

SEE LOUD-SPEAKER SUPPLEMENT *for*

*Choosing, Using
and Building*

132 PAGES

Wireless Magazine

*The Complete
Practical Story
of the Loud-speaker*

NO 75 APRIL, 1931

IN

SIXTEEN
WELL-ILLUSTRATED
PAGES



*Constructor
Points on the*

JAMES
SUPER
— 60 —

*The Sixty-station
Receiver for £12
That Has Set A
New Fashion*

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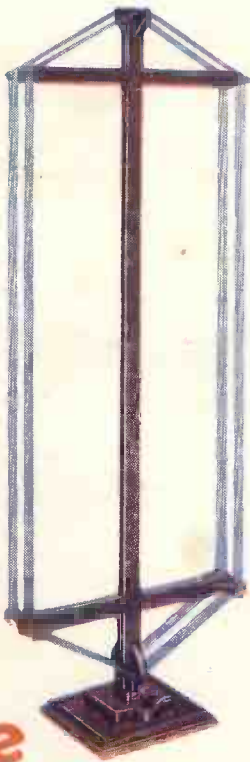


**and the world
laughs with you!**

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Editor:

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

Wireless Magazine

The Best Shitinsworth in Radio

Vol. XIII :: APRIL, 1931 :: No. 75

CONTENTS

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SPECIAL SUPPLEMENT

(After page 288)

Loud-speakers: Choosing, Using and Building

CHOOSING A GOOD LOUD-SPEAKER	Page Two
HOW THE MOVING COIL WORKS	Page Three
MAKING A LINEN LOUD-SPEAKER	Page Four
OUTPUT VALVES AND YOUR POWER NEEDS	Page Seven
A SIMPLE LOUD-SPEAKER TONE CONTROL	Page Eight
IS YOUR OUTPUT CIRCUIT RIGHT?	Page Ten
ABOUT THE INDUCTOR LOUD-SPEAKER	Page Eleven
NOTES ON LOUD-SPEAKER CHASSIS	Page Twelve
THINGS TO KNOW ABOUT UNITS	Page Fourteen

GENERAL ARTICLES

BROADCAST IDENTIFICATION SHEETS. By Jay Coote	234
WAVELENGTHS OF THE WORLD'S BROADCASTERS	238
IN TUNE WITH THE TRADE. By Fetter Lane	242
IS THERE NEED FOR A NEW TYPE OF RADIO SOCIETY? By Bernard E. Jones	247
THE WIRELESS ELECTION. Verse	259
MR. SPEAKER. Verse	268
RADIO HELPS THE SICK	283
ARE YOU A LISTENER OR A KNOB-TWISTER? By Whitaker-Wilson	284
RADIO MEDLEY. By BM/PRESS	289
THE LEAKY GRID	296
THE MONTH'S BROADCAST MUSIC	297
LISTENERS' FORUM: LETTERS TO THE EDITOR	304
UNDER MY AERIAL. Halyard's Chat on the Month's Topics	308
ACTIVITIES AT SAVOY HILL. By Our Special Commissioner	314
A LISTENER'S LOG. By Jay Coote	318
AROUND AND ABOUT	330
DANISH RADIO	332
LOUD-SPEAKER LIMERICKS	334
INTERVAL SIGNALS	336
BLUEPRINT AND QUERY COUPONS	336
INDEX TO ADVERTISERS	336

FOR THE CONSTRUCTOR

THE SUPER 60: PRACTICAL POINTS DISCUSSED BY W. JAMES	248
—POINTS THAT ARE ASKED ABOUT THE SUPER 60	254

—BUILDING THE SUPER 60 WITH ALTERNATIVE PARTS	PAGE 256
—REPORTS ON THE SUPER 60	322
THE BROOKMAN'S THREE-PLUS-ONE	269
—INDEPENDENT TEST REPORT	273
THE PLUG-IN COIL THREE	292
MAKING THE BINOWAVE COILS	306

TECHNICAL FEATURES

VALVES TO USE IN YOUR SET	228
WHAT IS REACTION? By J. H. Reyner, B.Sc., A.M.I.E.E.	257
WE TEST THOSE SETS: INTRODUCTION—	260
PHILIPS RADIOPLAYER	261
MC MICHAEL MAINS THREE	262
AMPLION TWO-VALVE A.C. SET	263
GECOPHONE ALL-ELECTRIC FOUR	264
MARCONIPHONE MODELS 220 AND 221	265
LOW-FREQUENCY CIRCUITS. By W. James	266
RADIO IN REVIEW. By Morton Barr	274
THOSE RESISTANCES	285
LOOKING AFTER YOUR BATTERIES. By J. H. Reyner, B.Sc., A.M.I.E.E.	286
POWER NOISES THAT SPOIL RECEPTION. By Alan Hunter	300
WHAT READERS ARE DOING WITH "W.M." SETS	302
TESTS OF NEW APPARATUS	326

GRAMO-RADIO SECTION

TWO-DISC CLASSICS	275
HOSPITAL GRAMOPHONES	275
RECORDS IN THE MAKING	276
FADING IN AND OUT	277
CHOOSING YOUR RECORDS. By Whitaker-Wilson	278
B.C. SYMPHONY CONCERTS	281
A COMBINATION AND ALTERATION	282
AVERAGE PICK-UP OUTPUTS	282

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THE EDITOR'S CHAT

ON page 284, Whitaker-Wilson gives a humorous setting to his question "Are You a Listener or a Knob-twister?" but he frames his reply in all seriousness and, of course, from the standpoint of a musician; nine out of ten readers may not agree with him and, if I am not mistaken, his article will occasion a heavy correspondence, in the course of which Whitaker-Wilson will get some hard knocks.

