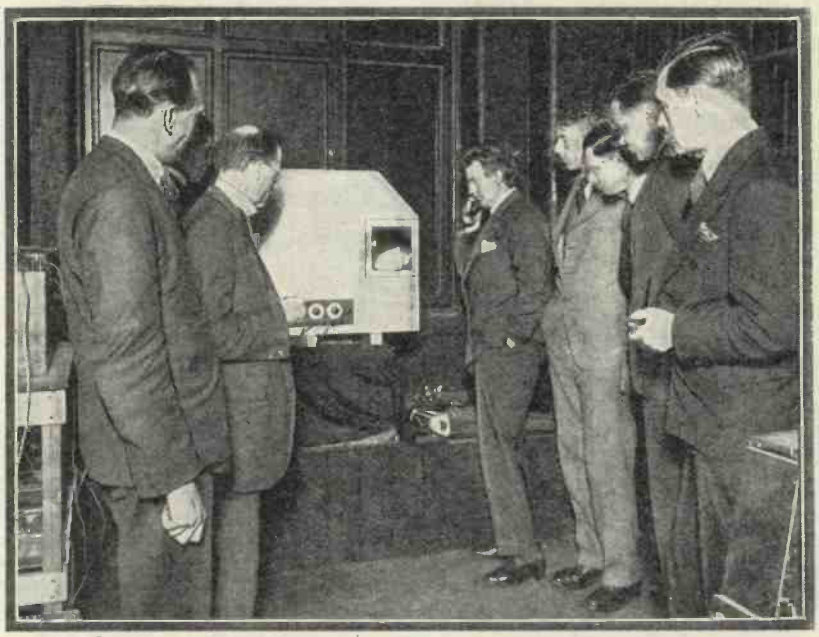
Atlantic Spanned

The year 1928 has been marked by many definite television advances. The Atlantic was spanned by wireless sight, then television was achieved between London and the *Berengaria* in mid-Atlantic.

In recent demonstrations I have seen very clear head and shoulder images of people with all facial expressions and movements, both in monochrome and in striking colours, and the latest development of all stereoscopic television shows images in three dimensions—length, breadth and thickness.

Surely the story of this young inventor's single-handed struggles whereby he was able to achieve true television ahead of the research departments of wealthy foreign organisations forms one of the most romantic pages of modern scientific history?

Our own impressions of J. L. Baird's latest achievements were published on page 305 of the previous issue



Demonstrating a daylight television receiver. J. L. Baird is seen at the right of the machine, with a telephone in one hand

J. H. Reyner's FURZEHILL FOUR

Here you see J. H. Reyner at work on the set in the Furzehill Laboratories at Elstree

This set can be built for approximately ten guineas (inclusive of coils and cabinet, but exclusive of valves)

In this article J. H. REYNER, B.Sc., A.M.I.E.E., describes the construction of a new one-dial all-wave set comprising screened-grid high-frequency amplifier, anode-bend detector and two stages of transformer-coupled low-frequency amplification

I HAVE already described the principle adopted in matched-reactance ganging. This system represents perfection in gang control, in that it is possible to arrange for the circuits to be tuned over the whole scale without any falling out of step. The tests which were made during the experiments indicated that no better results could be obtained, even if the circuits were individually tuned.

A Step Further

The application of this principle to screened-grid valve amplification was obviously but a step further, and on examining the matter, it became evident that a receiver of exceptional promise could be built utilising these ideas. During the early experiments, using split-primary transformers, the ganging on either range was found to be perfect, but owing to a slight difference in the capacity effect in the long- and short-wave positions a minor readjustment of the balancing condenser had to be made when changing from one wave to the other.

The present receiver, utilising a simple tuned-anode circuit with the screened-grid valve, overcomes this difficulty, and it is actually possible to arrange that the receiver remains balanced from 250 to 2,000 metres.

This is a remarkable feature and one which gives considerable pleasure in handling. The set is truly a one-control instrument, the only auxiliary controls being a volume control on the high-frequency valve for reducing the strength of near-by stations to a value which does not overload the amplifier, and a reaction control which is utilised to increase the sensitivity of the receiver slightly when receiving distant stations.

This latter control, on the long waves, is almost constant and need not be readjusted in going from one end of the scale to the other. Four or five stations can be selected at will by a mere rotation of the tuning control without any further adjustment, unless any of them happens to be so strong that the volume control has to be brought into commission. On the short waves there is a larger discrepancy and it will be found that a movement of about 90 degrees is necessary in going from the bottom to the top of the scale.

The only other controls on the panel at all are the wave-changing switch, which is the small knob on the left, at the bottom of the baseboard, and the push-pull switch, which is in a corresponding position on the right. Combined with this simplicity of operation we have an ease of manipulation, an open and straightforward layout which facilitates rapid construction and, finally, and most important, a low cost—the whole of the components listing at approximately ten guineas.

TEST REPORT OF THE FURZEHILL FOUR

Station	LONG WAVES Wavelength	Dial Reading
Huizen	1,875	92
Radio Paris	1,765	86
Kharklov	1,675	80
Daventry	1,565	72.5
Motala	1,360	58
Zeesen	1,250	49
Warsaw	1,110	39
Hilversum	1,070	35
SHORT WAVES		
Vienna	517.5	97
Brussels	508.5	95
5GB	491.8	91.5
Langenberg	471.6	87.5
Oslo	461.5	85.5
Rome	449	83
Brunn	441.5	81
Frederiksstad	435.5	79
Frankfurt	429	78
Here four badly heterodyned stations.		

Station	SHORT WAVES—*contd.* Wavelength	Dial Reading
Glasgow	405.4	73
Cork	401	71
Toulouse	389	69
Stuttgart	380	66.5
London	361.4	62
Barcelona	345	58
Copenhagen	337	55
Gleiwitz	330	53
Bournemouth	326.1	52
Breslau	322.2	50.5
Dublin	319.1	49.5
Königsberg	304	46
Hanover	298	43.5
(Relay Band)	294.1	42
Cologne	283	39.5
Bremen	273	36
Kosice	263	33
Kiel	255	30
Münster	250	28
Toulouse	245.5	26.5
Bordeaux	237	24

All the above were obtained at full loud-speaker strength. The set was not re-balanced at any part of the scale nor was the adjustment touched in changing over to long waves.

Novelties in the Circuit

The circuit is of straightforward nature, but contains one or two novelties. The high-frequency valve

is tuned-anode coupled; while, with the use of special coils, this is not the best arrangement, greater selectivity and improved signal being obtainable with a transformer coupling, the characteristics of the present coils are such that it works very satisfactorily as a simple tuned-anode circuit.

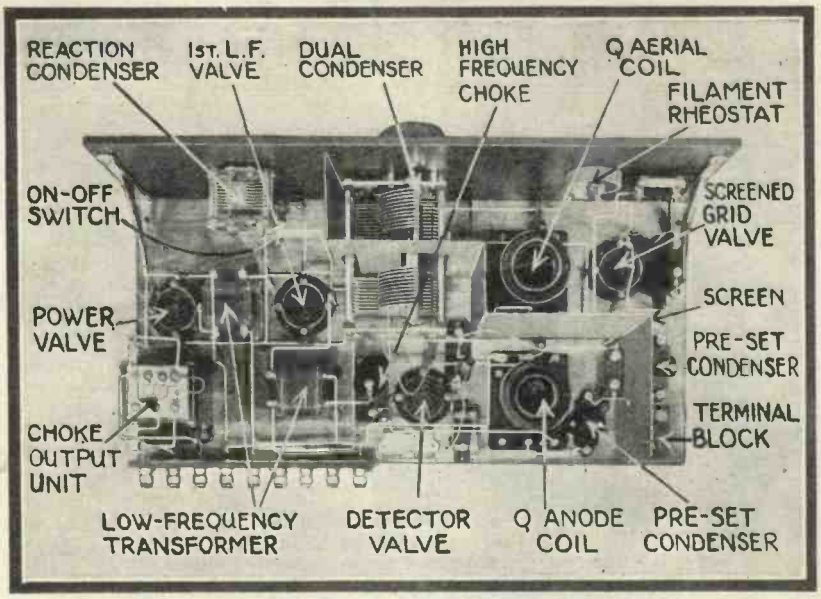
Astatic Properties

One of the difficulties with the use of the full coil in this manner is that of obtaining adequate stability, but this is overcome in the case of the Colvern dual-range coils owing to their astatic properties. This, combined with the use of a simple screen underneath and in between the coils, gives perfect stability, even if the anode voltage is increased to 150 volts.

The simple screen will be seen from the photographs to be extended to pass in between the two portions of the dual condenser and finally to come round to the panel, so screening the reaction condenser from the H.F. condenser. The use of a dual condenser is the particular feature of the matched-reactance ganging which is sufficiently accurate to enable the usual individual adjustment to be dispensed with. This represents a saving in cost of over a pound.

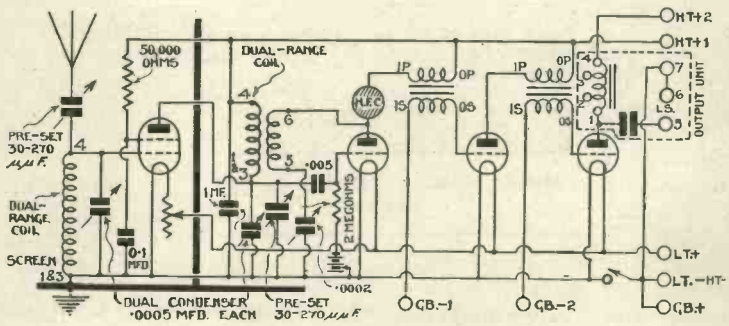
Quality Essential

It may be pointed out in this connection, however, that it is essential that a thoroughly reliable condenser should be used in this position. The correctness of the ganging depends essentially upon the fact that the capacity of both halves of the dual condenser shall be the same all the way round the dial.

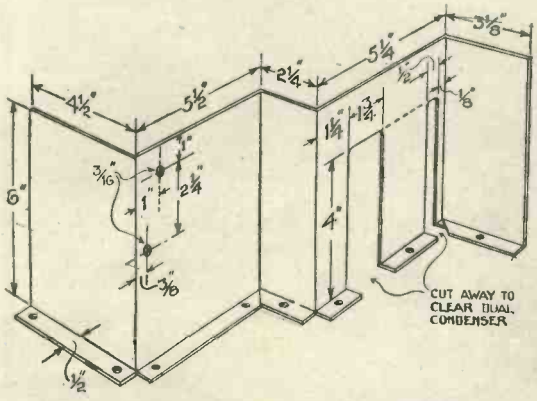


This plan view of the Furzehill Four clearly shows the layout of all the parts

At the present moment I have only tested the receiver with the actual condenser specified and results cannot be guaranteed with other makes. I am arranging, however, to try other makes of condenser in this circuit, and a list of condensers which have been so tried and found satisfactory will be given in the next issue.



This is the circuit of the Furzehill Four



Details of the screen used in the Furzehill Four

Across both halves of the dual condenser are connected small balancing condensers. In the aerial circuit this balancing condenser is connected in series with the aerial capacity, the aerial and earth being connected directly across grid and filament of the first valve. Variations of the pre-set condenser thus vary the total capacity and produce an equivalent effect to the alteration of the balancing condenser across the H.F. circuit.

Circuits in Tune

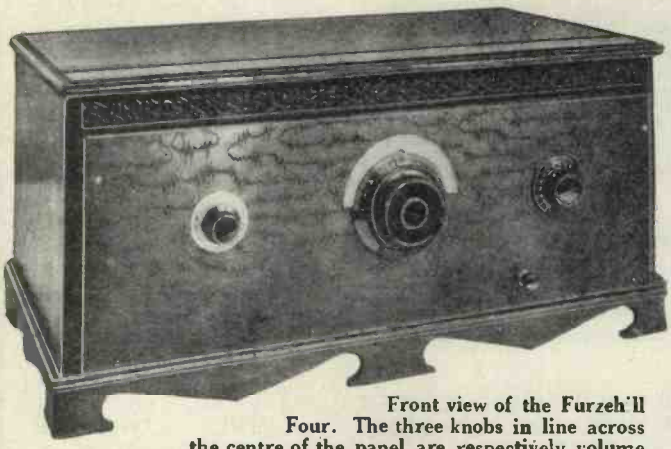
It is a matter of extreme simplicity to adjust the two pre-set condensers so that the circuits are accurately in tune, after which no further alteration is needed. As the spindle of the condenser is connected to L.T.−, whereas the H.F. coil is connected to H.T.+, a 1-microfarad condenser has been incorporated across from the H.T.+ point to L.T.− in the set itself. This gives perfectly satisfactory results.

In order to obtain increased selectivity and a better quality with freedom from overloading on the strong signals, anode-bend rectification has been employed. This removes the detector damping from the second tuned circuit and materially sharpens the tuning.

Use of L.F. Transformer

It is customary to follow an anode-bend detector with a resistance-coupled stage, but this has not been done in the present instance for a variety of reasons. In the first place, the use of a transformer following the detector assists the high-frequency choke in keeping H.F. currents out of the L.F. stages.

J. H. Reyner's Furzehill Four (Continued)

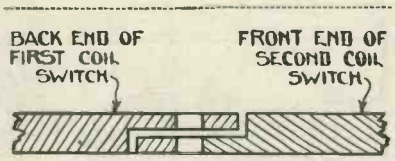


Front view of the Furzehill Four. The three knobs in line across the centre of the panel are respectively volume control, main tuning condenser, and reaction control. Below are the wave-change and on-off switch knobs

A second and more important point was that the reaction demand was much more uniform with a transformer following the detector than with a resistance-coupled stage. This is an important point in a single-control receiver, for the reaction demand should obviously be as uniform as possible.

Valves to Use

A low-ratio transformer has been employed, having a step-up of only 2-1. This has a relatively high-impedance primary and should be used following a valve which has a medium effective impedance. It must be remembered that the actual impedance of an anode-bend detector is three to five times greater than normal, owing to the negative grid bias. Best results are actually obtained by using one of the new detector series of valves marketed by the Mullard Company. These valves are known as the PM2D, 4DX, or 6D types as the case may be. They have an exceptionally high mutual conductance as a result of which they behave, even when used as anode bend rectifiers, as ordinary H.F. valves.



Method of coupling dual-range coils together

Increased Filament Consumption

The internal resistance rises to approximately the same value and the amplification factor remains sufficiently high to give good signal strength. This performance is obtained at a slight expense of filament current, but in these days filament consumption does not trouble us very much.

Other Suitable Valves

Those readers who do not wish to buy a special detector valve, although this is strongly to be recommend d, can use an ordinary H.F. or L.F. valve. Any valve having an impedance between 15,000 and 25,000 ohms will be satisfactory.

The second L.F. stage is also transformer-coupled, two B.T.H. transformers being utilised in this connection. The 2-to-1 and 4-to-1 combination I have always found a very happy one, and in the present instance, coupled with the use of a choke-output circuit to avoid all battery feedback, the circuit gives pleasing quality and large amplification.

How High-tension Connections are Made

The H.F., detector and first L.F. valves have all been connected to one H.T. tap, to which up to 120 volts should be applied. The use of the full voltage on the detector is quite satisfactory owing to the anode-bend rectification adopted, and the higher the voltage, the greater can be the grid bias in order to produce satisfactory working. The last valve has been connected to a separate H.T. tap for the benefit of those who wish to use 150 volts on the last valve.

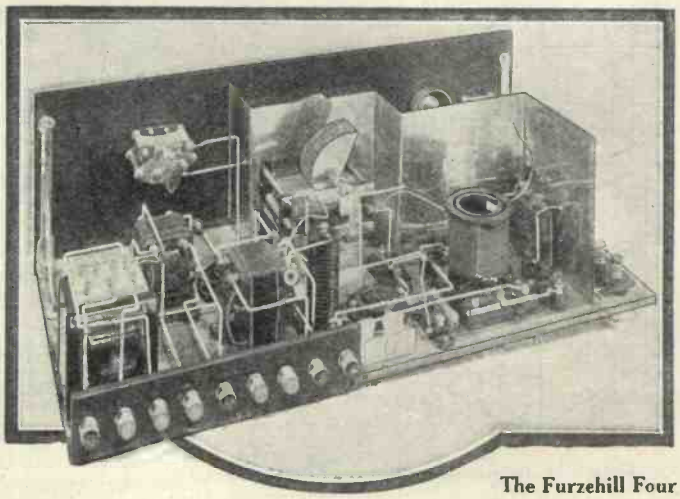
It is not desirable to place this voltage on the earlier valves, as the results are not so good although, as previously mentioned, the receiver is quite stable. If only 120 volts is available the two H.T. tappings should be connected together and both taken to a common H.T.

No Difficulty in Actual Construction

The construction of the receiver is not difficult. It is first of all necessary to cut out a sheet of copper foil and to mount this on the baseboard underneath the coils in the position shown. The various components can then be mounted in their respective places. It will be noticed that the screen has not been made to extend underneath the H.F. valve holder as this is a fruitful source of short-circuiting.

Arranging the Panel Components

The next operation is the mounting of the condenser, reaction condenser and on-off switch on the panel. It will also be necessary to drill a hole in the position indicated, to allow for the spindle of the dual-range coil



The Furzehill Four

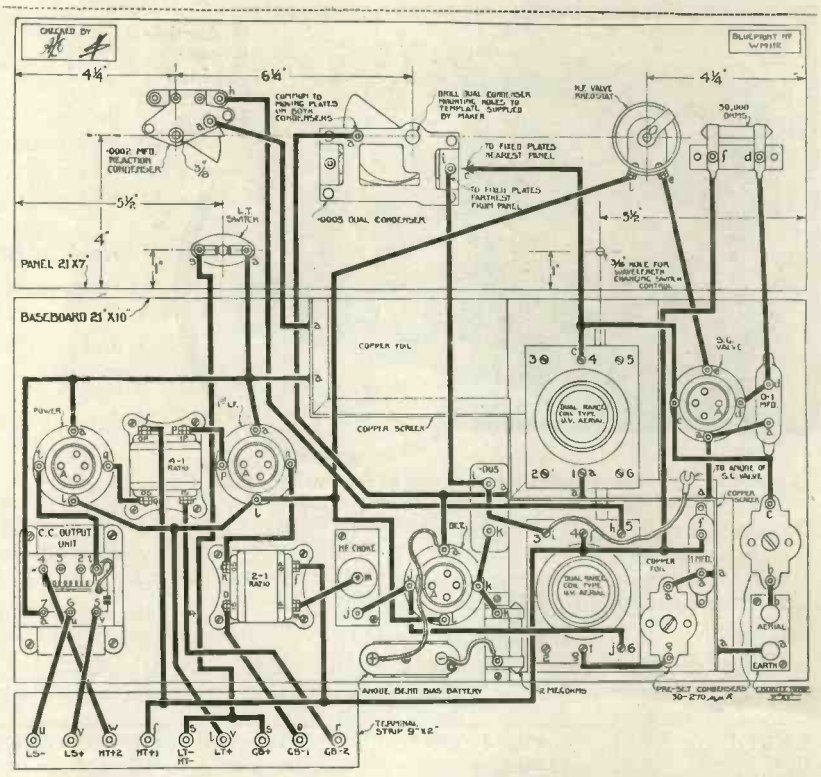
A One-knob Screened-grid Valve Set

switch to project through the panel. The panel may then be mounted in position and the screen inserted in place. This screen is cut away to allow it to fit over the dual condenser, a tongue projecting through the middle to screen off the small capacity between the two sets of fixed plates.

Mounting the Coils

A word may be added in connection with the mounting of the two dual-range coils. It is necessary to make a halved joint between the two switch strips. This may be done as follows: First of all take the two coils and make sure that they are in the correct position, that is, with the switch-spindle on the left. Then take the rear coil and pull the switch forward so that there is a fairly large tongue projecting at the front. File the *top* of the end of this switch strip until it is reduced to about half the thickness for a length of about ½ in.

Now take the front coil and push the switch away from one so that the tongue is projecting at the back. Now turn this coil over and file away the *bottom* portion of the strip for a length of about ½ in. as before.



This layout and wiring diagram can be obtained as a full-size blueprint for half-price (that is, 9d., post free) if the coupon on page iii of the cover is used by December 31. Ask for No. W.M.112

Care Needed

The two strips should now fit together as one and may be locked up by placing the nuts and bolts provided through the hole. A little care should be taken with this operation in order to ensure that it is correctly performed.

The two coils, linked up together, should now be placed in their proper position on the baseboard, and both switches placed in the "pull-out" position. In this position the stop screws will be at the front of the operating slots. The coils may then be screwed down in position and the switch mechanism tried. It should be possible to move both switches as one with an easy motion.

Completing the Assembly

Having done this, the short length of 4 B.A. rod should be taken and pushed through the hole in the front of the panel. It can then be fixed with two nuts to the small brass clip on the end of the switch strip and the knob provided can be screwed on the other end, so enabling the switches to be operated from the front of the panel.

If Tangent coils are used, a similar procedure is adopted for the mounting of the coils, but the switches are coupled together by means of a short threaded collar, provided with the coils.

THIS RECEIVER HAS BEEN SPECIALLY DESIGNED BY J. H. REYNER, B.Sc., A.M.I.E.E. AND REPRESENTS HIS IDEAS FOR A REALLY UP-TO-DATE SINGLE-CONTROL SET. IT WILL BE SEEN THAT THE CIRCUIT COMBINATION COMPRISES ONE SCREENED-GRID HIGH-FREQUENCY AMPLIFIER, A DETECTOR AND TWO STAGES OF TRANSFORMER-COUPLED LOW-FREQUENCY AMPLIFICATION

Beyond this operation no more difficulty will be experienced in the layout at all. The components are merely screwed in their correct positions and there is ample space everywhere. Follow the layout as carefully as possible and when the components have been completely assembled, the wiring may be commenced.

Held in Position by Wiring

Here again everything is straightforward and there are no special arrangements necessary. It may be noted that the small 50,000-ohm resistance utilised to apply the correct potential to the screening grid of the H.F. valve is actually held in its position by the wiring.

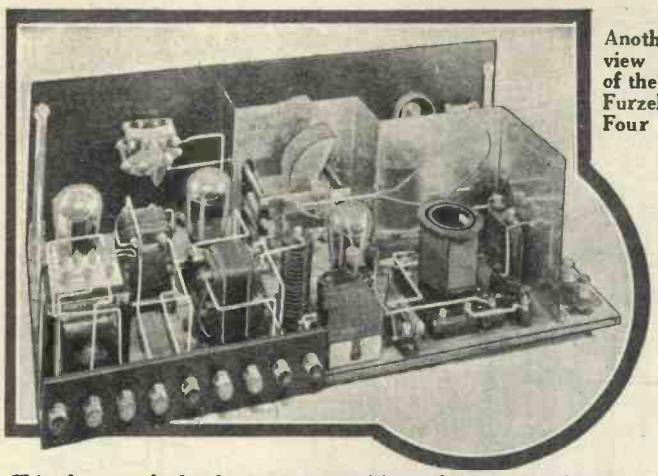
It can, if desired, be screwed to the panel, but this will involve screw heads showing on the front and if stiff wire is used the arrangement adopted in the original receiver will be quite satisfactory.

Blueprint Available

Those who desire one can obtain a full-size blueprint for half-price (that is, 9d., post free) if the coupon on page iii of the cover is used by December 31. Address your inquiry to Blueprint Dept., WIRELESS MAGAZINE, 58/61 Fetter Lane, E.C.4. Ask for No. W.M.112.

In wiring up, first connect together

J. H. Reyner's Furzehill Four *(Continued)*



Another view of the Furzehill Four

This photograph clearly shows the positions of the two low-frequency transformers and choke-capacity output unit

all the points marked *a*; then those marked *b*; and so on throughout the alphabet.

Few Preliminary Adjustments

Having completed the wiring and tested it out, the receiver is ready for use, and the preliminary adjustments are exceptionally few. Insert suitable valves in the holders. They should be as follows:

H.F. valve:—Any 2-, 4-, or 6-volt new type of screened-grid valve.

Detector valve:—Mullard special "D" type of valve or, alternatively, H.F. or L.F. valve.

First L.F. valve:—Medium-impedance L.F. valve.

Last valve:—Super power valve.

Battery Voltages

Connect up to 120 volts to H.T.+1 and 120 to 150 volts to H.T.+2. Bias the L.F. valves correctly according to the instructions given by the makers. Place 1½ to 3 volts negative bias on the separate detector grid-bias battery. The larger the H.T. voltage, the larger this bias should be, but if the value is made too large, it will be found difficult to make the circuit oscillate. In practice, 1½ or 3 volts will be found to give the best results.

COMPONENTS REQUIRED FOR FURZEHILL FOUR

1—Ebonite panel, 21 in. by 7 in. (Ebonart Moire, Becol, or Trolite).
1—.0005-microfarad dual condenser (Cyldon).
1—Slow-motion dial (Burndept, Igranic, or Lotus).
1—.0002-microfarad variable condenser (Cyldon Bébé, Dubilier, or Peto-Scott).
1—30-ohm panel rheostat (Peerless, Lissen, or Igranic).
1—Push-pull on-off switch (Lotus, Lissen, or Bulgin).
4—Antimicrophonic valve holders (Lotus, W.B., or Formo).
2—Q Coils (Colvern or Tangent).
1—.1-microfarad fixed mica condenser (Dubilier, T.C.C., or Mullard).
1—1-microfarad fixed condenser (Dubilier, T.C.C., or Lissen).
2—.00003 to .00025-microfarad semi-fixed condensers (Igranic Preset).
1—.005-microfarad fixed condenser (Dubilier, T.C.C., or Mullard).
2—Grid-leak holders (Dubilier, Lissen, or Mullard).
1—.25-megohm grid leak (Dubilier, Lissen, or Mullard).
1—50,000-ohm resistance (Ediswan).
1—High-frequency choke (Lewcos, Wearite, or Peto-Scott).
2—Low-frequency transformers, one 2 to 1, and one 4 to 1 (B.T.H.).
1—Choke-filter output unit (Igranic).
2—Terminal strips, 9 in. by 2 in. and 2 in. by 1 in. (Ebonart, Becol, or Trolite).
2—Ebonite bushes, ¼ in. long by ¼ in. diam.
11—Terminals, marked:—Aerial, Earth, L.T.+, L.T.−, H.T.+1, H.T.+2, L.S.+, L.S.−, G.B.−1, G.B.−2, G.B.+ (Belling-Lee or Eelex).
1—Battery clip (Bulgin).
Copper screen and copper foil for base (Parex, Ready-Radio, or Omnora).
1—Pair panel brackets (Magnum).
Short length flex.
2—Wander plugs, red and black (Igranic).
1—Spade tag (Clix).
Stiff wire for connecting (Glazite).
1—Cabinet with 10 in. baseboard (Ready Radio).

Now set the tuned-anode pre-set condenser (the one on the right-hand side of the screen at the back) to the nearly "out" position. As the screw is rotated in an anti-clockwise direction, a point will be obtained where the pressure suddenly becomes less, indicating that the condenser is at its minimum position. This is the position which should be used for preliminary work.

How to Balance Up the Receiver

Place the aerial pre-set condenser (on the left of the screen) at about half way. Now, on switching on and rotating the condenser, a number of stations will be heard, even if one does not live very close to a local station. Choose a not too strong station and balance up the receiver in the following manner:—

Rotate the tuning control and adjust the aerial pre-set condenser until the station tunes in. Having done this, a final re-tune may be made on the H.F. pre-set condenser, the circuit being tuned on both the pre-set condensers exactly as if they were the tuning controls. During this operation, the main tuning control is left where it is. *This is the only balancing operation necessary.*

Afterwards the pre-set condensers may be left set and the main control rotated, when the stations will be found to tune in without any further difficulty. On distant stations the reaction control must obviously be brought up a little, but on quite a number of stations no reaction is necessary.

Selectivity

A little difficulty may be experienced at first in finding the best tuning position. Generally speaking, the pre-set condenser across the H.F. circuit should be kept towards its minimum position. This enables a balance to be obtained with a relatively small value of pre-set condenser in the aerial circuit. This is a condition which makes for selectivity and it is for this reason that the method already given has been recommended.

Balance the Set on the Lower Broadcast Band

Balancing should be done in the short-wave position

Simple to Build and No Coil Changing

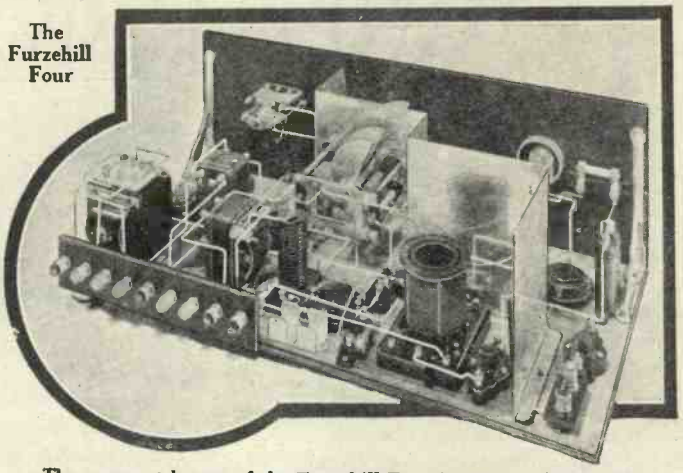
(switch in) as it is found to be somewhat easier here. On pulling out the range switch, the circuit will be changed over to the long waveband and will be found to be correctly balanced without any further readjustment. A number of stations may then be received on the long waves without difficulty.

Use of Short Aerial Best

It is best to use a short aerial and for these tests a comparatively short length of aerial only was employed. With this article is given a calibration scale which will fit in the Burndept two-speed dial used. Whether the actual calibration of the receiver as made by the reader agrees with this or not depends upon the setting of the pre-set condenser, but if he desires to obtain a calibration ready made for this receiver, he can do it in the following way :—

Cut out the scale provided and fit this in the holder given. Choose a station of which the wavelength is known. Set the tuning condenser until the pointer registers with the required wavelength. Then tune the station in on the pre-set condensers. If this is done, it will be found that the calibration given applies over the rest of the scale, both on the long and the short waves.

This calibration chart, of course, only applies to a Cyldon condenser of the log mid-line type, which was used in the original receiver.

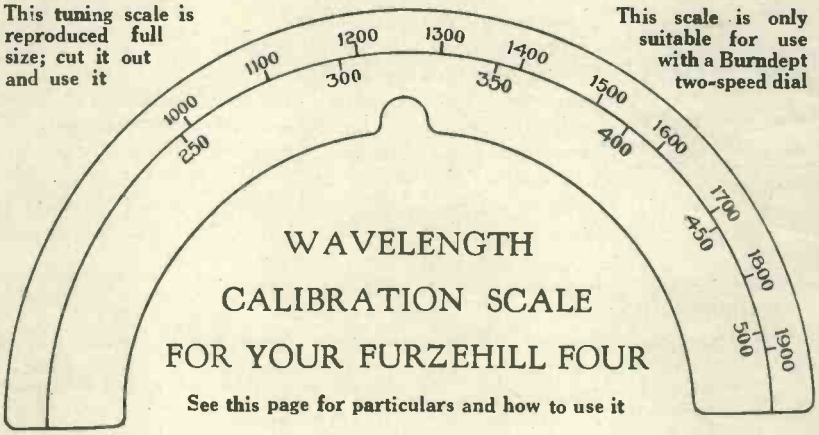


The Furzehill Four

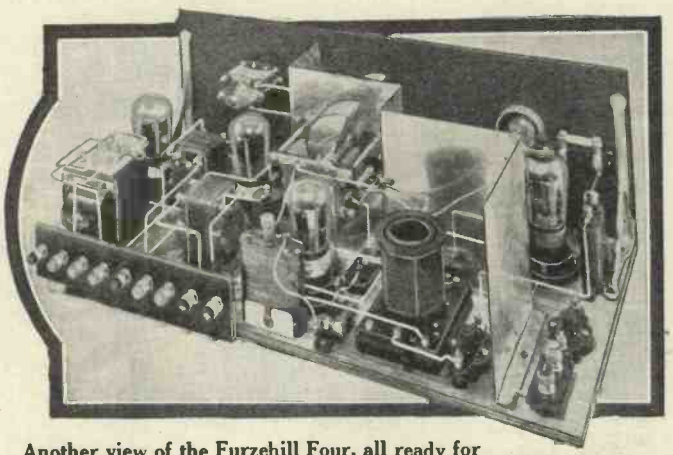
The compact layout of the Furzehill Four is apparent from this photograph, which clearly shows the arrangement of all the parts. Note especially the position of the screening

This tuning scale is reproduced full size; cut it out and use it

This scale is only suitable for use with a Burndept two-speed dial



[We shall be especially glad to have from readers their opinion of this new single-control receiver when they have completed its construction. Mr. Reyner believes the test report published on page 416 to be quite conservative in its scope and he hopes that many constructors will be able to beat it. ED.]



Another view of the Furzehill Four, all ready for use with the valves in position. The biassing battery for getting the best anode-bend point can be seen close to the main terminal strip

Who Has the Answers?

HERE are several questions pertaining to wireless to which research engineers are seeking answers :

Does transmission from east to west differ from that from west to east as indicated by the results of the Marconi expedition?

Is there a limit in wavelength beyond which transmission over land is practically identical with transmission over water?

Does the over-water transmission in certain parts of the world differ materially from that in other parts?

Is there a difference in transmission along and across the earth's magnetic field?

What are the causes of the ionisation of the reflecting layer?

Do the waves above a certain frequency fail to return to the surface of the earth? F. P.

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

Distant Reception

NOW that the long nights are with us once again, and atmospheric conditions have settled down to their winter best, you ought to be having a great time with the reception of distant stations. How many new

Distant Reception

distant stations have you pulled in already this winter?

I have been doing extraordinarily well with the distant stations the last few weeks, and I should like to compare notes with you. What would interest me most would be to hear which are your best stations within certain limits of distance.

Suppose we take the most distant stations first—those, say, which are 800 miles or more away from your receiving station. To which of the stations over our 800-mile limit would you give your vote just now? I am inclined to think that the majority of us would name Budapest, although Kattowitz would, perhaps, receive careful consideration from many of us.

What about the stations between 500 and 800 miles away? Which is your best station within these limits of distance? Is it Toulouse, Breslau, Nurnberg, or some other station, or was it Kalundborg on its old wavelength?

Of the stations between 200 and 500 miles away, my best just now is Cologne. Eiffel Tower and Hilversum, which are only just over the 200-mile limit, seem to have been a little disappointing lately.

Since we reverted to winter time, conditions for distant reception have been wonderfully good on the whole. A few new stations, together with at least two "mystery" stations, have added a little spice to such reception.

◆ ◆ ◆

Talking Films

What is going to be the effect on wireless of the introduction of the talking film into the cinemas of this country? Do you think this new demand for something bigger and better in loud-speaking equipment will ultimately lead to an improvement in the loud-speakers we use for wireless reception?

I am not quite sure whether the loud-speaking apparatus required in a cinema has much in common with our wireless loud-speakers. You see it is one thing to reproduce the huge volume of sound required in a large cinema, and it is a very different thing to reproduce the moderate volume of sound required in a small room in a house.

Speaking of the cinema reminds me of an interesting announcement recently made by one of the big film-producing companies regarding a new mystery film. In this new film, the story is based on the invention of television and the film shows the whole process of looking-in. The work of production of this television film is now going on, and it is claimed that, by the time the film is ready, television will be at the height of its "topicality."

A Huge Volume of Sound

So now you know. Television cannot be so far away, can it? George says the snag about this film is that we should not be going to the pictures when the pictures were coming to us.

◆ ◆ ◆

Headphones

When did you buy your last pair of headphones? I have two pairs of phones in my wireless cupboard just now. The older pair date back at least seven years, and a good pair they are still. The newer pair were purchased about three years ago.

To those of us who have been in wireless since before broadcasting began, it seems strange that head-

When Did You Buy?

phones should be mentioned so little these days. Why! we scarcely ever see headphones advertised in our wireless periodicals in these days of loud-speakers, do we?

Glancing through the advertisement pages of a recent number of the WIRELESS MAGAZINE, I found ten loud-speaker advertisements to one small headphone advertisement. In the first number of the WIRELESS MAGAZINE the advertisements of headphones easily outnumbered those of loud-speakers.

Although I should perhaps not like to see a return to the good old days when the acme of wireless reception was "phones-on-the-table" signal-strength, I think we ought not to neglect headphone reception altogether, do you?

A week or two ago, I constructed a new type of one-valve set and I had

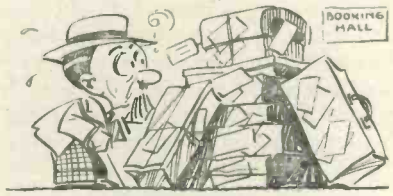
a great time with headphone reception from that set. Of course, I prefer using a three-valve set with loudspeaker, but I, for one, should feel that there was something missing about my wireless if there were no headphones in my cupboard.

◆ ◆ ◆

Station Identification

When will somebody or other hit upon a happy scheme of identification calls for our broadcasting stations? It really is strange how little progress is being made in this important direction.

Only last night I spent nearly an hour trying to identify a short-wave



Station Identification

station. I happened to be using what was to me a new type of coil, and I had very little idea of the wavelength range given by that coil. Quite unexpectedly I came across the loud ticking of a metronome. I listened to that metronome for at least ten minutes before I heard speech and then there came the familiar "Achtung" of a German station.

The voice was that of a woman announcer and I listened very carefully, but my knowledge of German is so slight that I could not get a clue to the station. I listened to several speeches or readings interspersed with long intervals during which the metronome ticked loudly enough to be heard next door.

I thought I heard the names Doeberitz and Berlin but I was not sure. It would have been of the greatest help to me if I could have definitely identified that station.

Amongst the recent schemes of station identification to be proposed have been call-signs in slow morse and calls in Esperanto. Of these two schemes, I prefer the former because I can sometimes read slow morse.

One night last week, I felt quite pleased with myself because I identified a Bremen relay through Hamburg by the call sign : dash, dot, dot, dot (B), dash, dash (M); dash, dot (N), repeated slowly.

Of the newer call-signs, I expect you like best of all Budapest's pretty little tune. George's first favourite call sign just now is Laibach's cuckoo; his second, Wilmo's cuckoo.

◆ ◆ ◆

Tired Topics

George sat smoking in my armchair. I knew something was about to be said for his puff frequency suddenly quickened from forty to sixty per minute and his output visibly increased.

"Some of you wireless writers are the absolute limit," he said.

"What's the matter now, George?" I asked.

"Why! here's a fellow actually telling us that a bradawl can be used to bore small holes in an ebonite panel when a drill is not available."

"But it's quite true, George."

"I know it is, but if the tip of the bradawl were as old as the tip itself, it wouldn't be much of a tip, would it?"

"There's no harm in repeating an old tip, George."

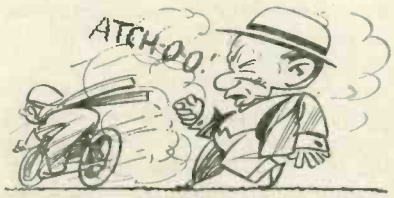
"Repeating—the way you wireless writers repeat yourselves and one another is amazing. In this week's wireless papers I've read no less than three times that dust between the vanes of a variable condenser causes scraping noises."

"So it does, George."

"I know it, but I'm not going to blow the dust out of my variable condensers three times a week for anybody. Have you ever written an article on soldering, Mister Halyard?"

"Not yet, George."

"There's hope for you, then. Soldering is the last tired topic of the writer on wireless. I have just read the latest article on soldering and in it the writer tells us that hot solder



Blow the Dust

sets more quickly if you blow on it."

"You knew that, George."

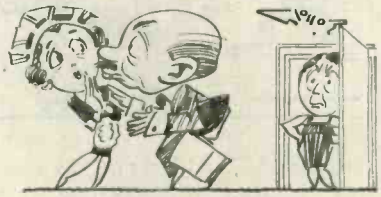
"Aye, but it's dangerous for some folk. You heard of the Scotsman who was soldering after midnight and blew on a hot joint——?"

"George——"

"Lost his eyebrows and would have lost his front hair if he hadn't been bald."

On Announcers

Did you happen to see the reference to the article on wireless announcers which appeared in the Belgian journal, *Theatre*? The opinions this writer expressed with regard to the announcers at our European broad-



Do You Agree with This?

casting stations were widely quoted.

I thought this writer was a little severe on some of the Continental announcers. For example, he stated that, although German announcers articulate very clearly, with the exception of the announcer at Frankfurt, their timbre is devoid of charm. Do you agree with this? Lack of knowledge of the language makes it difficult for us to judge, perhaps.

This same writer was very severe on Vienna and Kalundborg. The announcer at Vienna, he wrote, has a voice which is nasal and disagreeable, while the Kalundborg announcer has a harsh voice with a harder accent than a German announcer even.

Spanish announcers, he went on to say, speak with exaggerated volubility, while Hilversum speaks out of a drum and Brussels from the depth of the tomb.

"The true wireless orator," wrote this Belgian listener, "must speak clearly and calmly, but simply, naturally, like a good fellow, but without the slightest trace of the low comedian. Our friends across the Channel know how to do it. Each listener must have the impression that it is to him, and to him alone, that the British announceris speaking. The announcer for 5XX does not declaim. You would say he is making a confidence. He does not change some slight announcement into a pretentious melody of words. He does not try to please, and thus he pleases us."

All very nice and satisfactory from our point of view, but I would like to have this Belgian writer's opinion of the American announcer, wouldn't you?

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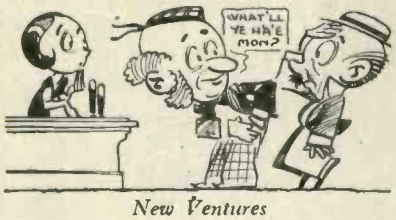
New Ventures

Although we are primarily concerned with the receiving end of wireless, we cannot help but turn an

Under My Aerial (Continued)



New Ventures

anxious eye, and later on, an anxious ear, to what is happening at the other end, the transmitting end.

Just now there are great goings on at the transmitting end. First of all there is the new regional scheme venture, which, so far as it has gone, includes the actual building of the new London transmitting station and the choosing of the site for the new Pennine station.

Then there is the proposed building of the new headquarters for broadcasting on a site in the heart of London. What an extraordinary opportunity this proposed new building will give for the erection of a building simply and solely for broadcasting.

The present studios at Savoy Hill, no matter how cleverly they are altered, can never be as good for broadcasting as studios planned and built in the light of the experiences of the last six years.

Several of the studios in the new "Broadcasting House" will no doubt, be of the "double-deck" type which has proved so successful recently. Smaller studios will, perhaps, be built specially for the broadcasting of news, announcements and talks.

I wonder what will be done with regard to the broadcasting of plays from the new headquarters. Do you think that the success of wireless drama, as we know it at present, merits the provision of a small theatre in the new building? We shall get this, and many other interesting queries answered, I daresay, as the plans for the new building mature.

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Wireless Tools

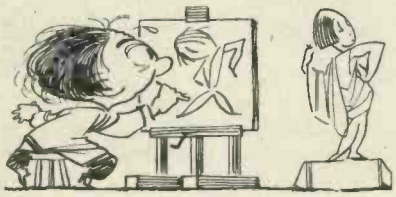
Have you ever compiled a list of the tools you use in your wireless constructional work? Try to draw up such a list from memory, and I think you will find the task both interesting and instructive.

What gave me the idea of making up a list of my wireless tools was a kit, which I happened to see the other day. In this outfit there were spanners, screw-drivers, soldering bit, files, pliers, scriber, centre punch, and hammer.

Now, there was one very obvious omission in that outfit. Got it? Something to bore holes with, of course. Hand drill? Well, yes; but I *have* bored holes in an ebonite panel with a gimlet before now, and I have laboriously enlarged those holes with a triangular file.

There was one tool in the outfit which I have never once used in my wireless constructional work. Which was that? You will easily guess.

By the way, do you keep your wireless tools all nice and tidy in a box or on a shelf in your workshop? I try to do so, but it seems impossible. At the present moment my soldering bit is in the scullery near the gas stove, my screw-drivers are on a shelf in the kitchen, and I



Try to Draw

haven't seen my pliers for a week. You see, other people in the house borrow my wireless tools for all sorts of non-wireless jobs.

◆ ◆ ◆

Coils

Have you noticed the tendency these days on the part of the designers of wireless sets to make more and more use of special coils in the sets they design?

It seems to me as if the development of the special coil has been one of the features of wireless design during the last six months. If this development continues during the next six months, as seems very likely, then one of the outstanding wireless features of 1928 will be the substitution of the all-wavelength coil for the series of interchangeable plug-in coils of standard sizes.

Coils!

I think you might be able to form some idea of this tendency in coil design by classifying your wireless friends as users or as non-users of plug-in coils. Do this, and I am sure you will come to the conclusion that the percentage number of your wireless friends using plug-in coils is lower than it was, say, a year ago.

I cannot say that I am any great lover of plug-in coils. I do not often use them, but I have always recognised the great advantage arising out of their standardisation. It is to be hoped that the use of special coils will not lead to confusion through lack of standardisation. HALYARD.

Jamming!

CAN anyone beat this? At about 5.35 B.S.T. this evening I tuned in Hilversum on a set which happens to be distinctly unselective when working on the longer waves.

This, coupled with the fact that I happen to live nearly midway between the 2LO transmitter at Oxford Street and the powerful telephony transmitter at Mitcham Common belonging to the Croydon Air Port, meant that in the background I could hear a good many other things beside the programme from Hilversum!

In fact, during the course of one particular minute I heard the following without altering the tuning of the set at all:—

(1) From Hilversum, a clock chiming, and striking an hour (evidently local time).

In the background:—

(2) From Oxford Street, the voices of "Belinda" and "Mac" conducting the London Children's Hour at the 2LO studio.

(3) From Mitcham Common, the voice of the Croydon operator replying to a message from the Imperial Air Liner G-EBOZ.

(4) From Boulogne, a faint "echo," so to speak, of the devastating spark note of FFB, calling a ship in morse on 600 metres.

(5) From an unknown wireless-telegraphy station, a C.W. Morse harmonic. W. O.

Wireless Magazine GRAMO-RADIO SECTION

CONTENTS

About Gramophone Records

By Capt. H. J. ROUND, M.I.E.E.

MOST amateurs have now tried their hand at playing records electrically, and some have been very successful at the game. Sometimes I think it is easier to play a record and get good results than to get good results from the radio, but most certainly the B.B.C. do not prove this point very well, because a lot of their gramophone transmissions are very poor.

Pick-up "Streets Ahead"

I have often played a record on my loud-speaker from a pick-up to compare with the result I have first obtained from a broadcast transmission of the same record and nearly always the effect from my own pick-up has been streets ahead.

That the fault does not lie in my H.F. and detector stages is shown, because I usually play through a modulator and oscillating valve, such as I described in a recent number of the WIRELESS MAGAZINE.

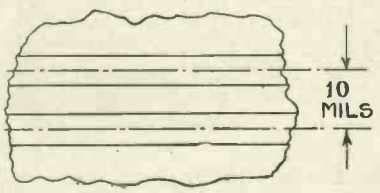


Fig. 2.—Uncut record

Yesterday I heard Hilversum playing records very well indeed, in fact, until I heard the quaint announcement of an H.M.V. record in mixed Dutch and English, I did not note that it was gramophone at all.

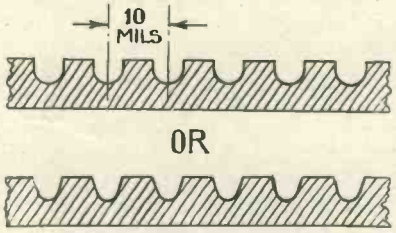


Fig. 1.—Grooves in a record

The bad effect given by the B.B.C. I put down to the pick-up used, or to the way it is attached to the amplifier. There is a considerable difference in the pick-ups now on the market, and even the good ones can be put wrong by an incorrect connection to the amplifying valve.

Cut Out Transformers

Every time I would say cut out transformers and connect the pick-up to the first valve direct—unless you have a measuring apparatus to record the effects you get. It may mean another valve, but if you use R.C. couplings you can't distort anything like as seriously as you can with a dud transformer.

Theoretically, a gramophone record cannot be as good as broadcasting direct, but possibly due to more careful balance, control, and general artistic arrangement by the gramophone controllers, the effects compare very favourably. Radio, theoretically, should be very nearly correct and is so very frequently nowadays, but we do get a lot of bad turns and even the general acoustic effects are very carelessly handled, except when a special sound stunt is being done.

Savoy Hill Bathroom!

Yesterday evening (Sunday, October 21) I heard a lady vocalist from 2LO, who was obviously singing in the Savoy Hill bathroom—or if I am mistaken, the sound-effect engineers should take those identical acoustic arrangements when they want a bathroom.

Now gramophone records are necessarily very imperfect and for various reasons. The spiral groove on a gramophone record is cut about 100 lines to the inch and Fig. 1 shows, in section, about what these cuts look like when magnified.

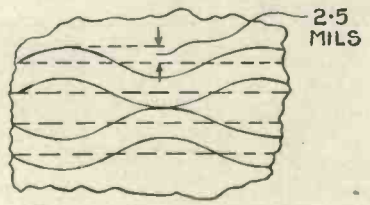


Fig. 3.—Cut record

Figs. 2 and 3 show a plan of the

About Gramophone Records *(continued)*

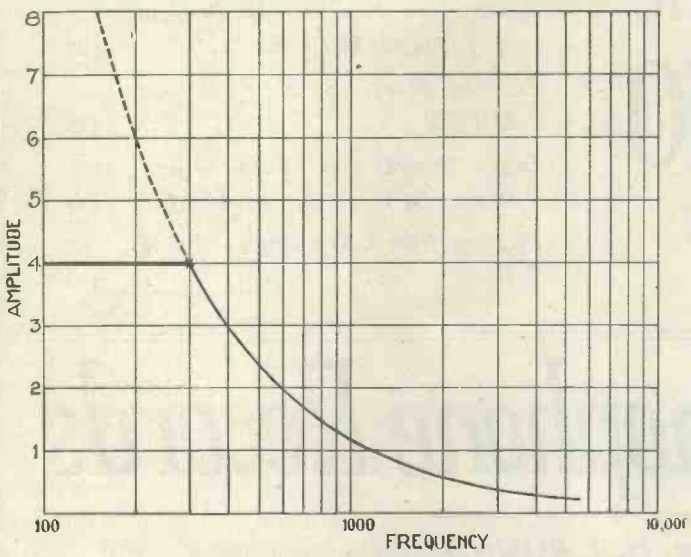


Fig. 4.—Record frequency-amplitude curve

cuts first of all unmodulated, and then modulated. It is usual to make the cut portion somewhere about the width of the uncut portion, and as a result, we see from Fig. 3 that the greatest amplitude we can safely use is 1/400 inch.

If we put greater amplitudes than this on the records, the chances are that somewhere the grooves will run into one another, and on reproduction we shall be liable to get that interesting effect of one line repeating itself.

Amplitude Law

Theoretically, the amplitude of all notes on the record, if made of equal strength before the microphone, should be inversely proportional to the frequency, for this law gives the correct effect on a first-class mechanical gramophone, but let us see exactly what this law would mean in practice.

If we made the maximum amplitude at 300 cycles 1/400th inch then at 150 cycles the amplitude would be 1/200th inch, sufficient to break down the walls between the lines. And if we made 150 cycles maximum 1/400th inch then 75 cycles would overstep the mark.

Certainly we could say never mind anything below 75 cycles, it is really not necessary, let us make that 1/400th inch maximum. But that would mean that 750 cycles would be only 1/4,000th inch and 5,000 cycles about 1/28,000th inch. Practice has shown that even such middle tones as 750 cycles would be too weak and the still higher tones would be well under the surface noise of the record.

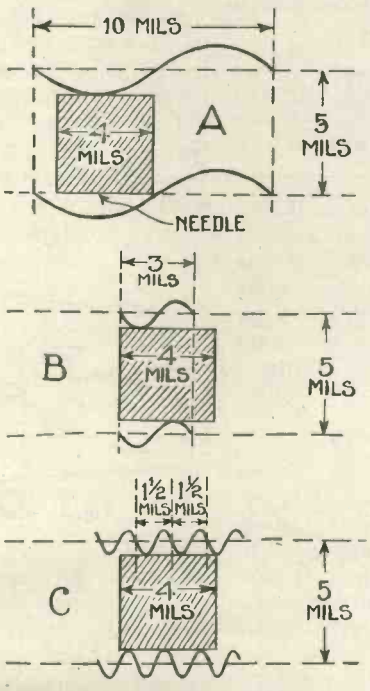


Fig. 7.—Needle size and different frequencies

What is actually done is to adopt a compromise. We say we will be satisfied with a correct result above some specified frequency, and we will cut down arbitrarily below that frequency.

Obviously the place where the change is made to take place is a mere matter of opinion. Some people like bass and others don't care as long as they get the "toon." The heavier the bass, the less is the melody we shall get.

Constant Amplitude

The compromise is usually made at some frequency between 200 cycles and 400 cycles: at above the specified frequency the law of the record is correct, below that frequency the amplitude is kept constant. I illustrate this curve in Fig. 4.

In our electrical pick-up and amplifier we can, if we like, fake in this decreased bass again, and in Fig. 5 I illustrate a method which I have employed to do this, but please don't ask me for exact values of condensers, inductances, resistances, etc. Try it out with about the values indicated, varying things until you get the effect you like best.

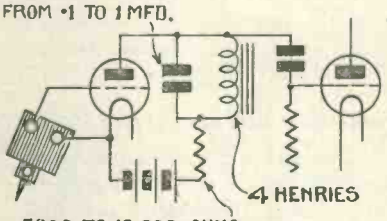


Fig. 5.—Method of "faking" the bass

The effect of this circuit is to put up the bass by resonance. Some wonderful piano results can be produced this way if a moving-coil loud-speaker is used. The amusing point about the trick is that by putting up the bass the total volume from the loud-speaker (if it can give bass, and only the moving-coil loud-speaker can do this effectively) is greatly increased.

No Extra Blasting

This effect is produced with no extra blasting on the power valve, because the record is, of course, reduced below normal in these bass tones, and is only brought up to normal by this trick.

Of course, the over-all magnification of the amplifier is reduced by the circuit shown, and, perhaps, another stage may be necessary.

A Special Article by Capt. H. J. Round, M.I.E.E.

Such an amplifier will be very drummy or boomy on radio.

Now I want to take up the question of how the gramophone can go wrong on the higher frequencies. In this case, the error lies not in the record, but in the pick-up, mechanical or otherwise. The

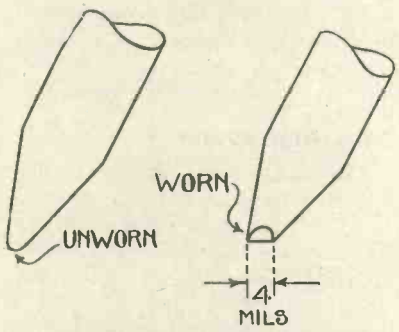


Fig. 6.—How a needle wears

groove of a record, I have pointed out, is about 1/200th inch wide, or 5 mils.

The needle starts with a rounded point, but in a few revolutions wears to a shape like Fig. 6, a kind of rounded chisel shape. The more the record runs the more this wears.

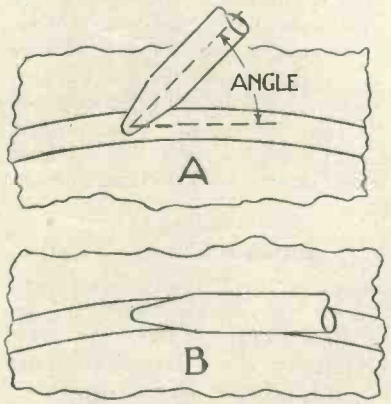


Fig. 8.— Needle angle

But for good playing the end should fit the groove and this is why steel needles are better than very hard ones, because the latter never wear to the groove shape. An examination under a microscope shows that an average needle covers 4 mils of length when it is worn to shape.

Now a record travelling at 78 revolutions per minute, has a surface speed at :

6 in. rad. of 48 in. per sec.
2 in. rad. of 16 in. per sec.
1 in. rad. of 8 in. per sec.

Wavelength

A frequency of 5,000 per second will give a wavelength in each of these cases of ;

6 in. rad.—10 mils.
2 in. rad.—3 mils.
1 in. rad.—1.5 mils.