Still another supplement this month, you will notice, and a first-rate one, too. It presents the salient points in choosing and using loud-speakers in easily digestible form, contains very many interesting and practical notes, and contains two constructional articles, "Making a Linen Loud-speaker with a Single Diaphragm" and "A Simple Loud-speaker Tone Control."

These special supplements have attained great popularity, and although I had intended dispensing with them some two or three months ago, the pressure of readers' opinion has not allowed me to do so. Next month the radio-gramophone enthusiast will find a supplement that will delight his heart, for within the limits of sixteen closely printed pages I propose to tell him everything that in a practical way he will need to know.

A feature of the present issue is the further attention devoted to the James Super 60—the greatest WIRELESS MAGAZINE constructional success yet. A "big" set—big in what it will do; rather big in number of valves—but not big in size; not big in cost, and not big in current consumption. The set for the discerning. An absolutely up-to-date set which will do more than any constructor set ever introduced by any wireless periodical in this country. That is some claim, but it is easy enough to substantiate it.

This month its designer, W. James, attends to a number of practical points and answers certain questions which a few readers have thought it wise to put to him before starting to build; in addition, we are already able to give readers' reports on the set. You won't forget how the name of this set is derived: "Super" because it is a super-het of the up-to-date non-troublesome variety and also because it gives super results, and "60" because it gets at least sixty stations, and gets them well.

Another interesting set in this issue carries the rather curious title of Brookman's Three-plus-one. The success of the Brookman's Three will be remembered by every reader. This present set is the old Brookman's Three plus one valve; in other words, it has a screen-grid stage, leaky-grid detector and resistance-coupled L.F. valve, plus a transformer-coupled power valve to give better loud-speaker volume, the result being a four-valver of straightforward layout and with only one wave-change switch. We publish an independent test report on the set.

Our Technical Editor, J. H. Reyner, provides new light on an old subject when he asks and answers the question "What is Reaction?" and has some wise words to say on the choice of a reaction condenser. Another article this month from his pen is "Looking After Your Batteries," in which he explains how to get better service and better reproduction with an ordinary battery-operated receiver.

The type of article of which I find the experimenter is very fond is represented this month by a contribution by W. James, describing the latest low-frequency circuits and providing material for first-rate experimenting.

We test this month five sets "before you buy." Our test reports are independent and illuminating, and I fail to see how any reader proposing to buy a set can afford to ignore them. We test and he should read before he buys. This month we deal with two A.C. threes, an A.C. two-valver, an all-electric four, and both A.C. and battery-operated models of a two-valver.

We have been happy during the last few weeks in hearing from a still greater number of readers who needed our help on one point or another. May we again express the pleasure it gives us to receive letters from readers and at having an opportunity of serving them in any way within our province. More and more readers are taking advantage of the half-price blueprint service, the advantages of which service I once again wish to impress upon all constructors.

THE EDITOR

Used with the NEW JAMES "SUPER 60"

(See article in
this issue)