Fig. 7 gives an idea of the needle in each case trying to move about in the groove. In Fig. 7 there is some chance of the 5,000-cycle being produced, but in the other two cases, B and C, the wave has no earthly chance of doing anything definite to the needle.

At Higher Frequencies

At these higher frequencies, what we ever get is rather problematical, and really perfect results could only be obtained with disc speeds of about 80 inches per second, unless we took drastic steps and decreased the width of the groove and the weight of the sound-box or pick-up.

The effect of making the groove narrower and shallower, and the sound-box lighter, would be less needle wear. We could, in fact, start with a sharper needle, and instead of a chisel of 4 mils length we could have one of 2 mils or less.

Weaker Results

This could be done with electrical playing, but would result in much weaker mechanical results and commercial considerations will not stand for this yet, but the day will come when it will be commercial.

I strongly recommend those who have microscopes to examine both records and needles, and test the points I have mentioned for themselves.

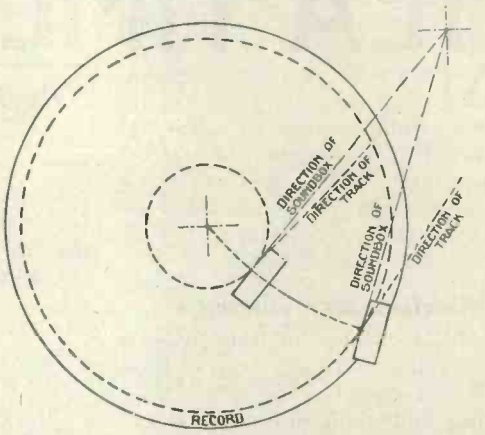


Fig. 9.—Bad needle-track alignment

Everyone must have noticed that the centre of a record plays with a duller tone than the outer edge, particularly on those recent records which for economical reasons are using more of the centre.

A partial solution of the difficulty is to use a fresh needle on the last inch or so nearest the centre and any criticism of a record should be delayed until the change of needle has taken place.

New Needles Wanted

The modern tendency to greater strength also damages a needle more—and what is really wanted is a needle just a little harder than steel, something which will wear to the shape of the groove, but will not wear really badly before the record is finished.

(*Continued on page* 484)

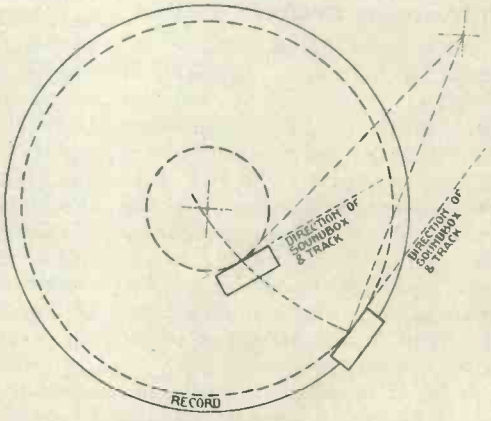


Fig. 10.—Modern needle-track alignment

TEA-TIME MUSIC FROM YOUR GRAMOPHONE

By H. T. BARNETT, M.I.E.E.

MY friends are full of complaints regarding the nature of the music that is given them through the medium of gramophone records at those times when occasional conversation is permissible and particularly when light refreshments are being served.

Miscellaneous Gatherings

In the case of miscellaneous gatherings of friends, many of whom do not regard music as the most important thing in life, and especially at meal times, the playing of records possessing strong and serious musical interest is regarded as a positive offence, not only by the frivolous minded, but also by all highly musical people, who cannot avoid feeling annoyance when a chance remark or the jangling of teaspoons interrupts some absorbingly interesting development.

First let us consider the kinds of records that never, under any circumstances, should be played on such occasions. Foremost in unsuitability to the surroundings are grand organ records, the better the worse; people do not want to have to shout remarks to one another nor do they wish a sub-conscious wondering whether they have brought a threepenny piece for the offertory.

Several ladies I know have a positive dread of hearing a grand organ played except under appropriate and serious conditions.

Introducing Oratorio

Many years ago an attempt was made to introduce oratorio at promenade concerts. At the first performance I went to, some ladies of frivolous temperament were dancing a jig to "All We Like Sheep Have Gone Astray." The incongruity of the thing soon killed the venture; but, after all, it was little more incongruous than the great D minor fugue as an accompaniment to a conversation about hats.

Next in unsuitability are grand orchestra records, even when they are of light music, such as the exquisite *Invitation to the Waltz* played by the Philadelphia Orchestra (H.M.V.). They are too interesting, they require and succeed in obtaining from anyone who is really musical too close a study, too keen an admiration for the listener not to become intensely angry with the continual interruptions that are sure to occur.

If we rule out at once the two greatest classes of records just mentioned, *because of their greatness*, in every other kind of record we may find examples highly suitable for light entertainments either in the drawing-room or in the restaurant; good enough to be worth listening to, should one have the chance, and yet not so entirely engrossing as to make one unmindful of, or impatient with the needs of the unmusical. Quite the most useful records for the purpose are the SALON ORCHESTRALS—delightful compositions, cleverly arranged, and played with high and emotional musicianship on not too large a number of instruments.

Do not overlook the special Combined Electric Gramophone and Three-valve All-wave Broadcast Receiver which is described and illustrated in this issue. Turn now to page 467

To my mind, in this class of work Continental bands are supreme, and fortunately there are several of them. I will name three for quality, Marek Weber (H.M.V.), and Dajos Bela and Edith Lorand (Parlophone).

There are plenty of 12-in. records in the group; so do not buy 10-in. records—there is no economy in it and the short time they run makes the programme scrappy.

Of the Marek Weber's (4s. 6d. each) the best are E.H.9, *Tosca*; C1407, *Moonlight on the Alster*; C1506, *Vienna by Night*. Everyone of the Edith Lorand's is excellent, although her recording characteristic is just as much harder in style than Dajos Bela's as Dajos Bella's is harder than Marek Weber's.

The recordings of the past year are, on the whole, the best, and of these I mention three only (4s. 6d. each); but the whole group should be bought—E10569, *Cavalleria Rusticana*; E10702, *Waltz Dream*; E10716 *Johann Strauss Fantasia*.

More High Praise

The same high praise can be accorded the Dajos Belas (4s. 6d. each) of the past year, and in addition one may say he is extraordinarily versatile, and that largely as the records may differ from one another in the style of the music, yet the interpretation is always the best possible. I will mention E10704, *Seranata Siciliana*; E10703, *Kaiser Waltz*; E10617, *O Sole Mio Tango*; E10665, *Festival Polonaise* (the *richest toned* record I have).

Used occasionally to vary the programme, PIANOFORTE numbers are excellent, but great care is needed in choosing them; it is not easy to find brilliant light music well recorded in sufficient quantity.

An ideal record in every way for our special requirement is E10561, *Soiree de Vienna* (Parlophone) (4s. 6d.). Another good one is E10717, *Prelude in D-flat* (Chopin) with *Forest Murmurs* (Liszt), Parlophone (4s. 6d.).

Very Suitable Group

As a group, Chopin's short works are all very suitable. Get the set on disc C1451, H.M.V. (4s. 6d.), played by Mark Hambourg, and any others of his. If you can afford them at 8s. 6d. a disc, get the Backhaus set (H.M.V.).

Now, if your reproducing apparatus is arranged correctly (see my series of "gramo-technic" articles in this magazine beginning June last), you may quite safely use the piano records in the wonderful "Broadcast Twelve" series, at 2s. each; they are well chosen, well played, and well recorded.

(*Continued at foot of next page*)

Drum Records for Your Gramo-Radio

By CAPT. H.T. BARNETT, M.I.E.E.

IN one respect, at least, the music that comes through our wireless from the B.B.C. orchestras and bands is superior in the aggregate to that obtainable from the ordinary run of gramophone records in that the drums are rendered in their proper proportion and can always be heard at their correct volume if our reproducing apparatus is good.

Why record manufacturers should deliberately have barred the drums from the make-up of their orchestras and bands so frequently, I never could understand, for even so long as ten years ago drum tone presented no difficulty at all to the recording engineers.

Old Recordings

Instances of these old recordings of the side-drums are the H.M.V. record of the *Regimental Marches of the Scots' Brigades*, played by the pipes and drums of the Scots Guards (3s.) and the Regal record with *The Mascot of the Troop* on one side and *The Ragtime Drummer* on the other (2s. 6d.).

Kettle-drums are well shown in the Parlophone acoustic recordings No. E10274, *Scenes Pittoresque*, Edith Lorand Orchestra (4s. 6d.), and No. 10158, *Funeral March* (Gotterdammerung), Berlin Opera House Orchestra (4s. 6d.), and these two are still obtainable.

They are both magnificent recordings, the last-mentioned being a particularly useful test record, because the strong horn tone will upset any really faulty mechanical device in any part of a gramophone.

Coming to more recent times, I am glad now to be able to give a list of recordings, all of them specially good in a general way and containing drum music in quite as full proportion as is given us by the splendid performing combinations of the B.B.C.

ORCHESTRAL RECORDS comprise *The Flying Dutchman*, two 4s. 6d. discs played by John Barbirolli's Orchestra, Electron; *Indian Suite*, played by Edith Lorand Orchestra, No. E10427 Parlophone (4s. 6d.); *Ride of the Valkyries* and *Rakoczy March*, No. 5005 Beltona, 4s.; *Fire Music*, played by Albert Coates and the Symphony Orchestra, No. D1079 H.M.V., 6s. 6d.; *Tannhauser*, No. 5003 Broadcast Twelve, 2s.; *Dagger Dance*, No. 718 Beltona, 2s. 6d.

VOCAL RECORDS.—*Why do the Nations*, sung by Edward Holland, No. 701 V.F., 4s.; *Drake Goes West*, sung by John Van Zyl, No. 7005 Beltona, 4s. 6d.; *My Old Shako*, sung by Malcolm McErchern, No. K-05286 Vocalion.

MILITARY BAND SELECTIONS.—*The Flying Dutchman*, played by 2LO Military Band, No. 4321 Winner, 2s. 6d.; *Rienzi*, No. 2360 Winner, 2s. 6d. (this is an example of a truly perfect acoustic recording; it was personally superintended by Mr. T. Hough); *Grand Overture* 1812, No. 835 Radio, 1s. 3d.

Ridiculous Without the Drums

MILITARY BAND MARCHES.—These, of all things, sound most profoundly ridiculous when the drum part is omitted. The following examples are all grand records: *King Cotton* and *Officer of the Day*, No. B2327 H.M.V., 3s.; *Marcia dell' Incoronazione*, No. 679 Beltona, 2s. 6d.; *Under the Double Eagle* and *Veoqui-Centennial Exposition*, No. B2361 H.M.V., 3s.; *Baltimore Centennial*, No. 582 Beltona, 2s. 6d.; *Second Connecticut* and *Semper Fideles*, No. 5050 Zonophone, 2s. 6d.

DANCE RECORDS.—*Indian Love Call*, No. 738 Beltona, 2s. 6d.; *Beneath the Burmese Moon*, No. 691 Beltona, 2s. 6d.; *Up to Date*, played by Marek Weber, No. E10061 Parlophone, 4s. 6d.; *Upright and Grand* and *Prudy*, No. C911 Homochord, 2s. 6d.

Tea-time Music From Your Gramophone (Continued)

Now, I am afraid you will have to buy a few 10-in. records, because piano transcriptions of popular melodies are only done in that size, and Raie da Costa's are truly works of high art. The whole group is good; they are Parlophones, and cost 3s. each.

Good Violin Solos

VIOLIN SOLOS, if chosen with great care, are very suitable; few are as good as E10562, *Sonata* 11 *and* 12 *Paganini*, Parlophone (4s. 6d. each). The "Broadcast Twelves" of Peggy Cochrane are excellent, and should be followed from month to month.

Occasional VOCAL records are necessary. Do not use male voices at all; they are too heavy and too dramatic for our particular requirement: so also is the contralto voice.

Do not buy records of a kind where every word must be heard for the song to be enjoyed. I think Galli-Curci (H.M.V.) and Lotti Lehmann (Parlophone) are the best representatives of perfect vocalisation, splendidly recorded. Galli-Curci's *Pur La* (6s) and *Una Voce* (8s. 6d.) are just the right style, and she has done many others. Lottie Lehmann's R20054, R20053, and R20050, at 6s. 6d. each, are all quite suitable.

Unless dancing is in progress, I think JAZZ music should be rigidly confined to that of the exhibition type; that is to say, CONCERT JAZZ. The Nikisch records, Parlophone (4s. 6d. each), and the Paul Whiteman's concert Orchestra records, H.M.V. (4s. 6d. each), are supremely good.

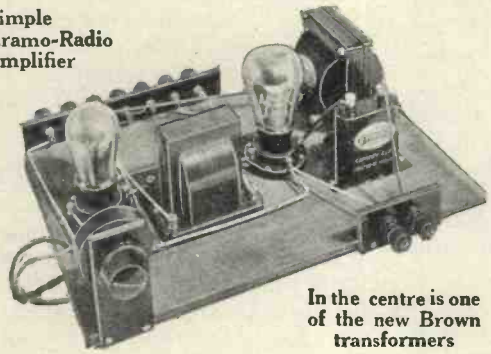
One good 12-in. PICTURE PALACE ORGAN record is *Memories of Schubert*, Electron (4s. 6d.).

Exquisite Little Trios

If you disagree with me in my opinion that 10-in. records are too "scrappy" for public use, then be sure to get the last half-dozen Christie Unit Organ records, Winner (2s. each), and from Parlophone get all the London Octette and the Major Bowes Trio records. From H.M.V. get the exquisite little trios for violin, 'cello, and piano, *Marche Miniature Viennoise* and *Syncopation*, both written by Fritz Kriesler, and played by Fritz and Hugo Kriesler and Michael Ronchelsen, H.M.V. (6s.).

W. James, Our Research Consultant, Discusses—

Pick-ups from A New Angle



Simple Gramo-Radio Amplifier

In the centre is one of the new Brown transformers

THE electrical playing of gramophone records is no new thing. For several years a valve amplifier and a loud-speaker have been employed to magnify the currents generated by an electric sound-box. But easy though it is to join a magnetic pick-up, as the electric sound-box is more usually termed, to an amplifier, there are one or two difficulties in the path of the amateur who is without the equipment necessary for measuring the working voltages and determining the characteristics of the amplifier

Unsatisfactory Methods

It is not satisfactory merely to connect a pick-up to the amplifier of a wireless receiver when good quality of reproduction is desired, neither is it reasonable to join a volume control across one of the components without a knowledge of the precise effect which it will have.

Further, true reproduction is not to be obtained by connecting in haphazard fashion a by-pass condenser or filter in order to remove surface noises.

The problem is best tackled by considering each item separately. We must remember first of all that it is not wise to overload the power valve that has the loud-speaker connected to it. In many instances the amplifier will be supplied with current from a large dry battery of, say, 160 volts, which may be obtained from three of large-size units connected in series.

The last valve may be of the super-power type and will require a negative grid bias of from 12 to 20 volts, or a little more, according to the characteristics of the valve. We have therefore to provide an amplifier which will fully load this power valve when necessary, always remembering there may be occasions when less volume is desired.

The following variables have also to be most carefully considered:

(1) The sensitivity of the pick-up. Different types generate voltages of varying magnitudes under identical working conditions.

(2) There are several varieties of gramophone needles, which affect the voltages generated by the pick-up.

(3) Certain records are naturally louder than others.

It is therefore obvious that we have to provide means for giving the full volume that may be taken from the last valve from the worst combination as regards sensitivity, which will be when a "quiet" record is being played with an insensitive pick-up and a "soft-tone" needle.

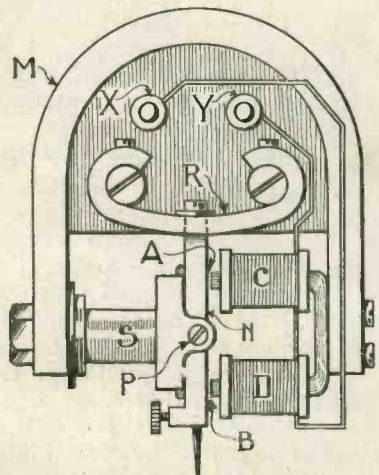


Fig. 1.—Diagrammatic sketch of typical pick-up

Actual Pick-up Voltages

On the other hand, a control must be provided to enable us to avoid overloading the last valve when the most powerful combination is employed, such as would be represented by a "loud" record, a sensitive pick-up and a "loud-tone" needle. Clearly, our first step must be to measure the voltages developed by the representative pick-ups when used with a variety of records and different types of needles.

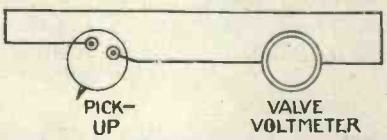


Fig. 2.—How the pick-up measurements were made

From amongst the pick-ups available two were chosen. One was a Celestion Woodroffe and the other a B.T.H. Preliminary experiments showed the Celestion to be the least sensitive of those available, whilst the B.T.H. was the most powerful. By altering the adjustment of the Celestion pick-up different degrees of sensitivity could be obtained, but for these tests the instrument was set to give the best all-round results.

How the Pick-up Works

Let us consider for a moment how a pick-up functions. A permanent magnet M (see Fig. 1) has a steel support S, which carries pivots P. An armature N is mounted on the pivots and has one end secured to a piece of rubber (R) whilst its opposite end is provided with a hole and fixing screw to take the needle.

Fastened to the other pole of the permanent magnet is a *U*-shaped piece of iron which carries a pair of coils, C and D, connected in series. The ends of the *U*-shaped piece are

flat and the armature is so positioned that there is a small air gap from each leg of the *U*-shaped piece to the armature.

When a Record Is Played

Under normal conditions the same number of magnetic lines of force pass from the permanent magnet across the two narrow air gaps, A and B. Now when a gramophone record is being played, the needle, and therefore the armature, is vibrating. When the armature is moved in the direction shown by the arrow, the air gap of A is reduced whilst the air gap at B is increased. As a consequence, the number of magnetic lines of force passing through coil C is increased and there is a reduction in the number passing through coil D.

Now when the number of magnetic lines of force linking with the turns of wire of a coil are varied, a voltage is generated. The voltage depends upon the variation in the number of lines and upon the number of turns. Therefore the voltage will vary with the movement of the needle. In the example considered, the number of magnetic lines of force linking with coil C are increased, whilst the number linking coil D are reduced. The two coils are connected in series, however, and the two voltages produced add together.

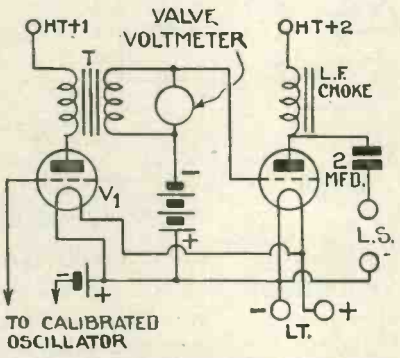


Fig. 3.—Circuit of Amplifier when testing Transformer-Valve Combinations

Opposite Polarity

When the needle is moved in the opposite direction from that indicated by the arrow the air gap at B is shortened, whilst that at A is lengthened. The number of lines of force linking with coil C is now reduced from the mean value and the number linking with coil D is increased. The voltages generated in the two coils add together, as before, but are of the opposite polarity, and if terminal X was positive in the first example, it will now be negative.

A pick-up therefore generates alternating voltages according to the shape of the groove in the record and the voltages vary according to the type of needle used and the material recorded, as these factors control the amount of movement of the armature.

Tests were made to determine the magnitude of the voltages developed. The results are given in the tables appearing on page 486.

The measurements were made by connecting a valve voltmeter of the anode-bend type across the pick-up, as in Fig. 2. Now this instrument reads R.M.S. values and we are more concerned with peak values, because we have to limit the peak voltages applied to the grids of the amplifying and power valves in order that they shall not normally exceed the grid-bias voltages used.

It is, however, not possible to determine the exact peak values. For a sine wave of voltage, the peak value is roughly 1.4 times the R.M.S. value. Thus, 1 volt R.M.S. has a peak value of 1.4. In order to deal with a signal of this magnitude, a valve would have to be biased by 1.5 volts negative.

It is conceivable, however, that the peak values of voltages generated by a pick-up may greatly exceed 1.4 times the R.M.S. value. Allowance must definitely be made for this factor, otherwise poor reproduction may be obtained.

It will be noticed that the B.T.H. pick-up gives approximately three times the voltage of the Celestion and that when a "soft-tone" needle is employed the voltage is approximately only one-third of that generated when the needle is of the "loud-tone" variety.

From these results it is clear that we may base the design of the amplifier upon an output voltage of .3 (peak) in the case of the Celestion pick-up and .9 (peak) for the B.T.H. We have assumed that the power valve will have a negative grid bias of from 12 to 20 volts, and it therefore follows that if the voltages from the pick-up are applied to an amplifier which magnifies them sixty or seventy times there will be adequate strength under the worst conditions.

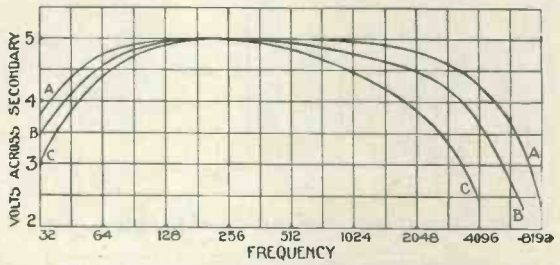


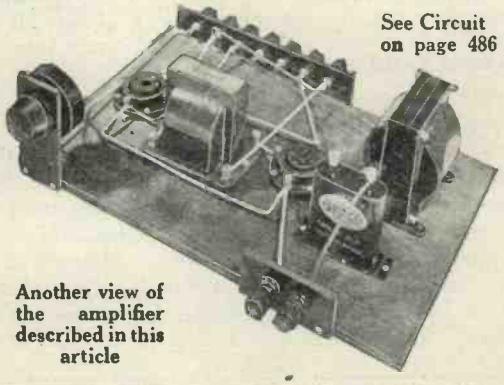
Fig. 4.—Curve for Brown transformer and Cossor valves. Curve A is with 16,000-ohm valve; curve B is with 20,000-ohm valve; and curve C is with 28,000-ohm valve

Danger of Overloading

Under normal and the best conditions as regards the magnitude of the voltages generated by the pick-up, there will be considerable overloading and, as a consequence, means must be provided to enable the user to regulate the voltages applied to the amplifier.

In the absence of definite information concerning the electrical characteristics of pick-ups it is necessary to rely to a certain extent upon one's own tests and experiences. It is my opinion that as the necessary amount of amplification may be obtained from a single stage, transformer coupled, this method will

See Circuit on page 486



Another view of the amplifier described in this article

Pick-ups from a New Angle (*Continued*)

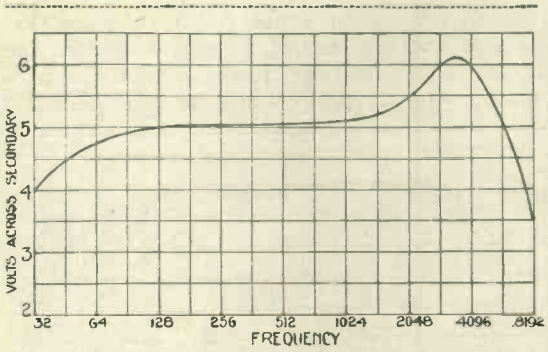


Fig. 5.—Same transformer with lower impedance valve

be most generally acceptable.

The next step is, therefore, to provide a single-stage amplifier which shall have the desired frequency characteristics and a volume control. It seems certain that too much of the higher musical frequencies is not required and, in fact, tests show the desirability of somewhat curtailing them.

Use of Scratch Filters

In many designs, a filter is employed to reduce the relative intensities of the higher notes, because by so doing, scratch and noise are minimised. But it is possible so to arrange the single-stage amplifier that the expense of a special filter need not be incurred.

A number of transformers were tested with various valves and curves taken. The method employed will be understood by referring to Fig. 3.

Valve Voltmeter

A calibrated generator of low-frequency oscillations is connected to the grid and filament terminals of valve V1. Transformer T is joined in the ordinary way and a valve voltmeter is used to measure the amplification.

It will be noticed that a choke-filter output circuit was employed with an ordinary cone-type loud-speaker.

The shape of the amplification-frequency curves depends to a certain extent upon the nature of the load in the anode circuit of the power valve, and it is, therefore, important that this circuit be used as in practice. Sometimes curves are shown with a resistance output or with a small condenser connected across the secondary winding of the transformer. It seems preferable to employ a loud-speaker in the output, because the effect of using different loud-speakers does not produce very marked changes in the amplifying properties of most transformers.

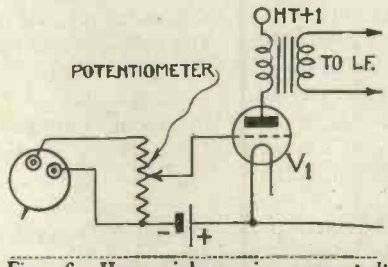


Fig. 6.—How pick-up is connected. It is across the ends of a 200,000-ohm Rothermel potentiometer and the grid of the valve is connected to the moving contact

After testing several types, the new B'own transformer was selected as giving the most desirable results.

The curve A of Fig. 4 shows the ratio of the secondary voltage for constant input voltages for a Brown transformer and a Cossor valve at V1 having an impedance of 16,000 ohms and an amplification factor of 16. Curve B shows the performance when a valve having an impedance of 20,000 ohms and a magnification factor of 20 was used at V1. It should be noted that the input voltage to the amplifier was so adjusted at a frequency of 256 cycles, which is middle C on a piano, that the secondary voltage was equal in both instances at this point.

Curve C refers to the transformer and a valve having an impedance of 28,000 ohms and an amplification factor of 27, the valve being rated at 30,000 ohms and 30 respectively.

Effect on Reproduction

You will notice that the higher musical frequencies are not amplified as much when a valve having a higher impedance is used. Similarly, the bass is weakened a little.

As the impedance of the valve is reduced, the bass is strengthened, and the treble notes are emphasised.

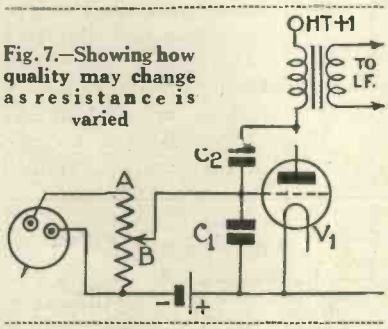


Fig. 7.—Showing how quality may change as resistance is varied

With a really low-impedance valve, the higher musical frequencies are magnified by much more than the middle and lower frequencies. This is shown by the curve of Fig. 5, which was taken when the valve V1 had an impedance of 10,000 ohms.

Bad Characteristic

Now for the reproduction of gramophone records we do not require the high notes emphasised, and the characteristic of Fig. 5 is, therefore, not suitable.

In order to obtain a magnification of seventy, a valve having a magnification factor of about twenty must be used. The frequency response curves of Fig. 4 are satisfactory. With the valve used to give the

(*Continued on page* 486)

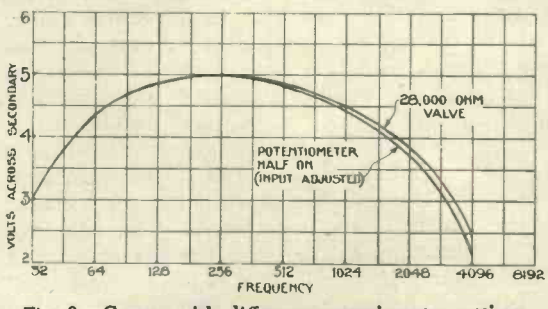


Fig. 8.—Curves with different potentiometer settings

A WIRELESS FICTIONARY

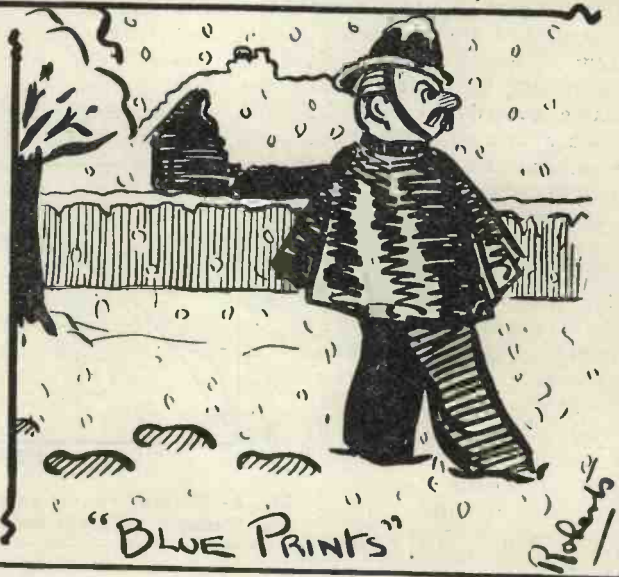
"HEAD PHONES"

"GOOD RECEPTION"

"80 VAULTS"

"STRAIGHT TO EARTH"

"WET CELL"



"BLUE PRINTS"

"Attack" in Loud-speakers

A Special Article by N. W. McLACHLAN, D.Sc., M.I.E.E., F.Inst.P.

IN various circles the subject of "attack" as applied to loud-speakers has been freely discussed during the past few months. As this phase of loud-speaker performance is not well known generally, and as it plays an important part in reproduction, the present article has been written to place the facts before the reader in a simple manner.

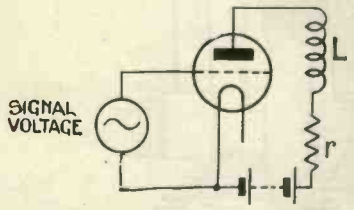


Fig. 1.—Power valve with loud-speaker in anode circuit

First of all, what do we mean by "attack"? Well, to be brief, I would describe it as getting on with the job as quickly as possible. At the end of one section of a musical composition we often see the words *attaque subito*, which means that the next section is to be begun immediately without pause or lapse of time.

No Delay Should Occur

Moreover, this "attack" business simply means that time must not be wasted, and that no delay should occur.

Now let us contemplate a few simple everyday occurrences with which we are all famil ar, but which we seldom or never pause to analyse critically.

We board the train at a station, it starts, and goes on until a steady speed of forty miles per hour is attained. The time taken to attain this speed may have been several minutes. There are two salient points: (1) The object to be achieved was to attain a speed of forty miles per hour; (2) the time taken was, say, three minutes. These one hundred and eighty seconds represent a delay or pause in attaining the ultimate object.

Moreover, the "attack" was very weak. Taking the case of a high-power motor-car, the same speed would have been attained in twenty seconds, which represents a vigorous "attack." Technically speaking, the *acceleration* of the car was *nine* times that of the train.

A Psychological Case

To take a psychological case, suppose we ask two persons the same question. One answers much more readily than the other; in other words his mental "attack" is more rapid and virile than that of the second person. Instances of various types can be quoted indefinitely

The general conclusion, however, is that there exists a time lag between the beginning of the action and its final result. Where mechanical contrivances such as trains, trams, buses, and motor-cars are concerned this lag is due to "inertia." The inertia exists by virtue of the "masses" of metal, etc., involved. The psychological case can be regarded as "mental inertia."

After this introduction we have to apply the above reasoning to the problem of the loud-speaker. We shall assume that the radio receiver is substantially distortionless so that the electrical currents at the studio are faithfully represented at the power valve which operates the loud-speaker.

Since the loud-speaker is actuated by these currents, we have to consider their effect in the anode circuit of the power valve. Fig. 1 shows a power valve with a loud-speaker connected in its anode circuit. To the grid of the power valve voltages are applied which correspond to the electrical currents at the transmitter.

Now in "attack" we are concerned with the time taken for the current in the valve circuit to attain its ultimate value. The loud-speaker can for simplicity be considered as an inductive resistance. This is not quite accurate, but it will serve our present purpose.

This article will be of especial interest to all those concerned about absolute purity of reproduction from their loud-speakers.

Dr. McLachlan has treated a difficult subject in a simple manner that can be understood even by the non-technical amateur.

The fact that there is any lag about loud-speakers at all will come as a surprise to many readers. Learn about one of the problems a manufacturer has to overcome.

An inductance is known to delay the building up of an electric current, so that the larger its value the greater the lag. On the other hand, if the load in the anode circuit were a resistance there would be no lag. Thus when the load is a mixture of inductance and resistance, the lag can be reduced by increasing the latter.

Current Accelerated

This, of course, reduces the maximum value of the current, but the time taken to attain this maximum is curtailed—that is, the establishment of the electric current is accelerated.

In Fig. 2 are shown two curves indicating the rise of the current in the circuit of Fig. 1 after the switch is closed. Curves 1 and 2 represent respectively the rise of current when the resistance is large and when it is small. In a reed-driven

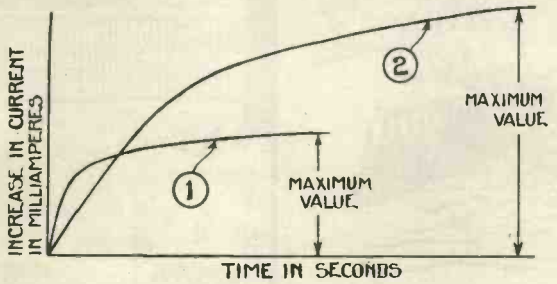


Fig. 2.—Showing rise of current through loud-speaker of Fig. 1 when a voltage is suddenly applied to grid of valve

loud-speaker the D.C. resistance of the windings usually lies between 1,000 and 2,000 ohms, and the inductance between 2 and 3 henries.

On the other hand the resistance of a coil-drive loud-speaker (without transformer output) is about 1,000 ohms, whilst its inductance is from .1 to .2 henry according to the frequency.

Rise in Current

Moreover if we have a valve and loud-speaker as shown in Fig. 1 and we suddenly alter the grid bias from −20 to −10 volts the current through the loud-speaker will rise as shown by the curves of Fig. 2.

Since the coil-drive loud-speaker has a smaller inductance than the reed-drive, the current through the former will rise more rapidly than that through the latter. Assuming the power valve to have an internal resistance of 3,000 ohms, the current in a reed-drive unit will reach 80 per cent. of its maximum value in about 1/500th second.

Whether this lag is perceptible to the ear I cannot say, because no measurements on the rapidity of aural response have been made. However, for the time being we shall assume that this small time interval cannot be perceived by ear.

Diaphragm Response

Now we come to the crucial point, namely, the current causes a force to be exerted by the coil or reed, whichever is used. What time elapses before the diaphragm responds to and accurately follows this force?

Since we have assumed that the lag in the electrical circuit is imperceptible to the ear, the problem of the loud-speaker response revolves itself into a purely mechanical one. In Fig. 3 a force F is suddenly applied to a mass M, which for the purpose of our investigation is a diaphragm. To simplify the argument, we shall assume the diaphragm to be perfectly rigid, that is, it always moves as a whole.

Moreover, if F is a steady unidirectional force, the velocity of the diaphragm will gradually increase. The time taken to attain a certain velocity will depend upon the magnitude of the force. The larger the force, the shorter the time taken to attain the desired velocity. Although the velocity gradually increases, it is important to notice that the rate at which the velocity increases is quite uniform, if the force acting on the diaphragm is constant.

The rate of increase in the velocity is known as the *acceleration*. Thus we see that the acceleration of the diaphragm corresponds to the driving force. When one increases so also does the other.

Some time ago I made a mathematical investigation regarding the air pressure or sound intensity due to a flat disc in vibration. Suppose O in Fig. 4 is a rigid circular disc mounted freely in a hole cut out of a large wall. If O is driven by a coil situated in a magnetic field (like the coil-drive loud-speaker) so that it vibrates two hundred and fifty-six times per second, a listener situated on the axis at P will hear a sound corresponding to middle C on the pianoforte.

Increased Volume

The loudness of the sound will increase if the force on the coil is increased. This can easily be effected by passing a larger current through the coil.

Now, suppose we keep the coil current constant at all frequencies from, say, 30 to 5,000 cycles per second; then the driving force will also be constant. Under this condition the acceleration of the disc as it moves to and fro will be constant, as we indicated above. The mathematical analysis showed that for **constant acceleration the sound intensity at P was the same for**

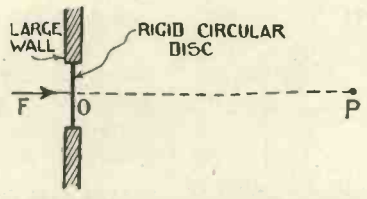


Fig. 4.—Sound at P is proportional to acceleration of disc, which is 2 in. diameter, and P is 2 ft. or more from O

all frequencies from 20 to 5,000 cycles per second.

From this it immediately follows that if a force is suddenly applied to a small rigid diaphragm, the acceleration of the diaphragm follows the force intimately. As the sound at P depends upon the acceleration of the diaphragm, it will correspond absolutely with the force producing it. There is consequently no lag between the application of the driving force and the corresponding sound, excepting the time taken for the sound to travel from the disc to P. Hence the "attack" is perfect.

We have dealt with a small rigid diaphragm in order to present the problem of "attack" in a simple manner. In practice, however, diaphragms are large, are not rigid (they bend easily), and have resonant frequencies. The extra size and the resonant effects complicate the problem of "attack" considerably.

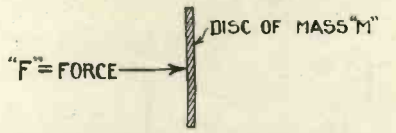


Fig. 3.—Mechanical example of application of steady unidirectional force

The larger diaphragm means that its effective mass is greatest at low frequencies, so that the attack at high frequencies will be the more brisk of the two. The lack of rigidity means that above a certain frequency the whole of the diaphragm is not moving in the same direction at once. The resonances of the diaphragm are superposed at the beginning and end of each "attack."

Suppose we have a conical diaphragm 9 in. in diameter, and that one of its resonant frequencies is 256 cycles per second (middle C on pianoforte). If this diaphragm is used in a loud-speaker to reproduce the note B (next to C) we shall hear two notes, namely B and C.

The note C may be loud enough to cause a definite dissonance, as it would if B and C were played simultaneously on the pianoforte.

False Transients

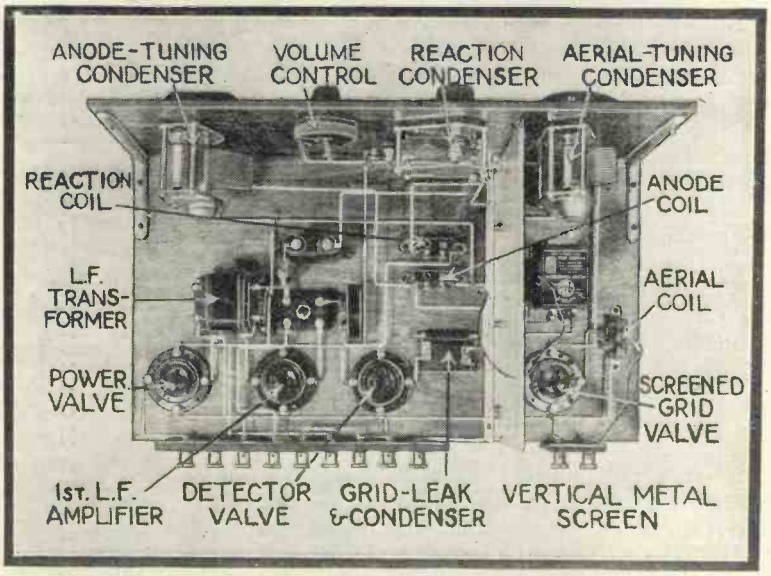
This indicates the general effect of resonances on "attack," or on what the applied mathematician terms *transients*. The diaphragm resonance amalgamates with the true sound to cause a "false" transient, that is, distortion.

Good examples of transients are found in: (1) Clapping hands; (2) drums; (3) plucking a stringed instrument; (4) rifle shot; (5) pianoforte. In these cases the sounds are sharp and sudden, not being sustained as in the case of an organ or bowing a violin. Moreover, in designing a loud-speaker to have a good attack, it is desirable to damp resonances adequately.

Only the question of cost is stopping many thousands of amateurs from building a screened-grid valve set. This article describes a receiver that can be built at a minimum of expense and in which many existing parts can probably be incorporated. Moreover, the actual construction of the set is quite simple and straightforward

The Economy Screened-grid Four

TO most readers the title of this article will be self-explanatory. Here are particulars of a screened-grid valve set that can be built for a reasonable price and in which it is possible to use a number of parts that the average home-constructor already has in hand.



This plan view of the Economy Screened-grid Four clearly shows the arrangement of all the parts

Components Used

For instance, amongst the components used are two .0005-microfarad tuning condensers, a rheostat, an on-off switch, three single-coil holders, four valve holders, a .0003-microfarad and a 1-microfarad fixed condenser, a low-frequency transformer and two-pin plug-in coils.

Build This Set at Very Small Cost

Many amateurs have such parts as these lying about or included in their existing receivers and they can, therefore, build this up-to-date four-valver at very little extra cost.

The WIRELESS MAGAZINE knows that it is only the question of expense that is stopping thousands of listeners from building a screened-grid valve set to find out for themselves what it can do and there is no doubt that this design will meet the needs of many.

Nothing essentially different from usual practice will be found in the circuit, a diagram of which is reproduced opposite. A tapped coil is used in the aerial circuit for the sake of increased selectivity and this is tuned by a .0005-microfarad condenser. The anode coupling between the screened-grid valve and the detector is also centre-tapped (the reason for this was explained by W. James in his article "Secrets of Success with the Screened-grid Valve" which appeared on page 350 of the November issue of the WIRELESS MAGAZINE), another .0005-microfarad condenser being used for tuning.

High-tension Supply

It will be observed that the high-tension supply to all four valves is common, the voltage on the screening grid of the high-frequency valve being reduced to the right amount by a resistance placed in series with it.

Grid-leak rectification is used for increased sensitivity. There is no fear of this getting choked up as a volume control is provided in the high-frequency stage in the form of a filament rheostat.

Reaction is obtained by coupling a small coil to the anode coil and controlling the amount of feedback by means of a .0001-microfarad variable condenser. This system necessitates an efficient high-frequency choke in the anode circuit of the detector.

"Motor-boat" Stopper to Prevent Battery Noises

The detector is coupled to the first low-frequency amplifying valve by means of a resistance-capacity coupling, which is obtained as one complete unit. This stage is also provided with a "motor-boat" stopper, which takes the form of a 50,000-ohm anode resistance and a 1-microfarad condenser. This prevents noises from occurring until the high-tension battery is quite exhausted, and also makes the set suitable for operating from the mains.

This set—which has been specially designed, built, and tested by the "Wireless Magazine" Technical Staff—has great range and can be relied upon to receive a large number of Continental transmissions at great volume. Moreover, it is not at all expensive for a set of its type

The first

low-frequency amplifier is coupled to the power valve by means of a low-frequency transformer. This combination of couplings giving great volume and perfect quality of reproduction.

Note that the rheostat controls only the filament of the screened-grid valve and that the whole set is switched on and off by means of a push-pull switch. Grid bias is applied to both the low-frequency amplifying valves.

Use Good Quality Parts

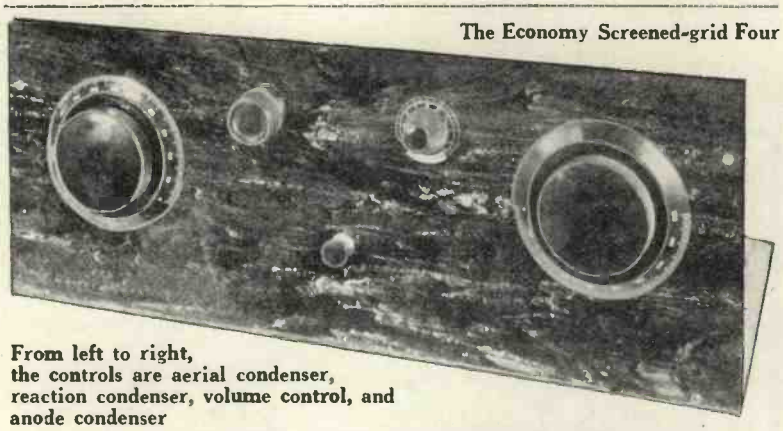
The prospective constructor will at once see what parts he can use of his own—but he should make sure that they are of reasonably good quality and not electrically defective.

As far as two-pin plug-in coils are concerned, the aerial and anode coils are centre-tapped, while the reaction coil is plain. For the lower broadcast band the following will be needed : Aerial, No. 60; Anode, No. 60; Reaction, No. 35. For the upper broadcast band use the following coils : Aerial, No. 150; Anode, No. 200; Reaction, No. 75.

By-pass Condenser

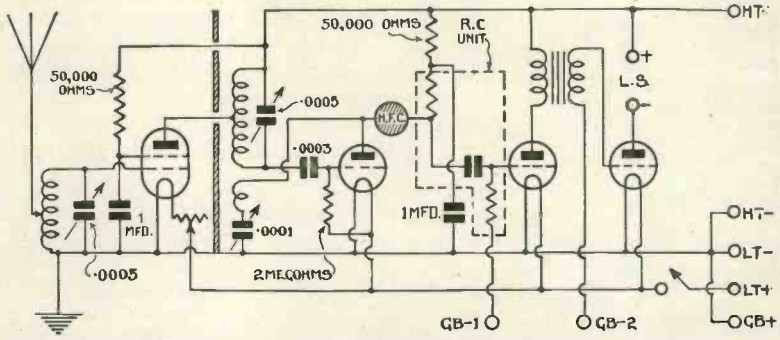
It is particularly desirable that the 1-microfarad condenser connected to the screening grid of the high-frequency valve should be of the make specified, as the internal construction of this particular model makes it non-inductive and therefore especially suitable for this position, where minimum losses are more desirable than elsewhere in the set. The other two fixed condensers can be of standard types as used in any normal receiver.

The Economy Screened-grid Four



From left to right, the controls are aerial condenser, reaction condenser, volume control, and anode condenser

The actual variable condensers used in the original Economy Screened-grid Four are provided with special vernier dials, which make for ease in tuning. Constructors are strongly recommended to use slow-motion controls even if they use old-type condensers that they have on hand.



Circuit of the Economy Screened-grid Four, which comprises H.F., detector, and two L.F. stages

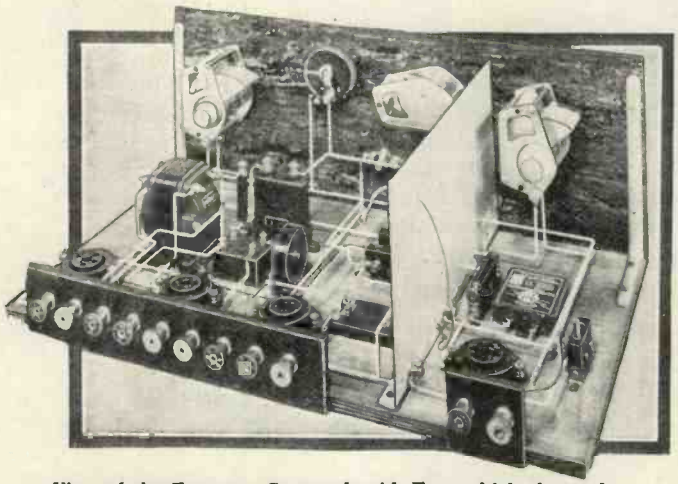
It will be observed from the photographs that a minimum of screening is utilised; the single vertical screen is, however, quite sufficient and the set is stable even when used without an aerial.

Short Flex Lead

Most of the connections are taken through the slots provided in the screen as it is sold. One hole must be made near the top, however, for the flexible lead from the anode of the screened-grid valve to the centre tap of the anode coil; this lead should be kept as short as possible.

The aerial and earth terminals are mounted on a separate strip from the rest of the terminals, so that the effectiveness of the screen is in no way lessened. For reception of a very powerful station it is quite sufficient to twist a flexible lead from the aerial lightly round the aerial coil and not actually connect it to the coil at all.

Some further notes on the high-tension supply will not be out of place at this stage. As already mentioned, a single source of supply is used for all four valves and the voltage must, therefore, be 120 volts. It will thus be seen that practically the full voltage is applied to the anodes of the screened-grid valve, the first low-frequency valve and the power valve, which is as it should be.

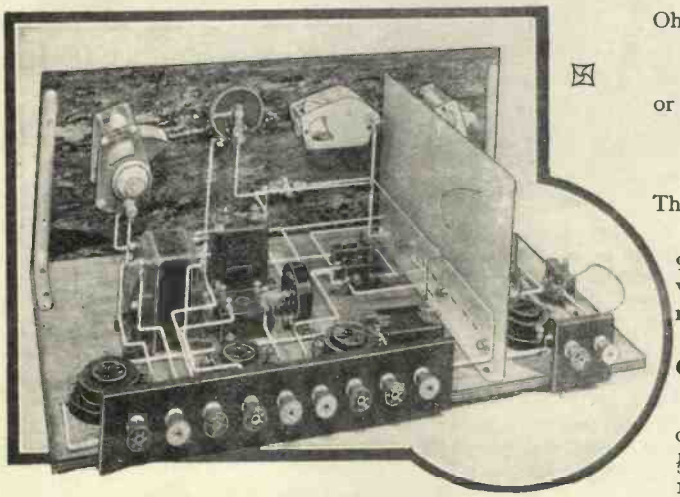


View of the Economy Screened-grid Four which shows the simplicity of the layout. It is desirable to keep the flexible lead through the screen, which connects the anode of the H.F. valve to the centre tap of the anode coil, as short as possible

Resistances to Reduce Voltages

In series with the screening grid of the high-frequency valve and the anode of the detector are placed resistances which have the effect of reducing the voltage. As grid-leak rectification is employed the value of the resistance for the detector (which

The Economy Screened-grid Four (Continued)



Another view of the Economy Screened-grid Four

it will be remembered, is really a "motor-boat" stopper in conjunction with a 1-microfarad fixed condenser) is not critical and a value of from 20,000 to 50,000 ohms will be found quite suitable for most valves.

As can be seen, a 50,000-ohm resistance was used in the original receiver.

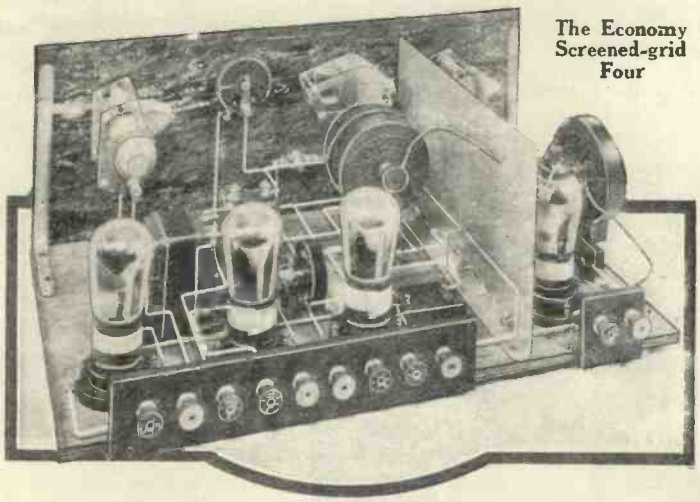
Value of "Screening-grid" Resistance

The value of the "screening-grid" resistance is more important, however. Really it should be found by actual measurement for each particular valve used as the characteristics of all types vary quite a lot. Perhaps this will be clearer if explained in detail.

To get the best results from any particular valve there is a particular screening-grid voltage required and at that voltage a certain current will flow. Our problem is to provide a resistance so that when the supply is obtained from a 120-volt source the same voltage is applied to the screening grid and, therefore, the same current will flow.

Measuring Screening-grid Current

We therefore measure the screening-grid current by means of a milliammeter when a particular voltage is applied to it. For instance, an SS215SG valve with 75 volts on the screening grid (and 120 volts on the anode) gave a reading of ½ milliampere. We then have to find a resistance which will, when passing ½ milliampere, lower 120 volts to 75 volts. In other words we must drop the voltage by 45.



The Economy Screened-grid Four

Ready for use with valves and coils in position

Ohm's law gives us our clue. We transpose the familiar

$$C = \frac{E}{R} \text{ to } R = \frac{E}{C}$$

or in this particular case

$$\text{Resistance} = \frac{\text{Voltage drop}}{\text{Current in amperes}}$$

This now becomes $\frac{45}{.0005}$, which is 90,000. Therefore, a 90,000-ohm resistance will be best with an SS215SG valve, but as this value is not made a 100,000-ohm resistance will be near enough.

Other Suitable Resistance Values

With 75 volts on the screening grid (and 120 volts on the anode) an Ediswan SG215 gave a reading of ⅓ milliampere. This works out to a resistance of 150,000 ohms. For a Marconi or Osram SG215 a 50,000-ohm resistance is about right.

Those who can afford it—and they are not very expensive—are recommended to obtain resistances of 50,000, 100,000 and 150,000 ohms to get the best value for any particular valve they may be using.

Blueprint Available for Half-price

Apart from these points there is no constructional difficulty about the receiver, especially if use is made of one of the full-size blueprints which can be obtained for half-price up to the end of December, if the coupon on page iii of the cover is used. If it is not desired to use a blueprint, a reduced reproduction of it will be found on page 440.

The price for the blueprint under the half-price scheme is 9d. post free and application for it should be made to Blueprint Dept., WIRELESS MAGAZINE, 58/61 Fetter Lane, E.C.4. Ask for No. WM112.

Choice of Components

Constructors who propose to build the Economy Screened-grid Four from parts they already have should take particular care that they are all of good quality. The list of components on page 439 will show what extra parts are needed.

The drilling of the panel is not a difficult job, and when this has been done, the necessary components can be mounted on it. These are the two .0005-microfarad variable condensers, the .0001-microfarad reaction condenser, the filament rheostat (30 ohms), and on-off switch.

When this has been accomplished, the panel should be fixed to the baseboard by means of the brackets and the

An Inexpensive Receiver for Range and Volume

remainder of the components placed in position. The arrangement of the parts will be clear from the photographs and reproduction of the blueprint.

No Difficulty in Wiring the Set

As soon as everything has been firmly fixed in position wiring up can be started, and no difficulty at all will be experienced in carrying this out if use is made of the blueprint. It will be noticed that each terminal point is marked with a small letter; these letters indicate which points are to be connected together and in what order.

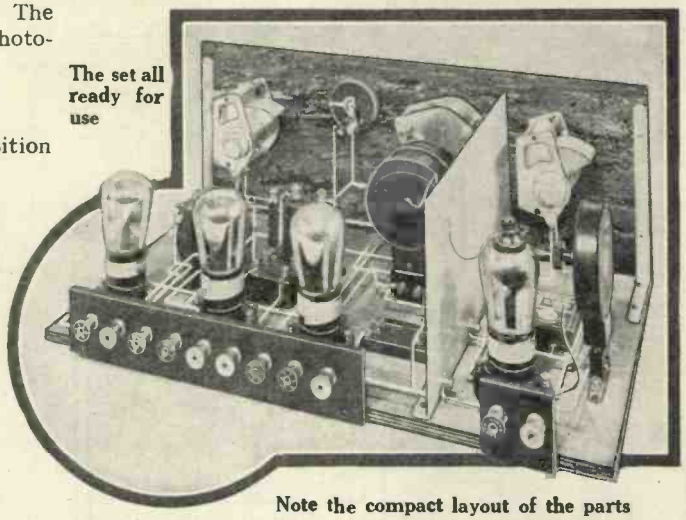
For instance, first connect together with one wire, or as few wires as possible, the points marked *a*; then connect the points marked *b*; and so on through the alphabet.

At this stage the set can be tested, provided suitable valves are to hand. The screened-grid valve can be a 2-, 4- or 6-volt valve (see complete list on pages 404–405), any make being suitable.

For the detector, a valve with an impedance of about 60,000 ohms should be used, while the first low-frequency amplifier should have an impedance between 10,000 and 20,000 ohms. A power valve with an impedance between 2,500 ohms and 5,000 ohms will be suitable with most loud-speakers.

Testing Out the Receiver

To test the set then, insert the proper valves and coils in their respective holders (the sizes of coils were indicated on page 430), and then connect up the batteries. Apply 120 volts to H.T.+, while to G.B.—1 apply from 3 to 6 volts, and to G.B.—2 from 9 to 18 volts, depending upon the type of power valve used. In matters of grid bias always follow the makers' recommendations.



The set all ready for use

Note the compact layout of the parts

Pull out the knob of the push-pull switch to put on all four valves, and turn the volume-control rheostat as far as it will go to the right. Now tune both outside condensers simultaneously until a station is picked up. If it is too loud turn the volume-control rheostat to the left.

For the reception of distant stations, the set can be brought on the verge of oscillation, and, therefore, in its most sensitive condition, by means of there action condenser; on no account let the set oscillate, however, because if it does the quality of reproduction will be very bad.

If Bad Oscillation Is Experienced

If the set oscillates uncontrollably, it is most likely to be because the wrong voltage is being applied to the screening grid of the high-frequency valve and the feed resistance should be changed as already explained. Another cause of oscillation may be the use of too large a reaction coil; again the remedy is a simple one and does not involve any structural alteration.

All that the prospective constructor need do now, having noted all the important points about the Economy Screened-grid Four, is to get together the components and order a half-price blueprint—if he wants to save time over the construction and wiring!

A Puzzling Fault in Testing

When the Economy Screened-grid Four was first tested out some fault was at once apparent. The set was used with a high-voltage accumulator to supply the high tension. The fault is mentioned here, as it will be of interest to readers.

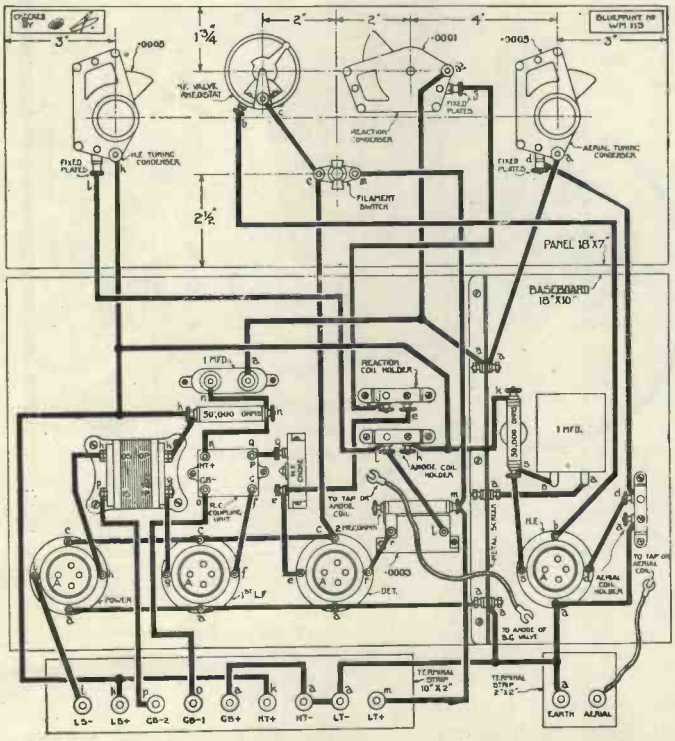
As soon as the set was switched on a bad low-frequency howl occurred. The accumulators were at once suspected and each 20-volt block was tested separately with a voltmeter while under load. As the batteries had just come off charge, all the readings were well up, as it had been expected they would be.

The set was then run over in detail and each component thoroughly tested. Ten minutes' work proved that there was nothing at all wrong with the set. What could it be, then? The battery was again suspected

COMPONENTS REQUIRED FOR THE ECONOMY SCREENED-GRID FOUR

1—Ebonite panel, 18 in. by 7 in. (Becol, Parfait, or Trolite).
2—.0005-microfarad variable condensers, with vernier attachment (Polar, Gecophone, or Jackson).
2—Dial indicators (Bulgin).
1—.0001-microfarad variable condenser (Polar, Dubilier, or Cyldon Bebe).
1—30-ohm panel rheostat (Lissen, Peerless, or Igranic).
1—Push-pull on-off switch (Benjamin Lotus or Lissen).
4—Antimicrophonic valve holders (W.B., Lotus, or Formo).
6—Two-pin plug-in coils (Lewcos, Atlas, or Lissen).
3—Single coil holders (Lotus, Lissen, or Peto-Scott).
1—1-microfarad fixed condenser (Hunt's Polymet).
1—50,000-ohm (or 100,000 or 150,000 according to S.G. valve) resistance with holder (Graham-Farish).
1—Metal screen, 6 in. by 10 in. (Magnum or Parex).
1—.0003-microfarad fixed condenser (Graham-Farish, Dubilier, or T.C.C.).
1—2-megohm grid leak (Graham-Farish, Dubilier, or Lissen).
1—High-frequency choke (Burndept, Wearite, or Lewcos).
1—Resistance-capacity coupling unit (Trix type B, Dubilier, or Lissen).
1—1-microfarad fixed condenser (Dubilier, Lissen, or T.C.C.).
1—50,000-ohm resistance (Graham-Farish).
1—Low-frequency transformer (B.T.H. 4 to 1, Ediswan, or Ferranti).
1—Pair panel brackets (Raymond).
2—Terminals strips, 10 in. by 2 in. and 2 in. by 2 in. (Becol, Parfait, or Frolite).
11—Terminals, marked:—Aerial, Earth, L.T.+, L.T.—, H.T.+, H.T.—, G.B.+, G.B.—1, G.B.—2, L.S.+, L.S.— (Eelex or Belling-Lee).
1—Cabinet with 10-in. baseboard (Caxton).
Stiff wire for connections (Glazite)
Short length of flex..

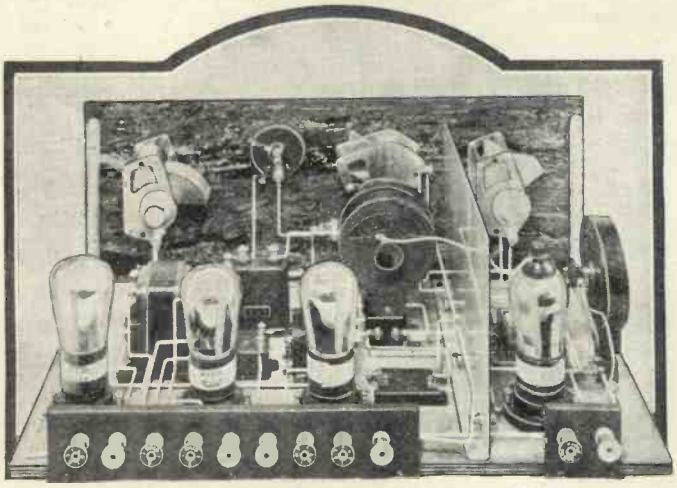
The Economy Screened-grid Four *(Continued)*



This layout and wiring diagram can be obtained as a full-size blueprint for half-price (that is, 9d., post free) if the coupon on page iii of the cover is used by December 31. Ask for No. W.M.113

and the circuit searched for a high-resistance contact between two of the 20-volt blocks, for the voltmeter had proved each block to be up to standard.

An inspection of the connections between the blocks resulted in the discovery that a plug and socket too liberally coated with vaseline (to prevent creeping of the acid over the metal and consequent corrosion) was acting as a high resistance. Removal of the vaseline did the trick and the howl vanished !



Another view of the Economy Screened-grid Four

Many Uses for Radio Science

WIDESPREAD use of radio, aside from its purely communication functions, is saving millions annually to commerce and industry in the United States. Millions have been saved for the shipping industry alone by radio as a navigation aid. The lighthouse service maintains radio beacons at all strategic points along the coast, and huge liners are thus kept on their course. Radio beacons also have played a large part in aviation as direction finders.

The larger power companies in nearly every big city in the United States find radio an invaluable aid in detecting an approaching storm. This information is necessary so that they may prepare to meet the "peak load" required during cloudy or stormy weather.

Distant Storms Ring Warning Bell

Warning of storm is given an hour or more prior to its appearance by means of a radio receiving set and a bell. The set responds to the distant lightning flashes and the bell rings.

Geologists in oil-producing states are now using radio to discover oil deposits. The process is simple : an explosive is set off near a suspected oil dome and a radio transmits the sound overland to a distant receiving station. The time required by the radio wave and the underground repercussion from the explosion are then compared. If the underground sound takes an unusually long time to come through it is probable that its course was deflected by an oil deposit.

Use of radio as an aid to mineralogists seeking to discover precious metal or ore deposits in the earth is another recent development. Radio impulses are discharged through the area to be tested and the mineral is detected by a process similar to that in discovering oil.

Controlling Ships By Radio

Naval experts have now perfected means of controlling a ship by radio.

Other non-communication uses of radio include the growing use of television, transmission of facsimile messages and photographs, and the utilisation of radio in connection with "wired wireless." Railways are also saving time and labour by installing radio on long freight trains for communication between the guard's van and the engine.

The depth-finder is another recent invention which measures the depth of water; this instrument is fitted to ships, making it possible for them to travel at full speed while the depth is recorded on a clock-like dial in fathoms, where formerly it was necessary to proceed at a very slow speed to permit heaving the lead. F. P.

How Your Aerial Wire Corrodes

Fig. 1.—Enormously magnified surface of aerial (copper) wire, showing its fresh, lustrous, fibrous formation

METALLIC corrosion is one of the worst foes to industrial stability. After taking extraordinary trouble to smelt a metal from its ores, that element, or an alloy containing it, begins to deteriorate unless it is painted or otherwise protected from the damaging agencies always present in damp or changeable air.

Seven-stranded Wire

In the present case it is the seven-stranded copper aerial wire with which I shall deal.

Readers will already know that new and fresh copper wire has a salmon-pink colour. After it has been exposed to the atmosphere for some time, however, it turns first grey or reddish-grey and finally black.

Gradual Oxidisation

It has then oxidised owing to the gradual action of damp oxygen upon it. Purposely oxidised copper is made up as ornamental articles, because of its presumed attractiveness; but where the metal has to encounter services of other characters, such as electrical conductors and so on, this conversion of copper into cupric oxide is undesirable, and produces expenses which *might* be avoided, *but usually cannot be.*

Many people must have noticed, when they have taken down their aerial, or maybe it has fallen owing to wind or accident, that its colour has become blackened—the fresh, lustrous, pinky one having vanished. The truth is that its surface has deteriorated in the manner hereafter described. Avoid *buying* dirty copper wire!

Copper wire is microscopically fibrous-crystalline, as shown in Fig. 1. Now, the minute, really invisible grains or semi-crystalline particles of metals are always undergoing changes, which can only be seen by the naked eye in bulk appearance, or felt as such.

Crystals unite to form larger ones or, split up into smaller fragments, loosen or tighten, as the case may be, without the mass itself being modified, so far as can be detected by ordinary means and observations.

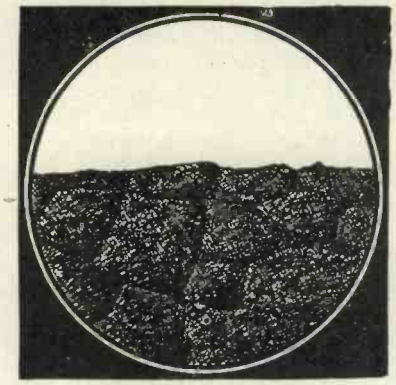


Fig. 2.—Enormously magnified surface of aerial (copper) wire, oxidised by the air into scaly, gritty, insoluble cupric oxide, which fails to convey the electric current

The microscope and chemical tests, however, soon reveal the truth of the formations.

Each minute grain is itself composed of what I must call atoms, though I am using the word in its ordinary and not scientific sense. They are specks, as it were, and as they change the particles, or grains, get contracted or expanded, and consequently cause irregularities, such as fissures, excrescences, rugosities, and pores.

The principal fact to be noted in this connection is that copper oxide is *non-conductive* to the electric current; so that when the outer film of each wire strand is affected beyond a certain depth its proper functions are seriously interfered with. Up to a definite degree the superficial skin of oxide may serve as an effectual protection, but beyond this point weakness commences to supervene.

Irregular Current Flow

Instead of the current being able to flow uniformly it does so irregularly, with results of a kind which are not always explicable. In Fig. 2 is shown a layer of such gritty oxide.

Another enemy of copper wire which is exposed to the atmosphere is the sulphuric acid suspended in the vapours of smoky towns, derived from the oxidisation of the soot sulphur.

How Cavities Are Formed

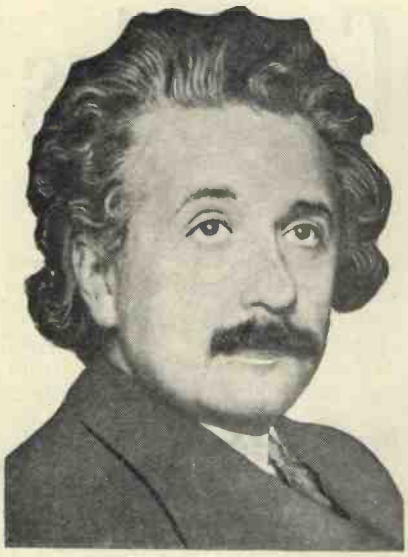
This attacks the copper and produces scattered spots of bluish or greenish colour, consisting of *soluble* crystals of the kind shown in Fig. 3. Rain washes them off, leaving the metal replaced by cavities.

In either case, whether the corrosion is due to oxidisation or sulphation of the copper wires, if such effects penetrate deeply enough the wires snap and fall or otherwise behave mischievously.

JAMES SCOTT.

Fig. 3.—Enormously magnified surface of aerial (copper) wire, converted into a mass of bluish green soluble crystals (non-conductive and loose), by the action of sulphuric acid formed from sulphur in the atmosphere

You Must Tell Your Friends About W. James's Touchstone!



Prof. Albert Einstein, the famous scientist who propounded the theory of relativity

New Theories of the Ether

By GERALD H. DALY

HAS science at last discovered something more definite about that mysterious medium—the ether of space—which is thought to play such an important part in wireless communication? Perhaps it will not be out of place to trace back to the origin of the ether theory and how it came about, in order to make the latest theory clear.

Isaac Newton's Theory

To account for the phenomenon of light, Sir Isaac Newton advanced the theory that it consisted of minute particles shot out from the luminous body—this was known as the corpuscular theory and held ground for many years, until it was finally dropped owing to the discovery of the phenomenon of interference.

For example, when two rays of light are focussed in a dark room, in a certain way, they blot each other out. The only explanation for this is that the two beams of light cancel each other. This would happen if light was of wave formation, when the troughs of one set of waves would fill up, as it were, the peaks of the other set of waves, thus cancelling the waves altogether.

Wave Theory Accepted

So the wave theory of light came to be generally accepted, although it had first been postulated by Huygens nearly one hundred years before.

But if there are waves, there must be a medium in which the waves can take place—sea waves take place in the sea, sound waves in air, and so on. What, then, was the medium in which light waves took place? It was not air, because light waves can take place in a vacuum.

Hence there must be something which pervaded even a vacuum; it must permeate everything and fill all space, to account for the light waves reaching the earth over the ninety odd million miles of space which separate the earth from the sun.

So a theoretical medium was postulated and given the name the ether of space. It was presumed to be everywhere—pervading all space and all things, yet invisible and entirely non-physical. Efforts were made to discover its existence in the absolute, but were unavailing: it remained a complete mystery. In the meantime Maxwell propounded

In this article is discussed a problem that is of vital interest to everybody connected with wireless; it should not be missed because its title may seem "difficult." Listeners are rather neglectful of the real fundamentals of wireless practice and this article will inform them of Science's latest theories

his electro-magnetic theory of light and showed that this ether medium in light phenomenon was the same as the medium in which electric and magnetic action took place, and the same laws were applicable.

Finally, two scientists, Michleson and Morley, prepared to make what is generally regarded in science as an absolute test of movement, a method which had then just been discovered. Simplified, it is as follows :—

A lamp is placed on a table which is floating in a bath of mercury. Two mirrors are arranged at right angles to each other and at equal distances from the lamp. One beam from the lamp is focussed on one mirror and another beam focussed on the other mirror. These beams are reflected back by the two mirrors, and if there is any movement of the earth through a sea of ether one beam will be reflected back sooner than the other. This test should be infallible, and it was never doubted for a moment but that the two beams would be reflected back at different times and demonstrate the earth's movement relative to the ether, or the movement of the earth through space, at any rate.

Science Receives A Shock

To the amazement of everyone, however, the two beams returned at precisely the same time. The experiment was tried again, with the same results. There was only one conclusion : the ether was a myth and the earth was not moving through any medium. (As a matter of fact, this experiment proved that the earth did not move at all—that it was quite stationary—contrary to astronomical observations; and science generally received a rude shock, because everyone had supposed that the earth moved through space around the sun, etc.; but we are not concerned with this latter aspect of the Michleson-Morley experiment.) From our point of view, the ether theory lost considerable ground.

Nothing To Take Its Place

There was nothing to take the place of the ether theory, however, and many scientists still adhered to it, maintaining that there was probably some explanation to the remarkable results of the experiment, because everyone knew that the earth moved through space, even if there was no ether, and the Michleson-Morley experiment had shown the earth to be stationary, which was absurd.

Along came wireless, and was soon discovered to be of the same family as light waves and subject to Maxwell's laws. All the early wireless

textbooks explained the wireless waves by means of the ether medium—it was the most simple thing to do.

Einstein's Special Theory

Then Einstein published his special theory of relativity, and was able to explain the mystery of the Michleson-Morley experiment. A thing might be moving for one person and not for another, said Einstein; it depended upon the position of the observer. This has been proved mathematically and experimentally.

Also, why Michleson and Morley always found the two beams of light to return in the same time was because light has a speed of 186,000 miles per second, and there are certain peculiarities connected with this speed which are not apparent when using slower speeds, such as that of a train. It is the absolute limit of speed, says Einstein; however fast the earth was moving, if Michleson and Morley continued to use light for making the experiment, and they themselves remained on the earth the result would always be the same.

Only Light Suitable

If the experimenters could have used some other travelling phenomenon of slower speed, a movement of the earth would undoubtedly have been shown; but light was the only possible thing to use, because it has a constant speed and is independent of the earth's movement—nothing else was suitable.

Now, because Einstein was able to explain the results of the Michleson-Morley experiment and, furthermore, ignored the existence of the ether or all-pervading medium in his theory, many people jumped to the conclusion that he had still further disproved the ether theory.

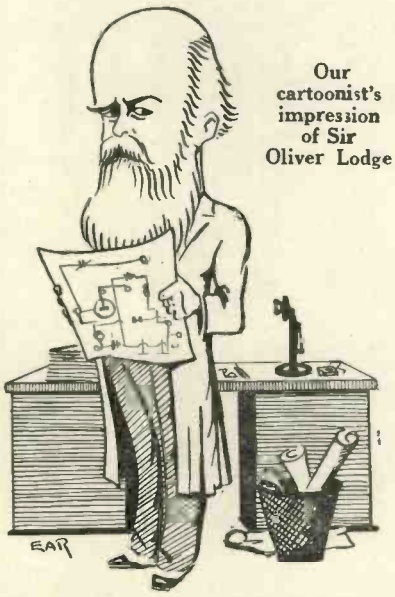
Ether Unnecessary to Einstein

This is, of course, a mistake. Einstein did not concern himself with the ether, because it was unnecessary to his theory; so that, really, the results of the Michleson-Morley experiment left the ether very much as it was before they had done the experiment.

In the meantime, however, wireless science was rapidly advancing, but still the method by which the wireless waves travelled was a mystery; engineers had mastered practically all there was to master about radio communication except this one thing. New theories sprang up, notably the one advanced by Dr. Steinmetz, that wireless waves were waves in the magnetic flux which surrounds and permeates the earth.

This sounds quite feasible until it is examined, when it requires more imagination than the ether theory,

ANOTHER GREAT SCIENTIST



Our cartoonist's impression of Sir Oliver Lodge

and the latter would appear far more possible, basing our supposition on the known facts about the waves.

This brings us to some more recent research which has taken place in Germany and, strangely enough, is based on the Einstein theory, which was thought to dispense with the ether of space. It is now believed, in fact, that the force of gravitation is caused by very small differences in the condition of this ether.

In addition to this, says the new theory, if the new cosmic ray, which is a denizen of the ether, can penetrate 16 feet of lead, it follows that the ether must be infinitely more penetrative and can pass easily between the atoms of matter without giving rise to any friction at all with matter. Thus we cannot hope to locate it with our instruments in their present comparatively insensitive stage.

State of Velocity

It would also appear that the ether is a kind of state of velocity approximating that of light; to understand it properly it is necessary to fully comprehend this colossal speed, to which humanity is unaccustomed. All phenomenon connected with the ether must have this velocity, that is 186,000 miles per second.

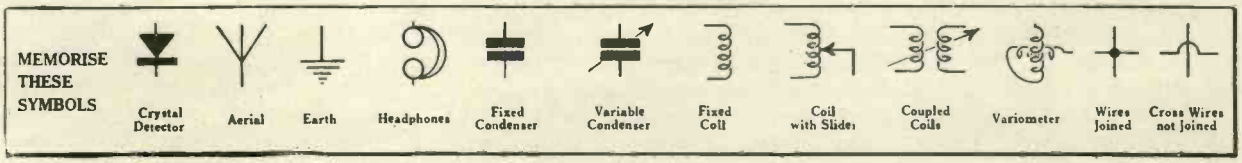
We know this to be true, because all the ether rays which we have yet discovered from cosmic rays—X-rays, light, heat, to our own wireless waves—all have this etherial speed of 186,000 miles per second. If we were as accustomed to this speed as we are to 20 miles per hour, the ether would present no mystery; but until our instruments are sensitive and precise enough we can only theorise about it, says the new theory.

Rapid Vibration

It may also happen that the ether itself is in a state of most rapid vibration—that its frequency is far greater than the frequency of any known ray—and it is due to this rapid vibration that it is able to penetrate and pervade all matter without the least indication of its presence physically.

No Physical Comparison

Apparently there is no physical comparison which we can draw with it; it vibrates like a jelly, yet it must be denser than the densest solid and able to permeate between the interstices of our atomic world—closely knitted as it is. Such an entity cannot be properly understood, even imagined, by us, with our physical senses, yet slowly we are finding out more and more about this mysterious medium and how it affects our existence with its marvellous rays, of which wireless is not the least important.



At Home with the German Listener

THE individual character of every human being is different, and this difference becomes all the greater if we compare two individuals from different surroundings and countries. Although broadcasting has done a lot, and will be doing more in the near future, to facilitate the understanding of one's national neighbour, the individual characteristics are bound to remain.

One Thing in Common

Listeners all over the world have one thing in common—they all have the radio disease in smaller or greater degree. Still, there remain individual characteristics. Everybody does not get the measles in the same way.

When broadcasting first started a little over four years ago in Germany the listener was only allowed the free use of crystal sets. Valve sets were restricted to a waveband of from 250 to 700 metres, reaction on the aerial circuit was forbidden, and every set had to be sealed by the government officials.

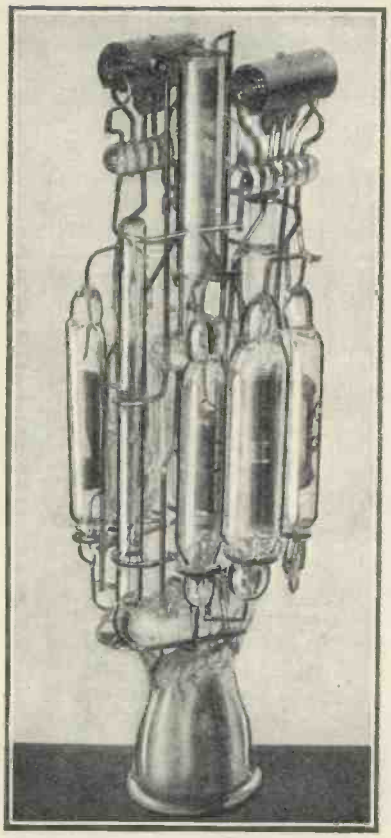
Those hardy amateurs who wished to build their own valve sets had to become a member of a recognised radio club, and then had to pass a more or less rigorous examination in theoretical and practical knowledge of radio sets and fundamentals of electricity.

Then, provided he passed (nearly all those who plucked up courage for the examination did pass), he received a special licence "*Audionversuchserlaubnis*" and was allowed to build his own (valve) set.

Fewer Oscillators Than Here

So at the beginning there was no oscillator nuisance to speak of. But about a little over a year later, in 1925, the *Audionversuchserlaubnis* was buried, the whole waveband was free for reception, and anybody could build a set. One can safely say that the oscillator nuisance is, as everywhere, rather bad, but I do not think quite so bad as in Britain.

The German policy is to cater for the crystal-set owner. Therefore, the great and still increasing number of the German stations (Kaiserslautern is the latest addition, on 279 metres). The need for greater selectivity in valve sets has, as on the greater part of the Continent, greatly increased. However, these sets are still in the large minority, although valve sets permitting of the reception at good loud-speaker strength of the local station and, after that has closed down, also of other stations have become extremely popular.



Loewe triple valve, which may soon be on sale in this country

The Loewe valve is the reason for this. It, in connection with a small unselective set and a loud-speaker, has become, next to the crystal set, the most popular means of broadcast reception in Germany. This small Loewe valve set only costs about £2, including the famous three-fold valve; so that even those of modest means can easily acquire it.

The other types of multi-valve, such as pentatron and the multi-valves made by nearly all the leading German valve manufacturers now, are quite popular and used to a large extent in valve sets; the Loewe "Volksgerat," however, far surpasses them.

The average receiver is mostly used only for reception of the local station, though the desire for other stations is best shown by the great popularity of relays by wireless link of other European, American and even Australian stations. Munich, in Bavaria, has, in fact, made quite a speciality of this type of relay.

And any number of listeners actually do sit up till all hours when an American relay is to be "put over," and great is the disappointment if atmospheric conditions prevent a successful relay.

Three- and Four-valve Sets

Valve sets usually run to three or four valves. Since the advent of good battery eliminators working off alternating-current mains, the multi-valve set has become more and more popular with those living at a distance from any broadcasting centre. Still, the single-valver holds its own, but will hardly be bought ready made.

Four- and two-volt valves are equally popular, with the balance slightly in favour of the two-volt type. Valves working straight off the electric-lighting circuit are in existence, and are capable of excellent reproduction. A number of manufacturers already build sets working exclusively with this type of valve.

More H.F. Amplification

High-frequency amplification has always been popular, usually one stage being used. Recently, with the advent of neutrodynes and shielding, high-frequency amplification is being used more and more. The general mode of coupling low-frequency amplifying stages still remains the transformer, though in the case of multi-valves the resistance-capacity method is exclusively adopted. High-grade sets in connection with power valves now mostly use this latter mode. Power valves, or last-stage valves, as they are called, are nearly always employed where a loud-speaker is to give good results.

Germany is going to be our most serious competitor in the world race for the greatest number of licensed listeners.

ARTHUR G. ALLAN.

Build Your Own Cabinet

AND THEN ORNAMENT IT!

THE building of a suitable cabinet in which to house your set is a difficulty more imaginary than real, and the fellow who can sort the intricacies of an involved circuit is surely able to do a simple piece of carpentry.

Fascinating Change

Indeed, it is a fascinating change to be able to complete the whole set by building the actual cabinet in which the parts are contained. Moreover, one is often so enabled to incorporate individual ideas and build according to taste and surroundings.

One need not think of a cabinet as merely a cupboard built of wood. Artistic touches added by the outlay of a few pence can make the cabinet a bright and attractive affair. Fancy turned beading can be used to good purpose, and a touch of colour is introduced by the application of a simple transfer.

With regard to the cabinet itself, the wood most commonly used is mahogany or oak, and nicely grained boards can be purchased quite reasonably. The small cabinet can be cut from ⅜-in. timber, but those used to house three or more valves should be built in ½-in. wood. The back can quite well be of three- or five-ply if cost is a consideration, and in measuring up allow for the terminal strip.

The two sides are squared up and given a rubbing of sandpaper ready to put in place. Mark off their position across the base with a pencil and drill holes from the underside for the screws. The base should project about an inch all round, and the edges are rounded off with a file and finished with sandpaper.

Before the sides are put on, have two 1-in. strips of wood to tack lightly on to the top edge to hold them the correct distance apart, whilst we glue and screw on the baseboard.

Whilst these parts are setting we can measure and cut off the back so it comes between the ends and flush with the upper edges. It should fit tightly enough to be glued, but blocking pieces of odd wood or the triangular fillets which can be bought are best glued in for further strength. One of these in place is illustrated by Fig. 1.

Constructing the Lid

The lid is usually in two pieces and a strip for hinging should be fixed along the back, as shown in Fig. 2, to provide for this. The front half of the lid is then screwed in place, the flat-headed screws being sunk below the surface and the hole filled with plastic wood-filler.

The back portion of the lid is then hinged on, fixing the flange to the lid itself before putting the other piece into the sunken rebate previously cut with a chisel. This latter is necessary to allow the lid to lie flat.

If it is intended to put a door to the cabinet, remember to allow for the projection of the knobs when measuring up the boards. The door can be of the drop variety or, if the panel is long, two ordinary panel doors can be made. If a drop door is fitted the set must be lifted on a false floor to allow it to slide out, for the board is hinged to the base. A fancy chain is fitted at each end to prevent undue strain, as is shown by Fig. 3.

An Artistic Finish

Thus we have a plain cabinet, but a more artistic finish is obtained from ornamental beading, two or three suitable specimens of which are shown at Fig. 4. This is quite cheap and made in strong white wood which can easily be stained down to the shade required. It can be used to form a panelled door or be fitted round the base and top. If a drop floor is fitted between the ends, it can be used to hide the edges of the latter parts. (See Fig. 5.)

A more elaborate base can be built up by proper moulding, but in this case remember to lift the inside floor of the cabinet to an equal height to allow the withdrawal of

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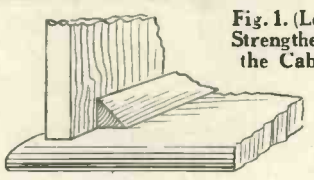


Fig. 1. (Left)—Strengthening the Cabinet

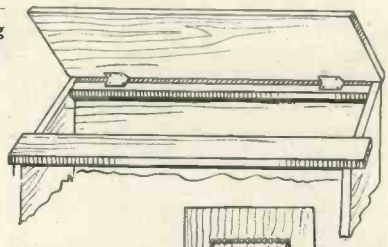
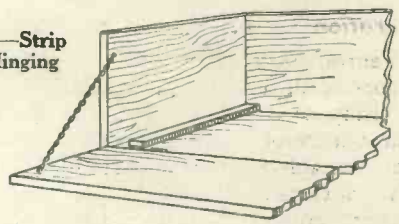
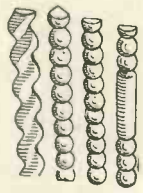


Fig. 2.—Strip for Hinging





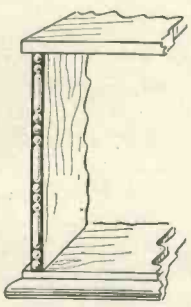


Fig. 4.—Specimens of ornamental beading for cabinets

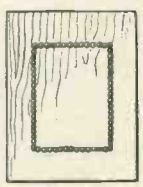
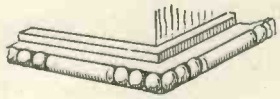


Fig. 5. (Left, right and below)—Uses of fancy beading



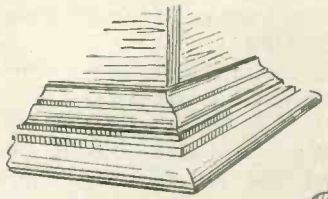


Fig. 3.—Chain to prevent strain

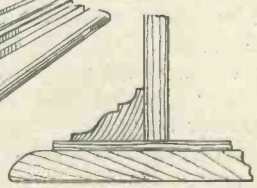


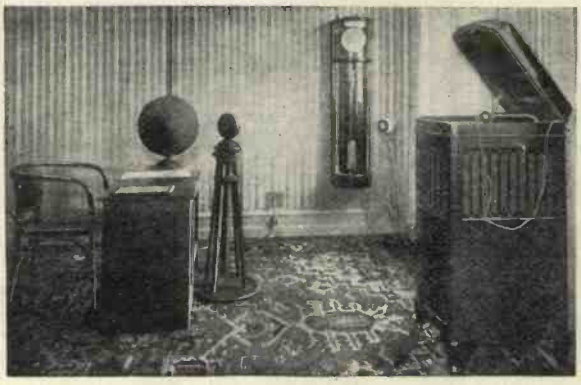
Fig. 6. (Above and right)—Base built up with moulding

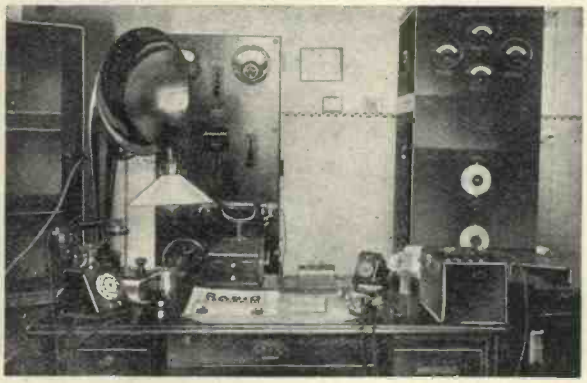
Swiss Radio

Some Views of Zurich - Höngg

On the right is a photograph of the large studio at the Zurich broadcasting station, while below is seen the small studio at the same station. The third photograph shows the transmitting apparatus at present in use.

An article on "Swiss Radio Difficulties" appeared on page 226 of the October issue of the "Wireless Magazine."





(*Continued from preceding page*)

the set. This is shown in section and perspective by Fig. 6, and can easily be done by adding three strips from back to front on the base to act as runners.

In addition to wood decoration, the amateur now has the possibility of adding charming and easily-applied transfers. A wide range of these is available.

Decoration on the Door

A central decoration for the door or doors is quite sufficient, and for the outlay of a penny or two this colourful addition is well worth while. Other suitable transfers can be easily obtained. They are applied by giving a coat of clear varnish and then placing face on to the wood in position. Press them there firmly and leave for a quarter of an hour.

The backing paper is then thoroughly damped and slid off, the transfer being allowed to dry before another thin coat of varnish is put over the colour face to harden it on permanently.

W. F. C.

Reception "En Tunisie"

A FRENCH friend of mine, who is kicking his heels in *l'Etat* service on the edge of the African desert, in Tunis, has forwarded a long radio log. This surprised me not a little, for I did not know amateur radio was ever thought of in such distant climes, but apparently there is no difficulty in getting supplies of valves, batteries, and so on from ship traffic at the coast.

His gear is rather out of date, and he is still struggling to quell the playfulness of two non-neutralised H.F. valves, followed by a detector with capacity reaction. A tricky handful, especially as the valves are of the high-capacity .8-ampere type !

Short-lived Dry Batteries

Dry batteries, which are very short-lived owing to the heat, provide the H.T., while a mighty accumulator for the L.T. is charged from a small generator attached to a local paraffin engine.

List of Stations

The number of stations he hears is astounding, considering the ill-favoured conditions. Here is his list, together with what he calls a "*coefficient d'appréciation de l'écoute.*" *Excellent*: Milan, Naples, Vienna, Langenberg, Rome, Brnö, Frankfurt, Stuttgart, Leipzig, Prague. *Good*: 5XX, 5GB, Barcelona, Toulouse. *Fair*: Madrid, Munich, Radio-Paris, Berne. *Bad*: Eiffel Tower, Moscow, Bordeaux-Lafayette, Motala, Zurich, and London.

Forty-six Stations

In all, forty-six stations are received, which is better than I could do, I think, in a sweltering clime and with an antidiluvian H.F. outfit. He complains bitterly of the *parasites atmosphérique*, and, indeed, he claims that static and morse interference prevent him from "bagging" over sixty stations.

QUEUE.

Broadcast Activities in Scotland

This article has been specially contributed to our pages by B.B.C. officials at Savoy Hill and is, therefore, quite authentic.

THE grouping of stations for the purpose of paving the way to composite programmes, one of the essentials of the projected regional scheme, was outlined in notes which appeared in the October issue of the WIRELESS MAGAZINE, in connection with the North of England stations.

System to Be Applied in Other Districts

This system of co-operative effort within a group of stations under the supervision of a single Regional Director, with the object of giving to listeners over a wide area the best selection obtainable of the entertainment and interest characteristic of that area, will be applied later in other districts.

Five persons will ultimately preside over the local, or regional, destinies of British broadcasting. The first to be appointed was the Northern Regional Director. On November 1, the title of Scottish Regional Director was brought into use. Other three directors to be appointed later will be responsible for the Western, Midland, and Northern Ireland Regions.

Strong National Flavour

In Scotland, preparations for the new order of things were started a considerable time ago and a growing tendency has been long evident to give a strongly national flavour to Scottish broadcasting. In the person of the Northern Area Director, as the new Scottish Regional Director was then called, a central authority was provided through whom the co-operation of the Scottish stations could be directed for the common benefit of listeners throughout Scotland.

Regular Simultaneous Broadcasts

A system of regular inter-station S.B. was inaugurated, providing for the relay of certain talks to all the Scottish stations. Each of the four stations, Glasgow, Aberdeen, Edinburgh, and Dundee, took it in turn to provide the talks, and not only was a higher standard secured by the fact that the talk was to be heard over the whole country and by the natural rivalry between the stations in aiming to give listeners something better than the other stations could provide, but the national area of reception compelled the speakers to concentrate on themes of national rather than local interest.

A similar regular arrangement was made as regards programmes and once a fortnight a special programme definitely Scottish in character was simultaneously broadcast from all Scottish stations, each station taking its turn in originating the programme.

In addition to these regular S.B.s, the Northern Area Director's staff was able to ensure that no event of national importance was missed by any Scottish station. They arranged for the S.B.s throughout Scotland of important outside broadcasts connected with national functions and ceremonies and compiled special studio programmes dealing with anniversaries such as St. Andrew's Day, Burns's Night, and Sir Walter Scott's birthday.

Broadcasting Resources in the Home

By this process of concentration, the whole broadcasting resources of Scotland were brought to an ever-

(*Continued on page* 448)

With Apologies to the B.B.C.!

NEIGHBOUR: *"In heaven's name, what you doing?"*
SANDY MCFEE: *"Och, I'm gettin' some egg-shells to be relayed frae Aberdeen."*

Broadcast Activities in Scotland *(Continued)*

increasing extent into the homes of listeners, who began to recognise that whatever event was of national interest its echo would be found in the Scottish programmes.

Broadcasting in Scotland took its place as a great national asset as the result of a conference in Glasgow on Broadcasting and Scottish National Life. As indicating its wide appeal, the conference was attended by the Secretary of the Scottish Education Department, the Moderator of the United Free Church of Scotland, Ministers of all denominations, representatives of educational authorities; of Women's Rural Institutes; of the Musical Festival movement and of various other bodies.

The conference aroused universal interest in broadcasting as a potential factor of inestimable importance and value in the national life. The B.B.C. fully realised that value and importance and made every effort to exercise its influence wisely by accepting the guidance of the Scottish Religious Advisory Council and Educational Advisory Council and by co-operating wherever possible with every other national body whose interests might legitimately take their place in programmes.

School Transmissions

Educational work has been nationalised and, in lieu of the former English transmissions, the Scottish schools now listen to the programmes of Scottish stations arranged by their own education official and undertaken solely by Scottish lecturers. Since this change was made, a large increase has taken place in the number of schools receiving the educational transmissions.

Geographical conditions formerly affected the development and extension of the use of wireless in Scottish schools, but a series of visits of inspection, allied to the introduction of a separate syllabus for Scottish educational transmissions, undoubtedly acted as a stimulus to experiment and Scotland, which has invariably shown keener interest than some other parts of the British Isles in educational development, now gives promise of more rapid progress.

Broadcasts of Special Bulletins

Other sectional interests have been served regularly in the bulletins which are broadcast for juvenile organisations, for farmers and for fishermen. The farmers have been particularly well served by a series of special agricultural talks given by research workers from the colleges and by practical farmers.

This series was arranged by a special Advisory Committee presided over by Sir Robert Greig of the Scottish Board of Agriculture and it has been widely appreciated by farmers in Scotland. The interests of Gaelic listeners also have been studied and specially catered for under the supervision of the Gaelic-speaking Director of the Aberdeen station.

National Interest Kept to the Fore

In the sphere of music and the drama the national interest has always been kept to the fore. An attempt was made some time ago to stimulate original Scottish work by offering prizes for a new Scottish radio drama and a new Scottish choral or orchestral work. Though neither of these competitions produced anything of outstanding merit, the large number of entries showed that the B.B.C. had very definitely succeeded in its desire to foster production in these fields and since then many Scottish plays and musical works have had their first introduction to the public through the microphone.

At the Café de Paris

Charles Watson, Conductor

B.B.C.'s Influence

It is in this function of introducing new Scottish work to the national audience that the B.B.C. has used its influence in Scottish life. In ordinary programmes, in special recitals, in reading and in talks, Scottish composers, playwrights and writers are constantly coming to the microphone to give Scottish listeners some new Scottish work.

Last autumn and winter there was broadcast a series of recitals by living Scottish composers; there have also been similar recitals by living Scottish poets. Scottish humorists, too, have had their special broadcasts, and, at the moment, Scottish novelists are giving a series of short-story readings.

By such careful attention to the production of Scotsmen and Scotswomen in every field of the arts, Scottish broadcasting is not only identifying itself very closely and very happily with the intellectual life of the country, but is also extending an interest in that life to many Scotsmen who had hitherto disregarded it for want of a lead.

So much for the past. In the future the position will be altered to the extent that two of the Scottish stations —Edinburgh and Dundee—will cease to function as separate entities and merely relay a universal programme during the greater part of the time.

Losing Little Significance

They will lose the very minimum of their national significance, however, for not only will they relay one Scottish programme a week from Glasgow, or on exceptional occasions Glasgow may even relay it from one of their studios, but they will relay certain Scottish talks and special events and their schools transmissions will continue to be the Scottish programme.

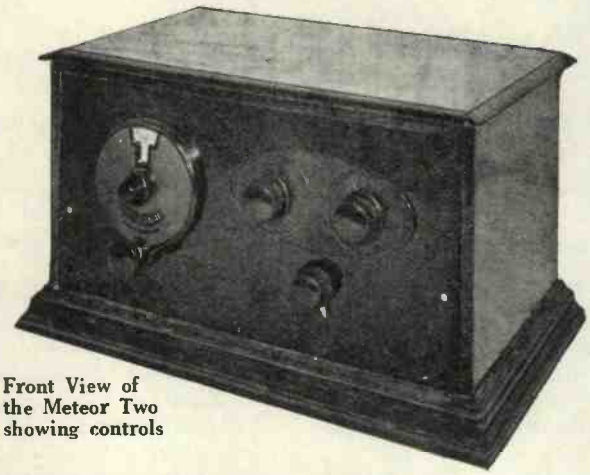
In this article is described a very powerful two-valver which is both simple to build and to operate. It is an ideal set for the beginner and gives really astonishing results for the number of valves. On a small indoor aerial in London it will receive 5GB at full loud-speaker strength without interference from 2LO, even when two-volt valves are used

The Meteor Two

Incorporates A Simple All-wave Tuner Unit

Comprises Detector and One Stage of Low-frequency Amplification

Designed, Built and Tested by the "W.M." Technical Staff



Front View of the Meteor Two showing controls

NEW valves and improved components have made it possible to construct small sets that are capable of giving really amazing results. For instance, used at a distance of 1½ miles from 2LO the Meteor Two will receive Daventry Experimental at full loud-speaker strength on a *small indoor aerial*.

This is no freak result, for it has been done by a member of the WIRELESS MAGAZINE Staff for a number of weeks now. Admittedly the quality of reproduction is not perfect when the set is being operated under these conditions, but great ranges can be obtained, if desired, even with a poor aerial system.

Triode or Pentode Power Valve in Last Stage

The valve combination used is a detector coupled by a high-ratio low-frequency transformer to a power valve, which can be either of the three- or five-electrode type (that is, triode or pentode).

Even with a three-electrode power valve, the Meteor Two will receive 5GB on a loud-speaker under the above-mentioned conditions, while with a pentode the volume is really amazing to anyone who has not kept in constant touch with modern developments.

The Meteor Two will appeal particularly to those in need of a cheap, yet simple receiver, and who are content with one or two alternative programmes on the loud-speaker.

Before the set is discussed further, readers are recommended to glance at the circuit diagram on page 450. From this it will be seen that the tuner is made up of a single coil (tapped) and a .0005-microfarad variable condenser with vernier.

Reaction is applied to the detector valve by means of a fixed .00025-microfarad condenser and an adjustable coil coupled to the aerial coil; this arrangement is found to be more stable and easier to control than ordinary moving-coil reaction.

A high-frequency choke suitable for the broadcast wavelengths is inserted in the anode circuit of the detector valve to prevent unwanted currents from passing through into the low-frequency circuits and so causing interference.

Rectified impulses from the detector valve are fed into the primary of the low-frequency transformer, which is of the high-ratio type, in this particular type 1 to 7.

In the anode circuit there is also a 0 to 500,000-ohm variable resistance. This, in conjunction with the 2-microfarad fixed condenser, constitutes an effective "motor-boat" stopper when the set is supplied from the mains, as it was in the tests mentioned at the beginning of this article.

Obtaining Best Anode-bend Adjustment

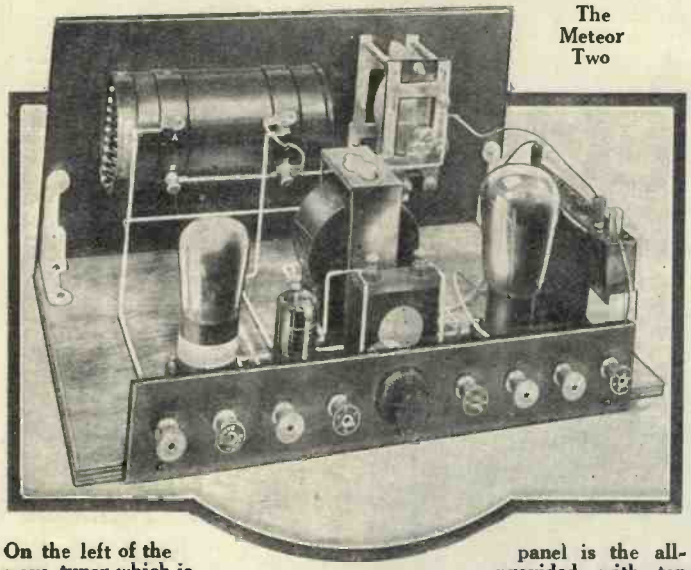
It also serves to adjust the high-tension voltage applied to the detector valve and so alters the characteristic for proper anode-bend rectification, no potentiometer being used in the grid circuit.

The power valve is indicated in the circuit diagram as a pentode, but it should be clearly understood that an ordinary triode valve can be used in this position if desired. This point will be discussed at greater length later.

Other points to note about the circuit are that a

You Can Use Either A Triode or Pentode Power Valve

The Meteor Two (Continued)



The Meteor Two

On the left of the panel is the all-wave tuner which is provided with ten tappings and covers all wavelengths from 250 to 2,500 metres. The knob in the centre of the terminal strip is for setting the anode-bend point

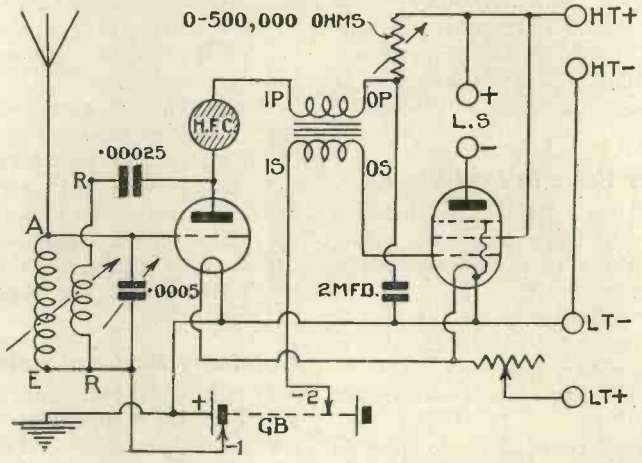
rheostat is provided as an on-off switch so that the valve filaments are protected from too sudden changes of temperature. Grid bias is applied to the grids of both valves, 1½ volts negative usually being enough for the detector.

As regards the actual components used in the Meteor Two, there are several interesting points that may be mentioned.

Special Tuner

For instance, the tuner is a complete commercial unit which has a wavelength of 250 to 2,500 metres approximately, the actual range being determined to a great extent by the aerial with which it is used. The makers recommend that a .0001-microfarad condenser be used in series with the aerial lead, but this will not be needed if a short aerial is employed.

The effect of inserting a condenser in series with the aerial lead is, of course, to lower the minimum and maximum wavelengths of the tuner.



Circuit of the Meteor Two

How the Wavelength Range Is Controlled

The wavelength range is controlled by a knob on the right of the oval tuner plate seen at the right of the panel in the photograph on page 449.

In all, ten tappings are provided. With the tuning condenser in different positions these tappings overlap to some extent, as the following readings show. These are for an indoor aerial of no great length :—

	Tap No.	Condenser
London (2LO)	2	100°
	3	40°
Daventry Experimental	3	85°
	4	53°
Daventry Senior	8	93°
	9	75°
	10	62.5°

Once the various settings for a given station have been found, always use the largest tap with the lowest condenser setting. Tuning will be found to be very much simpler if a vernier dial is used, as on the original set.

Arrangement of Reaction Control

On the left of the tuner plate is the reaction control, which needs no further explanation. An arrow on the plate indicates which way the knob should be turned to increase the amount of reaction applied.

Perhaps the most important feature of the Meteor Two is the high-ratio low-frequency transformer used. The reason for this is that great volume is obtained, although some sacrifice of quality has to be made to attain it.

The reproduction is quite good enough, however, for most ears, even when a high-impedance valve is used. With a valve such as the Osram HL610, for instance, a magnification of just over 200 is obtained from the detector stage alone, as the transformer has a step-up ratio of 1 to 7.2, and the valve a magnification factor of 30.

Best Valve to Use

Actually the transformer is intended for use with a valve having an impedance in the neighbourhood of 6,000 ohms and a magnification factor of about 8 to 12. For most purposes a compromise between the two types will be suitable.

Whilst on the subject of valves, we may as well discuss the power valve also at this stage. It has already been explained that either a triode or pentode power valve can be utilised. New readers may be glad to have some information on the respective merits of the two types.

The pentode will certainly give increased amplification, but the anode-current consumption is very large. It is essential to use at least triple-capacity high-tension batteries or a mains supply unit; if ordinary batteries are used the cost of running the set will be very heavy.

Those who use a pentode are further warned that they

Great Range and Power at Low Cost

are fragile and must be handled with much greater care than is the case with a valve of the ordinary type.

Handle your Pentode with Care!

The three grids are packed so close together that a slight knock will push them one against the other with a consequent short-circuit. Therefore, if you have a pentode, handle it with care!

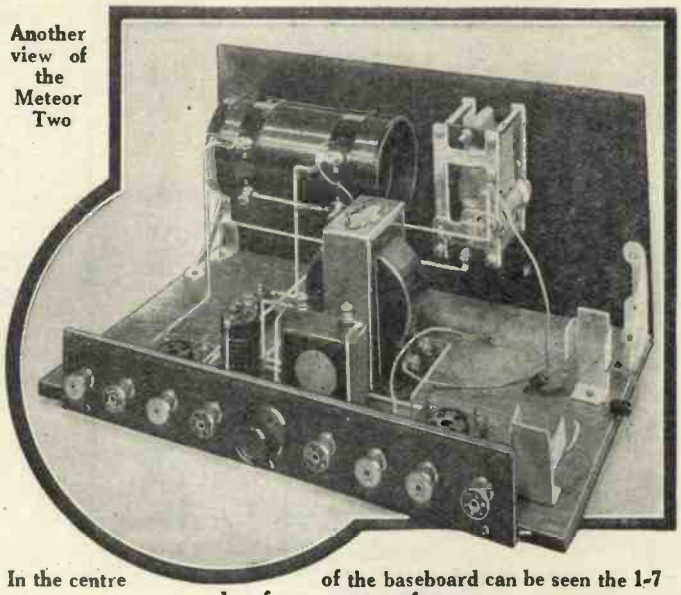
For most purposes a triode power valve will be found quite satisfactory; at least its anode-current consumption will be within the capabilities of most ordinary batteries and the cost of running the set will, therefore, be low.

Any valve with an impedance of less than 5,000 ohms will do, although for use with a normal loud-speaker it is not recommended that a valve with an impedance lower than 2,500 ohms should be used. For a choice of suitable valves consult the table reproduced on pages 404-5.

Constructors are recommended as far as possible to use only those parts mentioned in the list of components on page 452. The names mentioned first in the brackets in each case are those of the parts used in the original set, while those following are suitable alternatives if the first-mentioned part cannot be obtained.

Full-size Blueprint available for Half-price

No difficulty will be experienced in construction even if a full-size blueprint is not obtained. Copies of the blueprint can be had, if desired, for half-price, that is 6d. post free, up to December 31, if the coupon on page iii of the cover is used before that date. Address your inquiry to Blueprint Dept., WIRELESS MAGAZINE, 58/61 Fetter Lane, E.C.4, and ask for No. W.M.114.



Another view of the Meteor Two

In the centre of the baseboard can be seen the 1-7 low-frequency transformer

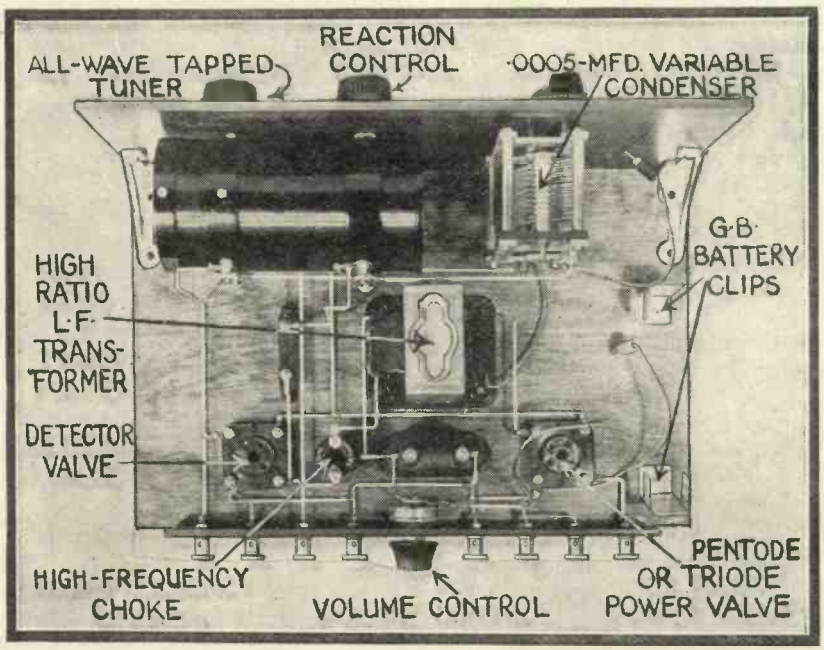
The first part of the construction is, of course, the drilling of the panel. This needs no explanation here, for full instructions for mounting the tuner are given with each instrument. Mount on the panel the all-wave tuner, .0005-microfarad variable condenser and 15-ohm rheostat.

Arrangement of Baseboard Components

Now fix the panel to the baseboard by means of small brackets and mount the rest of the components thereon. The arrangement of all the parts will be clear from the photographs and the blueprint (or the reduced reproduction of the latter on page 453).

It will be noticed that the components on the baseboard and the terminals on the strip along the back edge are arranged in the opposite way from usual in order to get the most efficient layout. Note also that the variable anode resistance is mounted on the terminal strip.

There is no difficulty about wiring up the set if use is made of the blueprint or the reduced reproduction of it. Connect up with one wire, or as few wires as possible all points marked with like letters.



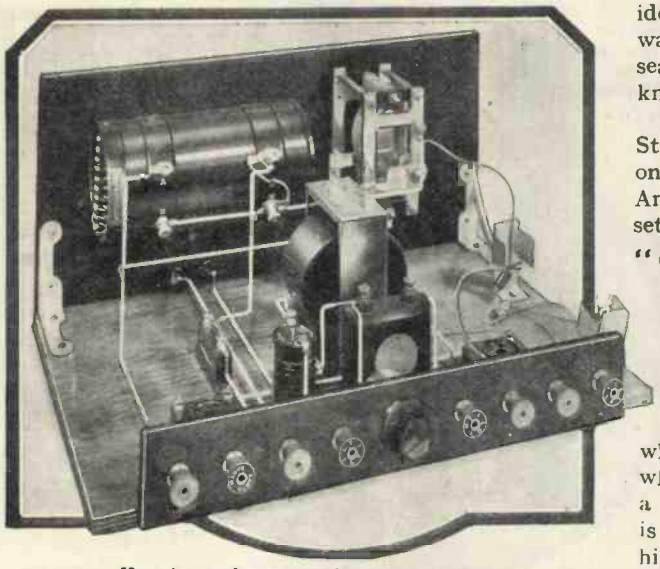
This view of the Meteor Two clearly shows the layout of the parts on the baseboard. Note that provision is normally made for a 9-volt grid-bias battery on the baseboard, but for some valves a 16½-volt battery may be required

Wiring up the Set

For instance, first connect together those points marked *a*; then those marked *b*; and so on through the alphabet. The flexible connections are not lettered.

If a pentode is not to be used omit

The Meteor Two (Continued)



Here is another view of the Meteor Two

the flexible lead with a spade tag attached to H.T.+ as it will easily cause a short-circuit should it accidentally touch some component.

Testing Out the Receiver

To test the receiver insert two valves in the holders (note that the detector is on the right of the baseboard, looking from the front of the set) and connect up the necessary batteries. If a triode power valve is used, it may be necessary to mount two 9-volt grid batteries or a 16½-volt battery on the baseboard.

To the grid of the detector valve apply 1½ volts negative bias, and to the power valve the value recommended by the makers. Normally 120 or 150 volts should be applied to H.T.+.

Preliminary Tuning Adjustments

Now turn the "Selector" switch on the tuner (that is, the right-hand knob on the tuner plate) to tap No. 3 or 4 and also turn on the rheostat. Next adjust the anode resistance on the terminal strip until a slight rustling sound is heard from the loud-speaker.

This indicates that the set is in a "live" condition and the reaction control should be moved to the right until it gets louder, but not so far that a howl occurs.

At this stage the knob of the vernier dial on the main tuning condenser should be turned slowly until a transmission is picked up.

Getting the Best Anode-bend Setting

When a station has been tuned in, reduce the reaction as far as possible and carefully adjust the variable anode resistance on the baseboard until the greatest sensitivity is obtained; there will then be no need to touch this control until the detector valve is actually changed.

To receive other stations move the tapping switch, readjust the reaction control, and again manipulate the vernier dial over the whole of its range.

As each transmission is picked up it should be identified, if possible, and its setting noted. In this way a great deal of time will be saved during subsequent searching, as the amount of overlap on each tap will be known.

The member of the WIRELESS MAGAZINE Technical Staff who has been using this set was greatly surprised on hearing, when he first connected it up, the same American voice talking at one or more condenser settings on nearly every tap of the tuner.

"Graf Zeppelin" Relay from America

After some minutes of puzzled listening he realised that he was hearing the relay of the American broadcast in connection with the landing of the *Graf Zeppelin*. He had not connected up in time to get the preliminary announcement!

This overlapping of the tuner tappings is somewhat confusing at first, because one does not know, when getting a station on a different tapping and with a different condenser setting, whether the transmission is a new one or one that has already been heard on a higher or lower tapping. No trouble will be experienced, however, if each station is logged directly it is heard.

Tell Us of the Results You Get!

We are certain that if this set is operated properly it will give really excellent service. When you have built the Meteor Two, write and let us know what you think of it; we have no doubt that your report will be favourable.

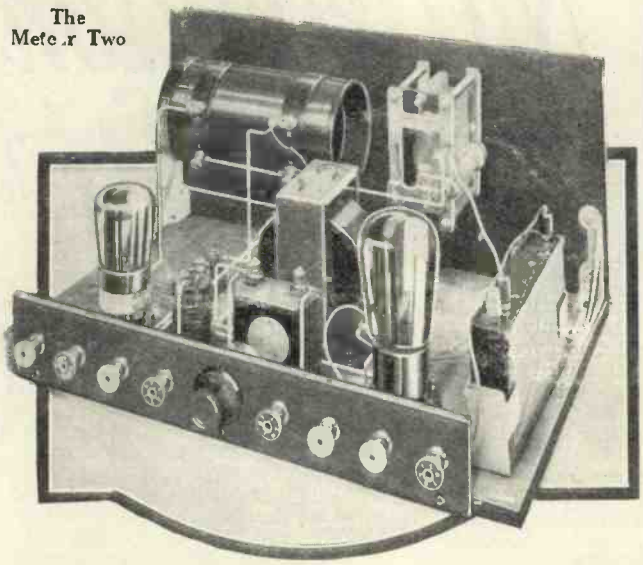
[THE LAYOUT AND WIRING DIAGRAM, AND ANOTHER PHOTOGRAPH OF THE METEOR TWO, APPEAR ON THE OPPOSITE PAGE]

COMPONENTS REQUIRED FOR THE METEOR TWO

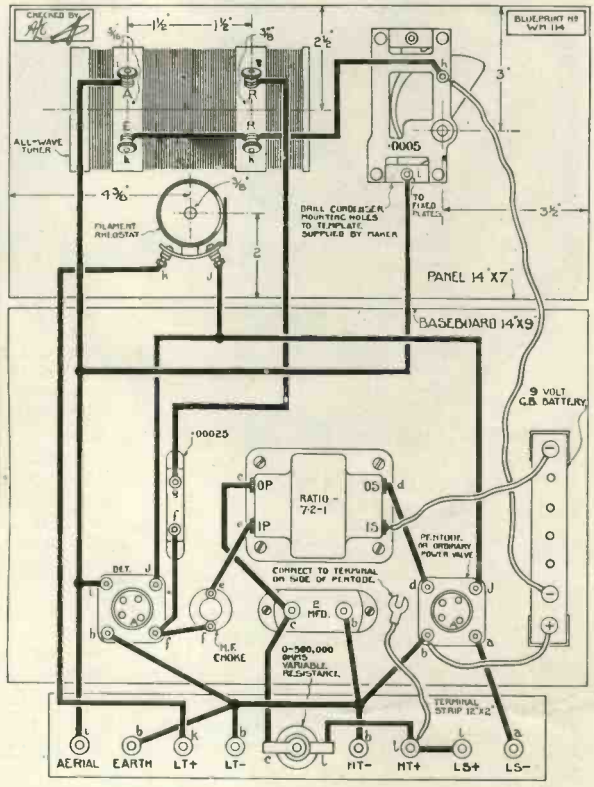
1—Ebonite panel, 14 in. by 7 in. (Trolite, Becol, or Parfait).
1—All-wave tuner (British General).
1—.0005-microfarad variable condenser (Cyldon, Burndept, or Lissen).
1—Vernier dial (Igranic, Lissen, or Lotus).
1—Low-frequency transformer (Igranic type G, ratio 1 to 7.2).
1—15-ohm panel rheostat (Igranic or Peerless).
1—.00025-microfarad fixed condenser (Trix, Dubilier, or T.C.C.).
2—Antimicrophonic valve holders (Formo, Lotus, or W.B.).
1—High-frequency choke (Peto-Scott, Wearite, or Burndept).
1—2-microfarad fixed condenser (Lissen, Dubilier, or T.C.C.).
1—0 to 500,000-ohm variable resistance (Clarostat, volume-control type).
1—Pair grid-battery clips (Bulgin).
1—Terminal strip, 12 in. by 2 in. (Trolite, Becol, or Parfait).
8—Terminals, marked :—Aerial, Earth, H.T.+, H.T.—, L.T.+, L.T.—, L.S.+, L.S.— (Eelex or Belling-Lee).
1—Cabinet, with baseboard, 9 in. deep (Carrington).
Stiff wire for connecting (Glazite).
Rubber-covered flex.
3—Wander plugs, one red and two black.

Incorporates A Simple All-wave Tuner

The Meteor Two



(Above) View of the Meteor Two all ready for use with valves in position. The detector is on the left and the power valve is on the right



(Right) This layout and wiring diagram can be obtained for half-price, (that is, 6d. post free, if the coupon on page iii of the cover is used by December 31. Ask for No. W.M.114; and address your inquiry to Blueprint Dept., "Wireless Magazine," 58/61 Fetter Lane, E.C.4.

Suggestions for a B.B.C. Bard!

ONE of the announcers at 2LO declaims the Weather Report and News Bulletin as though he were reciting poetic drama. Why should not the B.B.C. (Poetry Department, sub-section Highbrow) go the whole hog and produce something like the following?

Weather Report

A deep depression rolls across the main,
Centring on Iceland. Oh, ye torrents! pour
On Caledonia's eastward shore, on England's border,
And on her southern marches. Lies the snow
Where Pennine lifts her hills. Deep, deep it drifts
On Cambria's fields. London is lapped in mist,
Which shall disperse not till the tireless earth
Hath once more run its daily race, and I,
The Uncle, Thunderer—whose tongue no word may twist—
Again address thee on the morrow's eve.
What further say the Oracles? "Lo! all is change.
Behold! There is no cert.
Unsettled, restless, scarcely to be told,
To-morrow's weather will be—warm or cold."

News Bulletin

Breathes there the man with soul so dead
Who knows not that the Prince hath said,
When at Guildhall he gave the toast,
"Lo! he falls soft that rides the most."

Overseas

In China there is Li Hung Poo,
Who fights against old Yang Ki Soo.
Umbrellas up! It's even odds
They'll both fight shy of British squads.

General News

There was a young cookoo of Eton,
Who was heard first in May near Nuneaton.

And——

There was an old sailor of Bristol
Who killed an M.D. with a pistol.
The judge, with a smile,
Said: "It stands out a mile.
"Doc. said he got Mars on a crystal."

Lastly

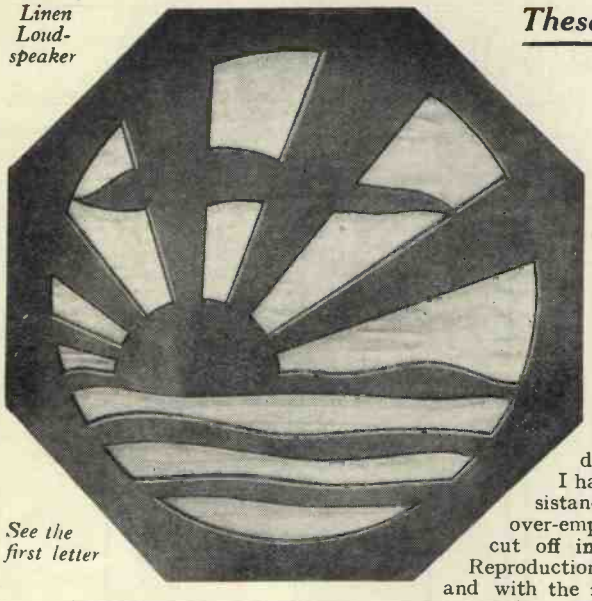
Hear a solemn S.O.S.!
Simon Slim is in a mess,
Tried to trip a motor-car,
Missed his step—and there we are.

Epilogue

Nighty night, Uncle, say it with care,
All the world's list'ning. Oh, what a "flair."
Use the right accent—Hugo is there.

E. B.

Linen Loud-speaker



See the first letter

These Letters From Readers Prove That There Is

No Deception About Our Sets!

LINEN-DIAPHRAGM LOUD-SPEAKER

THERE was never any doubt about the popularity of the Linen-diaphragm Loud-speaker (WIRELESS MAGAZINE, *September*, 1928) *and we have had many congratulatory letters on its performance. On this page is reproduced a photograph of the fretted cover made by a Shepherd's Bush reader, who says :*

I have much pleasure in enclosing a photograph of the Linen-diaphragm Loud-speaker published in the September WIRELESS MAGAZINE.

You will notice I have made a fret for the front which improves the appearance of it greatly. The loud-speaker works beautifully; volume is very good and the tone is very natural.

It is, no doubt, the last word in home-constructed loud-speakers; you could not wish for better.

◆ ◆ ◆

TUNED-ANODE THREE FROM THE MAINS

PERHAPS the ideal receiver from the point of view of convenience and reproduction is a mains receiver and a moving-coil loud-speaker. At any rate, one reader at Woodbridge is getting excellent service from such a combination, using the Tuned-anode Three from the Mains (WIRELESS MAGAZINE, *December*, 1927) :

I have recently constructed the Tuned-anode Three from the Mains and can speak well of its performance.

I required it for use with a Rice-Kellogg loud-speaker, which itself contains a transformer L.F. stage. The last valve in the set, therefore, had to be a power type, in spite of your warning in the description in WIRELESS MAGAZINE, in order to have a sufficiently low impedance compared with the primary impedance of the R.K. transformer (ratio 4-1).

In spite of the unusual circuit neutralising is not difficult, but, of course, the setting has to be altered when changing from short to long wavelengths.

Quality is excellent. As far as the ear can tell, every frequency from the topmost notes of a piano to the drums of an orchestra is reproduced evenly. Previously I had a not very good resistance-coupled set which over-emphasised the bass and cut off in the upper registers. Reproduction now is nearly perfect, and with the 2-microfarad condenser connected up, as recommended by you in a later article, mains hum is inaudible except when the station is standing by. It is no worse than a carrier wave.

I have not tried reaching out, as I am out for quality rather than distance; so that I listen mainly to 5XX and 5GB, both of which are excellent and of equal signal strength. I have also heard 2LO and various German stations without difficulty.

◆ ◆ ◆

CHUMMY FOUR

HERE is another enthusiastic letter from a Ewell reader who has built the Chummy Four (WIRELESS MAGAZINE, *June*, 1928), *the first home-constructor's portable with a screened-grid valve :*

I should like to inform you how pleased I am with the results obtained with my Chummy Four.

On considering the circuit when it was published, it appeared to me, to use an old expression, that someone had been looking beyond the tip of their nose, and here was a portable well in advance of anything on the market.

At the same time, I feel sure you will not object to a little friendly criticism concerning the general layout. Undoubtedly, for a set weighing something in the neighbourhood of thirty pounds, it would be more convenient to carry if the depth were kept down; but there are few people who carry this weight far—in the majority of cases they use their car or sidecar combination.

Secondly, when out with a portable receiver, one has to deposit it either on the ground or, say, on the running board of the car. In either of these positions to have one's hands bent back at an angle of something like 90 degrees for tuning-in purposes is somewhat uncomfortable.

Again, as it is advisable, whenever possible, to keep the set off "earth," the running board of a car is invariably used. This, you will agree, is a somewhat awkward place to have the set when moving the lid and frame aerial.

Bearing all these points in mind, I decided on the following alterations :—

The case, which is made of the best quality leather, measures 17 in. by 17 in. by 9 in., and the bottom has a section the same size as the panel, hinged. This allows for an inspection of the "works," changing valves, etc.

In the lid is housed a 16-in. Celestion loud-speaker movement and around this is the frame aerial. The batteries are in separate compartments and the ebonite lid which covers same also carries the station log.

With regard to components used, these are as specified, with the exception of the condenser dials, which are Igranics.

On the matter of valves, I tried out several combinations, and finally settled on the following : H.F., Cossor 210SG; det., Cossor RC; 1st L.F., PM1; output, Marconi DEP240. Although with this combination the drain on both the L.T. and H.T. batteries is somewhat above normal for a portable, the results more than justify it.

I am not interested in any way in trying to break records in the number of stations it is possible to receive, but what I do get *must* be good. In this respect I have logged sixteen stations. Others are there, but I have not bothered with them, because the volume and quality of any of the sixteen is all that can be desired.

I need hardly say that I am delighted with the set in every way, but before closing I would like to acknowledge the assistance given to me by Messrs. W. H. Gidden, who went to no end of trouble in making me the exact case which I wanted. Also the Celestion Co., of Kingston, for fixing me with such a superb loud-speaker movement. They were as keen to get the best results as I was.

◆ ◆ ◆

NOMAD SIX

MANY readers found the Nomad Six (WIRELESS MAGAZINE, *September*, 1927) *just the powerful receiver they needed. One reader at Hornsey is so pleased with his set that he has just sent us this second letter about it :*

I am sending you a further report of my Nomad Six, that I wrote you about before. I am now running it from the mains, and the results are even better than before. Hum is non-existent and no "motor-boating" troubles have been encountered, as I have a tapping for each high-tension terminal.

My alternative programmes come from Kaiserslautern, Cologne, Breslau, Toulouse, Stuttgart, Langenberg, and Budapest, all of which can be received

at full strength on a Celestion C12 loud-speaker.

I should also say that the above stations can be picked up any evening and owing to the fact that reaction is never more than a quarter of the way in, the quality is exceptional.

On Sunday mornings Huizen is received at loud-speaker strength. My aerial is very low and badly shielded, and the earth lead is 25 ft. long. No doubt with a more efficient aerial and earth results would be very much better; but, owing to circumstances, they will have to be left as they are.

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1928 FIVE

ONCE again an Australian reader writes in praise of a WIRELESS MAGAZINE *five-valver, this time the* 1928 *Five* (WIRELESS MAGAZINE, *January*, 1928) :

Having been a subscriber to your magazine for the past two years, I have never yet seen a report from a Western Australia reader, although I have noticed a few from New South Wales and Victoria.

I constructed your 1928 Five as soon as I received my copy of the January magazine. I had to guess at the number of turns for the long-wave coils, as you never published them till the following month.

Our local station operates on 1,250 metres, therefore I needed them first. However, I received them on the coils that I wound, but not quite as good, and I have since altered them. I received all the eastern State stations at good loud-speaker strength.

The only difference I have made from your circuit is that I have included rheostat control on all five valves; I find this is an advantage on the H.F. valves. I also omitted the milliammeter and the jacks, as with filament control I can control the volume without switching out the last valve.

Morse and atmospherics are bad at times, but not quite as bad as some foreign stations, operating on the same wavelength as 3LO Melbourne. I attach a list of stations that I have received up to the present.

There is one station who interferes on 5CL Adelaide at present. I will get his call-sign one of these nights when static is not too bad. The announcer has a strong American accent. Last Saturday night he was giving the latest baseball scores of the American League, but static was too bad to get his call-sign.

I don't know what the distances are from the eastern State stations, but Adelaide is one and a half hours ahead of us, and Melbourne, Sydney, and Brisbane are two hours and New Zealand nearly four hours ahead.

I do not wish for a better set than this, unless you can invent one that refuses to pick up Morse and static, and will only pick up broadcast programmes. Until that stage is reached the 1928 Five will always do me.

At present Perth, our local station, which is about 150 to 200 miles by air, is the only one I receive on the long waves. I have never used the phones on the set yet, except to pick up the eastern States at midday. 5CL comes in at good strength on the phones during the middle of the day. We have difficulty in obtaining parts here, as there are no wireless parts stocked in the local township, which is twenty miles away. Everything has to be ordered from Perth, which is 250 miles by rail, and then you cannot always get what you want. The prices here are nearly double those in England. However, we score in one item, we are not troubled by howlers; there are only four receivers within a radius of about twelve miles.

2FC, 2BL, 2GB, 2KY, and 2UE, of Sydney; 3LO, 3AR, and 3UZ, of Melbourne; 4QG, Brisbane; 5CL, 5DN, and 5KA, of Adelaide; 6WF, Perth; 1YA, Auckland, New Zealand; 2YK, Wellington, New Zealand; 3YA, Christchurch, and four foreign stations (unknown).

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EXHIBITION FIVE

THE letter reproduced below is quite unsolicited and is once again proof—if any were needed—that WIRELESS MAGAZINE *sets are the best. It is a comment on the Exhibition Five* (WIRELESS MAGAZINE, *October*, 1927) *and comes from Ireland :*

The writer has built and rebuilt at least one hundred sets for sale and as a hobby during the past five years or so. These sets include a famous six, published about two and a half years ago, and a still more famous five designed about the same time.

Of the latter I have built and disposed of no less than eleven. I mention these facts just to show I have some experience of wireless matters.

FULL-SIZE BLUEPRINTS

of any of the sets mentioned in these pages at the following charges : Sets up to and including three valves, 1s. ; sets with more than three valves, 1s. 6d.

Further, a blueprint of any one set constructionally described in this issue can be obtained for half-price if the coupon on page iii of the cover is used by December 31st.

Address your inquiry to Blueprint Dept., WIRELESS MAGAZINE, 58/61 Fetter Lane, E.C.4.

About seven months ago I had an order for a first-class set regardless of cost, and decided to experiment (at my customer's expense) on new ground, and started on the construction of the Exhibition Five. At first I thought I had backed a "dud" through some of the components shorting on the base screen and the use of unsuitable nent condensers, but once this was put in order the set gave no more trouble.

Living in what might be regarded as almost a "blank spot" reception with me has never been up to the standard of some of my neighbours, and I have always had to content myself with "fail" quality reception and not more than 60 per cent. of the B.B.C. transmissions, even when using six valves.

You can, then, imagine my surprise and delight when on the first evening's trial of the Exhibition Five I logged every single B.B.C. station from Belfast to Aberdeen in broad daylight and several British relay stations later in the evening, all on the loud-speaker.

But it is not the fact of being able to get stations that I failed to get before that appeals so much to me, but the fact that quality of reproduction is really much better than I have ever thought possible.

So delighted was I with this set that I decided to scrap my own four-valver and build another Exhibition Five for my own personal use.

This time I used the new Cyldon gang-control condenser, and added another power valve in parallel with the fifth. I also found it desirable in both sets to use a volume control.

In this last attempt I used a switch to cut out the two last valves, making it a 4-6 valve set instead of a 3-5, as in the original, and so far as I am concerned as it now stands it leaves nothing to be desired.

Further proof of the outstanding merits of the Exhibition Five is the fact that, to my knowledge at least, three other constructor friends have already set about building one or other of the two additions they heard at my home recently.

To anyone desirous of building a set for quality and stations, start at once on the Exhibition Five and you ensure against disappointment.

P.S.—The Editor is at liberty to publish this letter as it is or any portion of same so long as the real facts are not in any way altered.

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SIMPLICITY FOUR

A HOLYHEAD reader who sends particulars of a special type of indoor aerial also has some comments on the Simplicity Four (WIRELESS MAGAZINE, *January*, 1928) :

The first set used with this aerial was the "As Good As Money Can Buy" four-valver. I have written a couple of times praising that set.

The set I am using now is the Simplicity Four, and I find it a really wonderful set, as the attached list will show. I enjoyed myself very greatly hearing them "coming rolling in."

The aerial is about 40 ft. above the ground and my house is situate half-way up a hill. The lead-down to the set is not insulated, and it also comes through two doors that are nearly always closed.

To give you some idea of the volume obtained I have been asked by people living five houses away if I would put my loud-speaker outside so that they could enjoy the dance music. There are several high walls between us, but the people maintain they hear the music perfectly.

The list of stations received includes : Toulouse, Dortmund, Radio Lyon, Liverpool, Belfast, Newcastle, Dublin, Bournemouth, Konigsberg, Paris, London, Madrid, Stuttgart, Manchester, Hamburg, Cork, Glasgow, Frankfurt, Langenberg, Berlin, Daventry, Aberdeen, Brussels, Hilversum, Kalundborg, Konigswüsterhausen, and Motala.

How Radio Has Improved

Fred Fisher, Conductor of the Kit-Kat Band

SCIENCE, like Nature, either advances or retrogresses, it never stands still; thus we have an almost daily change in the intricate art of transmission, this change being for the better.

Of all the instruments which proved thorns in the side of those who had charge of gramophone-recording salons or wireless studios there have been none to even equal the pianoforte and the organ, the proper pipe organ I mean.

Piano Like A Banjo

Until quite recently, in spite of all endeavour, a piano solo, even an accompaniment, sounded on a record or through the wireless exactly like a banjo. Pianists were instructed to use the loud pedal as little as possible for fear of overloading, and consequent blasting, which simply meant imperfect mechanical musical reproduction.

In the earlier days of the gramophone or phonograph one well-known gramophone and wireless artiste was wont to remark that "He didna mind singin intaw a troompet if they'd only lay ma heid alane." Needless to say, this gentleman hailed from Scotland and is fortunate in possessing a voice which is unexcelled in wireless transmission and record making.

Avoiding Blasting

Of course, the operator moved the singer to and from the trumpet to avoid blasting in the higher registers, and this is what the singer complained about.

All that is changed now, however; new methods and practice on the part of the transmitters, a fuller knowledge of the limitations of the diaphragm and microphone, has resulted in a considerable all-round improvement, for which listeners should be very thankful.

I well remember, whilst conductor of a band of twenty-eight professional performers, the trouble I had in "placing" the instrumentalists, while making master records—those of

Percy Scholes, the B.B.C. music critic, who has retired to Switzerland

long vibration—the bass instruments—being quite near the trumpet, while those of short, quick vibrations—flutes, clarinets, piccolos—required to be further back in position, as they recorded better and easier than the others.

With a good set, and, say, two or three loud-speakers—trumpet, cone, and cabinet—it is possible to get over the ether, and to receive, a piano tone so life-like that the player might almost be in the room one is sitting in.

Similarily with the pipe organ. We were amongst the first to try records of a large pipe organ, and in spite of the fact that we had a good instrument, and a cultured player, the results were nothing short of appalling.

Using two of the then very latest type of Edison recording machines, if we registered the 2-, 4-, and 8-feet stops, we lost the 16-feet ones completely—in other words, the very characteristic of the organ, the pedal-work notes, did not register at all.

Cinema Type of Organ

Best results have been had from the cinema type of organ with its many different effects that are lacking in the church or the chamber pipe organ. These latter, even now, frequently come over no better than a good American organ or an Alexandre harmonium, neither of which have pipes, but reeds.

Thus, an organ transmitter who knows his job will have studied the acoustics of the building, the style of instrument, and will keep his work within a definite register if he wishes his hearers to get as true an organ effect as possible.

An Interesting Story

Two years ago, whilst acting as medical officer on a large liner, I chanced to meet the head of one of the most noted organ-building concerns in the world. He told us many interesting stories about his work, relative to gramophone recording and wireless transmission, and also related the tale of the one and only cinema house organ he had ever built.

Cecil Dixon, who took part in the Children's Hour recently

This instrument is in a large English town, the company spared no expense, but space was somewhat limited and the building was brand new, being built mainly of concrete.

Little did our friend know what he was letting himself and his company in for; in spite of all his experience and care, the organ could scarcely be called a success.

Keeping It Up to the Mark

Ventilation had not been provided for, the new concrete "sweated" freely for quite a long time, the moisture harming the structure of the organ very much, so that months after it was built it required the almost constant attention of a tuner of the firm to keep it up to the mark!

The style and construction of the cinema and the church organ are vastly different, the latter is almost always "spread"—there is, as a rule, plenty of room in the building for the numerous pipes, and this does not aid concentration of tone.

The cinema instrument, on the other hand, does not occupy nearly so much space, it has a multitudinous variety of "effects" which the other lacks, and recording and microphonic arrangements are much easier, the tone being more concentrated.

Vocal Transmission

There is another point which should not be missed either, and that is, vocal transmission. Voices from the London studio, as a rule, and as a whole, come over much better than many from the provincial studios, and the reason for this is not far to seek.

London, with its teeming mass of musicians, possesses a much larger choice of what might be termed local talent; it is rare to find a vocal transmission from London with any technical mistakes.

Artistes in the smaller, the provincial, towns do not seem to "get the hang" of microphone singing as do those more experienced ones from London—thus we often receive a transmission which is far from satisfactory.

"Mike," to start with, objects to this or that singer, and the loudspeakers then suffer very badly from overloading; thus, we have to detune considerably in a multi-valve set. All listeners are aware of the fact that there is a limit to detuning, to cutting down the tone, which ofttimes reacts unfavourably on the quality of reception.

Those in the know are frequently sorry for the criticisms to which the B.B.C. are subjected, for in truth,

George Allinson, director of the Arsenal Football Club, broadcast some football hints

they have a real man's job each day to please millions of listeners. Unfortunately, much of the criticism is unfair; it is of the destructive, not the constructive type, and this does no good whatever.

Recently home from a period spent on the Continent, I was struck with the favourable and kindly criticism of the B.B.C.'s work: one Belgian enthusiast told me that he invariably tunes in on 2LO, as it is by far the best station he receives.

It may be stated that his present set is a 1927 Five, which he swears by, thus showing his knowledge and good taste, besides which it is satisfactory to know for certain that the WIRELESS MAGAZINE is appreciated by foreigners.

In the hotel where we were staying when in Paris, both WIRELESS MAGAZINE and *Amateur Wireless* were on the writing-room table, and

G. K. Chesterton, the famous author

the manager also preferred the London programmes to those from near-by stations.

Large and Difficult Task

So, ere we criticise the efforts of the B.B.C., we ought to remember the large and difficult task which they have, the cheapness of our entertainments (ten shillings a year!), the terrific congestion of the ether which plagues our American friends who must operate at least a five "toob" set in order to get even reasonable results in reception—then, let us consider ourselves lucky.

There is one point, however, which might be noted by the B.B.C., and it is this: in provincial stations there are a number of transmitters (especially singers) who attempt far too difficult numbers for their voices A very ordinary soprano will try the *Jewel Song* from Faust, *Queen of the Night* number from *The Magic Flute*, before the microphone; needless to say, the singing is an *effort*, and this is exaggerated by the microphone and badly received at the listener's end, and the results are a complete failure.

Dictating to Broadcasters

Those in charge of the studios ought to be in a position to dictate suitable songs for certain vocalists who *will* attempt numbers far beyond their capabilities.

DOC PAGE.

Jay Whidden, Conductor at the Carlton Hotel

GET A FULL-SIZE BLUEPRINT FOR HALF-PRICE BY USING THE COUPON ON PAGE iii OF THE COVER!

Rebuilding That Old Set!

By JOHN SIMPLE

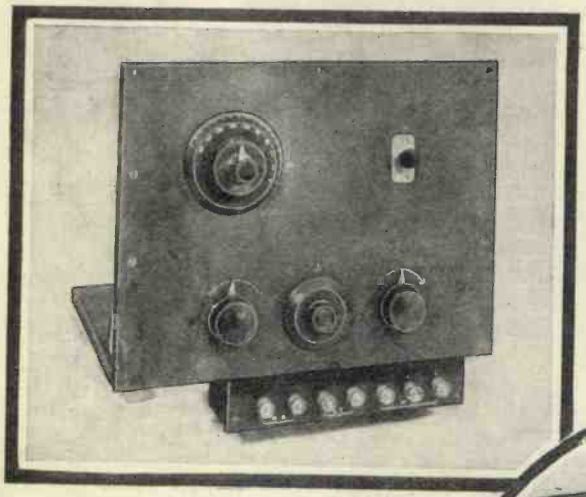


Fig. 1.—Old home-made two-valver, best described as a "Monstrosity Two"

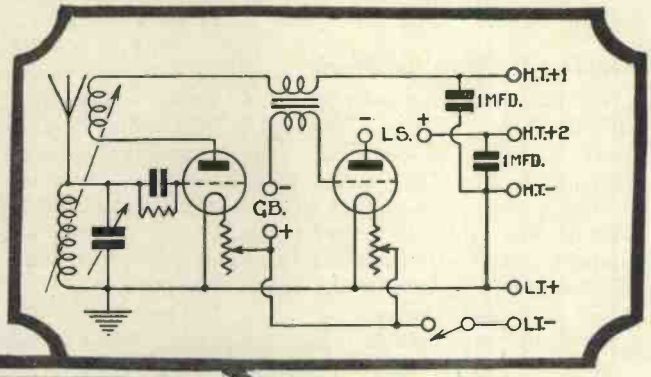


Fig. 4.—Circuit used; note the old-type magnetic reaction. The valve combination is a detector and a transformer-coupled low-frequency amplifier

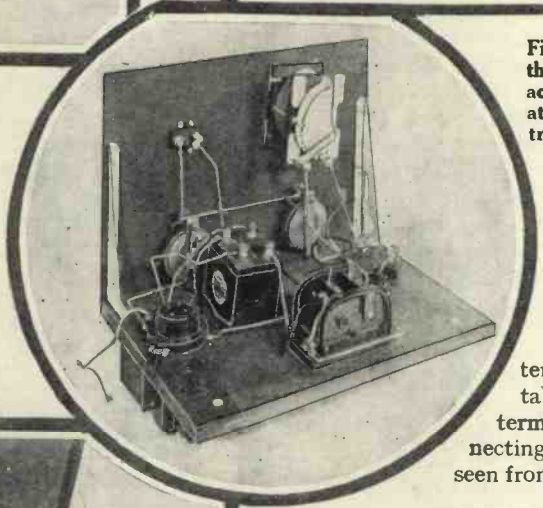


Fig. 3 (left).—General appearance of the wiring of the old set. It was not a work of art!

QUITE recently I was approached by a friend who owned the "Monstrosity Two," shown in Fig. 1, with a view to his bringing it a little more up to date. After making a good many uncomplimentary remarks about this receiver in general, I began to examine it in detail, as you will be able to yourself, if you refer to the photographs and circuit reproduced on this page.

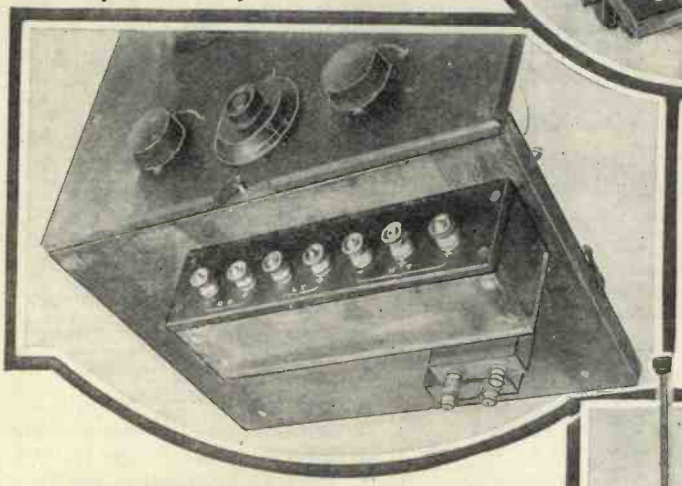


Fig. 2.—How the terminals were arranged. There was nothing in the box!

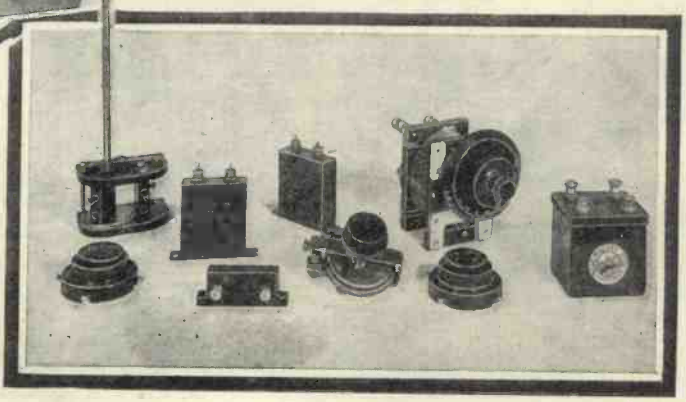
Fig. 1 shows the general appearance of the set. On the left is a variable condenser provided with an extra single-plate vernier, while on the right is an on-off push-pull switch. At the bottom there are three knobs, those on the outside being rheostats for the two valves, and that in the centre a moving-coil reaction control. The box-like object on which the terminals are mounted contains nothing more than the terminal shanks and their connecting wires. This can be better seen from Fig. 2.

Circuit Used in the Old Set

Fig. 3 shows the general assembly of the components and the way in which they were wired, which we eventually traced to the circuit indicated in Fig. 4.

We at once decided to scrap the old receiver and

Fig. 5 (below).—Components retrieved from the old set for use in a new three-valver. There was another Igranic rheostat in good condition, but this was not needed for the new set



rebuild it into a modern three-valver, using as many of the existing parts as possible. The next step, therefore, was to pull the old set to pieces and pick out those components which were in sufficiently good condition to be used again (for the old set had seen at least three winters of service).

Old Components Suitable for Use in New Set

The parts which were eventually found to be in good condition, and fit for use in another set are shown in Fig. 5. It will be seen that there are two Burndept anti-microphonic valve holders, a Lotus two-way coil holder, two T.C.C. 1-microfarad fixed condensers, one Lissen .0003-microfarad fixed condenser, an Igranic filament rheostat, an Ormond .0005-microfarad variable condenser and a Fuller Iron-clad transformer.

After a good deal of deliberation, it was decided to adopt the circuit indicated in Fig. 6. It will be seen that this is a three-valver, comprising a detector, one stage of resistance-coupled low-frequency amplification, and a stage of transformer coupling to the last valve.

Special Reaction Method

Reaction is a combination of the magnetic and capacity methods and is controlled by moving the reaction coil. The system adopted gives much smoother and more stable control than ordinary plain magnetic reaction.

The additional components

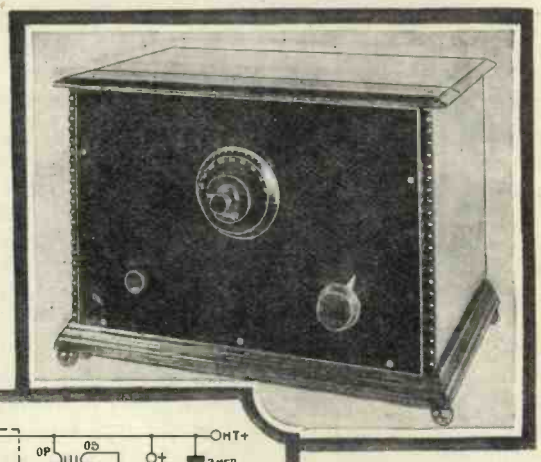


Fig. 11 (above).—This is the completed three-valver in a Pickett Cabinet

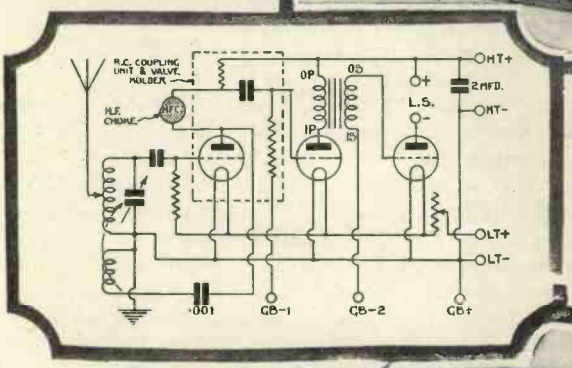


Fig. 6 (left).—Circuit of the new three-valver; detector with two low-frequency stages

Fig. 8 (below).—Completed set all ready for use

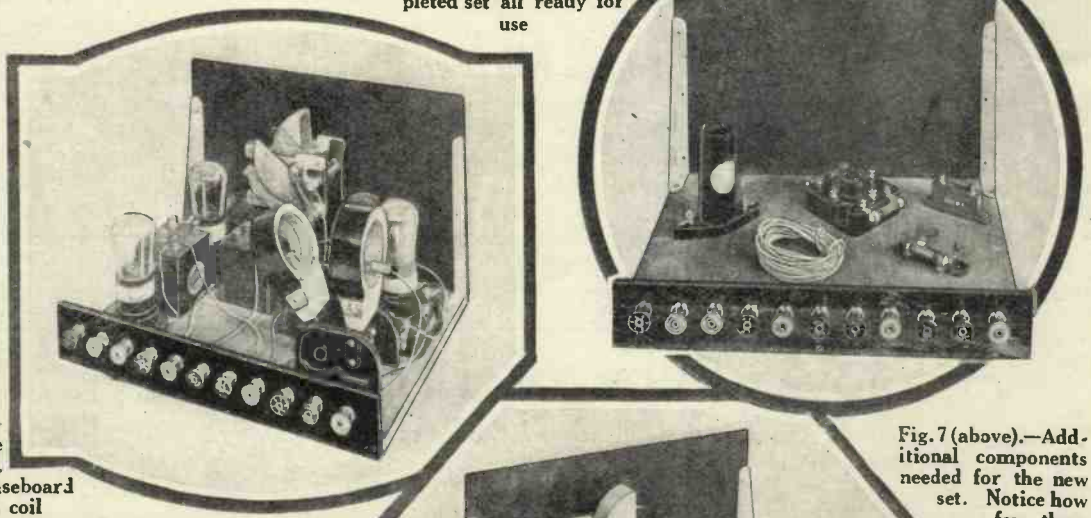


Fig. 9 (below).—Plan view of the three-valver. Note space on baseboard for reaction coil

Fig. 7 (above).—Additional components needed for the new set. Notice how few there are and estimate the cost. In the centre is the new Dubilier resistance-coupling unit and valve holder combined.

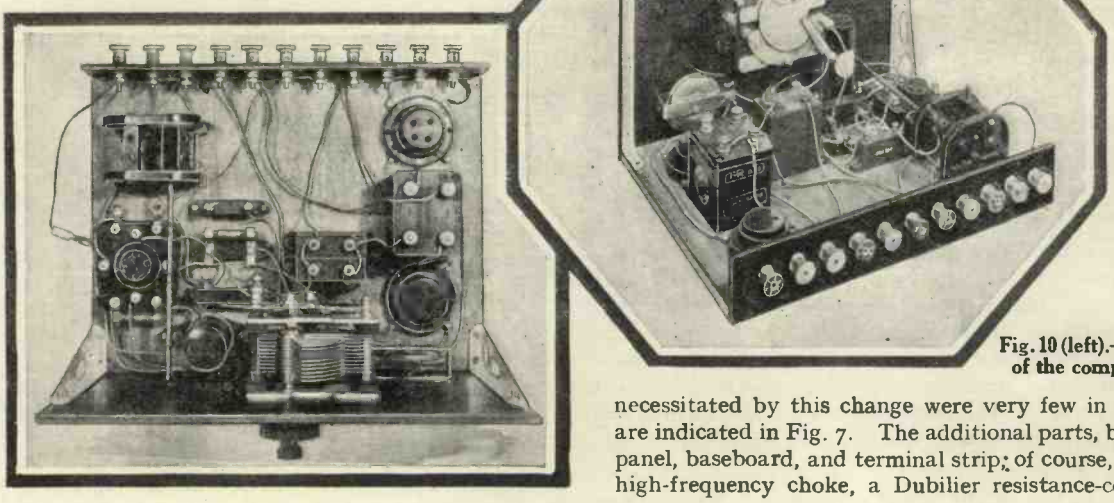


Fig. 10 (left).—Another view of the complete new set

necessitated by this change were very few in number and are indicated in Fig. 7. The additional parts, besides a new panel, baseboard, and terminal strip, of course, are a Lissen high-frequency choke, a Dubilier resistance-coupling unit

Rebuilding That Old Set! (Continued)

complete with valve holder, a new Lissen grid leak and holder, and a .001-microfarad Magnum fixed condenser. It will be seen that one rheostat is used for controlling all three valves; in fact it is really used only as an on-off switch.

Layout of New Set

The appearance of the rebuilt set can be seen from a glance at Figs. 8, 9, and 10, which illustrate what is really an efficient and up-to-date three-valver. It may be supposed that the baseboard components have been packed closer to the panel than is really necessary, but this is not the case, for space has to be left for the moving reaction coil when this is in a position of minimum coupling.

Before going any further, I should like to explain that this article is in no way intended to describe the construction of a new receiver, but merely shows how, with a little ingenuity, the amateur with an old and out-of-date set can use many of his existing parts in an up-to-date and efficient design. If you do not know enough about wireless to work out a new circuit for yourself any experienced amateur will be only too glad to co-operate with you.

However, to return to our set, the valves used in the old receiver were two of the first dull-emitters ever to be put on the market and were showing signs of age. It was, therefore, agreed that three new valves should be obtained and actually three Mullard's (a PM1A, PM1HF, and PM252) were used.

Used in the positions of detector, first L.F. and power valve respectively, these valves gave extraordinarily good results and the set, which is in use in a town just over twenty miles distant from London, is able to pick up on the loud-speaker a surprisingly large number of Continental transmissions, whereas the old two-valver could be relied upon only to receive London and Daventry.

For the purpose of obtaining increased selectivity a centre-tapped coil was used in the aerial circuit, while the reaction was an ordinary plain coil, not tapped at all. Actually those used were Atlas, but, of course, in such a circuit as this any well-made two-pin coils are quite satisfactory.

Redesign Your Old Set!

If you have an old set which you think is not giving the results that a more modern receiver would, why not try designing your own receiver in this way? Really it is not at all difficult and at the outlay of a pound or two you will both provide yourself with several evenings' work and also reap a reward in the way of improved reception of both English and Continental transmissions.

Another scheme which may appeal to you if you feel that you are not able to work out a circuit for yourself is to make a list of your existing components (making sure that all of them are in good electrical condition and really fit for use !), and compare this with the list of components required for new sets described in the pages of the WIRELESS MAGAZINE.

Choice of Many Sets

On an average five new sets are described every month and if you look back through a few copies you are sure to find a design that makes use of a large number of the parts you have on hand. In this way you will be able to build a new set with the minimum of trouble, of course, but you will miss some of the fun of designing your own circuit—which is always an interesting job for those who have sufficient knowledge and experience to undertake it.

The point to realise, however, is that nowadays there is no need to put up with poor results from an old set when it is so simple to find a modern and therefore more efficient design of which you can take advantage at the minimum of expense. Scrap that old set to-night !

A New Type of Broadcast :: Will It Be Developed?

SOME time ago the Cardiff studio broadcast a new thing in introducing the home atmosphere into a concert. The concert went under the name Cartref (home) and represented the gathering of a Welsh family on Sunday evening. The various members of the family chatted about the day's events, and being a Welsh home the events were naturally those of the chapel.

How It Was Arranged

There was criticism of a hymn from one member and then the hymn was sung; a solo became the topic of conversation and that was sung; bits of gossip were thrown in between the items and now and then the mother would tell the children that it was bed-time and they would plead to stay down to hear just another hymn.

This method suggests immense possibilities and would break the monotony of the present system of announcing each item in the orthodox way. Instead of having a set commentary or report of some pageant why not have the results from a home. The children who had seen the pageant added to cross-talk and questions would get at us more vividly. The father or mother could be a person who knew something about the affair.

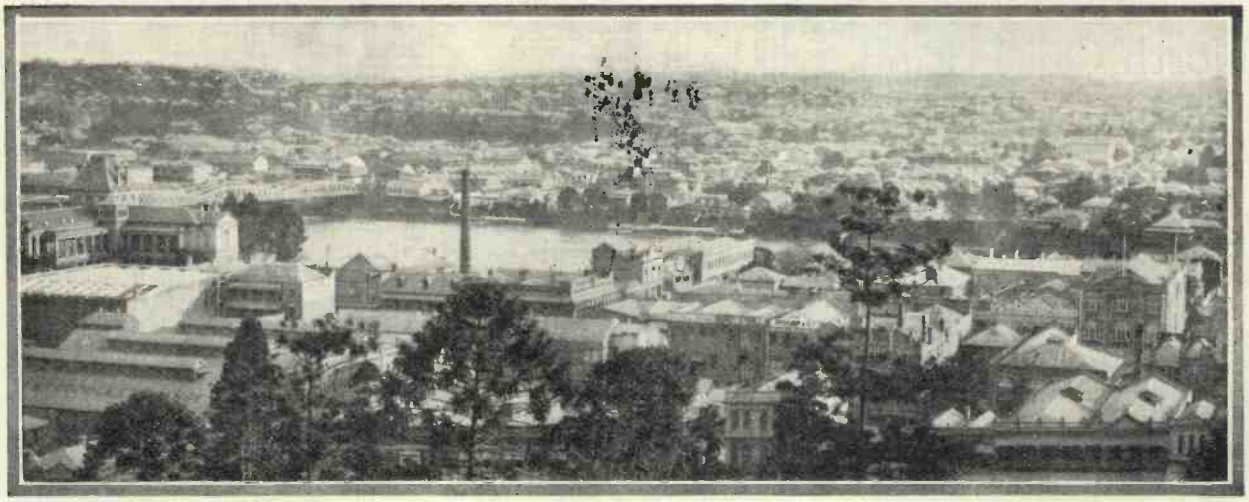
It would be interesting on Derby Day to have the gossip of home in addition to the official comments. In that gossip the disappointment and the triumphs would come to us as we feel them ourselves.

A Saturday evening in Cockney London was sent over very successfully from London and whenever something near this broadcast from a home has been tried it has been an unqualified success. There is so much humour and wit latent in this method that even the driest programme could be made lively.

Give Us "Discussions"

The criticism of talks would be lessened if two or three could discuss the subject rather than one person lecturing on it.

A Manchester home gossip on Saturday night after a football match would be interesting and the talk of a few boys who had been to the Oval. Why not broadcast a French or Irish home scene on Sunday nights? E. B. R.



A panoramic view of Brisbane

NORTH QUEENSLAND RADIO

UNDER the blazing tropical sun of North Queensland stands a steel-constructed mast pointing upwards, as if in defiance to the sun overhead—a striking contrast to the trees and their foliage, drooping in the noon-day heat.

In a flat-roofed, bungalow-shaped building, seated by an open window, is a wireless operator wearing headphones, an open-necked shirt, light trousers, rubber sandshoes, and countless beads of perspiration. He is the unfortunate officer of the midday watch and the means of warning the coastal vessels and residents of the scattered coastal towns of the approach of the dreaded cyclone, with its all-devastating wind, followed by the inevitable floods, adding further discomfort to the homeless unfortunates who once resided in the "track" of the cyclone.

Radio "Milestones"

To give such warnings is one of the duties of the wireless "milestones" that circumvent this island continent. Far out to sea, on lonely Willis Island, is the warning wireless station, where, by means of special instruments, tropical disturbances are quickly located and warnings issued to coastal stations.

On receipt of this warning, land stations cause the Red Pennant to be flown, as a signal that information of a disturbance has been received. On the notice-boards further information is posted showing the location, speed, and direction of travel, also the intensity.

Behind the "scenes" of such information sits a perspiring, heat-fatigued operator, modestly unconcerned in the value of his services, which to him is all in the daily routine.

If you should hear a faint but crisp signal in morse calling VIT (Townsville), VIC (Cooktown), VII (Thursday Island), VID (Darwin), or VIB (Brisbane), you will know that somewhere in our far-flung Empire a wireless operator is doing his duty.

This is the aerial of 4QG, owned and operated by the Queensland Government

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It is evening, and the burning sun, like a ball of fire, has finally dipped below the western horizon, marking the termination of another day. In the cool of the evening a tired, bronzed farmer sits eating his evening meal, whilst his eyes, at regular intervals, travel to the clock on the shelf.

Broken Stillness

Presently he stirs, leaves the unfinished meal, and goes to the corner of the room, where he connects up and tunes-in a five-valve receiver. The stillness is suddenly broken: "Hello! Station 4QG, Queensland Radio Service, owned and controlled by the Queensland Government. Prices at the Roma Street Market were as follows: Lucerne, chaff, first quality, etc."

The farmer, after making final adjustments, returns to his meal, listening to the distant voice, occasionaly pausing in his eating, sometimes with his fork in mid-air, but never missing a quotation. At times one can hear him murmur: "Too high; if only we had some rain."

Soon the voice from the air ceases, but the farmer does not

North Queensland Radio (*Continued*)

relax his attention; his attitude of expectancy arouses one's suspicion of something important to follow.

Presently the voice continues: 'Hello! Weather reports and forecasts officially supplied by the Government Weather Bureau. Forecasts for the following twenty-four hours: Showery and stormy weather, prevailing central and northern Queensland."

An Item of Interest

The farmer rises, switches off, and retires to read a three-day-old newspaper. He scans various items, and presently a grim smile crosses his face, for here is an item of interest.

He reads that somewhere in England the people are protesting against broadcasting, blaming such for the continued rains, and have even gone so far as to petition to the British Government to have broadcasting temporarily withheld.

Fruits of Prophecy

'Poor devils!" murmurs the farmer. "Don't know when they are well off." But it is an early start for the "man on the land," so he retires to bed to await the fruits of the announcer's prophecy.

◆ ◆ ◆

Somewhere in an elaborate suburban home, almost under the aerial of 4QG, and some 1,100 miles from the farmer, a young fellow sits amidst a throng of young people, toying with the dials of an eight-valve superhet, waiting for the dance music to be broadcast.

More Dance Music

In disgust he turns to his companions and remarks: "Why can't they cut out these markets and weather reports, and give us more dance music? Even, then, I suppose VIB would spoil it all with his beastly morse. It's a pity they aren't stopped."

The tropical moon looks down and smiles on it all, whilst somewhere in the scorching North we are listening.

IF YOU DON'T KNOW ALL ABOUT THE TOUCHSTONE YOU HAVE MISSED SOMETHING GOOD!

Clapham & Dwyer

IT has been said of Liddell and Scot that one was a fool and the other was not. So it is with Clapham and Dwyer

Each time I listen to them, I try my hardest to discover which is Clapham and which is not (or which is Dwyer and which is not).

Last night my patience was rewarded. Dwyer (now, was it Dwyer? Yes—I think so) came on alone and said that Clapham would soon join him. So that's one secret revealed.

However, it is of another secret that I am now thinking—the secret of their success. It is, I think, this: They generally give us only *one* outstanding joke—and that a good one—per turn. Consequently, we remember them (the jokes) afterwards with ease.

There are other excellent wireless humorists, and you would like to remember all their jokes, but probably fail to remember one, get annoyed with yourself, and consequently, though subconsciously, with the comedian in question.

Now, with Clapham and Dwyer it is quite different. I'm sure you still remember the "con-diddle-um-oh . . ." about the strange creature that lives in a stable and sees equally well by night and day; and that one that features a tree, an apple, and a bird. I dare say you, too, remember that masterly poem (?) of theirs:

Roses are red
Violets are blue
I can row a boat
But can'oo canoe.

Of course, I am not minimising the delicious fooling leading up to each joke, the time Clapham (?) takes in "getting it off his chest," and the pains taken to make it clear—apparently to one another, but incidentally to us.

Part of the Secret

Yet this is all a part of the same secret. For thus do Clapham and Dwyer help us to remember their jokes with ease, and this is undoubtedly a source of self-satisfaction leading inevitably to greater satisfaction with the artistes themselves.

That, don't you think, is the grand secret of Clapham and Dwyer? Long may they flourish. VERITAS.

A Recharging Diary

6.00—*Return home. Wife reports that accumulator seems to be running down. She wanted to listen to a talk on "Fifty-seven Ways of Serving Beef," and she couldn't hear anything. Lightly promise to take it to be charged after dinner. Sit down to meal and incidentally discover that wife knows at least one new way of serving beef.*

7.00—*After dinner, absently switch on. Strong signals. Ask wife, "What's the matter with that?" Signals fade immediately.*

7.02—*Look out and decide that we're going to have some more rain. Perhaps it would be better not to venture out to-night. Wife disagrees forcibly. Frigidly remind her that water and acid are bad companions.*

7.05—*Is accumulator really run down? Five minutes of fiddling proves that it is. Interrupted by wife's voice, inquiring have I forgotten accumulator? Assure her that I have not.*

7.11—*Half-hearted search for carrier. Has anybody seen it?*

7.12—*Wife suddenly remembers she lent it to people next door. Adds that she believes they're out. . . . There's a nice large piece of brown paper in the cupboard under the stairs. Removal of about a ton of assorted lumber discloses a small thin piece.*

7.20—*Look out again and reiterate opinion that some rain is due. Wife comes in with mac.*

7.25—*Start out.*

7.30—*Acid begins to leak through paper*

7.36—*Policeman eyes me suspiciously. Evidently thinks parcel is infernal machine. Inclined to agree with him. Accumulator now weighs close on a hundredweight.*

7.48—*Arrive at charging station. Closed. Feel a trifle annoyed.*

7.50—*Have the melancholy pleasure of knowing that my forecast was correct. The rain starts.*

8.10—*Arrive home. Spend the rest of the evening alternately resolving to buy an L.T. eliminator and another accumulator of Gargantuan proportions, together with a motor lorry.*

J. A. D.

Making A "Cheap" Set: What It Cost A Beginner

IT was the simplicity of the thing that attracted me—a few tools, no soldering, the necessary components and common sense. Knowing absolutely nothing about wireless, I gladly accepted advice and help which friends were anxious to give. The advice, which matched my pocket, was that valves and components could be obtained equally as good and much cheaper than those specified for the particular circuit.

Sold Me Some Parts

The friend whose advice I accepted was kind enough to sell me some spare parts which he had on hand, including a 60-volt battery which he assured me had at least five months life in it. Being a beginner I was not a little elated at being able to save money.

Under his direction I bought the components, together with an additional 60-volt battery and three cheap valves, "consignment just arrived, well recommended and equal to the best, price 18/6 the three."

Armed with a sketch of how to connect the batteries in series, and confident that I could not go wrong, I completed the construction according to plan, all excitement to get the set going. Checking all connections, carefully inserting the valves and coupling the batteries, the great moment came.

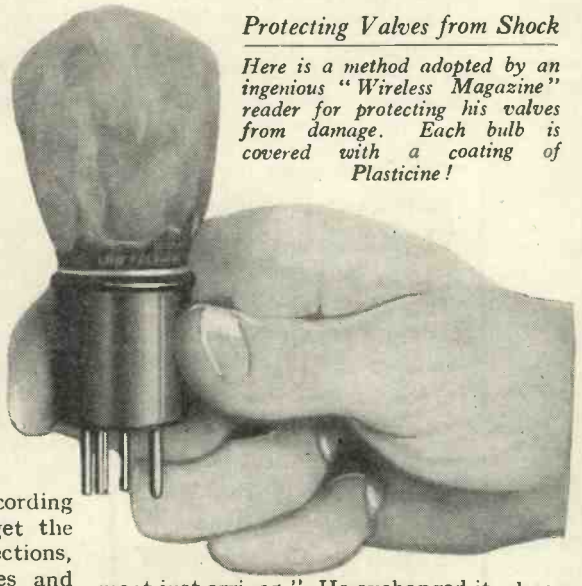
Wife and family were ceremoniously assembled to hear the first concert. A final look round, and the switch was pulled out. Not a sound! except the irreverent comments which the family heaped upon poor old father.

Silence and Seclusion

The friend was summoned. Prudence suggested that he should have silence and seclusion to conduct the *post mortem*. It was as well. His first glance was sufficient. I had mixed up H.T. and L.T. batteries and put twenty volts through my 2-volt valves. 18/6 gone west. Thank goodness the family were not present.

Another set of valves was installed. This time I made no mistake with the batteries. That sort of thing is only done once. Again I pulled the switch, and again not a murmur. My friend the expert spent three solid hours testing every part, and at long last discovered that the grid of the power valve was short-circuited. He assured me that it very rarely happened and that a reputable maker would be very apologetic for such a thing.

I interviewed the retailer and told him what I thought of his "consignment just arrived." He exchanged it without demur, merely remarking that it was a rare occurrence and that I happened to be the unlucky one.



Protecting Valves from Shock

Here is a method adopted by an ingenious "Wireless Magazine" reader for protecting his valves from damage. Each bulb is covered with a coating of Plasticine!

Everything now being all right, I hurried home and put in the valve. For the third time the pesky thing wouldn't even purr. My feelings by this time can be imagined. I took the lot back and discovered that the plate of the detector was shorted. The remedy was obvious. No more cheap, "just as good" ones for me. I exchanged the whole of them for those specified for the set. It cost another 15s. plus those I had blown out, and three days of fury with myself and sarcasm from the family.

But my troubles were not ended. The valves certainly worked, but the reception was negligible. To hear anything at all it was necessary to be perfectly quiet and to sit close up to the loud-speaker. This went on for three weeks while aerial, earth, and every mortal thing except the right one was examined for the cause, but they stood the closest scrutiny.

Old Batteries and New

Then I got the B.B.C. booklet on the "Maintenance of Wireless Sets." The only possible thing I struck was "Don't connect old batteries in series with new ones." My friend, the expert, had been invaluable for help and advice. He had kindly sold me an H.T. battery cheap; could it be that the trouble was there?

I didn't like to hurt his feelings, so I bought a voltmeter, and asked the man to explain exactly how it worked. I went straight for the "cheap" battery. *Every cell was dead!* Not a tremor of the needle from any one of them.

A new battery was at once placed in series with the other and, cheers, the music boomed out to the delight of the family, but most of all to poor old father.

I'm only a beginner, but I know a thing or two and I'm now giving advice which has cost me more than I dare disclose to my better half. It is this:

Four Golden Rules

1.—The cheapest way is to use specified components and no others.

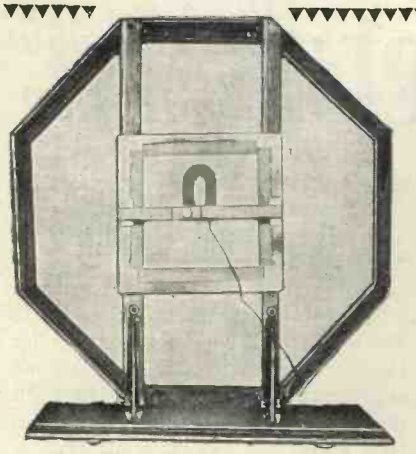
2.—Never buy spare parts from a friend. Friendship is too valuable to risk on the difference between a "cheap" and a new article.

3.—Read all the information you can before beginning to build.

4.—Avoid second-hand batteries like the plague.

N. CHESTER.

Tell Your Friends About the Inceptor 3—It's Worth It



The author's version of the linen-diaphragm loud-speaker

Hints on the Linen-diaphragm Loud-speaker

NO doubt many readers constructed the linen-diaphragm loud-speaker described in the September issue of the WIRELESS MAGAZINE, and some may have been troubled with "faults" which spoilt an otherwise excellent loud-speaker. A few notes on the elimination of the latter may, therefore, prove acceptable.

A Hissing Noise

The first likely trouble is a hissing noise on loud passages. This is caused by the vibration of the small brass tubes used for spacing the loud-speaker unit from the supporting cross-piece, and only occurs if they are at all loose. The remedy, of course, is obvious.

Another annoying blemish that may occur is a marked blasting effect on certain notes; this is not caused by overloading, but is due to the reed of the electro-magnetic unit not being quite central, and hence subject to lateral vibrations. As a result, the balance of the armature is upset and the above defect is created.

Centralising the Reed

The fault is obviously a constructional one, and it must be remedied by removing the screws attaching the framework of the small cone to the larger one, and carefully centralising the reed. The two cones can then be screwed together again; precaution must be taken, however, to use fresh holes for the screws, otherwise they will slip back into the old position.

Readers who are contemplating the construction of the loud-speaker would be well advised to take special care to set the reed absolutely central, relative to the two cones, in the first instance.

A third trouble may arise owing to the linen not sticking perfectly to the framework along the edges where the cone proper begins. As collodion solution forms but a poor gum this trouble is quite likely to occur.

It may be detected as a local vibration which can be heard by placing the ear close to the edge of the cone. The effect is much more marked with some instruments and voices than with others, and although slight at any one point, may, in the aggregate, give rise to an unpleasant resonant effect with some notes, similar to that produced in case two.

After some experiments the writer found the following simple and effective remedy: Pieces of sheet rubber $\frac{1}{16}$ in. thick are cut into strips 1 in. wide and long enough to fit the edges of the particular cone which is being treated.

These notes on the linen-diaphragm loud-speaker, which was first described in the September issue of the "Wireless Magazine," are contributed by a reader; they are published here in the belief that others who have experienced "faults" in the quality of reproduction may benefit by them.

Another reader's opinion appears on page 454.

They are then glued on so as to leave $\frac{3}{8}$ in. overhanging round the edges of the cones. This sticking process must be performed very thoroughly, particular care being taken to ensure that the rubber is stuck to the linen in all places. To effect this, one hand should be placed behind the diaphragm to take the strain, whilst the rubber strip is firmly pressed on with the other.

The photograph shows the method of attaching them to the square cone, and they are fixed to the octagonal frame in the same way.

It should be specially pointed out that the rubber "dampers" have no harmful effects whatsoever on the tone of the loud-speaker.

Having dealt with some possible defects, a note about adjusting the general tone may not be out of place. Whilst realising that individual tastes vary, the writer is of the opinion that a more pleasing tone is obtained by rigidly mounting the loud-speaker on a strong base than by hanging it on a wall, as suggested by the designers.

Spread of Vibration

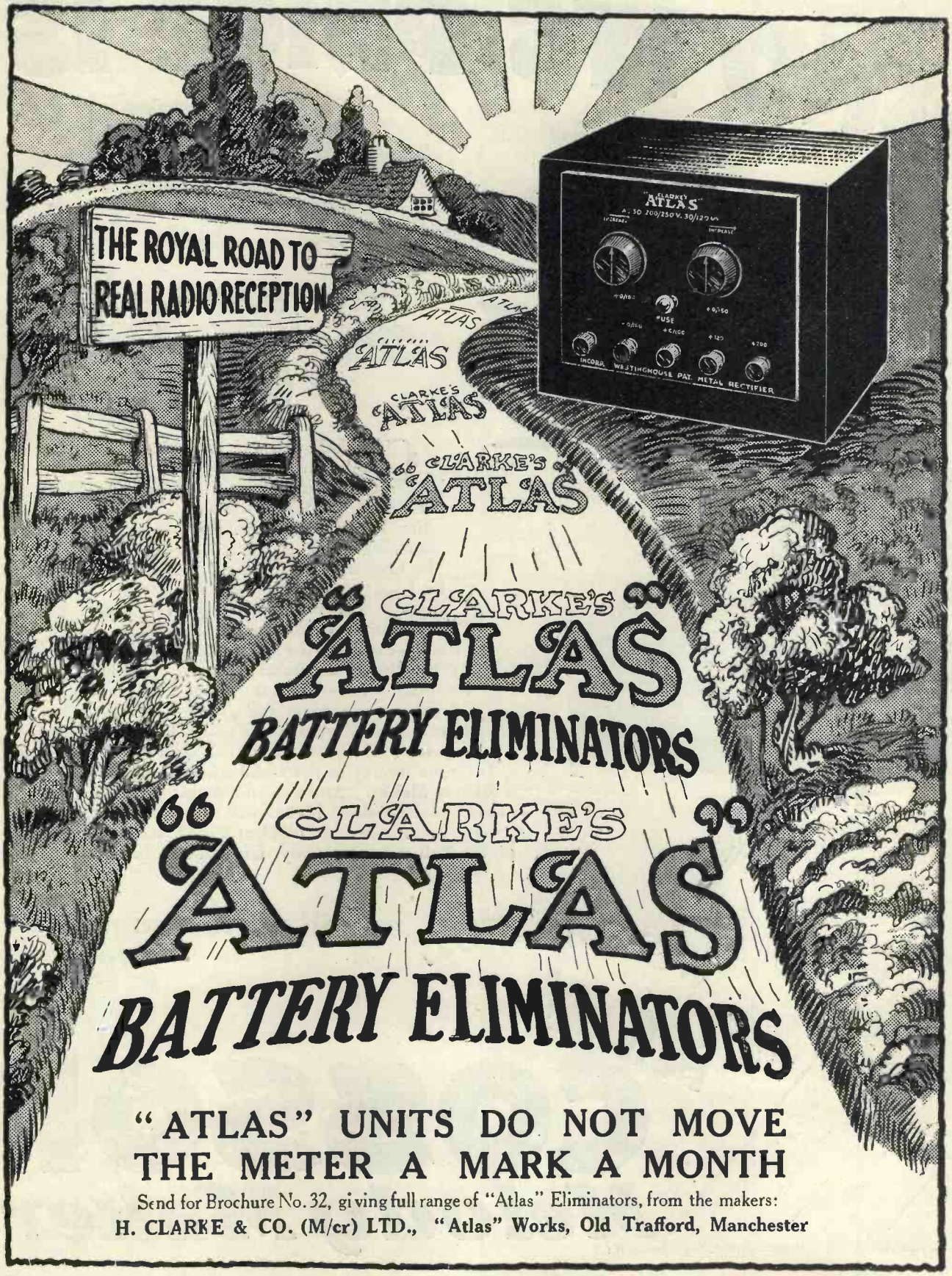
It will be found, however, that on loud signals the vibrations of the frame and sounding board will spread to the table or other support. The writer has even known the floor to vibrate. In order to check this, rubber feet can be attached to the base; those sold for fitting to the bases of wireless cabinets to prevent microphonic noises are excellent for the purpose.

The following suggestion for decorating the loud-speaker, which has a rather bare appearance in its "raw" state, may appeal to some constructors. A piece of very light material, such as artificial silk, of any desirable pattern can be stretched across the front of the large cone and tacked along the back of the wooden frame with "upholstery" tacks. This cover should not be attached to the reed, but pulled moderately tight to form a perfectly flat face. If light material is chosen there will be no loss of volume or clarity.

Use A Good Set!

Finally, in order to fully appreciate the possibilities of this type of loud-speaker, it is essential to have a well-designed, up-to-date set, capable of giving very high quality of reproduction. In particular, the use of a low-impedance power valve, such as those recently issued, is imperative if one desires to obtain a close approach to that full tone so beloved of all moving-coil loud-speaker enthusiasts.

G. S. B.



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6011

In this article is described the construction of a combined electric gramophone and three-valve broadcast set that can be built at low cost. The radio set is used as an amplifier when gramophone records are being played, the reproduction being made through a loud-speaker. If desired, all the necessary batteries can be accommodated in the case

The Gramophone Three

SPECIALLY DESIGNED, BUILT, AND TESTED BY THE "WIRELESS MAGAZINE" TECHNICAL STAFF

The complete Gramophone Three

THE great interest displayed by readers in our special Gramo-Radio Section (which this month appears on pages 425 to 432 and contains articles by Capt. H. J. Round and W. James) leads us to believe that there is need for a combined electric gramophone and radio set.

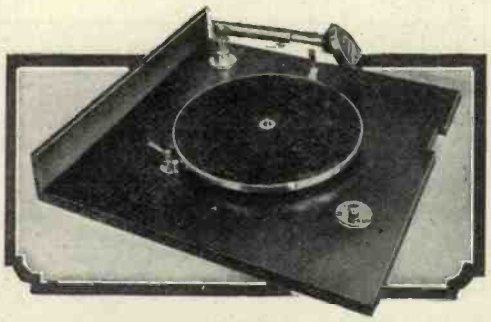
Three-valve Broadcast Set

We have therefore produced this Gramophone Three; it consists of a three-valve broadcast set with all-wave tuner, and comprising a detector and two resistance-capacity coupled low-frequency stages. As an electric gramophone, the set is used with a pick-up and loud-speaker (external to the cabinet), the detector valve in this case being biassed to amplify instead of rectify.

As can be seen from the photograph at the right-hand top corner, the combined electric gramophone-cum-radio set is neat in appearance and quite good enough to take its place in any scheme of furnishing.

Actually, the electro-magnetic pick-up, turn-table and double-spring motor are fixed at the right of the cabinet, so that the handle is in the most accessible position for winding. There is plenty of room underneath to house all the batteries, or even a mains supply unit, to provide current for the valves.

Of especial interest is the actual receiver portion of the combination. This, as can be seen from the photographs, is built up on the American style like any ordinary receiver. It is then placed in position as a complete unit, the panel being horizontal in use instead of vertical. This applies also to the valves, of course, but there is no possibility of their falling out of the holders as normally the cabinet will not be moved once it has been placed in position.



How the turn-table is arranged in the Gramophone Three. The pick-up and tone-arm used in the original set were of B.T.H. manufacture. Other suitable alternatives can, of course, be used, but care must be taken to get the proper tracking

This is the double-spring gramophone motor

First of all, then, let us discuss the radio receiver in detail for, housed in an ordinary upright cabinet, it can be used quite well as an ordinary three-valver; in this case it will appeal to those who already have gramophones.

Those who can read one are recommended to glance at the circuit diagram, on page 468. It will be seen that the tuner is tapped for additional selectivity and that moving-coil reaction is employed. In the grid lead of the detector valve is a jack switch; in one position this puts the magnetic pick-up in circuit in place of the aerial-tuning coil.

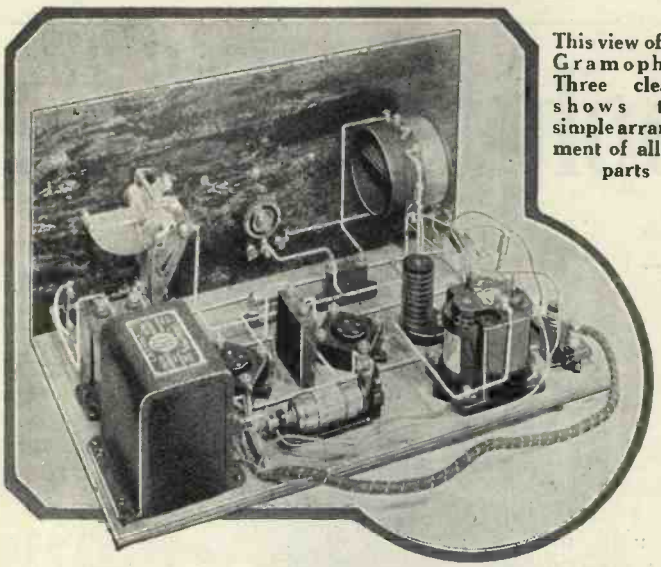
A volume control is automatically brought into circuit when the set is used for gramophone work.

"Motor-boat" Stopper

For coupling the first valve to the second a combined resistance-capacity coupling and "motor-boat" stopper is used; this makes the set suitable for running from a mains supply unit if desired without any fear of unwelcome noises being heard.

The second valve is coupled to the last power valve by another resistance-capacity coupling, not arranged

The Gramophone Three (Continued)



This view of the Gramophone Three clearly shows the simple arrangement of all the parts

Note the all-wave tuner on the right of the panel

as a complete unit, because of expense. The values here are 100,000 ohms for the anode resistance (this can be varied, of course, to suit different valves), .01-microfarad coupling condenser and a 2-megohm grid leak.

Special Output Unit

In the anode circuit of the last valve, a choke-capacity output is arranged; it would be bad practice to allow the heavy current that must flow in the anode circuit of the last valve to pass through the loud-speaker windings.

It will be observed that the whole set is switched on by inserting the loud-speaker plug in the set. This makes it less likely for the operator to leave the set switched on after using it for gramophone work (as often occurs with ordinary amplifiers) as the lid of the cabinet cannot be closed properly until the loud-speaker lead has been withdrawn. When records are being played, the lid should be closed as far as possible.

Range of the Radio Receiver

It might be thought that this receiver does not give sufficiently good results as a radio set because it is so simple. Actually it was designed with the object of getting both Daventry's at reasonable loud-speaker within a range of 100 miles or so.

Under test in Kensington, not more than 2 miles from 2LO, both 5XX and 5GB can be heard at good loud-speaker strength on a small indoor aerial. Moreover, once the voltages applied to the valves have been adjusted, the receiver is extremely simple to operate.

The all-wave tuner used was found to be especially good in use. The tappings give extreme selectivity (with a short indoor aerial, tapped on to A2, it was difficult to tune in 2LO at a distance of less than 2 miles!) and the reaction is easily controlled by the large dial.

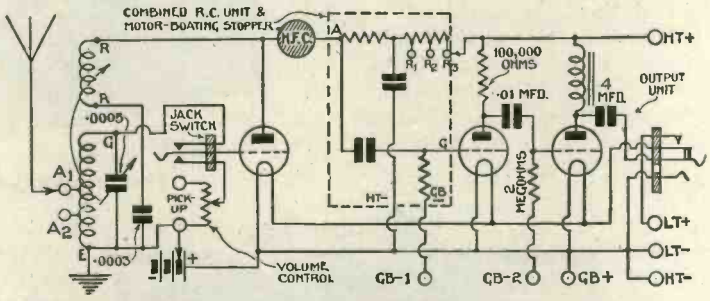
Simple Wave-change Switch

A glance at the photographs will show that there is a small extra knob in the centre of the reaction dial (on the left of the receiver). This is a push-pull switch for changing the wavelength range of the set: "in" for the long waves (1,000 to 2,000 metres), and "out" for the short waves (250 to 500 metres).

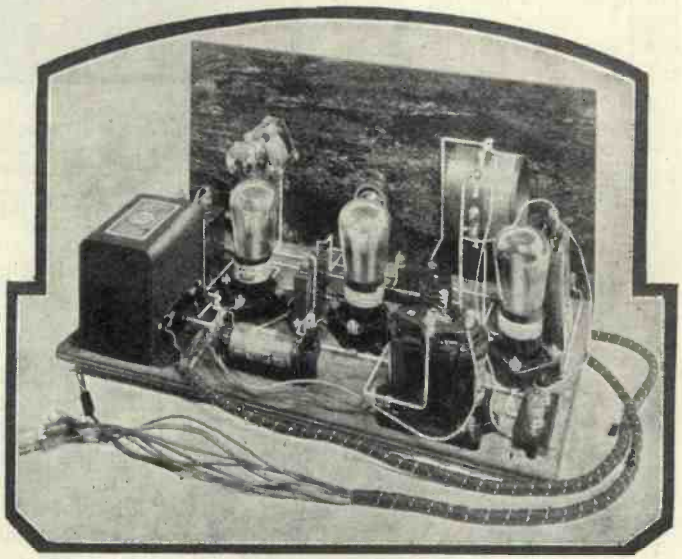
The combined resistance-capacity coupling unit and "motor-boat" stopper was utilised because it is so convenient and saves the use of at least five separate parts. In the model used, the wire-wound anode resistance is 200,000 ohms, the coupling condenser .008 microfarad, and the grid leak 1 megohm.

Three values of resistance can be obtained for the "anti-moto" part of the unit; these are 20,000 ohms (R1), 30,000 ohms (R2), and 40,000 ohms (R3). The by-pass condenser has a

(Continued on page 470)



This is the circuit utilised in the Gramophone Three. The combination comprises an anode-bend detector followed by two stages of resistance-capacity coupled L.F. amplification



Here is another view of the Gramophone Three. On the left is the large low-frequency choke

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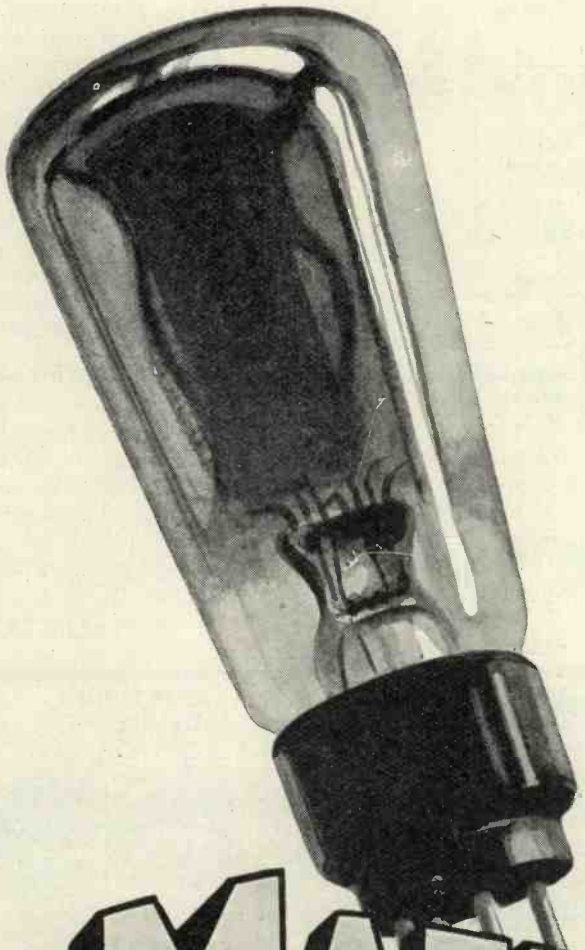

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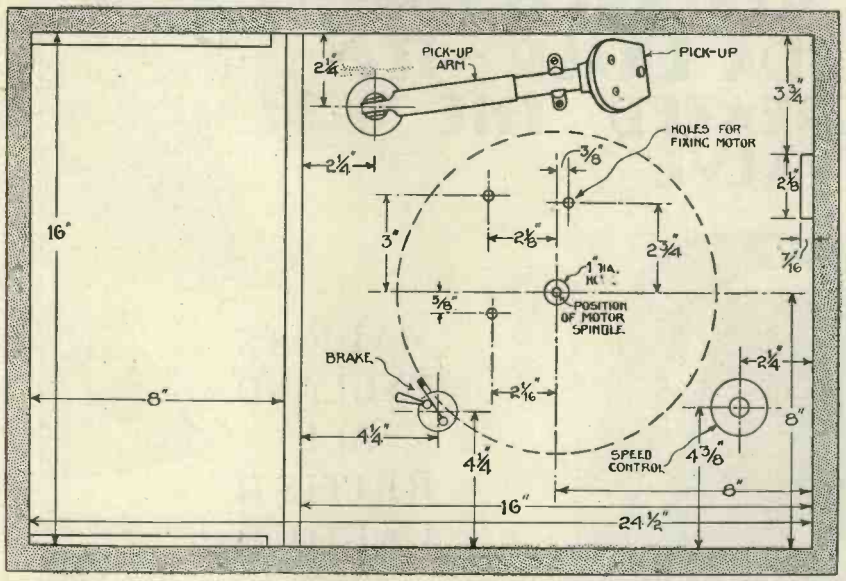
The Gramophone Three (Continued from page 468)



This diagram shows how the turn-table and motor, and pick-up and tone-arm, are mounted in position

capacity of 2 microfarads. (See circuit diagram).

Another component of outstanding merit is the low-frequency choke used as an output filter. This actually has an inductance of 28/14 henries, the latter figure being for a load current of 100 milliamperes. The D.C. resistance of this model is only 260 ohms, so the amount the high-tension voltage is reduced is negligible.

Volume Control

The volume control has a resistance of 0 to 500,000 ohms and is in shunt with the pick-up. When the combination is used for radio reception, control of volume is obtained by varying the reaction control.

In order to get the best results, it is important to use only the most suitable valves. The detector should have an impedance not exceeding 60,000 ohms, although it may be as low as 20,000 ohms. A Cossor 610RC valve was found to be quite satisfactory.

With a 100,000-ohm anode resistance in the second coupling, a valve with an impedance of 30,000 ohms is best, and for this position a Marconi or Osram HL610 (which has an amplification factor of 30) will be found excellent.

Choice of Power Valve

The choice of a last power valve depends almost entirely upon the type of loud-speaker used, but it certainly should not have an impedance greater than 3,500 ohms. When the set was tested, a Marconi LS6A (which is equivalent to three LS5A's in parallel) was found to give excellent results with a Mullard cone loud-speaker.

Interesting Valve

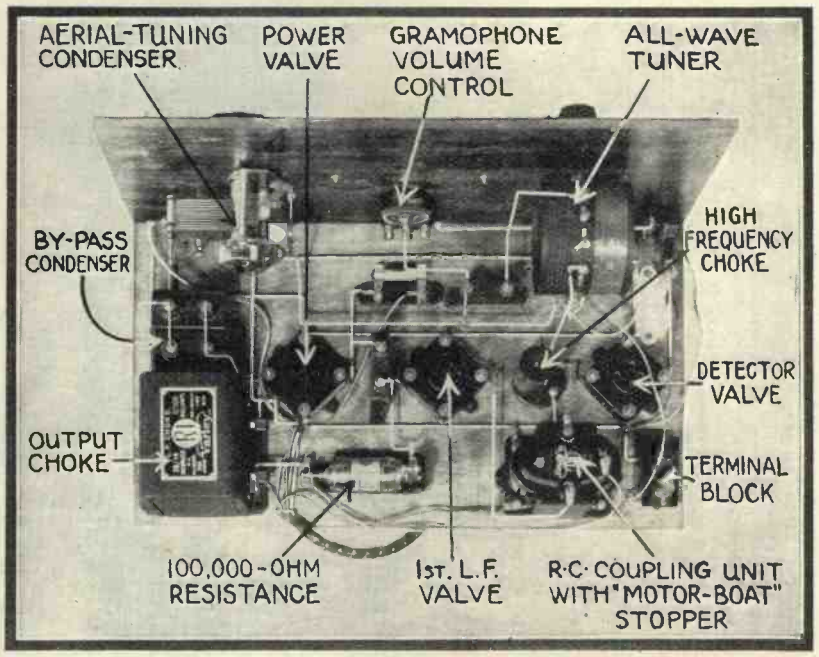
The LS6A is a most interesting new valve and has the following characteristics: Filament voltage, 6 volts; filament current, 1.6 ampere; maximum anode voltage, 400; impedance, 1,350 ohms; and amplification factor, 2.5 (the last two at 100 anode volts and zero grid volts).

Such a valve as this cannot, of course, be used if dry high-tension batteries are employed, and actually in our tests an Atlas D.C. unit was used on 200-volt mains.

Blueprint Available

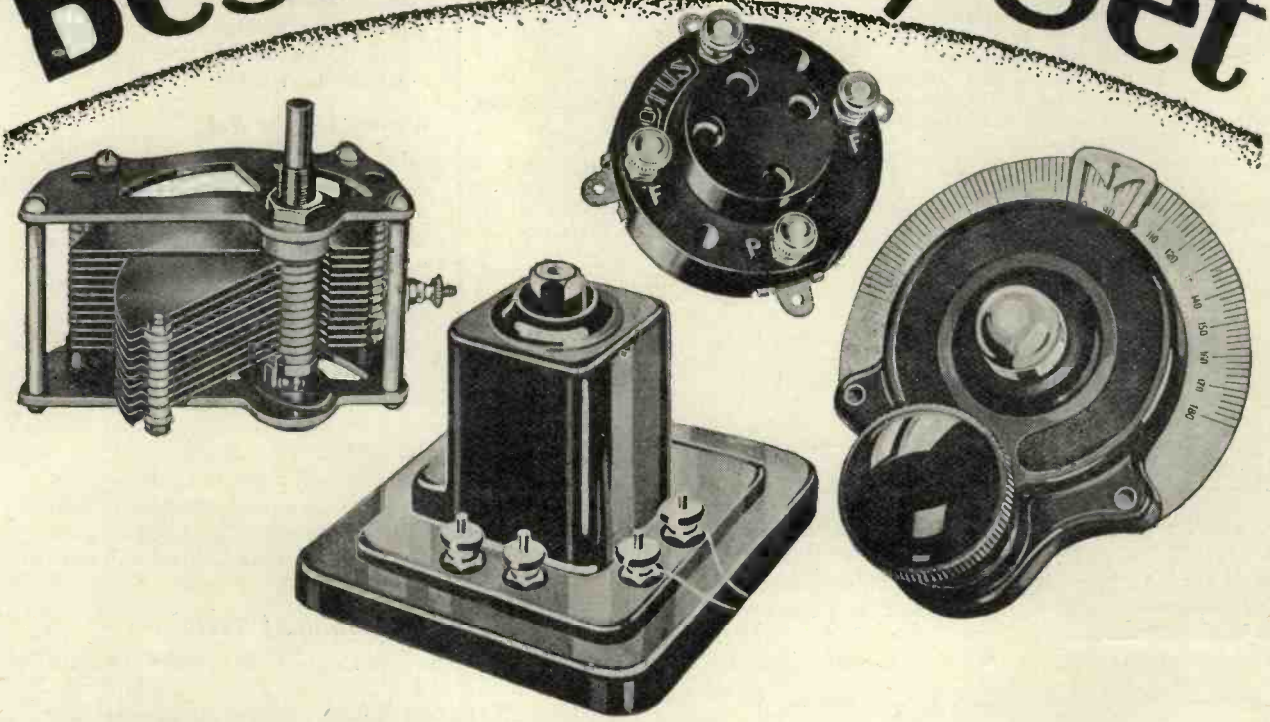
There is little that need be said about the actual construction of the receiver, which is quite straightforward, as a glance at the photographs will reveal. Those who desire one can obtain a full-size blueprint drilling guide, layout, and wiring diagram for half-price (that is, 6d., post free) up to December 31, if the coupon on page iii of the cover is used before that date.

(*Continued on page* 472)



This plan view of the receiver portion of the Gramophone Three clearly shows the arrangement of all the parts. It will be seen that the wiring is exceptionally easy and will present no difficulty even to the beginner.

Best for Any Set



Whether you make or buy your set, remember that good components make a good set. When you choose your set, choose Lotus Components. They are the best for any set.

Experts recommend Lotus Components. They are ideal for all such circuits as the Mullard Master 3* and Cossor Melody Maker. Accurately made and beautifully finished, these components embrace valve holders, condensers, dials, jacks, switches, plugs and coil holders as well as a range of Lotus Remote Controls providing wireless in every room for any kind of set.

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ayston.

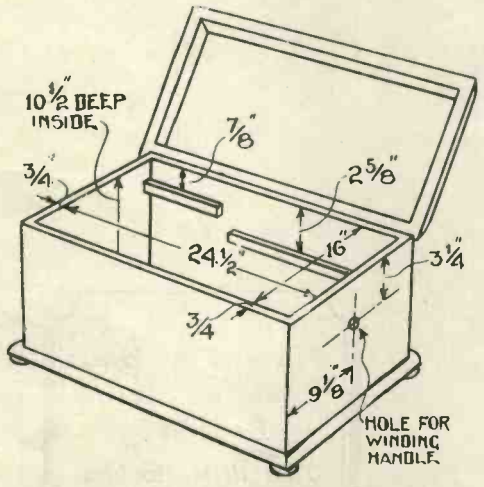
The Gramophone Three (Continued from page 470)

COMPONENTS REQUIRED for the GRAMOPHONE THREE

1—Ebonite panel, 16 in. by 8 in. (Becol, Trolite, or Parfait).
1—All-wave tuner (Wearite W.G.2).
1—.0005-microfarad variable condenser with vernier attachment (Jackson Bros., Polar, or Gecophone).
1—0 to 500,000-ohm potentiometer (Igranic, Megostat).
3—Dial indicators (Bulgin).
1—Jack switch (Lotus, No. 7).
1—Plug and jack (Lotus, No. 4).
3—Antimicrophonic valve holders (Benjamin, Lotus, or W.B.).
1—Combined resistance-coupling unit and "anti-moto" device (R.I. and Varley, type Z).
1—High-frequency choke (Wearite, Lewcos, or Peto-Scott).
1—.0003-microfarad fixed condenser (T.C.C., Dubilier, or Trix).
1—.01-microfarad fixed mica condenser (T.C.C., Dubilier, or Graham-Farish).
1—100,000-ohm wire-wound resistance with holder (R.I. and Varley, or Lissen).
2—2-microfarad fixed condensers (T.C.C., Dubilier, or Lissen).
1—Low-frequency choke (R.I. and Varley, type EY6).
1—7-way battery cord (Lewcos).
1—2-megohm grid leak with holder (Lissen, Dubilier, or Mullard).
1—Terminal strip, 2 in. by 1 in. (Becol, Trolite, or Parfait).
2—Terminals, marked: Aerial, Earth (Belling-Lee).
1—Battery clip (Bulgin).
2—Wander plugs, red and black (Clix).
Stiff wire for connecting (Glazite).
Short length of flex.
1—Double-spring motor and turntable (Peto-Scott).
1—Pick-up and tone-arm (B.T.H.).
1—Cabinet with 9 in. baseboard (W. T. Lock).

Address your inquiry to Blueprint Dept., WIRELESS MAGAZINE, 58/61 Fetter Lane, E.C.4; and ask for No. W.M.115. A blueprint is not essential, of course, for all the necessary details are reproduced on a smaller scale in these pages.

In obtaining the necessary parts, it is most desirable to follow, as closely as possible, the recommendations made in the list of components that appears at the top of this page.



Details of cabinet for the Gramophone Three

Use of Unsuitable Components

The majority of complaints received by the WIRELESS MAGAZINE in respect of sets not working properly are due to the use of unsuitable, if not of inefficient, apparatus for the particular circuit.

Notice in laying out the parts that a battery cord is used for connecting up. If the batteries are to be housed in the cabinet underneath the gramophone turn-table, then the seven-way cord specified can be replaced by seven separate short leads.

Wiring Up the Set

In wiring up the set follow the blueprint or reduced reproduction of it on page 474. A glance at either will show that each terminal point is marked with a small letter; these letters indicate which points should be connected together, and in what order. For instance, the points marked *a* are first connected with one wire or as few wires as possible; then the points *b* are connected; and so on through the alphabet.

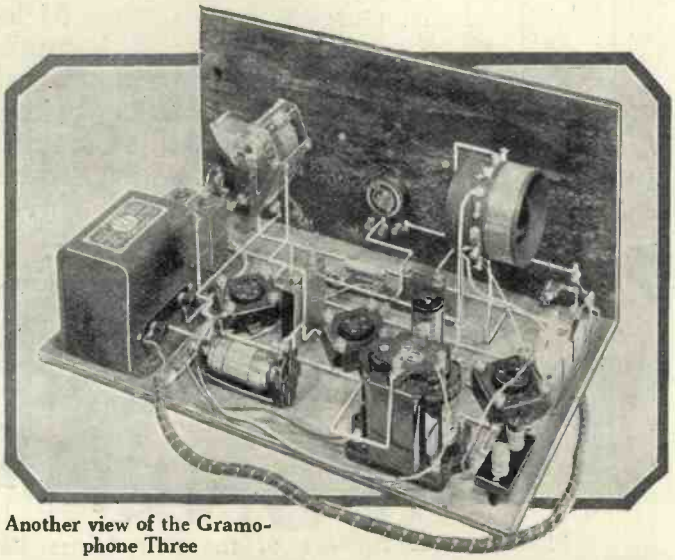
When every connection has been made, it is as well to test the set before finally placing it in the cabinet with the batteries. The pick-up is not connected to the volume-control unit until the whole set is assembled.

Connecting Up for Preliminary Test

Normally it will be found all right to connect the aerial to A1, for tuning is too sharp on a short aerial if connected to A2. The bias applied to the first low-frequency valve will have to be about −3 volts, while that applied to the detector (from a separate 4½-volt battery on the "baseboard") will have to be −1½ or −3, according to the particular valve used.

If a valve of the LS6A type is used in the last stage, it is desirable to use a separate anode lead if more than 200

(Continued on page 474)


Another view of the Gramophone Three

SEE THE GRAMO-RADIO SECTION ON PAGES 425—432

WHENEVER YOU HEAR FINE RADIO

YOU CAN BET THE VALVES ARE

EDISWAN

Complete Catalogue of the full range of Ediswan Valves free on request to The Edison Swan Electric Co., Ltd. (Publicity Dept.), 123/5, Queen Victoria Street, London, E.C.4.

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After all, it's what the valve does that counts!

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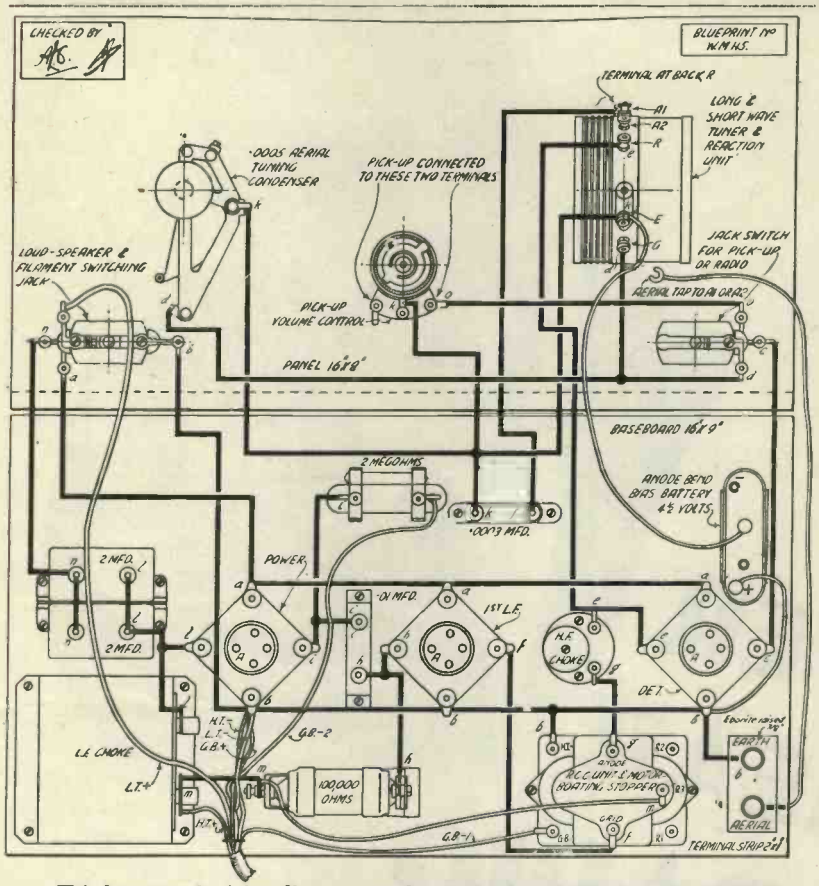
The Gramophone Three (Continued from page 472)



This layout and wiring diagram can be obtained for half-price (that is, 6d., post free, if the coupon on page iii of the cover is used by December 31. Ask for No. W.M.115

volts high tension is available. If not more than 200 volts is available, however, this voltage can be applied to all the anodes.

Applying Proper Bias to Valves

The bias required by the last valve may vary from —6 to —50 or even more, and in this respect the makers' instructions should be carefully carried out. By the way, a complete list of valves appears on pages 404 to 405 of this issue.

When all the batteries have been connected, push the loud-speaker plug into the jack, making sure that the knob of the jack-switch for the pick-up is "in."

For reception on the lower broadcast band pull out the knob on the tuner dial and adjust the reaction dial until the slight rustling or hissing sound is heard, which indicates that the set is on the verge of oscillation and, therefore, in its most sensitive condition for reception.

Readjusting for Best Possible Results

Now turn the knob of the variable condenser, on the right of the panel, until a station is picked up, when readjustments should be made until the best possible results have been obtained. To receive on the long waves simply push in the knob on the tuner dial.

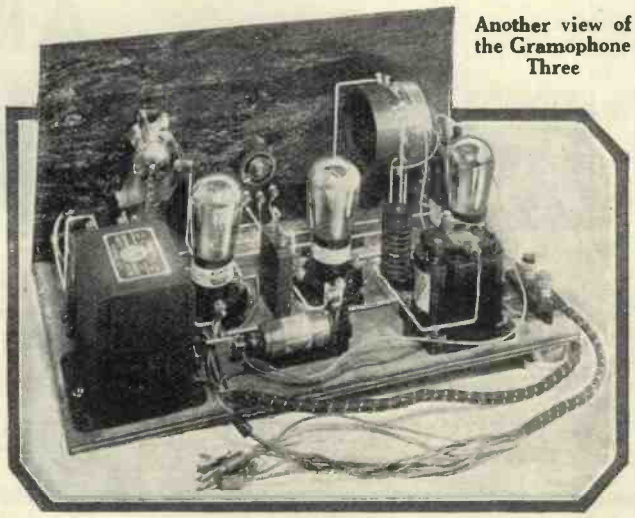
As soon as the constructor is satisfied that the purely radio part of the combination is working all right the set and batteries can be placed in position in the cabinet. It will be necessary to make two small holes in the back for the aerial and earth leads, and a hole will also be needed for the seven-way battery cord if the batteries are used externally.

Before the set is placed in position, of course, it will be necessary to mount the gramophone and pick-up tone arm. The motor recommended is a double-spring model and the method of fixing it will be clear from the diagram on page 470.

Needle-track Alignment

In our original receiver we used a B.T.H. tone-arm and pick-up. This is particularly efficient (see the article in the Gramo-Radio Section by W. James entitled "Pick-ups from A New Angle"), but other makes are, of course, available. The position for fixing a B.T.H. tone-arm is indicated in the diagram mentioned above, but this will not necessarily be correct for other models, as the needle-track alignment may then be wrong.

Readers who require further information on this point are referred to the following articles that have appeared in recent issues of the WIRELESS MAGAZINE: "Pick-up Angle and Weight," by Capt. H. T. Barnett, M.I.E.E., page 48, August, 1928; and "Getting the Best from Your Records," by the same contributor, on page 460, June, 1928.



Another view of the Gramophone Three

LET ME BE YOUR FATHER

I have acted as father and adviser to thousands of others. I give advice free, and when I do so I feel the responsibility of a father, either in advising a career or in guiding our students to success. Having been the self-constituted father and adviser to thousands of others, it is possible I may be able to help you and guide your footsteps so that you may make a success of your life.

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IT IS QUITE TRUE

and I state most emphatically that there are thousands of men earning less than half of what they could earn simply because they do not know where the demand exceeds the supply. Thousands of people think they are in a rut simply because they cannot see the way to progress. This applies particularly to Clerks, Book keepers, Engineers, Electricians, Builders, Joiners, etc. They do not realise that in these particular departments the demand for the well trained exceeds the supply. In Technical trades and in the professions employers are frequently asking us if we can put them in touch with well-trained men. Of course, we never act as an employment agency, but it shows us where the shortage is. In nearly every trade or profession there is some qualifying examination, some hall-mark of efficiency. If you have any desire to make progress, to make a success of your career, my advice is free; simply tell me your age, your employment, and what you are interested in, and I will advise you free of charge. If you do not wish to take that advice, you are under no obligation whatever. We teach all the professions and trades by post in all parts of the world, and specialise in preparation for the examinations. Our fees are payable monthly. Write to me privately at this address, The Bennett College, Dept. 173, Sheffield.

J. W. Bennett

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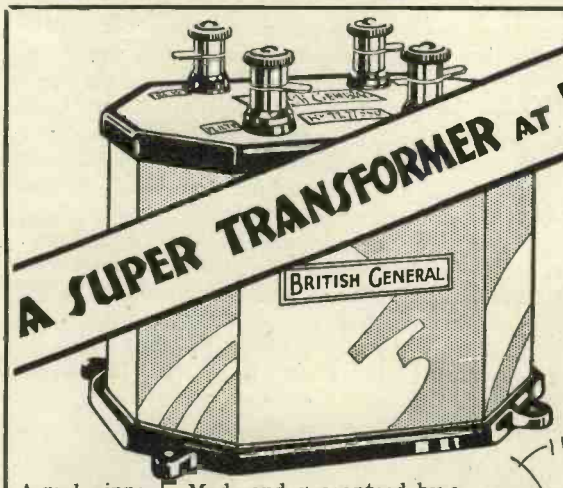

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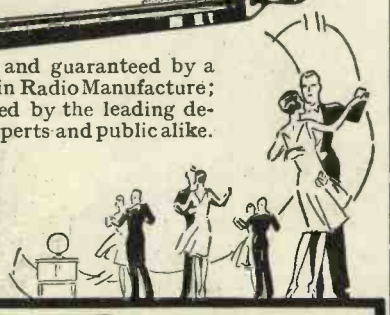

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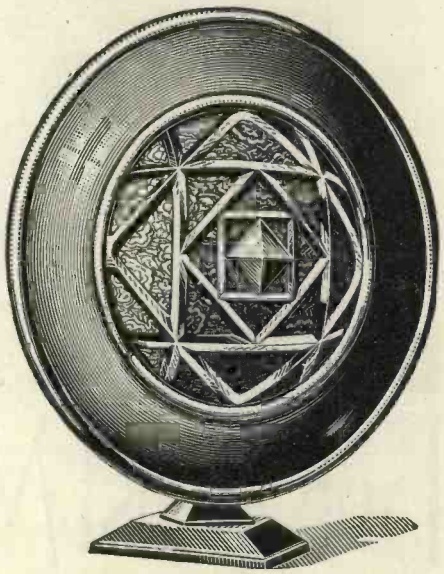

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Broadcast Music of the Month

Reviewed by STUDIUS

THE B.B.C. may be said to have stepped in where many managers have feared to tread in the way of orchestral concerts. Taking the British public as a whole, the only series of orchestral concerts that can be said to really succeed is that of the summer-time "Proms," at Queen's Hall, and how far this is due to custom, rather than the intrinsic value of the actual works, is difficult to say.

Two Famous Conductors

Two famous conductors may be said to have "opened" November, Sir Hamilton Harty with the Halle Orchestra at Manchester, and Sir Dan Godfrey with the fourth of his Municipal Orchestral Concerts at the Winter Gardens, Bournemouth. Included in the Halle programme was Berlioz' *The Trojans of Carthage*, a work which has not been heard since 1897, and was hardly worth the immense amount of time which Sir Hamilton Harty has devoted to it.

Sir Henry Wood's announced visit to Belfast for a special concert by the Belfast Symphony Orchestra included Mozart's Concerto in D with the Hungarian violinist, Miss Jelly D'Aranyi as soloist, Miss Marjorie Sinclair (soprano) and Charles J. Brennan (organ).

Sir Hamilton also conducted for the second of the B.B.C. National Symphony Concerts at Queen's Hall, when Brahms' Symphony No. 4 in E minor was broadcast via 5GB. Two other famous conductors include the Swiss, Ernest Ansermet, and Sir Edward German in a special concert performance of his own inimitable *Tom Jones*.

This being the Schubert Centenary year, nearly every phase of musical entertainment is tinged with this composer's influence. A novel idea was the arrangement of some of his works for military band performance, made by a well-known musician, Gerrard Williams, and performed by the Wireless Military Band under the baton of Mr. Walton O'Donnell.

Vocal Music Predominates

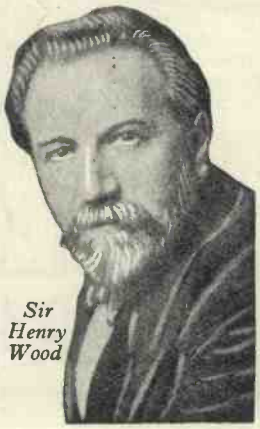
Vocal music occupies the greater part of the programmes, with more or less success. Apart from the relays of the British National Opera Company, in which we have some of the finest singers in the kingdom, there have been few outstanding programmes.

One, however, calls for comment, namely that of the Newport Choral Society which commenced its thirty-first season on the 13th with scenes from *The Song of Hiawatha*, the soloists being Miss Miriam Licette and

(*Continued on page 478*)

Ben Williams

Mary Lohden



Sir Henry Wood

Leonard Hirsch

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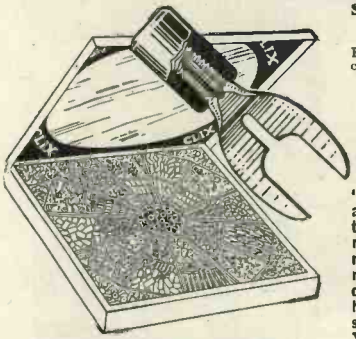

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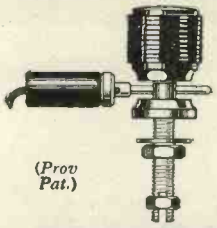

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Aerial Coil } Litz
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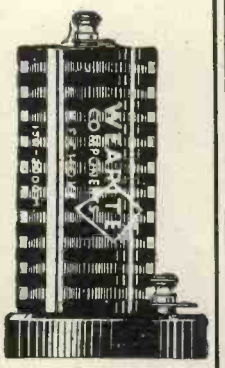

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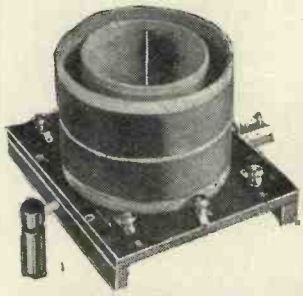

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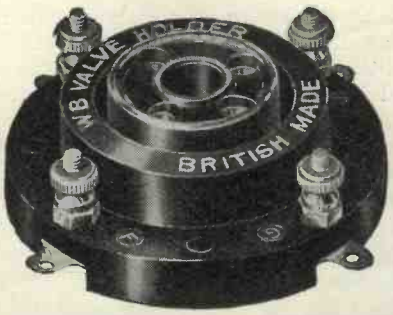
W  **B**

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Say Whiteley-Boneham and be sure of the best.

WHITELEY, BONEHAM & CO., LTD.,
Nottingham Road, Mansfield, Notts.

Broadcast Music of the Month (Continued from page 476)

Lucia Roger

Stanley Riley, vocalist

(Left)—Marie Sutherland, pianist

(Right)—Olive Kavann

Harold Williams of the B.N.O.C., and Mr. Hubert Eisdell.

All-Welsh Programme

The all-Welsh programme, relayed from Cardiff to 5GB, was carried out with the aid of the National Orchestra of Wales, and famous Welsh artists, including Leila Megane, J. Eddie Parry, and Alwyn Jones, the latter one of few singers who play their own harp accompaniments.

In the studio concerts, some highly trained and familiar voices have been heard. Miss Olive Kavann has been heard both in classical and lighter songs. Gaby Valle is a pleasant soprano singer, Mary Lohden has been heard both from 2LO and the provinces. Lucia Rogers hails from Manchester and is often heard, while Miss Hazel Gray, a Bristol contralto, has figured in more than one programme.

Operatic performances have played a great part in the music of the month, and though the palm must go to the B.N.O.C. for their performance of *Lohengrin*, a very fine one was that given by the Carl Rosa Opera Company in *Faust* with two famous artists, Mr. Ben Williams and Helen Enoch as Faust and Marguerite. In the studio, also, was heard Debussy's opera, *Pelleas and Melisande*.

Variety has been well handled lately. Early appearances were made by The Roosters last month, one of the best known of concert parties, while famous variety stars have made their bow before "the mike." Jack Hulbert, Clarice Mayne, Gracie Fields (who gave a special Lancashire programme from Newcastle as well as two London programmes), and Arthur Prince have all been heard, while familiar and special wireless artists have been Norman Long, touring the stations, John Henry and Blossom, and Miss Vivian Worth.

Outstanding Sketch

A sketch that was entirely "something out of the ordinary" was that presented at 5GB, and based on old mottoes such as "What is Home Without a Mother." Some well-known broadcast and operatic artists were included in the cast, amongst them being Wortley Allen, Harry Sexton, Mabel France of "Aunt Maria" fame, and Helen Enoch of the Carl Rosa Opera Company.

Plays of the Heavy Order

Plays have been distinctly of the heavy order, including Ibsen's dull play *The Pretenders*, and some attempts at "thrillers"—notably an air-raid incident *In the Cellar*, and a Hyde Park incident, entitled *In the Forests of the Night*. Miss Muriel Levy, who is noted for her many radio sketches, gave something more ambitious in a setting of De Maupassant's short story *The Diamond Necklace*.

A very wide range of instrumentalists has been broadcast, and it is good to note that some of the finest exponents have been heard

Hazel Gray, vocalist

(Left)—Septimus Hunt, vocalist

(Right)—Frank Laffitte

Muriel A. Levy

WISE WOMEN MAKE MEN MEND WITH FLUXITE!

–it simplifies all soldering

FLUXITE is sold in tins, price 8d., 1/4 and 2/8. *Another use for Fluxite: Hardening Tools and Case Hardening.* Ask for leaflet and improved methods.

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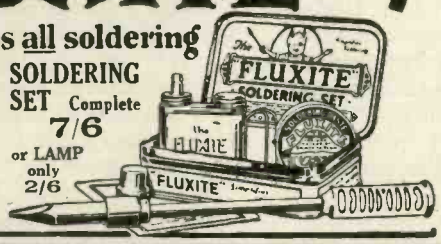
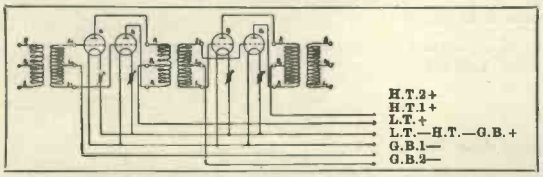


WEILO CIRCUIT No. 2

A PUSH PULL AMPLIFIER for Gramophone Pick-up



LOOK out for these circuits in every WEILO advertisement. No. 3 will be an H.T. Eliminator (A.C.) for use in conjunction with this circuit.

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For general use,

Model 10 POWER. Heavy shrouded type	Model 3 Heavy shrouded type
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Half Hours with the Professor

A CHAT ON RECTIFICATION

YOUNG Amp crept timidly into the Professor's laboratory with a large parcel under his arm. He found the Professor regarding two single-turn coils housed in splendid isolation in the middle of a bench. Megohm looked round as the boy entered.

"Oh, hullo, Amp," he exclaimed, "I haven't seen you for some time."

"Er, no," replied the boy, hesitatingly. " 'S'matter o' fac', I've been building a set—" He stopped short, torn between a natural pride in his set and a certain disappointment with the results, for in truth he had the set under his arm as he spoke.

Mutual Inductances

Megohm waited for the boy to resume, but Amp only stared at the two coils in which the Professor seemed interested, seeing which the savant chuckled and eventually said :

"Those are only two mutual inductances, Amp. I am trying out a new method of measuring amplification, but let us leave that and hear all about your set."

Realising that the Professor was in a favourable mood, Amp seized his opportunity. "It seems a shame to bother you with it, Professor," he said. "I get it to work after a fashion, but I can't quite get what I want out of it."

Amp's Three-valver

He unpacked the set as he spoke and finally hoisted it on the bench. It was a little three-valve receiver incorporating a detector, one resistance-coupled, and one transformer-coupled low-frequency stage. Megohm looked over the connections rapidly in order to size up the circuit.

"Using anode bend, I see," he remarked.

"Yes," replied the other. "I thought I would like to try and see what it is like. It doesn't seem to be much good."

"Oh, what makes you say that?"

"Well," answered Amp, "it doesn't seem to work. For anode bend," he went on, "you want to put on sufficient negative grid bias to work down at the bottom of the curve, don't you?" he asked.

"That is correct," agreed Megohm.

"Well," continued Amp, producing from his pocket a somewhat tattered leaflet showing a characteristic curve, "according to this characteristic I ought to put on about 5 or 6 volts on the grid in order to work on the bottom bend of the characteristic."

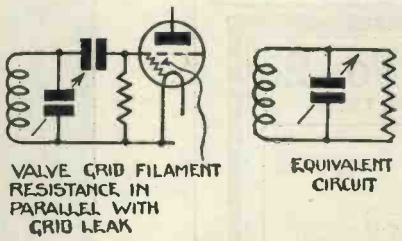


Fig. 1.—Circuit of Leaky-grid detector

"But that does not work, I take it," interposed Megohm.

Amp shook his head. "No," he said, "it doesn't work at all."

"I'm not surprised," was the answer. "You have entirely overlooked one factor. The curve you have chosen is the one with 100 volts H.T."

"Yes," interrupted Amp, "that's what I'm using."

"Maybe," agreed the other, "but it is not the voltage which you have on your anode, because you have a resistance in circuit and your actual voltage applied to your anode, therefore, is distinctly less. The fact is you will find that with the circuit which you have, about 3 volts is sufficient to give you satisfactory rectification."

"I tried smaller values," said the boy, "but although it seems to give me slightly better results, I still could not get the circuit to work. It wouldn't oscillate anyhow."

Quite Another Story

"Ah," broke in Megohm, "that is quite possible, but that is quite another story. You must remember one thing about anode-bend rectification and that is that the characteristic of your valve is quite different from its rated value."

"Why?"

"The fact that you are placing a large negative bias on the grid increases the internal resistance of the valve several times, while the amplification factor only increases by a small amount, so that the mutual conductance or 'goodness' factor of the valve becomes very poor. I will show you this effect in a minute or two, but you will see that your circuit conditions have been altered.

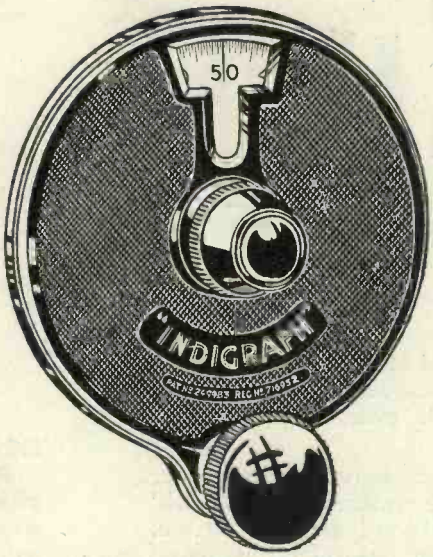
Two Effects Taking Place

"You are using an R.C. valve, followed by a resistance stage. The R.C. valve itself normally has a high internal resistance and you have increased this to several times its proper value. In the circumstances, two effects will take place. The first of these is that the external circuit has very low resistance compared with that of the valve so that the arrangement is not an efficient one and, secondly, due to the high total impedance of the circuit the anode current flowing will be very small. In such circumstances as this, it is

(*Continued on page* 483)

Do Not Overlook J. H. Reyner's Furzehill Four on Page 416

IGRANIC COMPONENTS IN THE 9 6·6 MYSTERY RECEIVER



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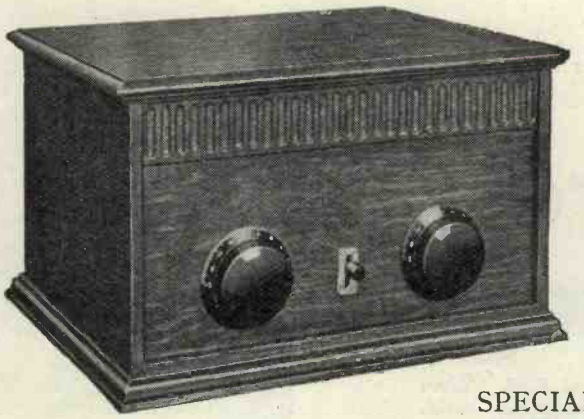

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Half Hours With the Professor (Continued)

difficult to get satisfactory oscillation whatever method is used.

"You will do better to employ an H.F. valve for your rectifier so that when you place your negative bias on it its resistance rises to something of the order of an ordinary R.C. valve. You then have your circuit conditions correctly adjusted, and you will obtain not only satisfactory rectification efficiency, but you will obtain smooth reaction. Let us try that and you will see the effect."

Behaving Properly

So saying the Professor fished out some wires and batteries and between them they connected up young Amp's set. As the boy had stated, it would not oscillate and did not seem to have any satisfactory performance, but the insertion of an H.F. valve in the detector stage completely altered the conditions, and following a readjustment of the grid bias to —3 volts the circuit began to behave properly.

"That certainly seems to be working better, Professor," said the boy, "but the strength does not seem to be very great."

"No," agreed Megohm, "you will find that it is not by any means as great as you would obtain with a grid detector. The reason for this is that the signal which you are applying is only comparatively small. The efficiency of the anode-bend detector is very poor for weak signals, but it becomes better as the signal strength is increased.

Getting the Best Results

"In order to obtain the best results from an anode-bend arrangement, therefore, it is necessary to have at least one stage of high-frequency amplification in front of the detector. Provided you do this, you will find that there is not the same discrepancy between the performance of the two types and, from many points of view, the anode-bend arrangement is considerably superior."

"What are those points, then, Professor?" asked Amp. "Most people seem to think that it is the proper thing to use, but I should like to know exactly why."

"One of the most important points is that the detector will not overload on a strong signal. The rectification obtained from the grid detector on different strengths of signal is a very variable quantity. For weak signals, up to about a ¼ volt input, the grid detector is very efficient and actually reaches a maximum at about the value I have just stated. Then we get a period where the efficiency remains about the same, but after this the efficiency definitely falls off and if we increase the input we actually obtain less current output. Under such conditions, it is clear that distortion is going to be obtained.

No Reaction Effect

"You may have noticed that on a strong signal like London, with the ordinary set, if you increase the reaction it seems to have no effect on the signal strength, but only introduces distortion. It does not cause a building up of the signals as is the case with a distant station."

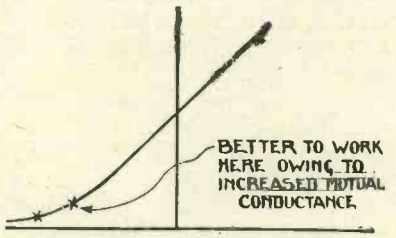


Fig. 2—Position of anode-bend point on valve characteristic

"Yes, Professor," exclaimed the Amp excitedly, "I have noticed that several times and wondered why it was. I thought the set was wrong."

"No, it is simply due to the grid detector, for as you increase the strength beyond a certain point—a little over ½ a volt—the efficiency falls off very badly and overloading occurs.

Will Not Overload

"An anode-bend detector, on the other hand, will not overload in this manner, but will give a steady increase in the output as the input is increased, so that where any strong signals are to be employed, the anode-bend method is very much preferable."

"By Jove!" exclaimed the boy, "that is very interesting. Then are there any other good points?"

Detector Damping

"There is one further very important aspect of the question, and that is the damping imposed by the detector. The grid detector works by virtue of the fact that a small amount of grid current flows at each oscillation and because of this the grid-to-filament path of the valve has a relatively low resistance, instead of being infinitely high as it should be. This resistance is shunted across the tuned circuit and you will readily see—(here the Professor drew the diagram shown in Fig. 1 on a piece of paper)—the damping effect across the tuned circuit.

"The result is," he resumed, "that the tuning of the circuit is made more flat and the arrangement is not so selective as it would be. If we use an anode-bend detector, however, the grid is always maintained at a negative potential and, provided that this potential is high enough, we never obtain any grid current, so that there is no damping introduced into the circuit. This is one of the principal advantages of the method, for we can obtain, with the same arrangements, a much better selectivity with the anode-bend detector than with a cumulative grid arrangement."

"Well," said Amp, "I certainly did notice the tuning on this little set was very much sharper than before."

Losing Efficiency

"You would find that," agreed Megohm, "but, as I pointed out, you are losing efficiency because the input to your detector is not strong enough. Let me show you the effect I mentioned regarding the increase in the internal resistance."

So saying he walked over to a valve case and picked out an ordinary high-frequency valve, which he inserted in the valve tester in the corner.

"Now," he resumed, "we will measure this under normal conditions —that is to say, with the grid connected to the negative of the filament." He made a rapid test and, after working out a few figures, said: "Well, that has an internal resistance of 22,000 ohms and an amplification factor of 17.5."

(*Continued on page* 484)

Half Hours With the Professor (Continued)

"Now," he continued, "we will increase the grid bias until the anode current is nearly zero."

Megohm did this and again took the characteristics, substituting a more sensitive meter in the anode circuit for that previously used. After the calculations had again been carried out, he turned to Amp and said:

Difference in Valves

"There, my boy, you see the difference. The internal resistance is now 110,000 ohms, yet the amplification factor is only 22. The mutual conductance was .75 in the first case and is only .2 in the second."

Amp was enthusiastic. "That is jolly good, Professor. I begin to understand the reason for my failure."

"Good," smiled the Professor, "it follows from the results we have just obtained that the best working position for the valve is not necessarily right down on the bottom bend of the characteristic. At first sight the best rectifying point would appear to be at about here on the curve."

Here the Professor drew the sketch shown in Fig. 2.

"Actually, however, at this point, the mutual conductance is very low and we find it better to work a little higher up the curve. Here the actual curvature is less, but the mutual conductance of the valve is greater, so that the net rectified output is somewhat better.

Smooth Reaction Control

"This is particularly the case where you have a reaction control and you wish to obtain smooth reaction. With sufficient grid bias to bring you right down on the characteristic you will probably find that the circuit will not oscillate, and it will be necessary to reduce the value slightly as we have just seen."

"Then you don't think the method is a wash-out?" asked the boy.

Method of Great Value

"Not by any means," was the reply. "The method is of great value, particularly if we can arrange a high-frequency circuit in front of the detector to ensure adequate voltage, even after comparatively weak signals."

"Then you think I had better add an H.F. stage to this set, do you, Professor?"

"If you do I think you will turn it into a very good receiver and one which will give you a great deal of enjoyment"

[Meet the Professor and Amp Again Next Month]

About Gramophone Records (Contd. from page 427)

There is no doubt that changing a needle for every record is essential unless a tungsten needle is used, the principle involved on this type of needle being to employ a wire of the exact diameter of the groove so that even if the wire does wear it remains the same size.

Mixed up with this question of the imperfect reproduction of higher tones is that of incorrect tracking. Nearly every gramophone up to last year had the sound-box incorrectly placed for best results.

Needle Tracking

It is fairly obvious that if the needle wears as in Fig. 6, if the angle to the track is varied (not the up-and-down angle, but the sideways one) during the playing, then the chisel-shaped point is continuously being ground in a different direction, resulting in more record-wear and also the needle never settles down to a fixed shape.

The first and obvious rule obtained from this consideration is that the needle shall always presen the same angle to the groove throughout the record-playing, and also obviously for many reasons, this angle will be best at zero. The chief of these reasons are strength and better reproduction of the higher frequencies.

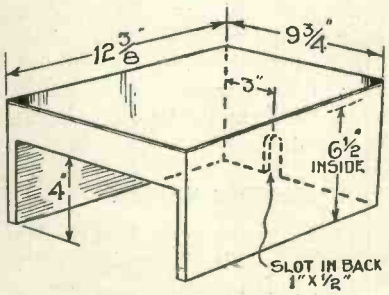
To make quite clear, I have drawn in *plan*, the track and the needle in Figs. 8 A and B, A being the case where the needle is at an angle to the track and (B) the best position of all when the angle is zero.

Now in the ordinary gramophone the swinging tone-arm has the sound-box or pick-up at the end of it. A little geometry on paper will soon convince you that if the sound-box is arranged as in Fig. 9, which is the way used in old gramophones, then the angle of the needle with the track varies very considerably over the whole record.

But, if the sound-box is placed as in Fig. 10, then a nearly zero angle can be maintained from a 1-in. to a 6-in. radius record. All the recent machines used by Columbia, H.M.V., and some other makers have correct tracking from about 2-in. radius to 6-in. radius, the error being only slight.

The Super-power Unit

IN response to requests from interested readers—and apparently there are many of them—we publish here details of the simple wooden cover for the Super-power Unit described on



Details of Wooden cover

page 364 of the previous issue of the WIRELESS MAGAZINE.

It will be remembered that the Super-power Unit is a two-stage amplifier for radio or gramophone work.

SO GREAT HAS BEEN THE DEMAND FOR THE "WIRELESS MAGAZINE" DURING RECENT MONTHS THAT IT HAS SOLD OUT RAPIDLY IN MANY DISTRICTS. IN ORDER TO AVOID DISAPPOINTMENT IT IS THEREFORE ADVISABLE TO ORDER YOUR COPY BEFOREHAND—THEN WE CAN MAKE SURE THAT EACH NEWSAGENT HAS SUPPLIES FOR ALL HIS CUSTOMERS!

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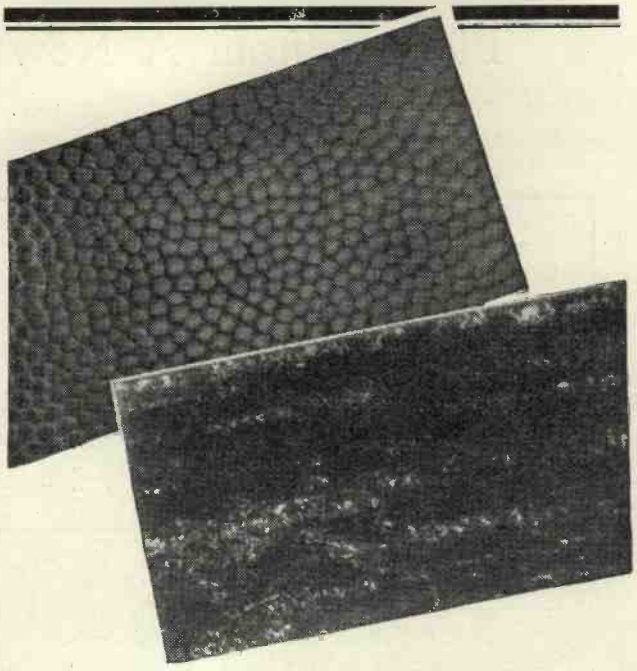

Build it with a Trolite Panel

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Trolite is supplied by wireless dealers in panels of any size, in two thicknesses, and in black, mahogany, or walnut patterns. Trolite strips, readily affixed by acetone without screws, are also supplied to any length and put the neatest possible finish to the panel.

The panels illustrated are the new "Trolite Morocco" and the "Walnut Grained." Trolite panels are also available in black, walnut or mahogany grained, and in wavy or cut etched patterns, and are sold at competitive prices. Beadings are made in three colours and two patterns at ninepence a foot.

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204-6, GREAT PORTLAND ST., LONDON, W.1.

MANCHESTER: 185 PRINCESS STREET

Pick-ups from A New Angle (Continued from page 432)

response indicated by curve B a magnification for the stage of about seventy is obtained at middle frequencies and with the valve of higher impedance used to provide the response shown by curve C, the total magnification is about ninety.

Our next step is to provide a suitable volume control. Various schemes were tried, but the simplest and best consisted in connecting a 200,000-ohm potentiometer across the input of the amplifier.

TEST RESULTS WITH B.T.H. PICK-UP

Record	Type of Needle: Loud	Medium	Soft	Remarks
H.M.V. B5525 ...	1 volt	.75 volt	.4 volt	Maximum values
	.6 "	.4 "	.2 "	Average values
Do. C1502 ...	.8 "	.6 "	.25 "	Maximum values
	.35 "	.25 "	.1 "	Average values
Do. D1428 ...	.85 "	.65 "	.3 "	Maximum values
	.5 "	.3 "	.2 "	Average values
Do. C1329 ...	.75 "	.5 "	.25 "	Maximum values
	.3 "	.2 "	.1 "	Average values

Input Connections

The connections of the input to the gramophone amplifier are given in Fig. 6, from which it will be seen that the pick-up is connected to the ends of the potentiometer and the grid of the first valve V1 to the sliding contact.

If the resistance of the potentiometer is too high the quality may change as the resistance is varied. This will be understood by referring to Fig. 7, where the condensers C1 and C2 represent the working grid-to-filament and grid-to-anode (and earth) capacities.

Reduction of High Notes

With the potentiometer half on, for example, a resistance of 100,000 ohms is in series with the grid of the valve and these capacities. Therefore, there will be a slight reduction in the higher musical frequencies owing to the resistance and capacity in series, and as the potentiometer is varied, so altering the amount of the resistance included between points A and B, the relative strengths of the upper frequencies will be varied.

Tests were made to determine a suitable value for the potentiometer. The curves given in Fig. 8 indicate the effect to be practically negligible with a 200,000-ohm potentiometer, but tests showed that a high-resistance potentiometer of one megohm was unsuitable.

The relative strength of the higher frequencies varied according to the setting of the potentiometer; they were weakened as the resistance included between points A and B was increased.

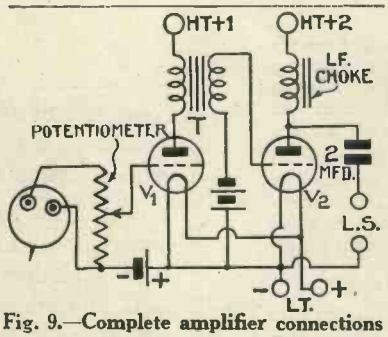


Fig. 9.—Complete amplifier connections

Our complete amplifier is, therefore, connected as in Fig. 9, and when valve V1 has an anode impedance of approximately 20,000 ohms the amplification frequency curve is that of Fig. 4 B.

When valve V1 has a higher impedance such as 28,000 ohms the amplification-frequency curve is like that of Fig. 4 C.

Valve V1 should be given a grid bias of negative 1.5 volts. This is adequate because the stage magnifies seventy or eighty times and, therefore, the power valve will overload before the amplifying valve, provided, of course, that the volume control is adjusted.

The arrangement has in practice proved to be very satisfactory, the tone being good and not marred by too prominent scratching. At the same time the higher notes are not eliminated in the amplifier as they are with many arrangements which employ a filter.

Sufficient Volume

The volume is sufficient for an ordinary room, but does not, of course, approach that given by a gramophone. However, as a power valve of the size described when fully loaded provides sufficient volume for ordinary purposes from wireless signals, the volume should be equally satisfactory when playing gramophone records.

When considerable volume is desired, a much larger power stage must be used with a mains unit in order to supply it with adequate power.

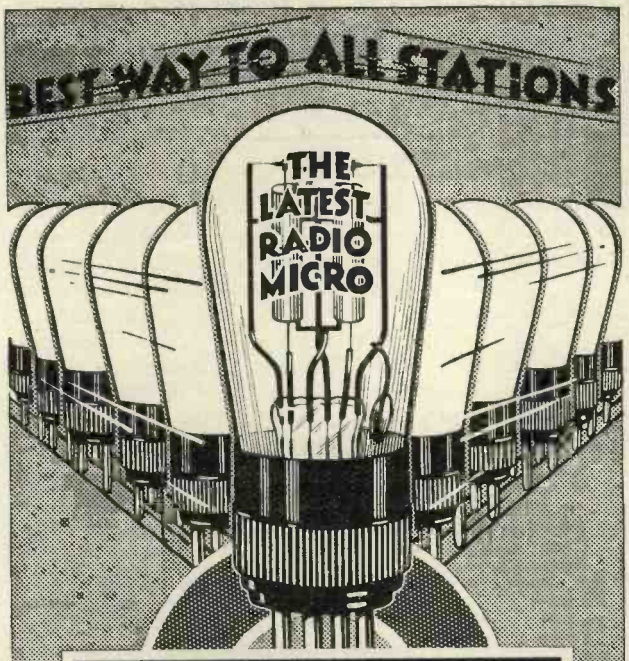
Suitable for Dry Batteries

The little amplifier described should satisfy those who have to employ dry batteries for high-tension. It is an easy matter to work out what further amplification it will be necessary to provide in order to load up a large power stage. A further valve will have to be used in the amplifier and it may be resistance coupled. Additional complications will be introduced, however, and the consideration of a really powerful amplifier will be left for the time being.

TEST RESULTS WITH CELESTION-WOODROFFE PICK-UP

Record	Type of Needle: Loud	Medium	Soft	Remarks
H.M.V. B5525 ...	.3 volt	.25 volt	.1 volt	Maximum values
Do. C1502 ...	.3 "	.2 "	.1 "	Maximum values
Do. D1428 ...	.25 "	.15 "	—	Maximum values
Do. C1329 ...	.25 "	.15 "	—	Maximum values

DO NOT OVERLOOK THE COMBINED ELECTRIC GRAMOPHONE AND RADIO SET DESCRIBED ON PAGE 467



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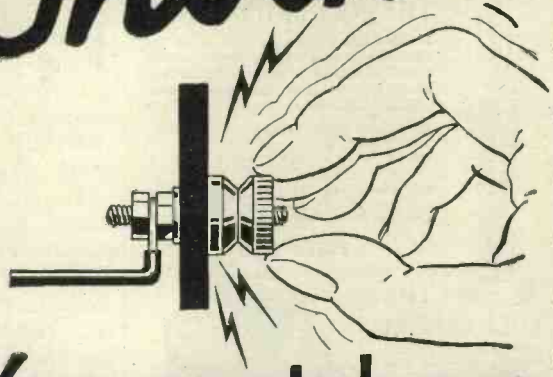

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By JAY COOTE

FROM time to time you must have had your reception of a distant and even a near-by transmitter spoilt through interference due to atmospheric disturbances, trains, trams, or other electrical causes.

Towards the end of the summer, during a short stay at Wiesbaden (Germany) in common with many thousands of other listeners to the Frankfurt station, I suffered from disagreeable noises such as a sharp crackling in the loud-speaker, miniature explosions, deep rumblings, and other disturbing sounds which made listening to foreign broadcasts an excruciating torture.

Tramway Interference?

At first, I felt inclined to attribute these interferences to the electric trams with which the famous watering resort of Wiesbaden is criss-crossed in every direction, especially as the disturbances greatly increased from dusk onwards when the Municipal "Strassenbahnen" (trams) switched on their lights.

The number of complaints, however, received from radio fans by the tramway authorities became so great that the engineers were induced to study the question thoroughly, and in conjunction with local scientists, a new theory was evolved.

Wiesbaden, as you no doubt know, is celebrated for its curative waters, which are pumped up from the bowels of the earth. Statistics prove that these underground streams for centuries have flown at the same speed, and that their temperature has remained constant. It would appear that the district contains separate subterranean water courses of widely different chemical properties, which, mixing in definite proportions, produce the curative blend.

Chemical Reactions

This combination, however, of different chemical bases increases the temperature of the waters, and it is assumed that the meeting of the individual streams which apparently takes place beneath Wiesbaden causes electrical discharges due to chemical reactions.

I was assured that the electrical interferences from which radio listeners suffered were in effect picked up through the earth and that they were peculiarly active after the setting of the sun. Whether the theory holds good or not I do not know, but it is a curious fact that a mineral water spring, on the Island of Nonnenwerth, in mid Rhine, gushes to a great height periodically at certain hours of the day; during the rest of the twenty-four hours there exists a small, but steady flow of water.

Reception Marred

Be it as it may, listeners in these districts are not hopeful of any improvement in their reception of distant programmes; the strength of the local transmitter (Frankfurt) fortunately for them, drowns the greater part of these underground statics, but loud-speaker reception is frequently marred by these extraneous noises.

I wonder whether the same disturbances have been noticed in any of the active spas of the United Kingdom.

◆ ◆ ◆

To-day we accept the mike as a matter-of-fact instrument, but there appears little doubt that from time to time it is likely to give us both unexpected and unrehearsed effects and, by its presence, may bring to the ears of listeners tragic events not contemplated by the studio programme organisers.

Ill-fated Theatre

I am prompted to mention this fact for the reason that when recently looking through some old programmes, I was reminded that Madrid (EAJ7) on more than one occasion relayed a performance from the ill-fated Novedades Theatre, which was burnt down, and caused great loss of life in September last.

The Novedades was a wooden construction of great size, of some age, and capable of seating about three thousand spectators. Its speciality was the production of spectacular plays, either drama or revues, and it enjoyed considerable popularity in the older and overcrowded portion of

the Spanish capital in which it was situated.

The night to which I refer the Union Radio studio gave us Jules Verne's Russian play *Michael Strogoff*, as performed at that theatre. Now, there was just the chance that on Sunday, September 23, when the fire took place, the date might have been chosen by the broadcasting authorities for a glimpse of the Novedades programme.

Basis of A Thriller

I wonder what would have happened. Would distant listeners have heard the cry of *fuego* (fire), and would they have realised that a tragedy was taking place, and at which, in a sense, they were assisting? The mike would remain alive, until switched off by the engineer in charge or until a cable fused in the flames. Here, in my opinion, you have the basis of a grand guignol thriller.

Curiously enough, on the same Sunday, Langenberg and the Rhineland stations relayed the motor-cycling championship contests taking place at Hamborn.

For some time I listened to this transmission, which was an interesting one, and in the course of which I picked up at one moment a huge outcry and shouts from spectators. Later in the evening when listening to the news bulletin, I was informed that a tragic accident had occurred on the track and that a German rider had been thrown and instantly killed. Did the agonised shout I heard coincide with this dramatic event? I wonder.

Just think for a moment how numerous are the relays which are nightly taken by both home and foreign stations of theatrical or other performances in the innumerable cities and towns to which, by means of our multi-valve receivers, we are in constant touch.

Spontaneous Effects

Many interesting stunts have been staged for us by the broadcasting studios, but in view of the ubiquity of the mike, I feel sure that now and again we shall pick up unexpected and entirely spontaneous effects not meant for our ears. As the French proverb says: "*Tout vient à point à qui sait attendre*" ("All things come to him who knows how to wait").

◆ ◆ ◆

It is highly improbable that you will have picked up broadcasts from stations erected in the more distant parts of Russia, although possibly on one or two occasions you may have heard a transmission from Kharkov or Homel. If, however, the more powerful transmitters at Leningrad and Moscow are within your reach, on some nights, through their medium, you will be given an opportunity of capturing excerpts from the programmes of other Russian studios, for during the autumn and winter months the authorities are carrying out a regular service of relays.

Keeping in Touch

In Soviet Russia no stone is left unturned to foster amongst the people a desire to listen to broadcast transmissions. Russia is a huge country possessing a large ignorant and uncultured peasant population, and the Soviet chiefs are anxious to keep in touch, by means of radio, with even the most distant corners of this land.

At the same time, for the development of the broadcasting habit, it is essential that Russian amateurs should also know what other European countries are doing. To facilitate the "tapping" of foreign programmes, the authorities have equipped the Technical High School at Leningrad with a full range of wireless receivers capable of picking up transmissions on long, medium, and short waves. Practical demonstrations are given on certain weekdays to students attending this school and in cases where the reception of foreign programmes is a successful one, the school is connected to the high-power transmitter in order that a broadcast may be made for the benefit of the general public.

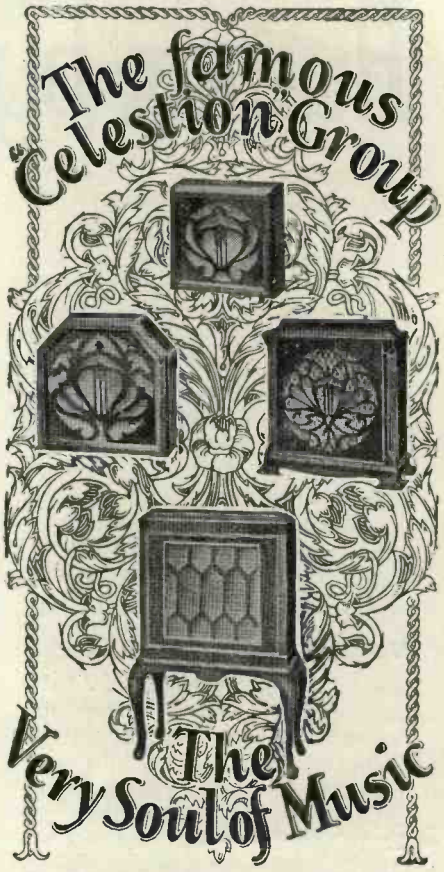
Do Not Express Surprise

For this reason you must not express surprise if on one evening you hear through Moscow or Leningrad portions of the Berlin, Copenhagen, Warsaw, or London entertainments.

◆ ◆ ◆

Brussels, by the end of this year, may be in full possession of a high-power station capable of giving good service to the entire country. For some few weeks, now, at odd times, you will have heard on the Radio Belgique wavelength of 508.5 metres short tests in speech, gramophone records, followed by an announcement to the effect that the trans-

(*Continued on page* 499)



DELIGHTFUL GIFTS

THE famous Celestion group of loud-speakers, consists of four models in oak or mahogany, as shown, with prices varying from £5 10s. to £25. There is also the Celestion-Woodroffe Gramophone Pick-up at £4 4s.

Insist on your dealer demonstrating, or visit our new showrooms, one minute from Victoria Station.

BRITISH THROUGHOUT

Made under licence

CELESTION

The Very Soul of Music

Write to Dept. K.

THE CELESTION RADIO CO., London Road, Kingston-on-Thames

SHOWROOMS:

106, VICTORIA STREET, LONDON, S.W.1

'Phone: Victoria 9530

Buying by Deferred Payments

SUCH a large quantity of radio goods, both components and complete sets, are bought on the instalment plan nowadays that it is advisable to know how most large concerns arrange for buying in this way, and the various aspects as they affect the law.

The instalment plan is, one might say, of American origin. At least, it first became popular in the States. And despite the huge activities of many London stores, particularly the furnishing departments, the practice of buying on instalments has not yet gained the same footing as it now has in America.

Not Derogatory

What is not yet generally realised in this country is that there is nothing derogatory to one's social pride in buying goods and paying for them month by month. In certain conditions, and when markets reach the same stage as they have done in the U.S., instalment purchasing is an economic necessity for most people. It would not be an exaggeration to say that probably 75 per cent. of inter-American business is done in this way.

All this is by way of emphasising the fact that modern deferred payments is a system quite different from that typified by the old notice still seen in provincial stores, "Weekly Payments Taken."

Undisturbed Accounts

Doubtless, quite a number of WIRELESS MAGAZINE readers would take still further advantage of present-day improvements in the way of better loud-speakers and so on, if purchasing them did not mean making a noticeable hole in a small banking account. A matter of a pound or two is usually of no import, for it disturbs practically no domestic accounts. But the purchase of, say, twenty-pounds' worth of new components, or of a ready-made set, necessitates much more consideration.

In no circumstance should the option of buying on deferred terms induce an enthusiast to purchase something which he could not possibly afford had he to pay "cash with order." This is, of course, a misappliance of deferred-term convenience, and one which, more than anything else, brings an excellent arrangement into bad repute, both with dealers and customers.

No system of instalment-paying can possibly give "something for nothing!" Nor can it make things cheaper. As a matter of fact, the actual total price *must* always be the same as the cash price, while the general rule is that deferred terms cost more in the long run owing to added interest on what really amounts to a loan.

So far the terms "instalment buying," "deferred terms" and "hire purchase" have been used indiscriminately, but they are by no means synonymous. That is what quite a number of buyers do not trouble to understand.

Most radio goods are sold on the deferred-payment plan, and not under the hire-purchase arrangement.

"Hired" to the Customer

When a dealer offers, say, a complete receiver on hire-purchase terms, the state of affairs obtaining is just what is literally implied. The set is "hired" to the customer, who pays the cost in instalments. The usual agreement is made out, and if the customer fails to keep his part of the bargain, the vendor has the option of demanding the return of the set. When the last instalment is paid, the set becomes the property of the hirer. An important thing to note is that, *provided the instalments are paid up to date, the customer can return the set at any time if he wants to do so, and there is no obligation for him to pay any further instalments.*

This may sound like a strong point in the purchaser's favour. This is so in theory. But in practice few people take advantage of a test of radio parts on the payment of a single month's instalment.

When radio apparatus is sold on deferred terms, the goods become at once the property of the buyer, who has to sign an agreement similar to that necessary in the case of hire-purchase. He cannot return his purchase to the dealer after, say, one month, and expect to "get away with it" on the payment of one instalment. If the purchaser neglects to keep up his monthly payments, the dealer is compelled to sue for his money. An unpleasant state of affairs which, fortunately for all concerned, seldom arises.

If instalment-plan business is to be done on a large scale, obviously someone must be prepared to finance the loans. Many radio dealers conduct their own deferred-term sales, for they realise that something of the kind is a necessity nowadays. In such cases the interest on the sums concerned is inconsiderable, and may not even be charged. This means that the total deferred-payment price is the same as that of the cash sale.

Reasonable Percentage

More often, however, a small additional charge is made when the sale is not strictly cash. This charge should be a reasonably percentage *on the value of the goods not paid for.* Usually a quarter-value deposit has to be paid, and the deferred-payments charge should, therefore, represent about 5 or 7 per cent. of the remaining three-quarter value, plus, perhaps, a small clerking charge covering the cost of applying for the monthly payments, stamps and so on.

A novel trade development is that in many instances manufacturers themselves are willing to help a dealer to effect a deferred-payment sale. This is of benefit to WIRELESS MAGAZINE readers, because manufacturers have usually a larger working capital for matters of this kind than local dealers, and deferred-payment business can often be effected in a more private and satisfactory manner.

Question of Insurance

In certain other classes of deferred-payment business—the motor trade, for example—insurance is inevitably bound up with the goods sold on instalments, for with cars which are not fully paid for, there is a risk attached which it is unfair should be borne alone by either vendor or purchaser. Except in rare instances, or when the apparatus concerned is of a very expensive nature, it is unusual to insure radio apparatus sold on the instalment plan.

KENNETH ULLYETT.

The wonderful R.K. moving coil Reproducer in new models at reduced prices

Prices:
Table Grand Model
A.C. £34 15 0
D.C. £30 5 0
De Luxe Model
A.C. £40 0 0
D.C. £36 0 0

Here is the R.K. Unit—the actual sound reproducing portion of the R.K. Speaker. Supplied complete with special output transformer & cone diaphragm
Price £8 5 0
Filter Unit £1 5 0 extra

It is universally admitted that an R.K. Reproducer is essential for *perfect* sound reproduction. It will be welcome news to many to learn that this wonderful instrument can now be obtained in new and cheaper forms.

The illustrations show the new models—the "Table Grand" and "De Luxe." The equipment consists in each case of the complete mains-driven amplifier and moving-coil unit contained in a well-finished cabinet.

The wonderful atmosphere of reality which characterises the performance of the original R.K. Reproducer is present in these new instruments. Arranged for reproduction from either a radio set or from a gramophone record using an electrical pick-up.

Ask your dealer to demonstrate the capabilities of these instruments.

B T-H **MADE IN BRITAIN BY BRITISH LABOUR** RK

The British Thomson-Houston Co. Ltd. 3046

HEAT DAMP OR COLD

will not harm

GRAHAM-FARISH

OhmitE

ANODE RESISTANCES

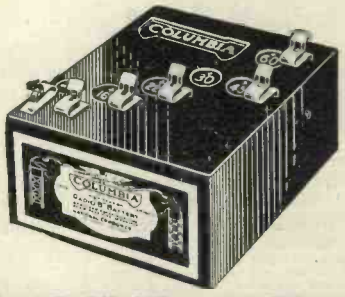
An OhmitE can be boiled or frozen without affecting its performance; but what is more important it is guaranteed to carry 10 milliamperes on voltages up to 500 volts D.C. They are

Better than Wire Wound!

PRICE ANY SIZE UP TO ½ MEG **2/3**

GRAHAM-FARISH OF BROMLEY KENT

for 10/6



The World's Best Battery

The new 10/6 60-volt Columbia brings the world's most famous battery into your home.

Columbia is definitely the world's best H.T. Battery and every discriminating Radio enthusiast uses them.

Columbia RADIO BATTERIES

J. R. MORRIS, Imperial House, Kingsway, London, W.C.2
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FOR EVERY USER OF —

SIFAM

RADIO METERS

This enterprising innovation marks a new step forward in after-sales meter service. Now you can buy Sifam, the unchallenged leader in popular priced Radio Meters and at the same time be assured of a first-class meter repair service. Repairs are carried out in our own works by a staff of experts.
In price and guaranteed accuracy Sifam meters are all that you need. Use them for detecting and rectifying distortion, avoiding run-down batteries and burnt-out valves and regulating plate and filament supply. Ask your dealer to show you the complete range, and send for free leaflet, "What simple meters can show you" from Dept. W.M.

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Radiometer Headquarters, Bush House, Aldwych, W.C.2

Moving Coil Instruments 25/-. Moving Iron 10/-. New Pocket Voltmeter, 0-6-120 volts, 7/6.

0–30 flush type illustrated

25/-

WET H.T. BATTERIES
Solve all H.T. Troubles
SELF-CHARGING, SILENT, ECONOMICAL
JARS (waxed) 2½" x 1½" sq. 1/3 doz.
ZINCS, new type 11d. doz. SACS 1/2 doz.
Sample doz. (18 volts), complete with bands and electrolyte, 4/3, post 9d.
Sample unit 6d. Illustrated booklet free.
Bargain list free
AMPLIFIERS 30/- 2-VALVE SET £4
B. TAYLOR, 57 Studley Road, STOCKWELL, LONDON

AN XMAS HINT:
Every "*Receiver*" says "DARIO"
See page 487

Further Letters From Priscilla

Chronicled by

Stewcombe Manor,
Little Bodley,
near Hurdham.
30th October, 1928.

DEAR MR. EDITOR,

I do not apologise in the *least* for writing you again after all this time, for your replies have given me the impression that we are quite *old* friends and that you did not mind my earnest if artless suggestions about wireless. I admire your magazine so *very* much, too, its covers are so decorative. I see it quite frequently at the bookstall here whilst waiting for the train. A most edifying production, reflecting considerable credit on your technical and artistic abilities.

What leads me to renew our correspondence is a trivial matter upon which I feel that I need some of your good advice. I think I told you that when my nephew was staying with me last year he made me a most handsome wireless set, which he left with me and which has provided me with a great deal of pleasure.

True, he used the cover of my sewing machine in which to construct it, and this is a little awkward at times, but I am amply compensated by the wonderful results which I am able to obtain so often as to be *very nearly* almost always.

Only yesterday I heard a delightful lecture on life in Gorgonzola, or some such *antipodial* spot, and I realised anew how entirely this epoch-making discovery brings one into contact with the real activities of the outside world.

Well, my nephew came back to me for the holidays this summer, in fact, he is still here. Upon seeing how much enjoyment I was still deriving from his apparatus, he almost *scoffed*, declaring that science had made such strides since his last visit that he absolutely *must* be permitted to rebuild the instrument and embody in it all the latest improvements.

He launched into a long divagation interspersed with technical expressions of which the sense escaped me and his explanations of which left me only further befogged, and in the upshot he demanded five pounds of me for components the very names of which made me suspicious.

You will have gathered, I hope, that it is not the money which I grudge him. He is a dear boy, only seventeen and most strictly brought up, but I hesitate to entrust him with this large sum for a purpose which is not clear to me and which *might*, after all, prove an unworthy one. Among other explanations, he said that one could really escape from the *nursery* stage of radio only by having a bias against the "grid."

Now I do not profess to know which part of the broadcasting organisation the grid may be, but I am fair and British enough, I hope, to entertain no unjust prejudice against anyone, *even* for my personal advantage. He also wants me to purchase a screen and is positively *ribald* when I point out, as I did, that we already have a handsome one, set in a mahogany frame, which he is welcome to use, provided he promises not to tear it.

My nephew, though a dear boy, is just a *little* lacking in patience with my, perhaps, old-fashioned ways and my reasonable plea that, after all, you cannot listen to more than *one* lecture at a time. Yet I understand that the scheme underlying all this *persuasiveness* aims at capturing a large number of *small* waves which have been slipping unnoticed through my set up to now.

Well, to capture these little waves will cost five pounds, it seems, and what I really want to ask you is whether you *conscientiously* think the investment to be a wise one. I have been deriving great enjoyment from the large ones—quite an economical pleasure, it would appear, since naturally one needs far fewer of them.

Is it not a fact that if I let my nephew alter the set in order to catch the little waves (whether by bringing the meshes closer together or what not) I shall, apart from the initial expense, have to make use of a far larger number?

Can you tell me the approximate additional *recurring* expense and whether you think my licence will include this extra consumption?

Unversed though I may be in these

Playne-Smythe

HUGH R. SEELEY

subtleties, my own plain common-sense hints that my nephew's enthusiasm may not be free from some taint of a *baser* aim. One small thing he said made me prick up my ears at once. He was recounting a visit which he had paid to the Westchester broadcasting station and in order, no doubt, to impress me he referred to the proceedings taking place with the aid of a red lamp!

Now I *do* know enough to feel sure that one does not use a red light to develop music in the same way that one illuminates a dark room in the case of photographs, but on the other hand red lights *are* used at all the spiritualistic *séances* one reads so much about nowadays, and I have a horrid suspicion that Philip is tampering with occult matters and that perhaps he has some *blasphemous* idea of making my set into a kind of Ouija board and *me* into a medium!

Quite clearly the reference to the red light slipped out unintentionally, but it was the cloven hoof which showed me which way the wind blew.

You see, dear Mr. Editor, that the issue is a *vital* one and that there is more dependent upon your advice than the mere question of money.

This emboldens me to make a further timid suggestion.

If you think my fears are justified and that I should on no account permit these *iconoclastic* experiments, then would you perhaps write to my nephew *yourself* and exhort him to desist.

Should you, on the other hand, consider the matter grave enough for personal intervention and you would care to speak with him about it, then I need hardly say how grateful I shall be, or how pleased, to welcome you to Little Hurdham on any afternoon to tea.

My womanly instinct tells me that all is *not* as it should be, and *that* seldom fails me.

Believe me.

Very sincerely yours,

PRISCILLA PLAYNE-SMYTHE.

P.S.—When I pulled down the little lever on my wireless set last night, I heard a man singing a song in which, at various intervals, he said: *And that's my weakness now,* and I should so much like to know where the words come from, for I once overheard my dear father—he was a J.P. you know and has been dead many years—use the same expression as he took a decanter and tumbler out of the tantalus.

I might mention one more coincidence; about twenty years ago, a Miss Ada . . . . I cannot recall her full name—who was staying at the Hall, about five miles from my cottage, sang a *very* pretty song, in the church rooms at a concert organised by our *dear* Vicar. She was the god-daughter, I understand, of Patti, or some other well-known singer, I believe—I cannot *quite* remember, but that does not really matter, does it?

Curiously enough, I heard the same song last night; I cannot recall the title, but I could hum it to you if you *wished* me to do so. I never thought I should hear this melody again, so many years later, and in such a *miraculous* manner.

It stirred up memories of that evening at the Vicar's concert, for I remember how I had provided a dainty supper for some guests, kept my maid up and *no one* ate anything! Perhaps you could tell me the title of the song, as I feel sure that so much information must reach you in your daily post bag.

◆ ◆ ◆

Stewcombe Manor,
Little Bodley,
Near Hurdham.
15th November, 1928.

DEAR MR. EDITOR,

I never *dreamed* when writing to you some time ago on, to me, an important subject and asking for your advice, that you would use my letters as material for your magazine. I hardly know whether to be upset at this breach of my confidence or complimented by the interest which, apparently, my perplexities have for your readers.

Still, I thought that we were both people of the world so far as *I* am concerned and I really do *not* think you should have done it or having done

(*Continued on next page*)

TRIX
COMPONENTS
Are used in two sets described in this issue!

THE TRIX
R.C. UNIT
used in the ECONOMY SCREENED-GRID FOUR

is highly recommended for portable sets. It cannot vary or develop noises. The patented resistance elements and coupling condenser, with first-grade ruby mica insulation give highest amplification consistent with high quality. Hermetically sealed in highly-finished brown moulded case. Price 5/6. Get yours to-day!

THE TRIX
FIXED CONDENSER
used in the METEOR TWO

with real ruby mica insulation and copper foil, solidly built into a highly-finished Trixite moulding, represents the really faultless condenser. When tested by Faraday House for Capacity, Insulation Resistance and Pressure, the TRIX Fixed Condenser passed out with full honours. Copy of report in each box. Prices:
.0001 mfd up to .002 mfd. .. 1/- each
.003 mfd. up to .006 mfd. .. 1/6 ,,
.006 mfd up to .01 mfd. .. 1/9 ,,
.0003-mfd. models supplied with free pair of grid clips.
Full particulars of the complete TRIX range of Tested Components on application to the manufacturers:

ERIC J. LEVER (TRIX) LTD.
8/9, Clerkenwell Green, E.C.1
'Phone: Clerkenwell 3014/5

SOLVES *EVERY* RESISTANCE PROBLEM
CLAROSTAT

Volume Control Type ...	8/6
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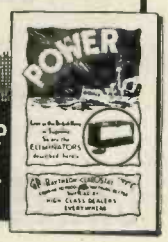
Our unique 8-page "POWER" PAMPHLET, together with a new 20-page booklet with numerous new and interesting circuits, sent on receipt of 3d. stamps to cover cost of mailing.

Order these at your Dealers. Where not yet represented we will be pleased to supply post free at the above list prices.



CLAUDE LYONS LTD
76, OLDHALL ST.,
LIVERPOOL

Further Letters from Priscilla Playne-Smythe (Continued)

it you really should have answered me. Were my questions beyond your power to reply to or did you perhaps not consider them *worthy* of an answer?

In case the *latter* alternative should apply, I am sure you will be interested to hear that many people do not share your opinion and that your printing of my letters has resulted in my receiving quite a *number* of them from perfect strangers, all eager for my opinion in regard to some wireless problem which is vexing them.

This was a surprise to me, since I do not *really* consider myself to be an expert by *any* means and admit in all modesty that there may be several of the more *abstruse* aspects of the science on which I am not an authority.

Since your, may I say, *indiscretion* caused these queries to be addressed to me, I do really think that the least you can now do is to assist me in replying to such of them as baffle me.

Here are a few of them :

Father of Five of Evesham enquires whether it is possible, by using a *double* aerial and cutting out one or the other, to separate a song from its accompaniment or (and this really *does* seem to have a great deal in it), whether one could not be used for atmospherics and all *parasitic* noises, leaving the other for purer reception. He sends me a diagram but I think he must, perhaps, have made a mistake, as I find that it is a printed plan torn from a newspaper and labelled "Beachcomber." Still the questions are quite extraordinarily interesting and show that spirit of independent research which inspires the root of so *many* useful discoveries.

Then there is :

Ether Pusher, of Burnley, whose handwriting is really *shocking*, but who desires to know whether the statement that my set was built in the lid of a sewing machine is "iodic" (or it *may* be "jonic)" and if so, whether his dog-kennel could be transformed into an automatic loud-speaker and made to bark when the tally-man calls !

Of course, I can reply truthfully

Look Out in the Next Issue for Details of A Fine New Set Designed by W. James, Our Research Consultant, whose "Touchstone" Has Met With Tremendous Success Throughout the Country

"yes" to the *first* part of his enquiry and shall do so, but the second, the *constructive* portion, is quite beyond me. The reply would depend to a great extent upon the kind of dog he keeps, would it not?

An "Earnest Enquirer" of South-end-on-Sea has written me a letter which makes me seriously doubt whether he can be *quite* right in his mind. It is a rigmarole in the *blottésque* school of handwriting and is compounded of such terms as "shunting resistances," "2,000,000 microhenries" and "reuption-cackling."

I have taken the trouble to look these up in the books of reference at my disposal, such as the "Complete Handyman" and Webster's Dictionary, but with very little result. "Micro" *of course*, is Hebrew for "small" and my correspondent would therefore seem to be troubled with two million little Henries, whatever these may be apart from vermin. Could "Reuption-Cackling" possibly be a slip of the tongue for "reuction cappling"? which latter term I seem to remember hearing *my* nephew use.

If so, what *is* it?

All these inquiries, though somewhat *technical*, have been in perfectly *good taste*, but what am I to say to or of a person at Leyton who enquires whether it is advisable to "treat the leads with gut-reviver, like what the tennis players use," in order to stop losses? This reference to a medicine said to be used by our tennis stars seems to me to be most indelicate and *un-nice*, to say the least of it, and I do not propose to reply at all.

Mr. Broadsmith, our veterinary surgeon, to whom I have shown the letters, has advised me to take no notice of them and hints that they may not have been meant *earnestly*. Is it possible, do you think, that there may be people so *irreverent* as to wish to make me appear ridiculous and, in the horrible slang so *rampant* nowadays, to pull my leg?

In any case, I shall expect a helpful reply from you *this time*, for it all happened through your fault.

Yours very truly,
PRISCILLA PLAYNE-SMYTHE.

WIRELESS CABINETS in SOUND QUALITY of WOOD

Highly Polished First-class Cabinet Work

MAKERS OF ALL DESIGNS FOR OLD AND NEW WIRELESS SETS AS PERIODICALLY ANNOUNCED IN THIS JOURNAL

Special line of closed cabinets totally enclosing Batteries and Accessories

Thousands of satisfied users. Send for Illustrated Price List

Money returned if quality and workmanship not equal to our guarantee

CAXTON WOOD TURNERY CO., MARKET HARBOROUGH

Profit by Public Experience!

READ THESE EXTRACTS FROM UNSOLICITED LETTERS WHICH WE HAVE RECEIVED

F.P. of Cardiff, writes :—

"I feel I must write and tell you how very satisfied I am with the results obtained with one of your 99-volt H.T. Batteries. Previous to using your battery I experienced a great deal of trouble with other firms' batteries that are sold at a much higher cost than yours. I have had your battery in use, pretty constant, too, for 6 months and when it gives out shall certainly invest in another, and am advising all my wireless friends to put their trust in Ripaults, too."

E.G.B. of Kensington, London, writes :—

"I am so pleased with the improvement in the tone and volume of my set since I tried one of your Self-regenerative Batteries that I would like you to know of it. . . . Not really knowing what the set was capable of, I have been quite content with its performance. A friend of mine, however, who has made a special study of Wireless Batteries, strongly recommended me to use one of yours. . . . Since I installed your Battery I realise what an enormous difference a good battery can make to a set, both the tone and volume being improved to a truly amazing extent."

E.S. of Penzance, writes :—

"The writer would like you to send three more 60-volt Ripaults dry batteries as two previously supplied. He has tested your batteries under identical working conditions with "*xxxx-xxxxx*" dry batteries and find that those supplied by you have given 80 per cent. additional running hours."

H.M.F. of York, writes on May 24th, and says :—

"I bought one of your Standard (Model C.M.) Chocolate Label H.T. batteries *last November*. It is still going strong. This is surely splendid service."

RIPAULTS'
SELF-REGENERATIVE H.T. DRY BATTERIES
GIVE 50% LONGER LIFE.

Standard Capacity.	Double Capacity.	Treble Capacity
60 volts ... 10/6	60 volts ... 15/6	60 volts ... 19/6
99 volts ... 16/6	90 volts ... 22/6	90 volts ... 29/6
9-volt Grid Bias ... 1/9	18-volt Grid Bias ... 3/6	

RIPAULTS Chosen for the New Cossor Melody Maker.

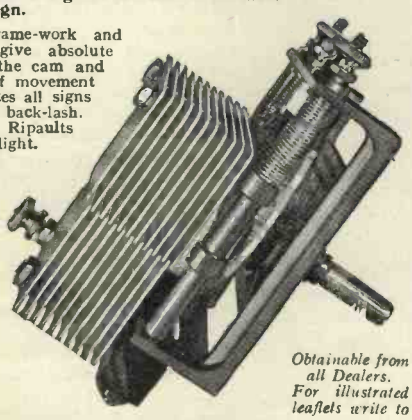
"LIGHT ON THE H.T. BATTERY"

A 24-page booklet specially written for us by an author who is recognised as an expert on H.T. Batteries; chock full of real interesting and valuable tips on the correct choice of batteries for every type of receiver. Published at 6d. but sent Post Free for 2d. stamp if you mention *Wireless Magazine*.

RIPAULTS' LATERAL ACTION CONDENSER.

This new improved model of the famous Ripaults' Lateral Action Condenser is a great advance in variable condenser design.

The die-cast frame-work and runner plates give absolute rigidity, while the cam and spring method of movement entirely eliminates all signs of jerkiness and back-lash. Tuning with the Ripaults condenser is a delight.



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ROYALTY
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Advt. of The General Electric Co., Ltd., Magnet House, Kingsway London, W.C.2.

Tested by J. H. Reyner, B.Sc., A.M.I.E.E., in the Furzehill Laboratories

Novelties & New Apparatus Tested

R.I. and Varley Bi-duplex Transformer

R. I. & VARLEY TRANSFORMER

R. I. & VARLEY low-frequency transformers are well known for their constancy and good performance in low-frequency amplifiers. The makers have recently placed on the market an additional low-frequency transformer designed to handle greater primary currents without any tendency for saturation to occur.

A special form of winding is employed in the instrument, which is claimed to give much better results as far as current-carrying capacity is concerned. The windings and substantial iron core are completely housed in a large metal case with a black crystalline finish.

The primary terminals are placed on one side, the secondary on the other, mounted on small insulated panels and clearly marked. The step-up ratio is 3-1.

Tested in our laboratories we obtained an inductance of 33.3 henries at 2 milliamperes and an inductance of 31 henries at 12 milliamperes through the primary winding, indicating that even with heavy primary currents of the latter order there is no tendency for saturation to occur. Like other of the well-known R.I. transformers, this component has a good frequency characteristic and will function well in almost any type of receiver.

Other particulars can be obtained from R. I. & Varley, Ltd., of 103 Kingsway, W.C.2.

◆ ◆ ◆

FORMO VALVE HOLDER

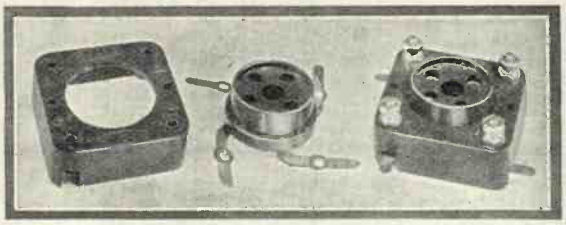
EVER since the antimicrophonic valve holder became universally popular better and less expensive designs have been brought out, until now one can obtain first-class anti-microphonic valve holders at prices ranging between 1s. and 2s.

One of the latest additions to the valve-holder market is the new Formo holder, which sells at the low price of 1s. 3d. An inspection of this holder reveals that the design and workmanship are good for an article so inexpensive.

The internal part of the holder, carrying the valve sockets, is fixed to a supporting base by four thin metal strips which serve to insulate it from vibration. Finally a square insulated case slips over the holder and base and forms a stop when removing a valve.

The insulation resistance between the terminals of the component proved to be infinite, whilst it was found that valves fitted in securely, but easily, and could be removed without any tendency to overstrain the holder. The springing was adequate for normal purposes, a particular point being that the soldering tags are arranged to project sideways, which facilitates the wiring up of a number of the valve holders in a row.

The address of the Formo Co. is Cricklewood Lane, N.W.2.



Formo valve holder, complete and dissected

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MET-VICK AERIAL UNIT

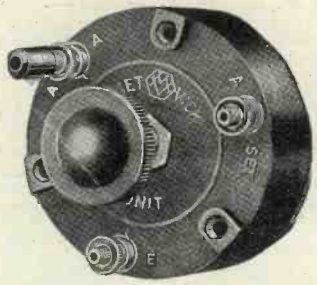
THE sensitivity of modern receiving sets, which operate at small distances from high-power broadcast stations, calls for a high degree of selectivity, a degree, in fact, higher than can be obtained without the use of many tuning circuits.

With the advent of the regional system there are likely to be a number of high-power stations in proximity to the receiving sets, and therefore selectivity will be of even greater importance.

To meet the needs for extra selectivity, the Met-Vick people have brought out an ingenious device, called the Elastic Aerial Unit, which, when used in conjunction with an aerial, has the effect of altering its length from a maximum to a few inches. In this manner, it is possible to adjust the pick-up on the aerial, and therefore the selectivity, to any degree desired.

This device not only affects the pick-up on the aerial, but also regulates the efficiency of the earth, and by adjusting the control of the Metro-Vick elastic aerial it is possible to balance out even the local high-power station.

The instrument actually consists of an auto-transformer working in conjunction with the three electrodes of a condenser. A balance is obtained by rotating the central electrode to the correct position.



Met-Vick Elastic Aerial Unit

The price of the instrument suitable for wavelengths from 200 to 600 metres is 12s. 6d.; on the high wavelength from 1,000 to 3,000 metres a different type is required, costing 15s. 6d., but the need for such a device is not as great on these wavelengths. Tests which we have carried out on this instrument prove that the makers' claims are amply justified.

The makers are Met-Vick Supplies, Ltd., of Old Trafford, Manchester.

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MAZDA POWER VALVE

SUCH loud-speakers as the moving-coil type are at the present time enjoying world-wide popularity; there is, therefore, a strong demand for several types of power valve which will successfully handle the enormous power output required to operate these loud-speakers efficiently.

Amongst the new range of Mazda valves is a type called the PX650 which is a special valve for the last stage of a high-power amplifier. A brief examination of this valve will reveal the large dimensions of all the electrodes which have been found necessary in order to obtain a high value of emission coupled with a high mutual conductance.

The characteristics which we obtained from this valve seem to justify the extra physical dimensions of the electrodes and the filament consumption of .5 ampere at 6 volts.

The impedance obtained in our tests was approximately 1,500 ohms with an amplification factor of 4.5, showing that the mutual conductance is nearly 3, an excellent figure for such a valve. The capabilities of this valve may be aptly expressed by the fact that the correct bias with an anode potential of 200 volts is 40 volts. Under such circumstances, the output from one valve is sufficient to operate efficiently a moving-coil speaker at considerable volume.

Mazda valves are manufactured by

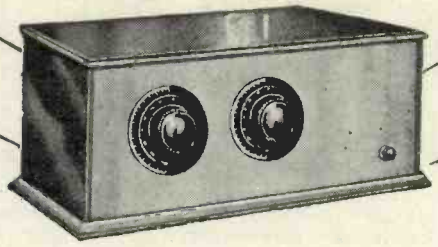
(*Continued on page 498*)

Could you want better proof than this?

There is to-day a certain "flash in the pan" popularity for complete kits of components which, if allowed to run rife, may easily retard the progress of radio development. An additional 5s. spent on even one component may result in your being able to tune in several additional foreign stations, the substitution of another component may result in a far greater degree of purity; in short, a little experience, even a little common sense, may make all the difference between mediocre reception and really good reception. Could you have better proof of the truth of this than the wonderful results obtained with the original Mullard Master Three—just by a little judicious substitution. In all there were 46 stations tuned in during one evening (22 at loud-speaker strength), and a whole programme was received from America during the summer. The moral is—think out for yourself, and don't spoil the ship for a ha'porth of tar. Remember the additional cash is often negligible and in all cases is well worth it.

Multi-cellular H.F. Choke, 9s. 6d.

Resistance Capacity Coupler Type A. £1



Straight Line Super Transformer 25s.

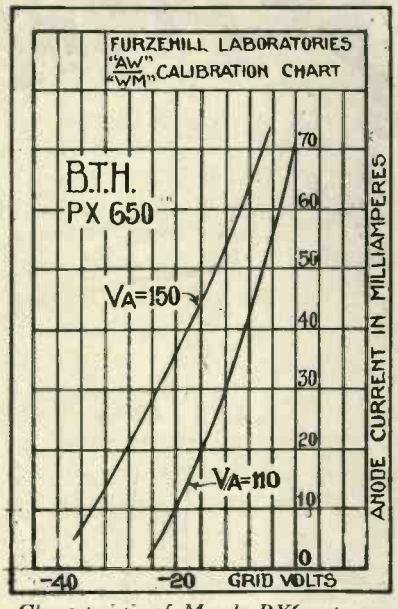
For the benefit of those who wish to get the same results from the original Mullard Master Three, the additional cost will be 15s. 6d.

RI AND Varley LTD.

THE MARK OF BETTER RADIO

Kingsway House, 103, Kingsway, London, W.C.2 Telephone: Holborn 5303

Novelties and New Apparatus Tested *(Continued)*



Characteristic of Mazda PX650 power valve

the British Thomson-Houston Co., Ltd., of Crown House, Aldwych, W.C.1.

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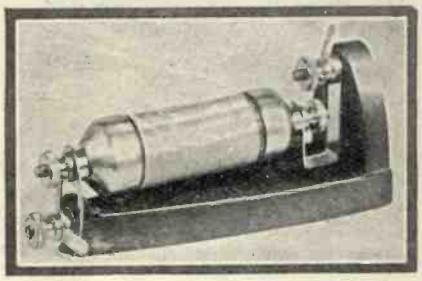
LISSEN WIRE-WOUND RESISTANCES

WIRE-WOUND resistances are favoured for use in the anode circuit of valves since they operate silently and have a constant resistance value under varying anode-current loads. Recently the introduction into L.F. amplifiers of filter circuits for prevention



Lissen wire-wound resistance with holder

of battery feedback has furthered the need for a reliable wire-wound resistance.

We have received for test a Lissen wire-wound resistance mounted in a vertical holder. At either end of this resistance there is a terminal which allows the component to be fixed securely in slots cut in metal strips mounted at either end of the holder and connected to a terminal. A feature of the holder is that it can be mounted either vertically or horizontally as desired.

The resistance submitted for test had a specified value of 250,000 ohms, which proved to be accurate within a few per cent. The component represents good value for money and can be recommended.

The address of Lissen, Ltd., is Friars Lane, Richmond, Surrey.

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NEW "POINT EIGHT" VALVES

ONE of the most interesting types of new valve recently placed on the market is the directly-heated mains valve brought out by the Marconi and Osram valve companies. The filaments of these valves can be run off raw alternating currents provided that the correct step-down transformer is used, giving a voltage of .8.

The valves are fitted with a short thick filament, the temperature of which does not vary with rapid fluctuations and in consequence the A.C. fluctuations do not cause changes in emission which would give rise to a continuous hum.

The first of the series, the H.8, is a high-impedance valve having a good over-all characteristic. Tested in our laboratories the valve was found to have an impeddance of approximately 48,000 ohms, with an amplification factor of 33.

Osram P.8 valve

The second of the series, the HL.8 is a good general-purpose valve. The specimen which we tested had an impedance of 20,000 ohms and an amplification factor of 21. These figures speak for themselves.

The final valve, a P.8, is a power-valve which we found had an impedance of approximately 6,250 ohms and an amplification factor of 6.25.

A set of these valves was recently tested in one of our laboratory receivers. It was found that, provided anode-bend rectification was employed and the grid returns taken to the moving arm of a filament potentiometer, excellent results were obtained with scarcely a trace of hum.

To avoid back-coupling in the L.F. amplifier, it was necessary to reverse the L.F. transformer secondary windings. These tests have convinced us that there is a future for such valves and we have no hesitation in recommending them.

Marconi valves are marketed by the Marconiphone Co., Ltd., of 210 Tottenham Court Road, W.1, and Osram valves are sold by the General Electric Co., Ltd., of Magnet House, Kingsway, W.C.2.

CASON VALVE HOLDERS

TWO new Cason valve holders have recently been placed on the market and samples of these have been submitted for test. The first of these, which is priced at 1s. 6d., has a number of commendable features, including a novel form of springing, which successfully preserves the valve holder from external shocks. The valve sockets are mounted on a thin circular insulated disc, which is sufficiently flexible to bend slightly when an ill-fitting valve is inserted.

Cason valve holder; sold at 1s. 6d.

The second valve holder has no springing device whatsoever and is therefore suitable for use with amplifying valves and A.C. mains valves. Terminals, shrouded sockets and soldering tags are also provided in this holder, which sells at 10d.

These holders are made by Cason Mouldings, of Chiswick Road, Lower Edmonton, N.9.

CATALOGUES RECEIVED

Three most interesting booklets have been received from the Rothermel Corporation, Ltd., of 24-26 Maddox Street, Regent Street, W.1, entitled respectively "Radio," "The Great Voice," and "Volume Controls and Voltage Controls —Their Use." The first, for which a charge of 6d. is made, is a well-produced 68-page catalogue of American radio products; the second contains particulars of Magnavox moving-coil loud-speaker and various amplifying components; while the third is a most useful 34-page booklet explaining the use of various resistances. The last two can be obtained post free if mention of the WIRELESS MAGAZINE is made.

Particulars and circuit diagrams of all their coils (excepting the new Touchstone coils) are contained in a 44-page catalogue issued by the London Electric Wire Co. and Smiths, Ltd., of Church Road, Leyton, E.10. Every WIRELESS MAGAZINE reader should have a copy for reference; it can be obtained post free.

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CHANGE OF ADDRESS

We are informed that, owing to greatly increased business, the Ready Radio Supply Co. have moved to more suitable premises at 149 Borough High Street, London Bridge, S.E.1, within three minutes' walk of London Bridge Station. At this address can be heard the Inceptor Three, Touchstone, Furzehill Four, and other successful WIRELESS MAGAZINE receivers.

Tell Your Friends About W. James's New Set—The Touchstone

Continental Notes

(*Continued from page 489*)

mission was carried out by *Station Experimentale* labelled with the cryptic number 21,401.

Truly this conveys but little to the distant listener, but it is interesting to know that the transmitter, which I understand is at Haeren, in the immediate neighbourhood of the Belgian capital, will eventually, when it is taken over, be installed on another site—possibly in the vicinity of Nivelles (Hainaut) towards the centre of the country.

Rivals in the Field

Radio Belgique, however, so far as I can see, will not secure a broadcasting monopoly, for there are rivals in the field. Admittedly Ghent, Schaerbeek and Chatelineau are but small fry, at present, and for some months Belgian listeners will turn to Brussels for their main radio entertainments.

But in 1929 a more serious competitor will enter the lists, for a report reaches me that the Flemish-speaking population of the country has decided to erect a 7-kilowatt transmitter in the city of Louvain, at a cost of some three millions of francs. The capital for this private enterprise has been over-subscribed, one million francs extra having been secured for working expenses, and a committee has been formed to run this concern.

Backbone of the Organisation

From private information received, I am given to understand that the backbone of the organisation is the Boerenbond, a Catholic association of land workers which plays an important part in Belgium's internal politics.

The choice of wavelengths is a limited one, but it is probable that the transmitter will work on 265 metres, previously used by Brussels, and later adopted by the ill-fated Antwerp relay. With such a financial backing there is every reason to expect that *Radio Leuven*, as the station is to be named, will be placed on a sound basis and will give to Belgium what she requires, bilingual radio broadcasts.

Articles on Wireless in North Queensland and in Germany appear on pages 461 and 444 respectively.

READY RADIO

SUPPLY COMPANY

159 BOROUGH HIGH ST., LONDON BRIDGE, S.E.1.

Three minutes from London Bridge Underground and Southern Stations.

Telephone: HOP 5555 (Private Exchange). **Telegrams: READY, HOP 5555, LONDON.**

DEMONSTRATIONS

DURING BROADCAST HOURS

WHICH? shall it be? — Mr. James' already-famous **"TOUCHSTONE"** or Mr. Reyner's new **"FURZEHILL FOUR"**—both really excellent four-valvers. Before deciding, come along and compare them under identical conditions on the New Ready Radio Loudspeaker.

HEAR BEFORE YOU BUY

Also Demonstrations of the "INCEPTOR THREE" and other successful Press receivers.

IMMEDIATE DESPATCH of ALL the CORRECT parts for these Receivers.

WRITE, WIRE OR PHONE YOUR ORDERS

"FURZEHILL FOUR"

	£	s.	d.
1 ebonite panel, 21 in. by 7 in. by ¼ in. (Ebonart moiré)	0	9	0
1 .0005-microfarad dual condenser (Cyldon log mid-line)	1	5	6
1 slow-motion dial (Burndept Ethovernier)	0	6	0
1 .0002-microfarad reaction condenser (Cyldon Bébé)	0	8	6
1 30-ohm panel rheostat (Peerless)	0	2	3
1 push-pull on-off switch (Lotus)	0	1	6
4 anti-microphonic valve holders with terminals (Lotus)	0	7	0
2 dual range coils (Colvern type UV)	1	15	0
1 0.1-microfarad fixed condenser (Dubilier type B775)	0	8	6
1 1-microfarad Mansbridge condenser (Dubilier)	0	2	6
2 Preset condensers, .00003 to .00025-microfarad (Igranic)	0	5	0
1 .0003-microfarad fixed condenser (Dubilier)	0	2	6
2 grid leak holders (Dumetohm holder)	0	2	0
1 .25-megohm leak (Dubilier)	0	2	6
1 50,000-ohms leak (Ediswan)	0	2	6
1 H.F. choke (Lewcos)	0	9	0
1 L.F. transformer, 2 to 1 and one L.F. transformer 4 to 1 (B.T.H.)	1	10	0
1 choke coupling output unit (Igranic)	1	1	6
Terminal strips and bushes	0	1	4
11 marked terminals (Belling-Lee)	0	4	2
1 grid bias clip (Bulgin)	0	0	3
1 copper screen and foil (Ready Radio)	0	12	6
1 pair of panel brackets (Magnum)	0	2	6
2 wander plugs, one spade tag, and 2 ft. R.R. flex	0	0	6
30 ft. Glazite for wiring	0	2	6
Ready Radio solid oak or mahogany cabinet	1	12	6
Valves as specified	2	18	0
Total (including valves)	£14	15	0

READY-BUILT SETS COMPLETE with VALVES

Prices, including Royalties:

"FURZEHILL FOUR" £18 15 0

THE "TOUCHSTONE" £17 5 6

"INCEPTOR THREE" £14 0 0

THE "TOUCHSTONE"

	£	s.	d.
Solid mahogany or oak cabinet, 26 in. by 8 in. by 8 in. (Ready Radio)	2	0	0
1 ebonite panel, 12 in. by 8 in. by 3/16 in. (Radion)	0	8	0
1 .0003-microfarad 2-ganged condenser (Jackson Bros.)	1	8	0
1 vernier drum dial (Jackson Bros.)	0	10	6
4 anti-micro. valve holders with terminals (W.B.)	0	6	0
1 set of two coils, as specified	1	10	0
1 .0003-mfd. fixed condenser (T.C.C.)	0	1	10
1 .005-mfd. fixed condenser (T.C.C.)	0	3	0
2 1-mfd. fixed condensers (T.C.C.)	0	5	8
1 2-mfd. fixed condenser (T.C.C.)	0	3	10
1 2-meg. grid leak (Ediswan)	0	2	6
1 60,000-ohm resistance (Ediswan)	0	2	6
2 porcelain holders (Bulgin)	0	1	0
1 200,000-ohms wire wound resistance with holders (R.I. & Varley)	0	9	6
1 L.F. transformer ratio 3.6 to 1 (Igranic G type)	1	10	0
1 panel mounting rheostat 15 ohms (Peerless)	0	2	3
10 terminals (Belling-Lee)	0	5	0
2 terminal strips, 10½ in. by 2 in. and 5½ in. by 2 in.	0	1	11
1 neutralising condenser (Gambrell neutrovernier)	0	5	6
1 panel-mounting volume Control (Clariostat)	0	8	6
1 on-off switch (Bulgin)	0	1	6
1 balancing condenser (Bulgin N147)	0	5	0
1 screen 7⅝ in. by 7¾ in. and ½ in. turnover (Ready Radio)	0	4	6
30 ft. Glazite	0	2	6
4 valves, Marconi as recommended, 6, 4, or 2 volt	2	6	6
Total (including valves)	£13	5	6

"READY RADIO" COMPONENTS FOR THE "SUPER CHUMMY FOUR"

	£	s.	d.
Oak cabinet with wound frame aerial (Ready Radio)	2	19	6
1 set of copper screens (Ready Radio)	0	16	6
2 new anode coils (Ready Radio)	0	5	0
1 turntable (Ready Radio)	0	8	6
Complete kit of parts, including valves and batteries	£18	9	3

Detailed Price List of "Super Chummy Four" on Application.

NEW READY RADIO CABINET CONE SPEAKER £4 4 0 (Supplied in Solid Oak or Mahogany)

Free blueprints with all orders over £2 *Cash with order or C.O.D.*

RING HOP 5555 (Double Five Double Five)

INLAND: All orders post free. **OVERSEAS: Consignments carefully packed and insured.**

In this article is described the construction and operation of a simple one-valver that will appeal particularly to the beginner in radio, and also to the listener who needs only headphone reception. It is not at all difficult to build and is quite inexpensive

The Special One

Front view of the receiver

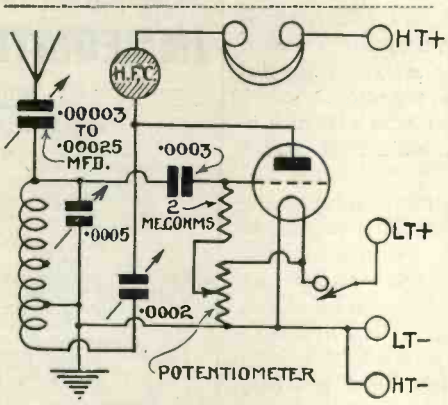
AT this time of the year especially, many people are attracted to wireless who have not previously had a receiving set at all. They naturally want to get the best possible results at the lowest expense and therefore a simple one-valver is good enough for many of them.

Such a simple set is that described in this article. It is well within the scope of any beginner and will give headphone reception of a surprising number of stations.

For Flat-dwellers

This Special One is also recommended to those flat-dwellers who want only a small set for headphone reception.

Not the least interesting feature about this one-valver is the use of a single tapped coil for aerial tuning and reaction effects. Actually a double-tapped coil is used, the few turns tapped off from one end being utilised as the reaction winding. However, if any prospective constructor has a number of centre-tapped coils on hand, he should try them before buying any double-tapped coils.



Circuit of the Special One

There are two disadvantages about the use of a centre-tapped coil. Only half of it is used (in this particular circuit) for aerial tuning, while the other half is used for reaction; this is rather too large.

Good Proportions

These disadvantages automatically disappear when a double-tapped coil is utilised. In the case of a No. 60 coil, for instance, 50 turns are available for aerial tuning, while the remaining 10 turns are available for reaction.

The arrangement is clear from the circuit diagram, reproduced on this page. In the aerial lead is placed a semi-fixed series condenser, for fine control of the selectivity of the receiver. The aerial portion of the coil is tuned by a .0005-microfarad variable condenser.

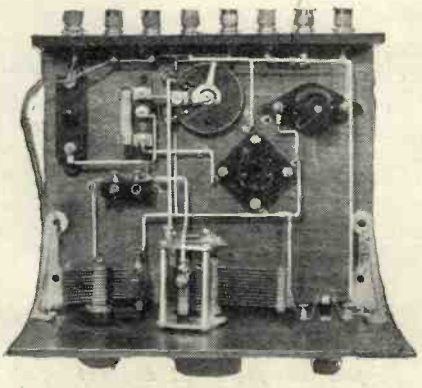
For the sake of sensitivity, a leaky-grid detector is used, the grid return being made through a leak used in conjunction with a potentiometer across the low-tension supply. This arrangement allows of maximum sensitivity being obtained, but more important still is the fact that the reaction can be controlled by this means to be smooth over the whole scale of the tuning condenser.

Reaction Control

Reaction is obtained by a .0002-microfarad variable condenser, connected between the anode of the valve and the small tapped portion of the tuning coil. In the anode circuit is placed a high-frequency choke to prevent unwanted currents from flowing through the phone windings.

The simple appearance of the set can be judged from the photographs.

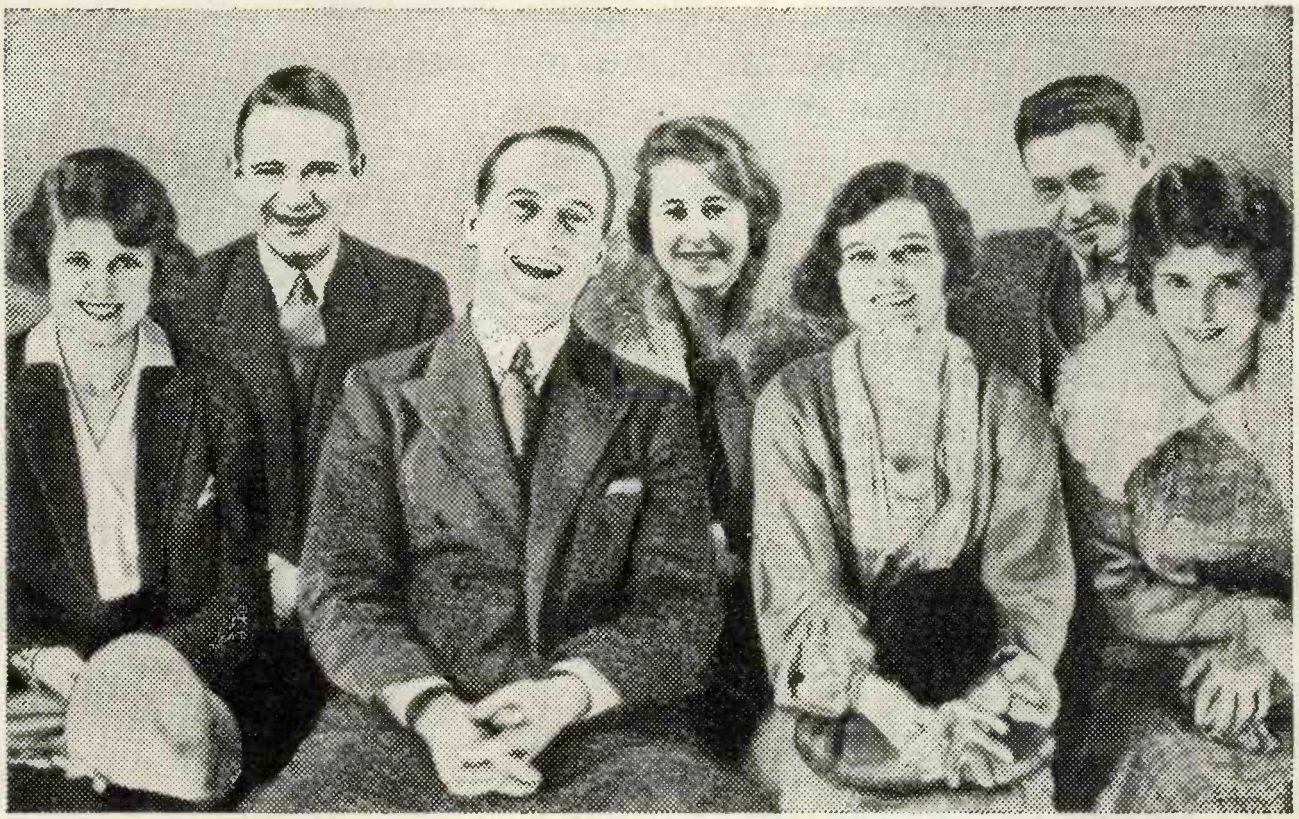
(*Continued on page 502*)



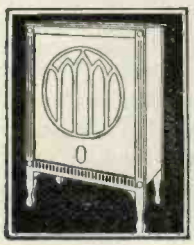
Plan view of the Special One

COMPONENTS REQUIRED FOR THE SPECIAL ONE

1—Ebonite panel, 9 in. by 6 in. (Trolite, Red Triangle, or Parfait).
1—.0005-microfarad variable condenser (Lotus, Lissen, or Polar).
1—.0001-microfarad reaction condenser (Dubilier, Cyldon Bébé, or Peto-Scott).
1—On-off switch (Trix, Lotus, or Lissen).
1—.00025-microfarad semi-fixed condenser (Formodenser or Igranic Preset).
1—Single coil holder (Lotus, Magnum, or Peto-Scott).
1—Antimicrophonic valve holder (Formo, Lotus, or W.B.).
1—.0003-microfarad fixed condenser (T.C.C., type SP).
1—2-megohm grid leak (Dubilier, Lissen, or Peto-Scott).
1—30-ohm baseboard rheostat (Lissen or Igranic).
1—High-frequency choke (Magnum, Wearite, or Burndept).
1—Terminal strip, 9 in. by 2 in. (Becol, Red Triangle, or Parfait).
8—Terminals, marked :—Aerial, Earth, L.T.+, L.T.—, H.T.+, H.T.—, Phones +, Phones— (Belling-Lee or Eelex).
1—Pair panel brackets (Magnum).
Stiff wire for connecting (Glazite).
Short length of flex.
1—Cabinet with baseboard, 7 in. deep (Caxton).



Gallery . . . . or stalls? Sound straining its way to your ear and losing all sense of personality in the process . . . . or sound intimately audible? ◘ One reason why everyone is enthusiastic about the new Amplion Speaker is that it seems to bring your receiver so much nearer to the microphone. You hear more perfectly because you hear more completely. You hear the low notes and the high notes naturally balanced, for the new Amplion Speaker gives an even response over the whole range of frequencies. ◘ It has been claimed by competent authorities that the new Amplion is the most accurate reproducer of sound on the market, not excepting the moving-coil type of instrument. An achievement in itself—but here is the greater achievement. It is so sensitive that it can give this splendid performance from a simple two-valve set. It requires no batteries, transformers or mains connections to operate it. The secret is an entirely new form of moving-iron movement, employed exclusively in the new Amplion Speakers and fully covered by patents. ◘ Hear the new Amplion Speakers and you will double your radio pleasure.



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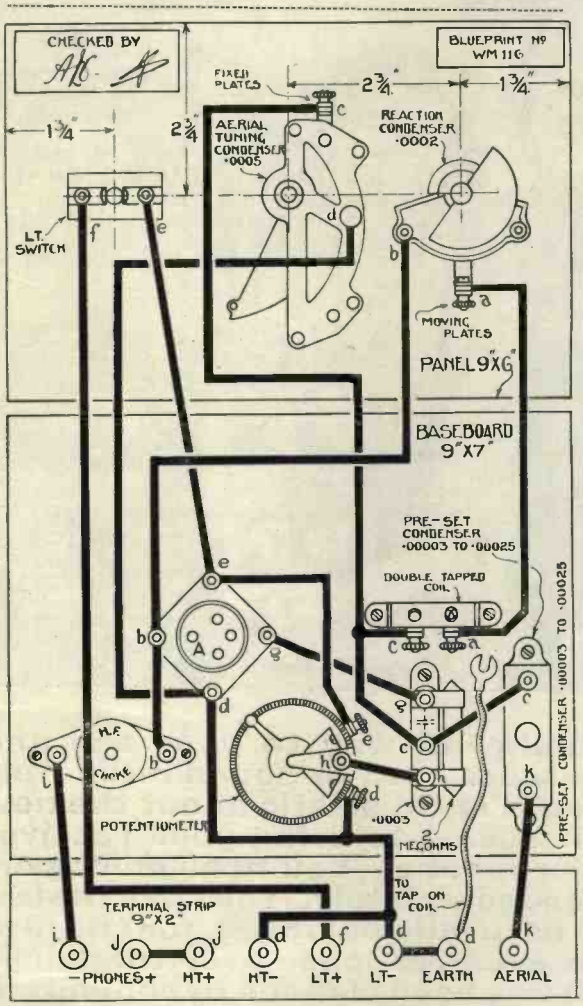
The Amplion Radio Gramophone in Oak £58 12 6 . . . in Mahogany £63 12 6, including Royalties.

Amplion Standard Speakers, Cone and Horn Types, 52/6 to £5. Junior Models, 35/- to £3 3 0.

Catalogue from all Radio Dealers, or from Graham Amplion, Limited.

London: 25/26, Savile Row, W.1. Manchester: 10, Whitworth Street West. Glasgow: 6/8, West George Street. Works: Slough.

The Special One (Continued from page 500)

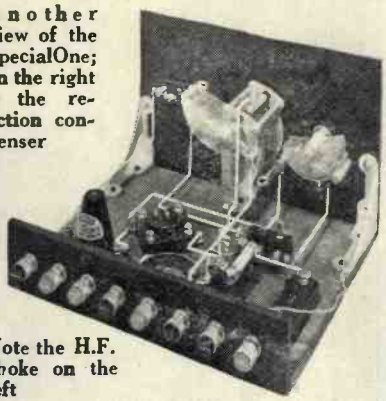


This layout and wiring diagram can be obtained for half-price (that is, 6d., post free) if the coupon on page iii of the cover is used by December 31. Ask for No. W.M.116

Special attention has been paid to the choice of components for this set in order to get the best value for money. It is possible to get cheaper components than those specified, but such a procedure will probably result in impaired efficiency.

Controlling Selectivity

The semi-fixed condenser in the aerial lead controls the selectivity of the receiver and can be omitted if the aerial to be used does not exceed 30 feet in length; if the aerial is longer than this, however, it should be retained, as it will be found useful in getting the best tuning and reaction adjustments.



Another view of the Special One; on the right is the reaction condenser

Note the H.F. choke on the left

full-size blueprint layout, drilling guide, and wiring diagram if application, accompanied by the coupon on page iii of the cover, is made by December 31. Ask for No. W.M.116, and address your inquiry to Blueprint Dept., WIRELESS MAGAZINE, 58/61 Fetter Lane, E.C.4.

Starting the Construction

The first part of the construction to be undertaken is, of course, the drilling of the front panel, and the mounting of the necessary components thereon. These are the variable tuning condenser, reaction condenser, and push-pull on-off switch. When these have been mounted, the panel should be fixed, by means of the brackets, on the baseboard and the remainder of the components fixed on the latter.

(Continued on page 504)

Only one coil is used in the Special One, which is very cheap to build

On the front panel there are only three controls—reaction, aerial tuning and an on-off switch. There is thus no difficulty about the operation of the set

Note should be made of the fact that the grid condenser is of the series-parallel type. That is, it is provided with three unequally-spaced terminals, the condenser being connected between the two consecutive terminals that are farthest apart; the third terminal is unconnected internally, and serves only to clamp one of the grid-leak clips.

Baseboard Potentiometer

The potentiometer is of the baseboard type, as once it has been set for a particular valve, there is no need for further adjustment.

For 6d. it is possible to obtain a

THE LIST OF COMPONENTS REQUIRED APPEARS ON PAGE 500

A leaky-grid detector is used

The Special One

The Special One

Simple to build

BECOL

SPECIFIED FOR THE

SIX-SIXTY MYSTERY RECEIVER

Becol Ebonite Panel 21" x 7" x ¼ "8/4 POSTAGE 6d.

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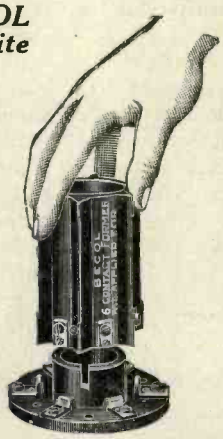

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Special offer of BECOL Formers as specified by W.M., also FRAME AERIAL, 4"

Write for particulars to the Sole Makers

THE BRITISH EBONITE CO., LTD.
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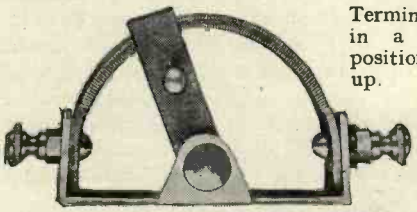
A POPULAR RHEOSTAT

The Peerless Varistor is a new baseboard type of Rheostat and is suitable for controlling all types of Valves.



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3, 6, 10, 15, 20, 30, & 60 ohm **1/3**

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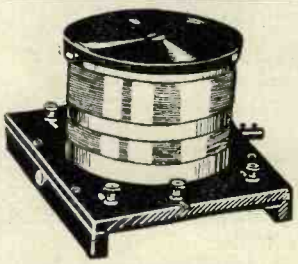

Finston "Q" COIL

The "Q" Coil is a very efficient type of tuning inductance and gives exceptional results, covering a waveband of 250/550 and 1,000/2,000 metres.

The Finston "Q" Coil was recommended by J. H. Reyner in his "Ace of Twos" receiver, ("Amateur Wireless," September 22.)

AERIAL COIL **15/-** H.F. TRANSFORMER **21/-**
REINARTZ COIL **21/-**

As specified and officially approved.

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From all Dealers or

108/9 Great Saffron Hill, London, E.C.1.

"— the best pick-up I have ever heard . . ."

(Mr. G. Readman, jun., of 9 Moray Place, Edinburgh)

"———against one costing £4, yours was infinitely the better of the two. . . . What to me is so extraordinary is the almost complete absence of scrape and the clearness of reproduction. I tried some 17 years' old song records, the words of which I could never hear on this gramophone, and they all came out quite clearly on your pick-up."

Makes an old gramophone as good as new, and enormously improves a modern one.
No surface noise.
Fitted in a few minutes—in place of your old sound-box, attached to your radio receiver, and your favourite records will be reproduced with absolute fidelity on the loud-speaker.

—and it costs only £1 : 0 : 0

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For plugging-in to any receiver. With 9 ft. twin flexible wire.
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Price **8/6**

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Wireless (1928) Limited

BLACKHEATH, LONDON, S.E.3

Showrooms: 15 *Bedford Street, STRAND, W.C.2*

A.J.W.

The Special One (Continued from page 502)

When all the parts have been firmly fixed in position, wiring up can be started. This will present no difficulty if the blueprint (or reduced reproduction of it on page 502) is consulted, for this shows the order of wiring, and the actual points that have to be connected together.

How to Connect Up the Set

For instance, first connect together with one wire, or as few wires as possible, the points marked *a*; then connect the points marked *b*; and so on through the alphabet. In this way the wiring is built up in the simplest manner, and an easy means of checking it is provided.

At this stage, the set can be given a preliminary test, but first of all, appropriate coils and a valve must be obtained.

The coil used must, as already mentioned, be of the double-tapped type, so that the larger portion of it is used for aerial tuning and the smaller portion for reaction. For the lower broadcast band a No. 60 coil will be found suitable with most aerials, while for the upper broadcast band a No. 200 coil should be tried.

As regards valves, there is a very wide choice. Any valve of moderate impedance will be suitable—say between 15,000 and 30,000 ohms. Between these values the impedance is not critical, and the list on pages 404 – 405 should be consulted for the final choice.

To test the set, then, insert the valve and coil in their respective holders, and connect the appropriate flexible lead to the "bottom" tapping point on the latter. Apply to the L.T. terminals an accumulator of the voltage of the valve to be used, and to H.T.+ anything up to 100 volts or so.

Operating the Receiver

To operate the receiver, first screw the knob of the small pre-set condenser on the baseboard right down and pull out the knob of the on-off switch. Now move the sliding contact on the baseboard potentiometer until it is near the positive end and adjust the reaction condenser on the panel until the slight rustling or hissing sound is heard which indicates that the set is on the verge of oscillation.

Smooth Reaction Control

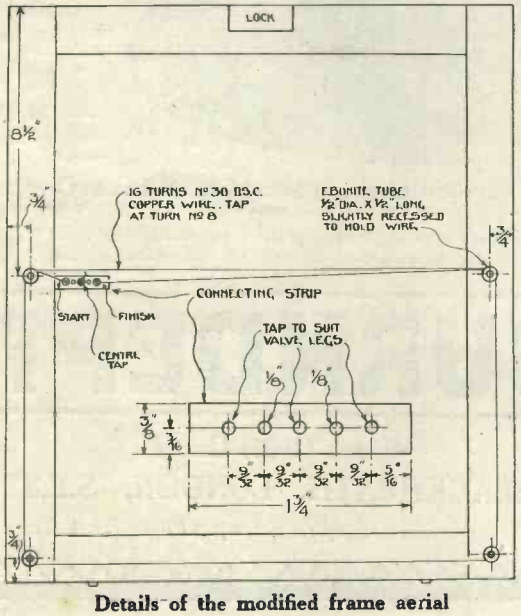
Now turn the knob of the main tuning condenser until a station is picked up, when the reaction control should be readjusted. If oscillation is too fierce, move the potentiometer slider back towards the negative end, when a smoother control will be obtained.

If difficulty is experienced in cutting out the local station or reaction is troublesome to obtain, withdraw the screw of the pre-set condenser and so reduce its capacity.

Test Report of the Super Chummy Four

READERS who have made up the Super Chummy Four receiver have, in some cases, reported difficulty in stabilising it. We set ourselves the task of discovering the cause of the trouble and the remedy, and in the following notes we explain how the set may be somewhat modified to give complete stability and entirely satisfactory results.

One of the main troubles experienced appeared to be due to readers not employing the full screening system so that direct interaction occurred between the frame-aerial winding and the windings of the anode coils. This is easily overcome by using the screening specified at the back of the receiver.



Details of the modified frame aerial

To reduce further the possibility of interaction we have altered the disposition of the coils with respect to the frame-aerial winding. A glance at the small reproduction of the revised blueprint wiring plan will show that the windings of the coils are now placed at right angles to the winding on the frame aerial.

It will also be noted that a somewhat different variable resistance is used on the panel. The wiring to this has also been altered.

This resistance has an entirely fresh duty to perform. It is connected between the 120-volt H.T. positive terminal or connection in the receiver and the by-pass condenser which is connected to the screening grids of the two screened-grid valves. The original H.T. positive tapping from this latter point is now dispensed with.

Screened-grid Voltage

By varying the amount of resistance in use in this new component the voltage drop between the 120-volt tapping and the screening grids is varied. Thus a continuously variable voltage can be applied to the screening grids of the two screened-grid valves. This is an asset, for in the original design it was certainly a very tricky matter to discover the best voltage by tapping the H.T. battery for getting maximum amplification and yet complete stability at one and the same time.

When first we started to experiment to overcome the oscillation experienced by constructors we tried

(Continued on page 506)

'TOUCHSTONE' RECEIVER

Complete Kits of Parts for building this wonderful receiver.

20/- DOWN and 11 monthly payments of 19/11

"ULTRA" Double Action Air Column Loud Speaker

This loud-speaker automatically segregates high notes from low notes, which are reproduced through two distinct units in the one loud-speaker. The result is perfect reproduction over the whole range of frequencies. Specially recommended for radio gramophones. Very moderate in price, but of really excellent performance. Full details of various models in our big list.

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1 Wearite All Wave Tuner W.G.2 ..		15	0
1 J.B. .0005 Slow Motion Condenser ..		14	6
1 Igranic 0-500,000 ohms variable resistance		6	0
3 Dial indicators			9
1 Lotus jack switch No. 7		3	3
1 Lotus plug and jack No. 4		4	6
3 Benjamin valve holders		4	6
1 R.I. Varley anti-mobo resistance capacity coupler (type Z)	1	5	0
1 Keystone "High-Low" H.F. choke..		3	6
1 T.C.C. fixed condenser .0003-mfd. ..		1	10
1 T.C.C. fixed condenser .01-mfd. ..		3	6
1 R.I. Varley 100,000 ohm wire-wound resistance with holder		7	6
2 T.C.C. 2-mfd. fixed condenser ..		7	8
1 R.I. Varley L.F. choke, type E.Y.6 ..	1	1	0
1 Lewcos 7-way battery cord		8	6
1 Dubilier 2-megohm grid leak ..		2	6
1 Terminal strip 2 in. by 1 in. by ¼ in.			6
2 Belling-Lee terminals A.E.		1	0
1 Pair of battery clips			6
2 Wander plugs			6
1 Keystone double spring motor, complete with turn-table	2	2	0
1 B.T.H. pick-up and tone arm ..	2	5	0
Keystone wire, screws, etc.		1	7
	£11	0	7

20/- DOWN SECURES COMPLETE KIT OF COMPONENTS FOR BUILDING THIS HANDSOME RECEIVER BALANCE IN 11 MONTHLY PAYMENTS of 20/-

PETO-SCOTT CO., LTD.

77, CITY ROAD, E.C.1 'Phone: CLERKENWELL 9406.

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Build a COMPLETELY SCREENED Set

FORMO (ARTHUR PREEN & CO. LTD.)

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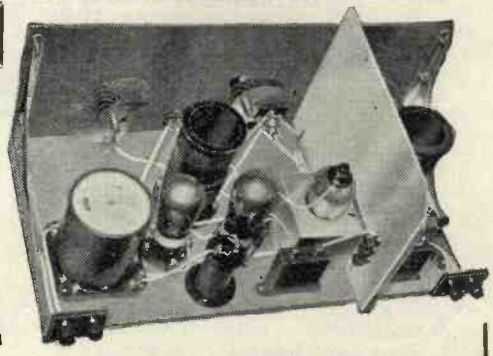

An amazingly simple set to construct and operate

Obtain a Broadsheet from your dealer and read why you should—

Completely Screen the Grid

NO COIL CHANGING

From HIGH WAVE to LOW WAVE on a Push-pull Switch

Send post card for FREE FULL-SIZE LAYOUT PLAN and wiring instructions.

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UNTARNISHABLE COPPER SCREENS ARE USED IN AND SPECIFIED FOR THE:

"FURZEHILL 4" SCREEN with Foil, terminals and ready drilled 12/6

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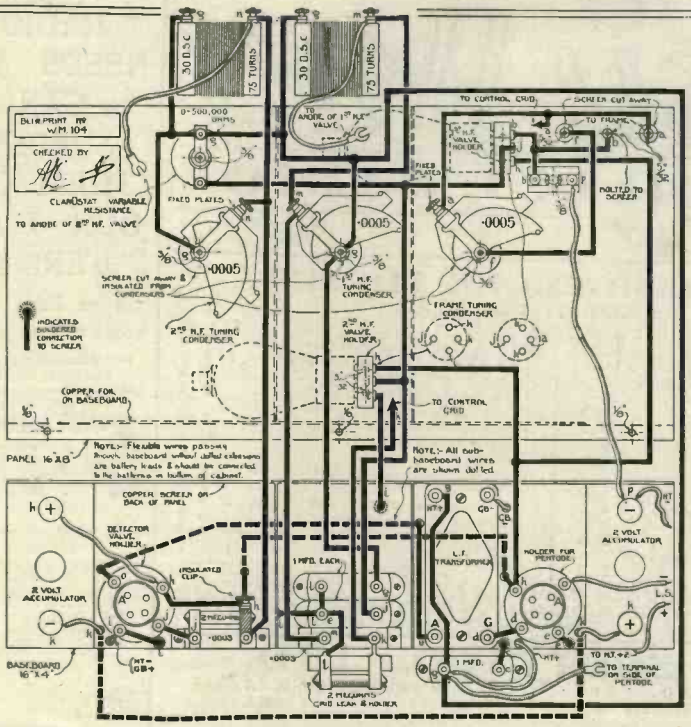
Test Report of the Super Chummy Four (Continued from page 504)



This modified layout and wiring diagram of the Super Chummy can be obtained for 1s. 6d. post free. Ask for No. W.M. 104

using the set with the screen at the back removed. It was found to be impossible to obtain stability in this way without reducing the dimensions of the frame aerial.

We therefore rewound the frame aerial on insulated pegs screwed to the backboard of the cabinet and arranged the frame to be of such dimensions that it would fit comfortably into the space allowed at the bottom of the cabinet for the batteries and loud-speaker. In doing this we found that it was quite satisfactory to leave off the back screen of the receiver.

Altering the Frame Aerial

Should any constructor wish to do away with the screening at the rear of the set itself then altering the size for the frame-aerial winding will allow of this being done.

The whole of the latest experimenting with this set has been conducted with an ordinary power valve in the final position of the set and the results obtained with only the one ordinary L.F. valve are surprisingly good.

Tuning, with the latest modifications, is extremely critical, but no reader should experience difficulty in this matter if he will adhere to the following instructions. The resistance used is a Clarostat "volume control" and adjustment of this is rather coarse owing to its high resistance. A better instrument to use would be the Clarostat "power" variable resistance. If the latter is used its setting will be much less critical and wider variation or rotation of the knob will result.

If the former component is used then the knob should be turned fully in a clockwise direction before any attempt is made to switch on the receiver. The set can then be switched on and the local station tuned in to the loudest possible strength.

After this the knob of the Clarostat resistance should be turned about a quarter or half a turn in an anti-clockwise direction, when it will be found that the receiver will break into oscillation. Turning the resistance knob back again in a clockwise direction until the set is just off the oscillation point will put the receiver into its most sensitive state of adjustment.

There should now be no need to make further alterations to the setting of this resistance although a very slight readjustment, when a distant station has been tuned in, will effect a decided increase in the volume of signals received.

If readers have any difficulty in tuning-in a distant station then the resistance should be turned until the set is just oscillating, when the required station will be brought in quite easily. As soon as possible, however, the correct setting for this resistance should be remade as otherwise the settings already obtained for other stations will be thrown out. The tuning of the set will only be difficult during the early tests.

Tuning Dials in Step

The two H.F. tuning dials, as will be seen from the test report, are practically in step, so that no difficulty will be experienced in this respect. The frame-aerial tuning condenser requires very careful handling in our revised set, but this is mainly due to the fact that we have made the frame aerial so small. With a frame of the dimensions originally specified for this set readers should not experience extremely critical setting for the frame-tuning condenser.

(*See also page* 512)

Test Report on the Super Chummy Four

Loud-speaker reception on stations marked *, others on phones, where super-power valve only was used.

Wave-length.	*Station.*	*Condensers.* 1	2	3
*242	Nurnberg	13	27	17
*250	Muenster	15	30	20
254	Kiel	26	32	24
260	Malmo	30	35	38
*277	Kaiserslautern	38	40	45
*283	Cologne	40	49	50
298	Hanover	44	54	56
303	Koenigsberg	46	57	56
*322.6	Dublin	48	60	60
349	Prague	50	65	64
*364	2LO	82	90	90
375	Madrid (EAJ7)	89	96	97
*380	Stuttgart	91	100	100
*389	Radio Toulouse	93	102	101
396	Hamburg	96	106	105
*416	Goeteborg	99	108	106
422	Kattowitz	106	112	110
*428	Frankfurt	109	116	114
435	Seville (EAJ5)	112	119	117
441	Brunn	114	120	119
*450	Rome	116	123	122
462	PTT Paris (when Oslo closed down)	124	132	130
*491	Daventry 5GB	130	135	135
*508	Brussels	137	140	140
*517	Vienna	139	143	142
*544	Milan	146	151	149
*555	Buda-Pest	150	154	153

J. GODCHAUX ABRAHAMS.

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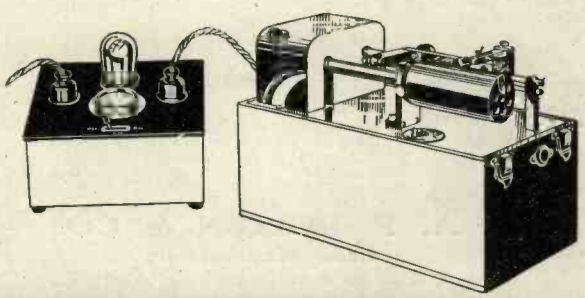
Being a standardized apparatus, it will receive not only the pictures transmitted by the B.B.C., but those from abroad as well.

It is only necessary to connect the **Fultograph** to any ordinary set in place of the loud-speaker, wind up the clockwork motor, and wait developments. As soon as the picture transmission starts so does the **Fultograph**—automatically. It stops automatically too, when the picture is complete, which can then be removed and retained. No developing or fixing is required.

Fultograph

Wireless Pictures (1928) *Ltd.*,
Dorland House,
14/16, *Regent Street*,
London, *S.W.*1.



More About the Touchstone (*Continued from page 413*)

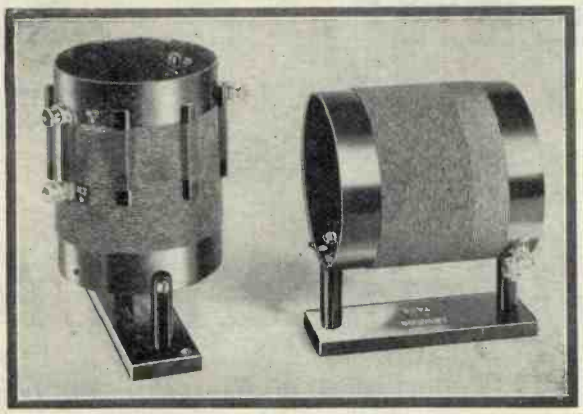
way of connecting them, as will be seen by referring to the diagrams. It is important that the windings be properly connected if a good balance is to be obtained.

Good Balance

The balancing circuit itself includes a neutralising condenser and the third winding on the transformer. Its construction is such that the balance holds good over the whole tuning range, even when the aerial and earth are removed.

A reader who wishes to construct his own high-frequency transformers will find that he can purchase the necessary wire from most dealers. Particular care must be taken when handling the high-frequency cable. This has twenty-seven strands of fine wire, each of which is silk covered, and the two ends of the coil have to be connected to terminals. It is therefore necessary to remove the insulation from every one of the strands for about one inch, and then to solder them together, before soldering the cable to a connecting tag on the terminal.

A blunt knife may be used to remove the insulation from each strand separately. At first one or two strands may be broken, but as it is necessary to solder all the strands, when several are broken the ends should be cut off and a fresh joint prepared.



The Lewcos version of Touchstone coils

To hold the spacers in position whilst winding the fine wire primary, two rubber bands may be used and, if the wire is pulled fairly tightly whilst winding, the spacers will be held firmly in position.

Mounting Positions

The intervalve high frequency transformer is mounted vertically and the aerial grid transformer horizontally. They are fitted at right angles, and you will observe that the intervalve transformer, which is connected to the detector, cannot act as a small frame aerial to collect signals from a powerful nearby station.

This stage, including the valve and transformer, magnifies from forty to fifty times with complete stability and no reaction is fitted, because with this amount of magnification, and that provided by the aerial-grid coil, even really distant stations are received at considerable strength.

Amplification Curves

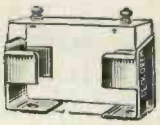
The low-frequency amplifier has been briefly described. It was designed to provide the necessary magnification and to have certain frequency characteristics. The shape of the amplification-frequency curve of Fig. 5 shows with what success the various components were proportioned. A curve showing the relative amplification at various frequencies for the resistance stage is given in Fig. 6 and for the transformer stage in Fig. 7. These two stages combine to give the result of Fig. 5.

Type of Loud-speaker

It is not very difficult to determine the response of an amplifier at various frequencies, and with present-day loud-speakers it is doubtful whether straight-line amplification is desirable. A good deal depends upon the type of loud-speaker, but it seems that too prominent treble is not required.

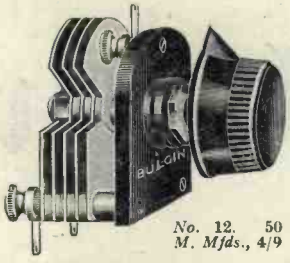
BULGIN
RADIO PRODUCTS
The choice of critics

250 Gadgets and Components! British made, thoroughly tested, and guaranteed to be electrically and mechanically perfect. It is only possible to describe three of them here, but they are all illustrated and described in our fifty-six page Catalogue, which will be sent free on request.



SWITCHES

Bulgin Switches are famous. From the original Push-pull Switch (illustrated here) to the special Twin Circuit Station Selector, there is a switch for every purpose. Baseboard Switches, Panel Key Switches, Knife Switches, and Two-, Three-, or Four-Spring Switches for wavelength changing, all of which are constantly being specified for the best circuits.

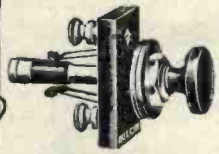


No. 12. 50 M. Mfds., 4/9

G.B. CLIPS

Bulgin G.B. Clips, when first brought out, standardised the fixing of batteries inside the cabinet. We make the largest range of any manufacturer, one for every purpose at varying prices. Note particularly the quality and finish compared with imitations.

Illustated is the No. 1 Type, **6d.** pair. other models sell at **2d., 4d., and 4½d.**



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THE INCEPTOR 3
WIRELESS MAGAZINE, OCT. 1928

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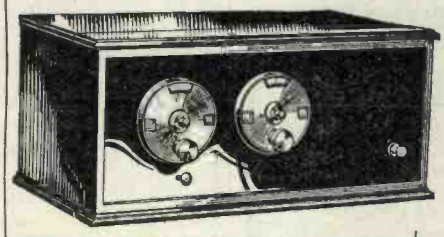

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Genuine Listed Components 3 Valve Holders, Lotus, at 1/3. Colvern Combined Wave Coil, 17/6. Permacore Transformer, 25/-. Climax "LFA" Transformer, 25/-. Climax H.F. Choke, 7/6. Benjamin Battery Switch, 1/3. J.B. .0005 Log, 11/6; .00035, 10/6. Mullard .0003 and 2 meg., 5/-. Magnum Panel Brackets, 2/6. Mullard .0001 Fixed, 2/6
TOTAL ... £5 12 6

PLEASE ADD 3/6 Total £5 16 0 and I will include
2 Handsome S.M. Dials, Set of connecting Links, 8 plugs, 2 Spades, 4 Engraved Terminals, 2 Ebonite Strips, Twin Flex Splendid Aluminium Panel 18 x 7, drilled ready for use, 9-volt Grid Bias, Baseboard. Carriage Paid.

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1 Mahogany cabinet, 21 in. by 7 in. by 10 in.	1	13	0
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1 Burndept slow-motion dial		6	0
1 Cyldon reaction condenser .0002-mfd.		8	6
1 Peerless panel rheostat 30 ohms		2	0
1 Lotus push pull switch		1	6
4 Lotus valve holders with terminals		7	0
2 Colvern dual range coils	1	15	0
1 Dubilier 0.1-microfarad condenser, type B. 775 mica		8	6
1 Dubilier 1-microfarad Mansbridge condenser		2	6
2 Igranic Preset condensers .00003 to .00025-mfd.		5	0
1 Dubilier fixed condenser .0003-mfd.		2	6
2 Dumetohm holders		2	0
1 Dubilier grid leak .25-meg.		2	6
1 Ediswan grid leak 50,000 ohms		2	6
1 Lewcos H.F. choke		9	0
1 B.T.H. transformer, 2 to 1 ratio		15	0
1 B.T.H. transformer, 4 to 1 ratio		15	0
1 Igranic tapped choke coupling output unit	1	1	6
1 Terminal strip, 9 in. by 2 in.		1	3
1 Terminal strip, 2 in. by 1 in. with 2 bushes			6
11 Belling-Lee terminals		4	2
1 Grid bias clip			6
1 Copper screen, 20 in. by 6 in.		10	6
1 Copper foil, 9½ in. by 6 in.		2	0
1 Pair panel brackets Maguum		2	6
2 Ft. rubber covered flex			2
2 Igranic wander plugs			6
1 Spade tag			2
30 Ft. Glazite		2	6
1 Screened grid valve	1	2	6
1 Det. 1 L.F. and 1 Super power	1	13	6
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NO RADIO WITHOUT DARIO

See page 487

"Wireless Magazine" REFERENCE SHEETS

Compiled by J. H. REYNER, B.Sc., A.M.I.E.E.

Month by month these sheets can be cut out and filed—either in a loose-leaf folder or on cards—for reference. The sequence of filing is a matter for personal choice. In a short time the amateur will be able to compile for himself a valuable reference book.

WIRELESS MAGAZINE Reference Sheet **No. 96**

D.C. Mains Receivers (Grid Bias in)

WHEN the filaments of the various valves in a receiver are wired in series to work off D.C. mains or from rectified A.C., a difficulty arises, unless sufficient precautions are taken, in the provision of grid bias. It is necessary to ensure that the grid bias on each valve is correct with respect to the negative filament leg:

The negative legs of the respective filaments, however, are all at different potentials. If the circuit is so arranged that the detector valve is the most negative, the filament of the first L.F. valve will be at a potential of +V, that of the second valve +2V, and so on, V being the voltage of the filaments of the valves, assumed to be all equal.

It is preferable, in practice, to arrange the valves in this manner, that is, so that the last valve in the receiver is the most positive. If this is done a single grid-bias battery may be used with its positive terminal connected to the negative leg of the last valve (see Sheet No. 94).

The last valve would be provided with 9 volts grid bias. The preceding valve is V volts positive with respect to the last valve, so that if we are using a 6-volt valve and we require a bias of 3 volts, we should connect the grid-bias lead to −9 volts. The effective bias would then be +6−9=−3 volts. Thus both leads would be connected to the same point on the battery, but each valve would receive the correct bias.

By special arrangements it is possible to utilise the actual voltage drop on the valves themselves without any battery. This was done in the circuit given in Sheet No. 95.

The values of the constants of the circuit in Sheet No. 95 are given herewith:—

C1=8 microfarads;
C2=C4=.0005-microfarad variable.
C3=neutralising condenser.
C5=.0003-microfarad variable.
C6=.0003 microfarad.
C7=C8=C9=C10=2 microfarads.
R1=400-ohms potentiometer.
R2=2 megohms.
R3=50,000 ohms.
L1=20-henry choke to carry 120 mA.
L2=25-30 or 75-100.
L3=60 or 200.
L4=60 or 200 centre tapped.
L5=30-40 or 100-150.
L6=H.F. choke.
L7=20-henry choke to carry 20 mA.
R4=R5=600 ohms.
R5=0-600 ohms, to allow for different supply voltages. } to carry 100 m A.

WIRELESS MAGAZINE Reference Sheet **No. 97**

Electrolytic Condensers

AN electrolytic condenser operates by the provision of a very thin film of gas at the surface of a plate. This gas acts as the di-electric and, by virtue of the extreme thinness, gives an arrangement having a very high capacity.

Commercial electrolytic condensers are made in a dry state, the essential principle being the same, but the liquid being dispensed with. It is possible, however, to construct an electrolytic condenser of the wet type comparatively easily. For this purpose aluminium plates should be used immersed in a suitable electrolyte, one of the phosphates or borates being the most suitable. Ammonium phosphate, ammonium borate, or ordinary sodium borate (borax) may be used for the purpose with satisfactory results.

A number of plates should be cut up and mounted up in alternate order as in the case of an ordinary air condenser. The alternate plates, of course, are connected together. The plates should then be assembled in their alternate order, taking hold of them by the edges as far as possible. The connection tags should them be painted with enamel or wax to prevent the liquid from obtaining access to these portions.

The plates may then be immersed in a suitable container and a saturated solution of borax should be made up. This may be prepared by using warm water and dissolving as much borax as the solution will contain. When the solution is cold, strain it off to remove any undissolved particles and fill the condenser until the liquid is level with the top of the plates. A layer of oil may then be poured on to prevent evaporation and the condenser is ready for forming.

Forming is carried out by connecting the condenser to a battery for three minutes in one direction, after which the connections are reversed and the condenser is left on for a period of 24 to 48 hours until the current flowing through it is absolutely negligible. The forming voltage should be a little higher than the maximum voltage at which the condenser is to be used. The lower the forming voltage the higher the capacity.

A current of several amperes will flow during the first few minutes of the forming process, but this will subsequently drop away to a value of 40 or 50 milliamps only, falling away later to nearly nothing.

A condenser having six pairs of plates 3 in. square will give a capacity of the order of 2,500 microfarads.

WIRELESS MAGAZINE Reference Sheet — *No. 98*

Diatonic Scale

THE ordinary musical or diatonic scale is made up of a series of tones and semi-tones, the arrangement having been chosen as one which gives the simplest and most pleasing set of notes from a musical point of view. The scale is so arranged that every eighth note is the octave of the first note. This means that the note has exactly the same tone value, but its pitch is one stage higher.

We can pick out on the piano a series of notes, starting at the bottom and finishing towards the top, each one of which is essentially the same note, but is an octave higher or lower than its immediate neighbour. It is found that the frequency of a note and its octave are related by the ratio 2 to 1. Thus middle C on the piano is 256 cycles per second, and the C immediately above it corresponds to a vibration of 512 cycles per second.

The frequencies of the notes intermediate between one note and its octave always bear a similar relationship to each other. The frequencies of the notes between middle C and the upper C are given in the table below, and the relative frequency differences are also quoted.

The first, fourth, and sixth intervals are known as major tones. The second and fifth intervals are minor tones, and the third and seventh intervals are semi-tones. It will be seen from the figures given that major tones are connected by the ratio 8/9, minor tones 9/10, and semi-tones by the ratio to 15/16.

To enable similar scales to be played in any key the major and minor tones are divided into semi-tones, these being provided by black keys on the piano. The total number of semi-tones in an octave is twelve, these being so chosen that the ratio of the frequencies of one tone to the next tone is 1.059 approximately.

This gives what is known as a scale of equal temperament, but does not give the intervals quite correctly, except in the standard case of the middle C scale. It is for this reason that tunes played in different keys sound slightly different to the discriminating ear.

Note	C	D	E	F	G	A	B	C
Actual frequency ..	256	288	320	391.3	389	426.6	480	512
Relative frequency ..	24	27	30	32	36	40	45	48
Ratio	1	1.125	1.25	1.33	1.5	1.66	1.875	2

WIRELESS MAGAZINE Reference Sheet — *No. 99*

Detector Connections

FOUR types of detector connection are given in the diagram herewith.

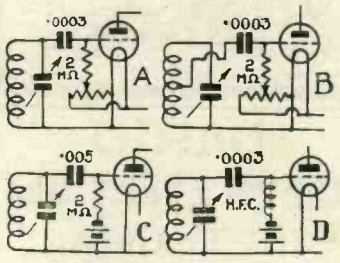
The first arrangement shows a cumulative-grid detector with the grid leak connected to a potentiometer across the filament. This is desirable in order to obtain the best operating condition for the detector valve. A small positive potential, usually of the order of 1 to 2 volts, is all that is necessary to provide the most efficient rectification. If more than this is provided the detector damping increases rapidly, making the circuit flatly tuned, while if reaction is applied round the detector, this is apt to be ploppy.

For 2-volt valves, a centre tap is usually satisfactory, and for 4- and 6-volt valves a ⅓ or ¼ tap respectively will probably be found best.

The second system shows a method of reducing the damping due to the detector valve upon the tuned circuit. This is done by connecting the detector across a portion of the tuned circuit only.

Diagram C shows an anode-bend arrangement using a blocking condenser and grid leak. This is useful in tuned-anode and similar circuits, but the blocking condenser must be at least .005 microfarad in order to obtain adequate rectification efficiency. If this condenser is made too small, a certain amount of cumulative grid action will take place and the arrangement will not work as satisfactorily as it should.

An alternative method is that shown in the fourth arrangement, where a small value of condenser is chosen, but a high-frequency choke is utilised in place of the grid leak. If this H.F. choke is of high quality, little loss in signal strength results from this connection and true anode-bend rectification will result.



Detector Connections

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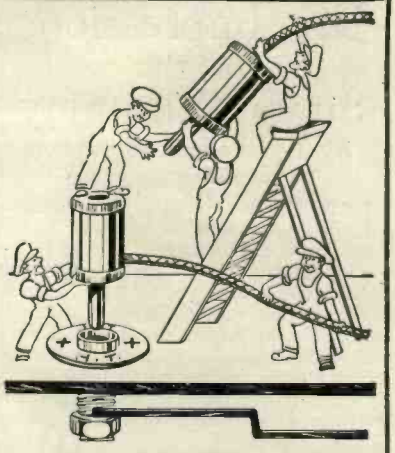
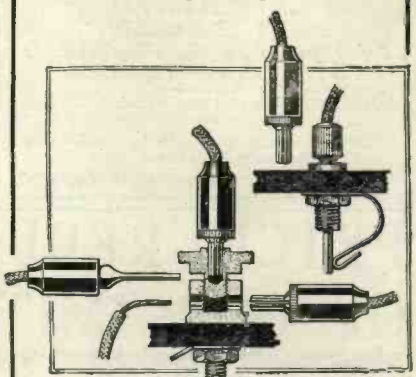


"Two Into One will go!"

All Eelex accessories have multiple uses, and above you see the Eelex gnomes of efficiency making two joints into a socket by means of Eelex plugs. It's surprising how the number of connections and wires can be reduced by using Eelex terminals, spades, plugs, pins and eyes, and how neat your set can be made to appear. Also the Eelex system of standardisation makes the possibility of a wrong or accidental connection practically impossible. All constructors should write for a copy of the new Eelex Booklet 31—which tells you about the Eelex gnomes of efficiency and describes all the Eelex Wireless accessories free on receipt of a post card.



The diagram above shows the use of a spring jack attached to a socket for use with 'phone or loud-speaker tag ends or plugs. Also the famous

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My Impressions of the Super Chummy

By J. Godchaux Abrahams

(*see also page* 504)

THE Super Chummy fully deserves its qualification of *super*, for it does all that I could do with my pet Chummy —and then some! Further, as it possesses the extra advantage of two screened-grid valves, it is possible to reach out to much greater distances, and, providing too high an amplification is not used in the last stage, by inserting a super-power instead of a pentode valve, you may listen on headphones.

Remarkably Selective

The receiver is remarkably sensitive and free from oscillation; complete control is obtained by a fine adjustment of the resistance across the anode coils, by which, with care, the volume can also be increased or reduced to suit your requirements. Actual tuning in to the various wavelengths is a simple matter if it be remembered that it is critical on all condensers. The selectivity of the circuit is such that you will experience no difficulty in side-tracking your local transmitter, however powerful it may be.

I append a log of transmissions (see page 506) captured on three separate evenings; October 31 was a particularly favourable night to allow of condenser readings being fully checked over, for on that night all German stations transmitted continuously, as well as Berne and Vienna, in their anxiety to give to their listeners news of the progress of the *Graf Zeppelin* on its return to Friedrichshafen.

With Triode Power Valves

With an ordinary super-power valve alone, the stations marked * were received at comfortable loud-speaker strength, others on these nights required a pentode or could be heard clearly on headphones. For loud-speaker reception they lacked punch with only one stage of L.F. amplification.

To achieve good results with the Super Chummy some little care must be used, but within half an hour or so of your working with this receiver you should acquire the necessary light touch on the tuning controls. From that moment you will realise that in this receiver you possess an instrument which allows you to reach out afar and to pick up transmissions hitherto unknown to you.

With the Super Chummy at your elbow you may roam over Europe to your heart's content.

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Can supply at once correct parts for the
"Furzehill Four" "Meteor Two"
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WRITE FOR OUR CATALOGUE
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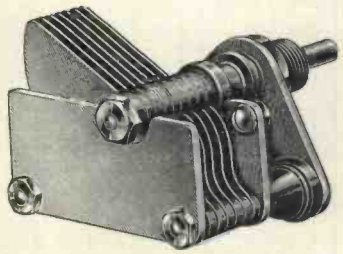
DARIO
KEEPS EVERY SET
"In Training"

See page 487

Index to Advertisers

PRICE REDUCTION FOLLOWS SUCCESS OF OUR "MITE" CONDENSER

THE demand for our specially-designed miniature components has proved considerably greater than was anticipated; consequently, we have been able to effect reductions in the prices of our "Mite" Condenser. In the construction of portable and small sets you can save valuable space by the use of this Condenser and our small Anti-Capacity Switch. Neither is a freak—the Condenser follows the lines of the standard "Utility" patterns, has marked low-loss features and a ball-bearing spindle.



The New Prices

Capacity .0005, With Dial, 7/6 Less Dial, 6/6 Vernier 10/-
„ .0003, „ „ 7/- „ „ 6/- „ 9/6
„ .0002, „ „ 6/6 „ „ 5/6 „ 9/-

Ask your local Wireless Dealer to show you these small lines. You will be interested, too, in our range of new Thumb-Controlled Condensers and Dials—they are all of first quality and fully guaranteed.

You will find our New List useful for reference. Write for a copy to-day. "Utility" Components are Made and Guaranteed by

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GUARANTEED
COMPONENTS

FULL-SIZE BLUEPRINTS FOR EVERY REQUIREMENT

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CRYSTAL SETS

All these 6d. each, post free.

For the R.C. Enthusiast	WM13
Two-programme Set	WM25
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Alternative-programme Set	AW 39
Super Set	AW 64
Tapped-coil Set	AW 95
"Best-yet" Set	AW114

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★Special One	WM116
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Economy One	AW 71
Loud-speaker Special	AW 78
Ultra-sensitive Hartley One	AW103
Fan's Short-wave One	AW119
Super Reinartz One	AW127
Beginners' One-valver	AW140

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British Broadcast 2 (D, Trans)	WM44
Two-programme 2 (D, Trans)	WM56
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Crusader (D, Trans)	WM69
Flat-dweller's 2 (HF, D)	WM76
Two-Daventry Two (D, Trans)	WM97
Tetrode Short-wave Two (SG, D)	WM99
Key-to-the-Ether Two (D, Pentode)	WM107
★Meteor Two (D, Trans.)	WM114
Wide-world Short-wave (D, Trans)	AW 11
Reinartz 2 (D, Trans)	AW 21
Empire Short-wave	AW 28
Next Step 2 (D, Trans)	AW 34
Centre-tap 2 (D, Trans)	AW 42
Three-option 2 (D, Trans)	AW 51
Rover 2 (HF, D)	AW 53
General-purpose 2 (D, Trans)	AW 55
All-wave (D, Choke)	AW 57
Yule (D, Trans)	AW 59
30/- 2 (D, Trans)	AW 61
Economical 2 (D, RC)	AW 66
Britain's Favourite (D, Trans) *Price 4d., with copy of "A.W."*	AW 74
Home-and-Abroad 2 (D, Trans)	AW 77
Two-wave (D, Trans)	AW 83
Ultra-selective Hartley (D, Trans)	AW 90
Oceanic Short-wave (D, Trans)	AW 91
Trapped Reinartz (D, Trans)	AW 92
"Q" 2 (D, Trans)	AW 99
Long Distance Two (HF, D)	AW110
Three-waveband Two (D, Trans)	AW112
DX Headphone Two (HF, D)	AW133
Ace of Twos (D, Pentode)	AW143
Home Two (D, Trans)	AW146
Chapman-Reinartz Two (D, Trans—4d. with copy of "A.W.")	AW148

THREE-VALVE SETS

All these 1s. each, post free.

Five-guinea 3 (HF, D, Trans)	WM29
Mains Three-valver (D, 2LF)	WM34
Tuned-anode from the Mains (HF, D, LF)	WM43
Metropolitan (D, 2 LF)	WM48
Everyday (D, 2 Trans)	WM52
Music Charmer (D, RC, Trans)	WM60
Britannia (D, RC, Trans)	WM67
Pole-to-Pole Short-waver (D, RC, Trans)	WM89
Glee-singer Three (D, 2 RC)	WM92
Aladdin Three (HF, D, LF)	WM95
Inceptor Three (SG, D, Pentode) *Price 1s. 3d. with copy of "W.M."*	WM105
All-wave Screened-grid Three (HF, D, Pentode)	WM110
★Gramophone Three (D, 2RC)	WM115
Split-primary (HF, D, Trans)	AW 24
Modern Tuned-anode (HF, D, Trans)	AW 35
Tetrode 3 (HF, D, Trans)	AW 36
Alternative-programme 3 (D, 2 Trans)	AW 38
All-from-the-Mains (D, 2LF)	AW 41
Special (D, 2LF)	AW 44
Economy 3 (D, 2RC)	AW 48
Short-wave (D, RC, Trans)	AW 50
Ether-searcher (D, RC, Trans)	AW 52
Standard (D, 2 Trans)	AW 56
Hartley DX (D, RC, Trans)	AW 63
Britain's Favourite (D, RC, Trans) *Price 4d., with copy of "A.W."*	AW 72
Broadcast 3 (D, RC, Trans)	AW 76
Selectus 3 (HF, D, Trans)	AW 81
Q-coil 3 (D, RC, Trans)	AW 84
Clarion 3 (D, 2 Trans)	AW 88
Miniature Hartley Three	AW101
Summer-time DX Three (HF, D, Trans)	AW106
Three-valve Mains Receiver (HF, D, Trans)	AW109
British Station Three (HF, D, Trans)	AW122
Optional Two-three (D, 2LF)	AW124
"Simpler Wireless" Mains Three (D, 2LF)	AW126
Simplicity Screen-grid Three (HF, D, Trans)	AW132
"Proms" Three (D, 2 RC)	AW137
Adaptable Three (D, 2 Trans)	AW139
New-style Baffle Three (D, RC, Push-pull—Price 1/6)	AW141
All-wave Mains Three (HF, D, Trans, Rectifier—Price 1/6)	AW144
All-purpose Short-wave Three (D, RC Trans)	AW147
Screen-grid Q-Coil Three (HF, D, Trans)	AW150
New-style Mains Three (HF, D, Trans—Price 1/6)	AW151

FOUR-VALVE SETS

All these 1s. 6d. each, post free.

Revelation (HF, D, RC, Trans)	WM24
Simplicity (HF, D, 2 Trans)	WM49
Astral (HF, D, 2 RC)	WM53
Trapped 3–4 (D, 2RC Paralleled)	WM61
Gramo-Radio 4 (D, RC, 2 Trans Push-pull)	WM70
Q-coil 4 (HF, D, Trans, RC)	WM71
Screened grid 4 (HF, D, 2RC)	WM77
Five-pounder Four (HF, D, RC, Trans)	WM91
Frame-aerial Four (HF, D, 2RC)	WM85
Symphonic Four (HF, D, 2LF)	WM98
Touchstone (HF, D, RC, Trans)	WM109
★Reyner's Furzehill Four (SG, D, 2 Trans)	WM112
★Economy Screen-grid Four (SG, D, RC, Trans)	WM113
All-purpose 4 (HF, D, RC, Trans)	AW 43
Tuned-anode 3–4 (HF, D, 2 Trans)	AW 49
Special 4 (HF, D, 2LF)	AW 70
"Q" 4 (HF, D, RC)	AW 98
Near and Far Three-Four (HF, D, RC, Trans)	AW113
Pick-up Three-four (D, 2 Dual-imp.)	AW118
Explorer Four (HF, D, RC, Trans)	AW120
Summertime Searcher (2HF, D, Trans)	AW128
Overseas Shortwaver (HF, D, 2 Trans)	AW134
Ranger Four (SG, D, RC, Trans)	AW145
Facility Four (HF, D, 2 RC—Q-coil)	AW154

FIVE-VALVE SETS

All these 1s. 6d. each, post free.

Exhibition 5 (2HF, D, RC, Trans)	WM33
Phoenix (2HF, D, 2LF)	WM42
1928 Five (2HF, D, 2 Trans)	WM46
All-the-world 5 (2HF, D, 2RC)	WM63
Cataract 5 (HF, D, RC, Push-pull)	WM79
Empire Five (2SG, D, RC, Trans)	WM96
Individual 5 (2HF, D, 2 Trans)	AW 25
School 5 (HF, D 2RC)	AW 85

SIX-VALVE SETS

1s. 6d. each, post free.

Nomad (2HF, D, RC, Push-Pull Trans)	WM31
Connoisseur's Six (2HF, D, RC, Push-pull)	WM88
Eagle Six (3HF, D, RC, Trans)	WM106
Short-wave Super-6 (Super-het, Trans)	AW 67
Adaptor for above (see miscellaneous list)	AW67a

SEVEN-VALVE SETS

1s. 6d., post free.

Simpladyne (Super-het)	WM22

PORTABLE SETS

		Price	Post Free
Springtime 2 (D, Trans)	WM12	1/-	
Countryside 4 (HF, D, 2 Trans)	WM17	1/6	
Handy 3 (D, 2 Trans)	WM27	1/-	
Chummy 4 (HF, D, RC, Trans)	WM80	1/6	
Chummy 4 (with modification for LS and H.T)	WM80a	1/6	
Pilgrim Portable (D, Trans)	WM94	1/6	
Holiday 3 (D, 2 Trans)	AW 32	1/-	
Table Grand 4 (HF, D, 2RC)	AW 93	1/6	
Attaché Portable 2 (HF, D)	AW 96	1/-	
Companion 5 (2HF, D, RC, Trans)	AW 100	1/6	
Daventry Portable (D, Trans)	AW 105	1/-	
Daventry Loud-speaker Portable (2HF, D, RC, Trans)	AW 107	1/6	
Town and Country (HF, D, RC, Trans)	AW 111	1/6	
House and Garden (screened-grid HF, D, RC, Trans)	AW 116	1/6	
Hand Portable (D)	AW 125	1/-	
"Best-yet" Portable (SG, D, 2 Trans)	AW136	1/6	

AMPLIFIERS

All these 1s. each, post free

Two-valve D.C. Mains Amplifier	WM16
Range Extender (HF Unit)	WM38
True-tone Amplifier (3 valves)	WM47
Gramo-radio Amplifier (2 v.)	WM72
Super-power Unit (2v.)	WM103
One-valve DX Unit	AW 37
Utility (RC, Trans)	AW 68
Screened-grid HF Unit	AW 75
One-valve LF Unit	AW 79
Add-on HF Unit	AW 82
Super-power Push-pull	AW 86
Hook on Short-waver	AW104
Purity Amplifier	AW108
Add-on Distance-getter	AW117
Add-on 3	AW121
Screened-grid HF. 1	AW129
Screened-grid HF Amplifier	AW138

MISCELLANEOUS

		Price	Post Free
A.C. Mains Eliminator	WM141	1/-	
Cone Loud-speaker	WM55	1/-	
A.C. Adapter for "Simpler Wireless" Sets	WM57	1/-	
Moving-coil Loud-speaker	WM58	1/-	
D.C. Mains Eliminator	WM59	1/-	
Wavetrap	WM64	1/-	
Portable Cone Loud-speaker	WM73	1/-	
Permanent-magnet Moving-coil Loud-speaker	WM75	1/-	
"Junior" Moving-coil Loud-speaker	WM81	1/-	
Universal Short-wave Adapter	WM82	1/-	
Linen-diaphragm Loud-speaker	WM90	1/-	
Valveless A.C. Power Unit for L.T	WM100	-/6	
Valveless A.C. Power Unit for H.T	WM101	- 6	
Heterodyne Wavemeter	AW 7	1/-	
Rectifying Unit for "Simpler Wireless" Sets	AW 62	1/-	
Adapter for Short-wave Super 6	AW 67a	-/6	
H.T. from A.C. Mains	AW 73	1/-	
"AW" Moving-coil Loud-speaker	AW 97	1/-	
H.T. Eliminator for A.C. (200 v. output)	AW 102	1/-	
L.T. and H.T. Mains Unit (DC)	AW 123	1/-	
Anti-motor-boating Unit	AW 130	1/-	
Knife-edge Wavetrap	AW 131	-/6	
All-metal Eliminator for H.T.	AW 135	1/-	
Duplex-diaphragm Loud-speaker	AW 142	1/-	
Power-plus Loud-speaker	AW149	1/-	
Linen-diaphragm Loud-speaker with Baffle	AW152	1/-	
Universal Output Unit	AW153	1/-	

A blueprint of any one set described in the current issue of the "Wireless Magazine" can be obtained for half-price up to the date indicated on the coupon (which is always to be found on page iii of the cover) if this is sent when application is made. These blueprints are marked with an asterisk (★) in the above list and are printed in bold type. An extension of time will be made in the case of overseas readers.

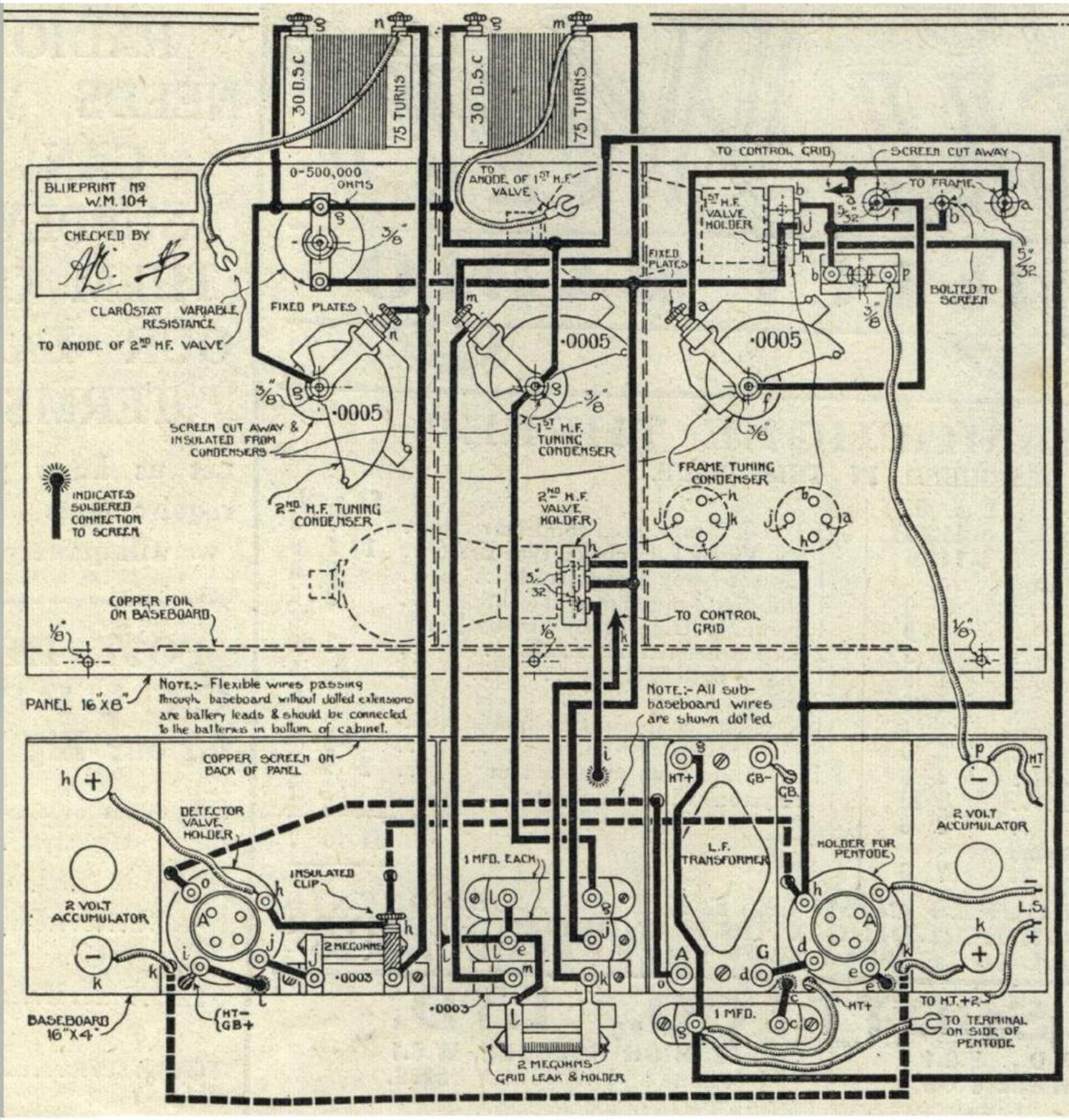
Send, preferably, a postal order (stamps over sixpence in value unacceptable) to

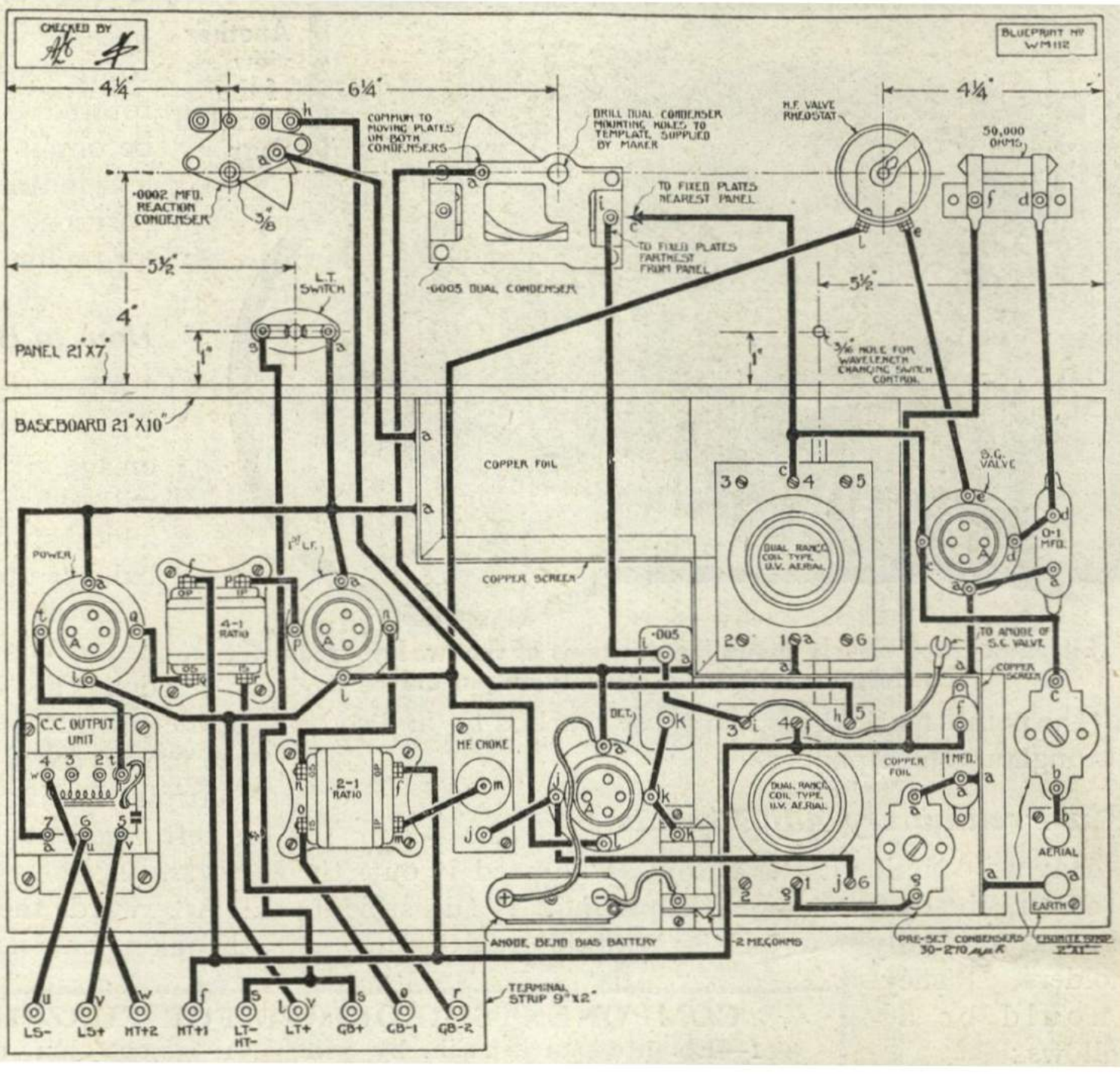
Wireless Magazine

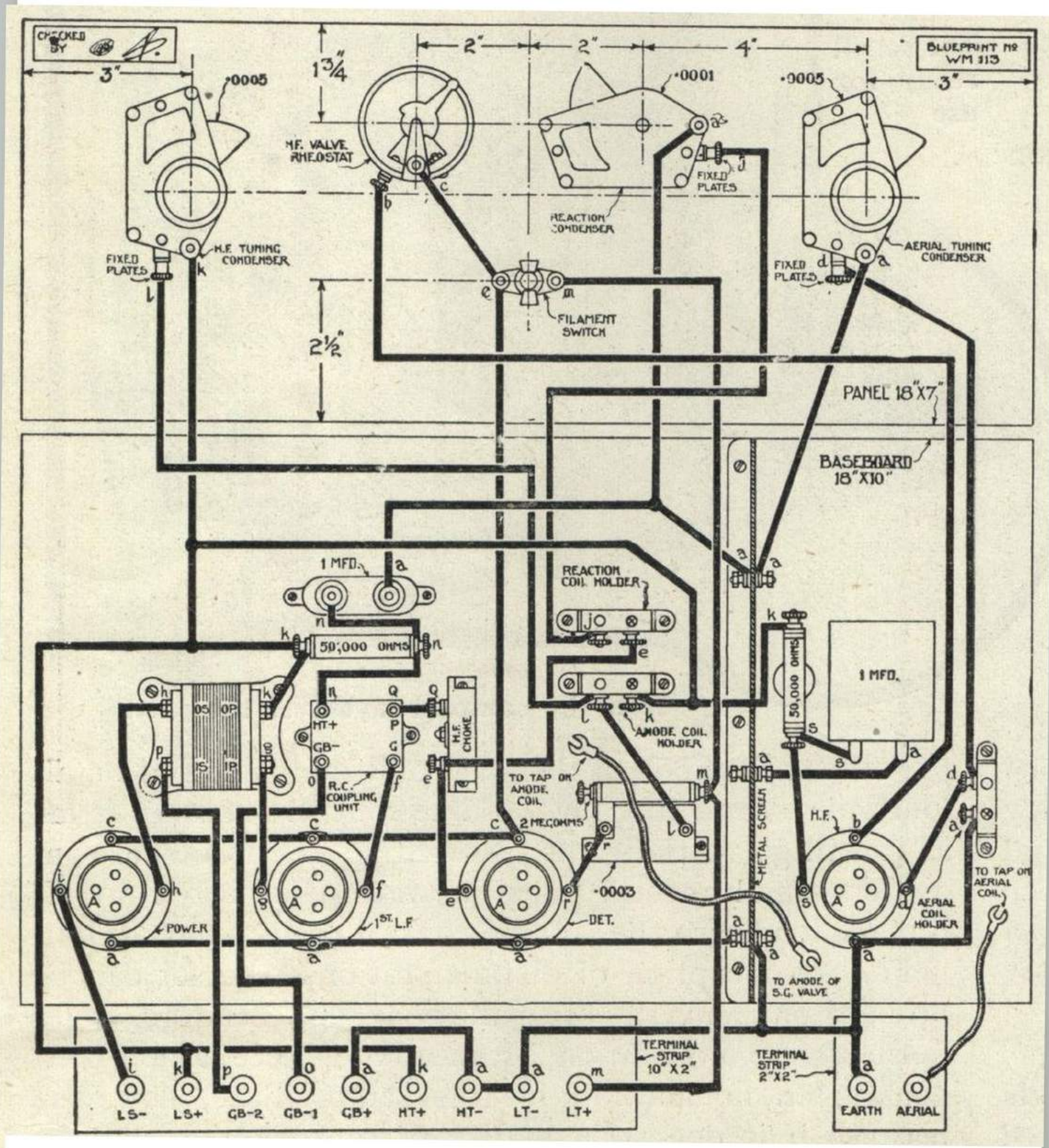
Blueprint Dept., 58/61 Fetter Lane - E.C.4

Half-price **BLUEPRINT** Coupon Valid until December 31. 1928
FOR ANY ONE SET CONSTRUCTIONALLY DESCRIBED IN THIS ISSUE.

Fee of 1s. **INFORMATION** Coupon Valid until December 31, 1928
NOT MORE THAN TWO QUESTIONS TO BE ASKED AT A TIME


30 D.S.C
75 TURNS
30 D.S.C
75 TURNS
BLUEPRINT Nº W.M. 104
CHECKED BY
0-500,000 OHMS
CLAROSTAT VARIABLE RESISTANCE
TO ANODE OF 2ND H.F. VALVE
FIXED PLATES
·0005
SCREEN CUT AWAY & INSULATED FROM CONDENSERS
2ND H.F. TUNING CONDENSER
INDICATES SOLDERED CONNECTION TO SCREEN
COPPER FOIL ON BASEBOARD
PANEL 16"X8"
TO ANODE OF 1ST H.F. VALVE
1ST H.F. TUNING CONDENSER
2ND H.F. VALVE HOLDER
TO CONTROL GRID
TO CONTROL GRID
SCREEN CUT AWAY
TO FRAME
1ST H.F. VALVE HOLDER
FIXED PLATES
BOLTED TO SCREEN
FRAME TUNING CONDENSER
NOTE:- Flexible wires passing through baseboard without dotted extensions are battery leads & should be connected to the batteries in bottom of cabinet.
NOTE:- All sub-baseboard wires are shown dotted
COPPER SCREEN ON BACK OF PANEL
DETECTOR VALVE HOLDER
INSULATED CLIP
2 MEGOHMS
·0003
2 VOLT ACCUMULATOR
BASEBOARD 16"X4"
HT- GB+
1 MFD. EACH
·0003
2 MEGOHMS GRID LEAK & HOLDER
L.F. TRANSFORMER
HT+
GB-
GB.
HOLDER FOR PENTODE
1 MFD.
HT+
2 VOLT ACCUMULATOR
L.S.
TO H.T.+2
TO TERMINAL ON SIDE OF PENTODE
HT-


CHECKED BY
BLUEPRINT NO WM112
4¼"
6¼"
4¼"
COMMON TO MOVING PLATES ON BOTH CONDENSERS
DRILL DUAL CONDENSER MOUNTING HOLES TO TEMPLATE SUPPLIED BY MAKER
H.F. VALVE RHEOSTAT
50,000 OHMS
·0002 MFD. REACTION CONDENSER
3/8"
TO FIXED PLATES NEAREST PANEL
TO FIXED PLATES FARTHEST FROM PANEL
·0005 DUAL CONDENSER
5½"
5½"
L.T. SWITCH
4"
PANEL 21"X7"
1"
1"
3/16" HOLE FOR WAVELENGTH CHANGING SWITCH CONTROL
BASEBOARD 21"X10"
COPPER FOIL
S.G. VALVE
DUAL RANGE COIL TYPE U.V. AERIAL
0·1 MFD.
POWER
L.F.
4-1 RATIO
COPPER SCREEN
·005
TO ANODE OF S.G. VALVE
C.C. OUTPUT UNIT
2-1 RATIO
H.F. CHOKE
DET.
DUAL RANGE COIL TYPE U.V. AERIAL
COPPER FOIL
1 MFD.
AERIAL
EARTH
ANODE BEND BIAS BATTERY
2 MEGOHMS
PRE-SET CONDENSERS 30-270 μμF
TERMINAL STRIP 9"X2"
LS-
LS+
HT+2
HT+1
LT- HT-
LT+
GB+
GB-1
GB-2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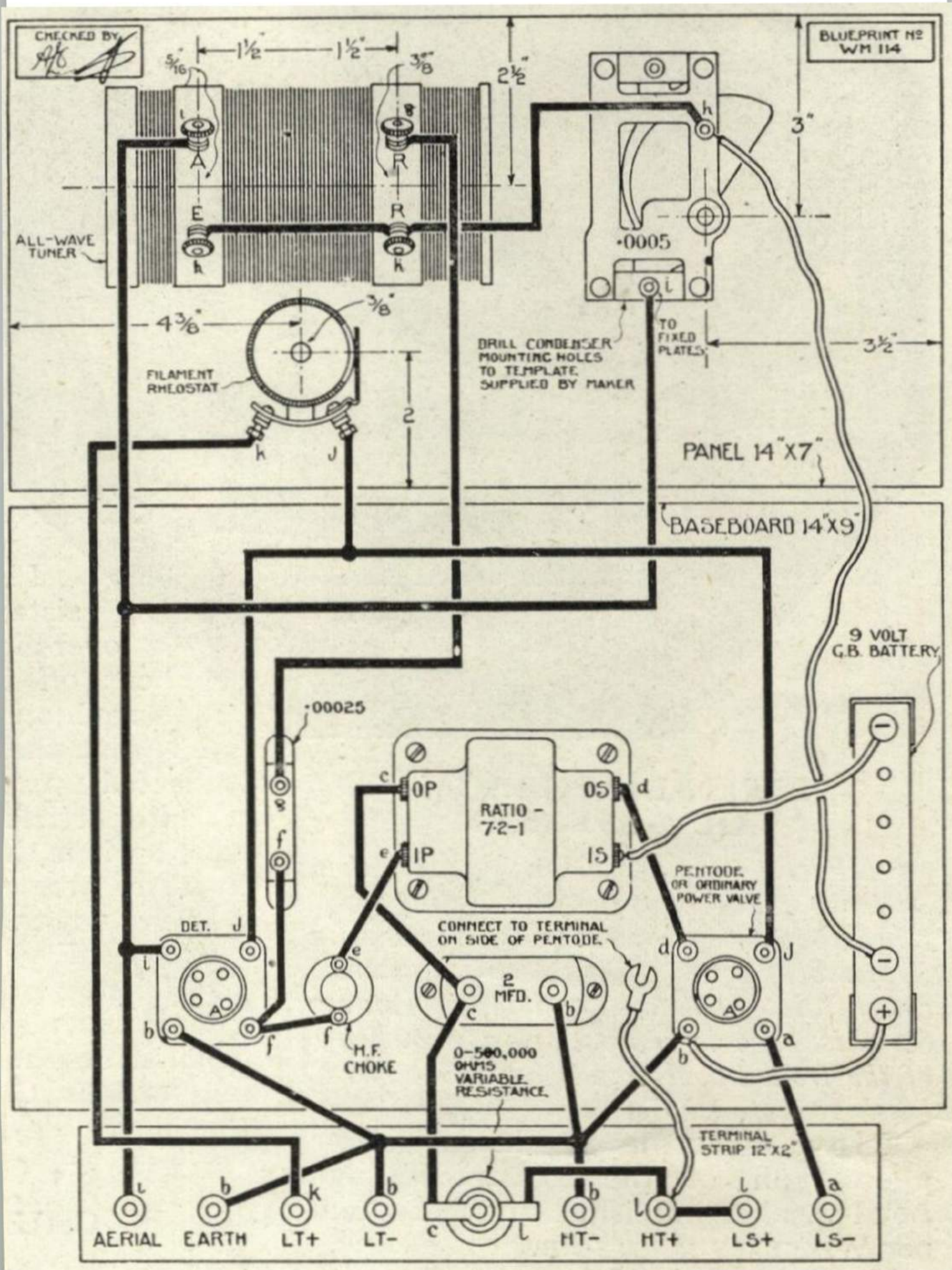
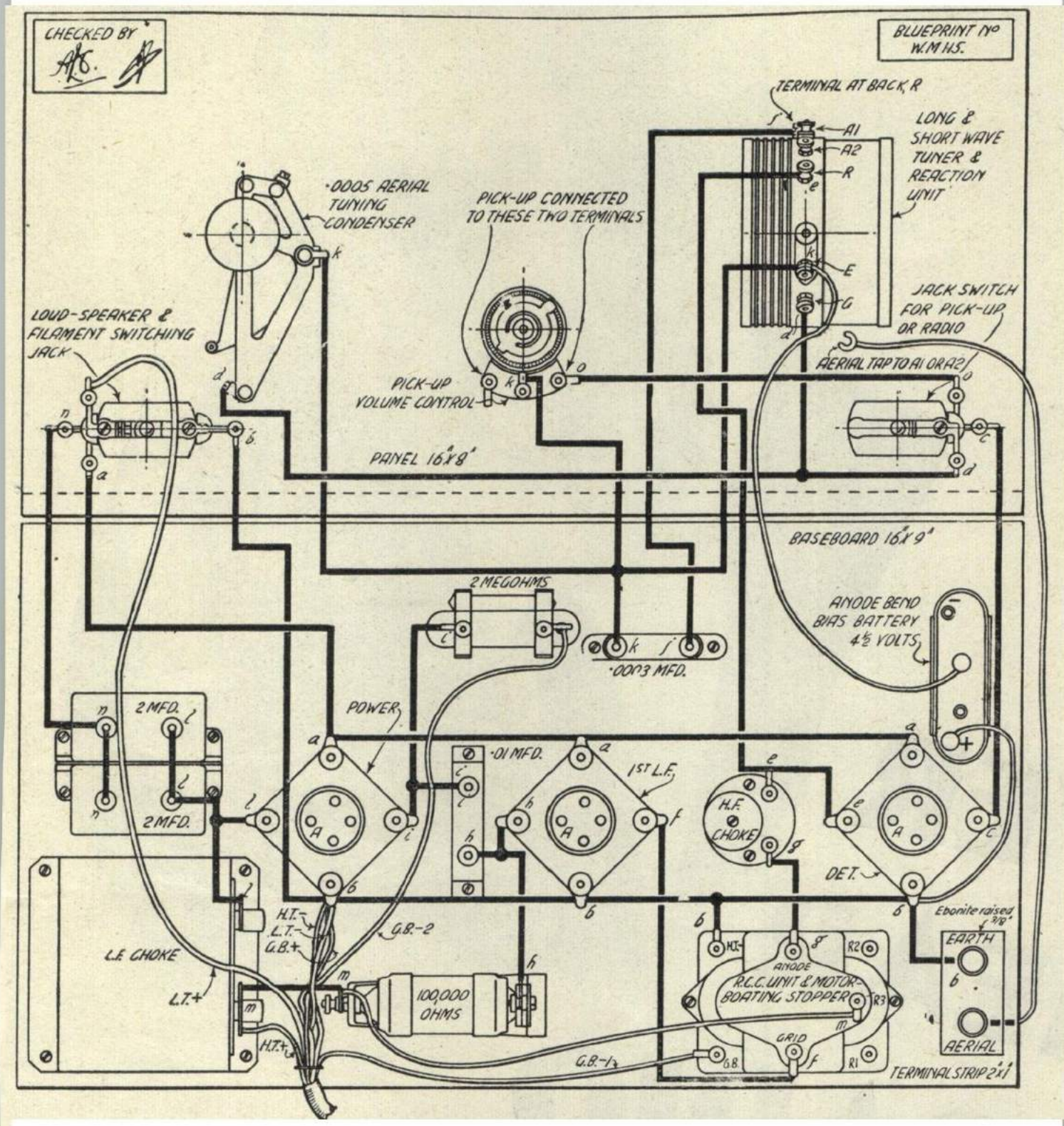
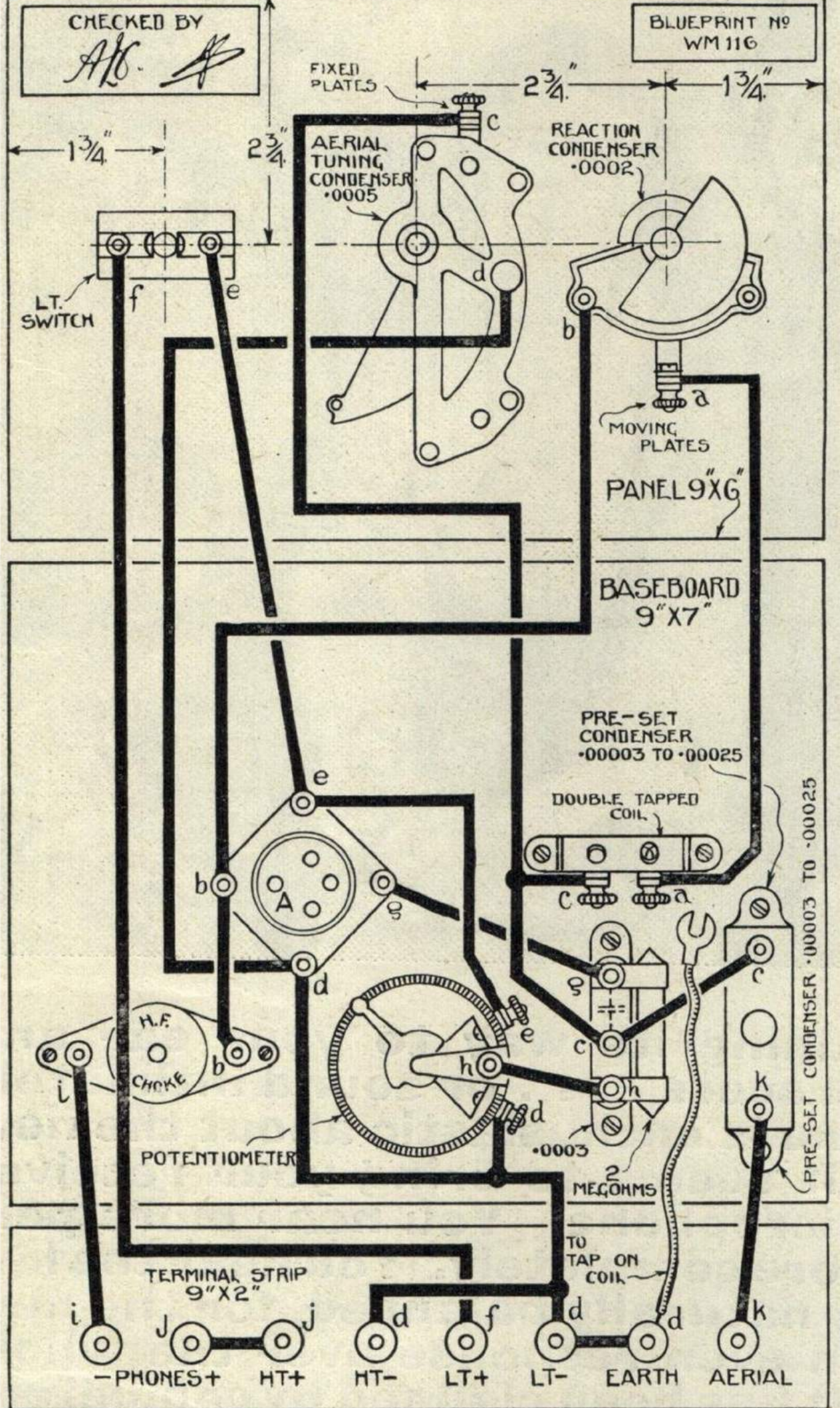
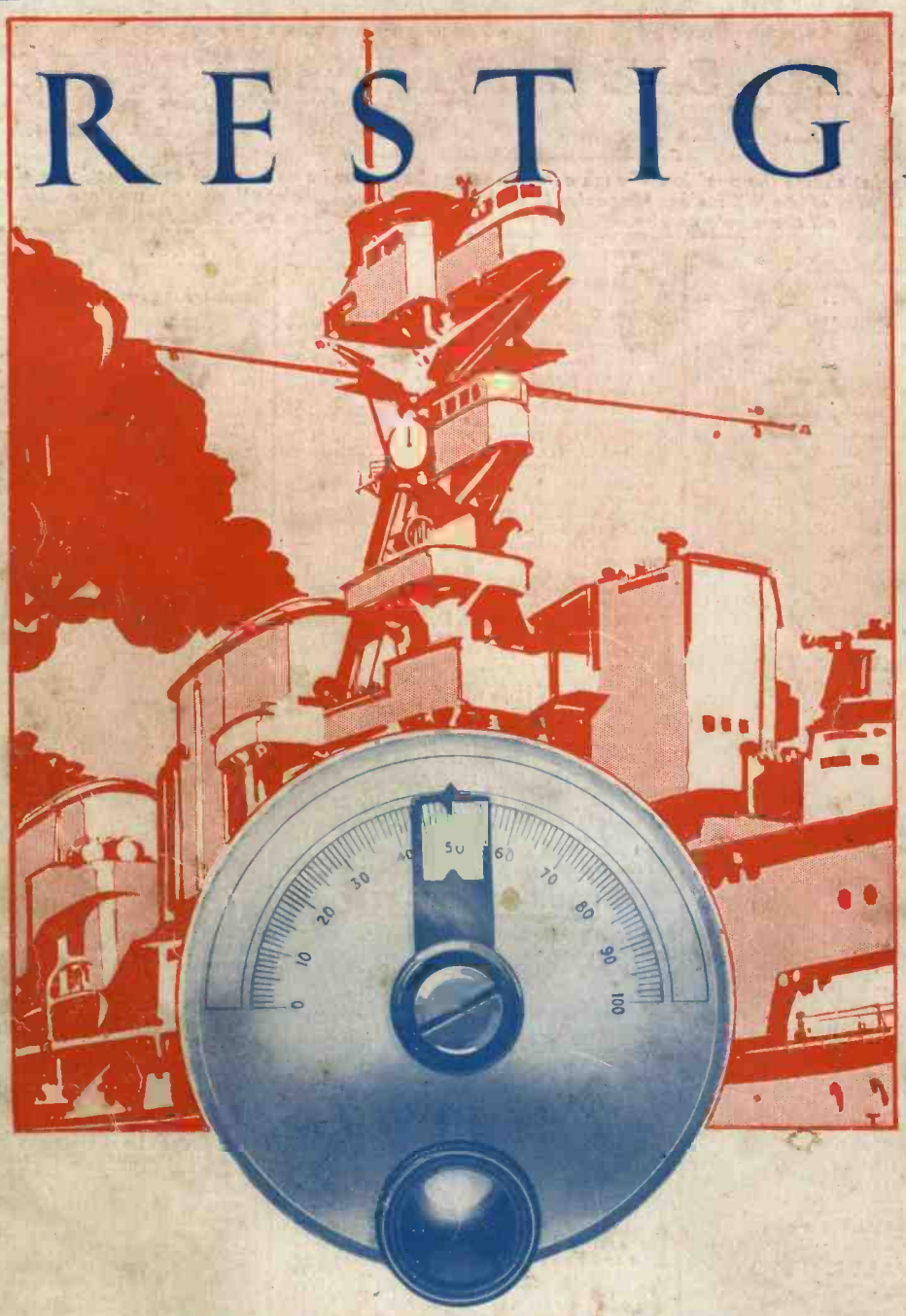
BLUEPRINT NO WM 313
3"
·0005
1¾"
2"
2"
4"
·0001
·0005
3"
M.F. VALVE RHEOSTAT
FIXED PLATES
REACTION CONDENSER
FIXED PLATES
H.F. TUNING CONDENSER
FIXED PLATES
AERIAL TUNING CONDENSER
FILAMENT SWITCH
2½"
PANEL 18"X7"
BASEBOARD 18"X10"
1 MFD.
50,000 OHMS
REACTION COIL HOLDER
50,000 OHMS
1 MFD.
AMODE COIL HOLDER
TO TAP ON AMODE COIL
2 MEGOHMS
H.F. CHOKE
R.C. COUPLING UNIT
METAL SCREEN
H.F.
TO TAP ON AERIAL COIL
AERIAL COIL HOLDER
·0003
POWER
1ST. L.F.
DET.
TO ANODE OF S.G. VALVE
TERMINAL STRIP 10"X2"
TERMINAL STRIP 2"X2"
LS-
LS+
GB-2
GB-1
GB+
HT+
HT-
LT-
LT+
EARTH
AERIAL


CHECKED BY
BLUEPRINT Nº WM 114
1½"
1½"
2½"
3"
5/16"
3/8"
ALL-WAVE TUNER
A
E
R
R
h
h
·0005
h
l
3"
4 3/8"
3/8"
FILAMENT RHEOSTAT
2
h
J
DRILL CONDENSER MOUNTING HOLES TO TEMPLATE SUPPLIED BY MAKER
TO FIXED PLATES
3½"
PANEL 14"X7"
BASEBOARD 14"X9"
9 VOLT G.B. BATTERY
·00025
g
f
c
OP
RATIO - 7·2·1
OS
d
e
IP
IS
PENTODE OR ORDINARY POWER VALVE
DET.
J
CONNECT TO TERMINAL ON SIDE OF PENTODE.
d
J
l
e
2 MFD.
c
b
b
f
f
H.F. CHOKE
0-500,000 OHMS VARIABLE RESISTANCE
a
b
TERMINAL STRIP 12"X2"
l
b
k
b
c
l
b
l
l
a
AERIAL
EARTH
LT+
LT-
HT-
HT+
LS+
LS-


CHECKED BY
BLUEPRINT No
W.M H.S.
TERMINAL AT BACK, R
A1
A2
R
E
G
LONG & SHORT WAVE TUNER & REACTION UNIT
·0005 AERIAL TUNING CONDENSER
PICK-UP CONNECTED TO THESE TWO TERMINALS
JACK SWITCH FOR PICK-UP OR RADIO
LOUD-SPEAKER & FILAMENT SWITCHING JACK
AERIAL TAP TO A1 OR A2
PICK-UP VOLUME CONTROL
PANEL 16"X8"
BASEBOARD 16"X9"
2 MEGOHMS
·0003 MFD.
ANODE BEND BIAS BATTERY 4½ VOLTS
2 MFD.
2 MFD.
POWER
·01 MFD.
1ST L.F.
H.F. CHOKE
DET.
L.F. CHOKE
H.T.-
L.T.-
G.B.+
G.B.-2
L.T.+
H.T.+
100,000 OHMS
G.B.-1½
ANODE
R.C.C. UNIT & MOTOR-BOATING STOPPER
GRID
G.B.
R1
R2
R3
Ebonite raised ⅛"
EARTH
AERIAL
TERMINAL STRIP 2"x1"


CHECKED BY
BLUEPRINT Nº WM 116
FIXED PLATES
2¾"
1¾"
1¾"
2¾"
AERIAL TUNING CONDENSER ·0005
REACTION CONDENSER ·0002
LT. SWITCH
MOVING PLATES
PANEL 9"X6"
BASEBOARD 9"X7"
PRE-SET CONDENSER ·00003 TO ·00025
DOUBLE TAPPED COIL
H.F. CHOKE
POTENTIOMETER
·0003
2 MEGOHMS
PRE-SET CONDENSER ·00003 TO ·00025
TO TAP ON COIL
TERMINAL STRIP 9"X2"
-PHONES+
HT+
HT-
LT+
LT-
EARTH
AERIAL

PRESTIGE



No name carries higher prestige in Radio than J.B. The name is famous throughout the world for Precision Instruments of the highest quality, and in every circuit of merit designed, one or more of these J.B. Masterpieces will be found.

The illustration shows the new J.B. Vernier Dial price 5/6, a veritable triumph in engineering skill.

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