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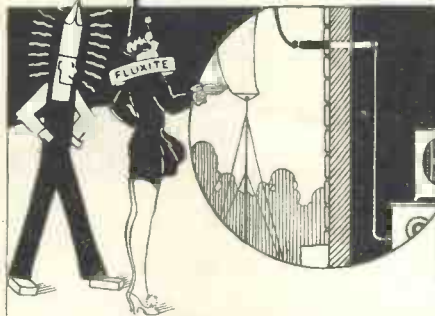
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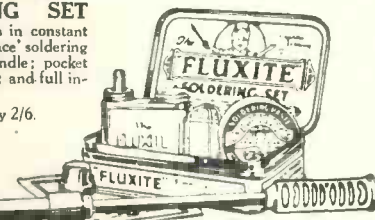
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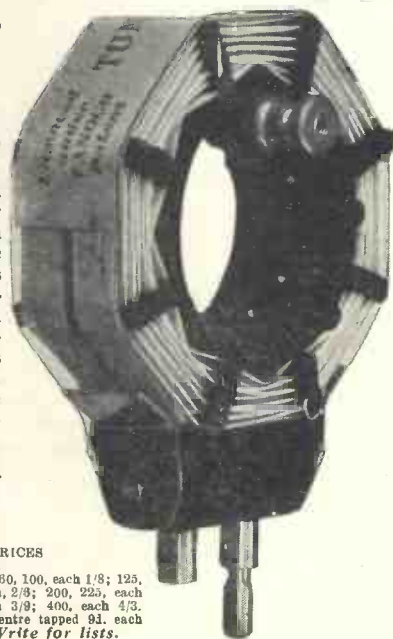
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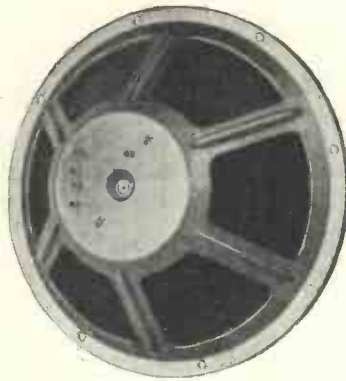
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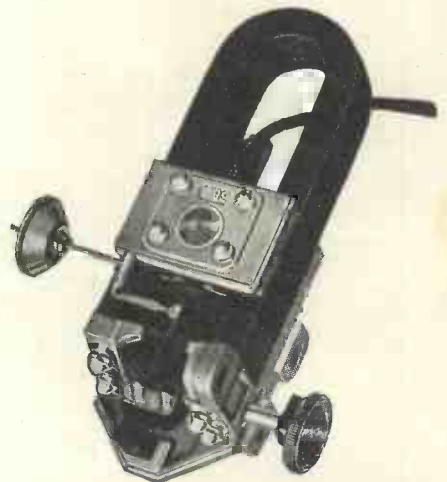
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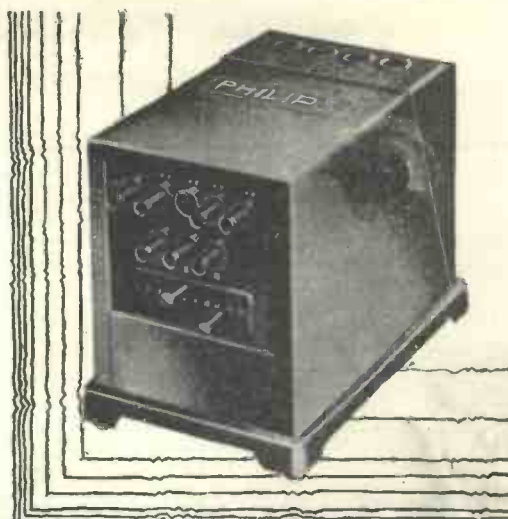


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VALVES TO USE IN YOUR SET

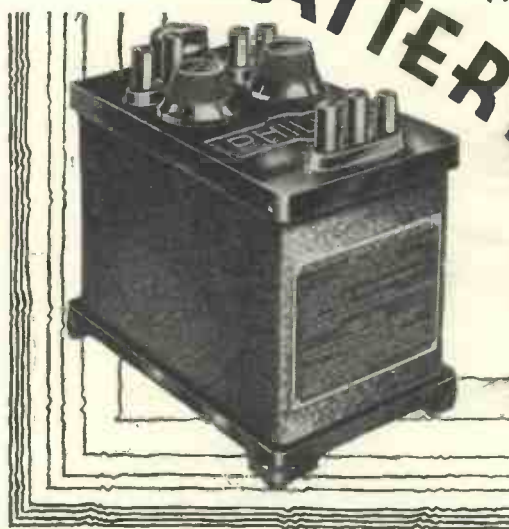
Make	Type	Impedance	Amplification Factor	Filament Current	Minimal Conductance	Anode Current at 120 volts	Grid Bias at 100 volts	Grid Bias at 150 volts
Two-volt Three-electrode Valves								
Mazda ..	H210	59,000	47	.1	.8	.5	—	1.0
Lissen ..	H210	58,000	35	.1	.6	1.1	—	1.5
Six-Sixty	210RC	55,500	39	.1	.7	1.6	1.0	1.5
Mullard	PM1A	51,000	36	.1	.7	1.5	—	1.5
Cossor ..	210RC	50,000	36	.1	.72	1.5	—	1.5
Tungsram	R208	50,000	35	.1	.7	1.0	—	1.5
Marconi	H2	35,000	35	.1	1.0	.5	—	1.5
Osram ..	H2	35,000	35	.1	1.0	1.0	—	1.5
Six-Sixty	210HF	25,000	19	.1	.75	2.75	—	—
Eta ..	BY2023	23,000	20	.12	.85	1.5	—	—
Tungsram	H210	25,000	25	.1	1.0	2.0	—	—
Mullard	PM1HF	22,500	18	.1	.8	1.0	3.0	4.5
Lissen ..	HL210	21,000	18	.1	.85	2.2	1.5	4.5
Mazda ..	HL210	21,000	26	.1	1.25	3.0	1.5	3.0
Cossor ..	210HF	20,000	22	.1	1.2	1.2	1.5	3.0
Marconi	HL2/c	20,000	22	.1	1.1	—	—	—
Mullard	PM1HL	18,500	28	.1	1.5	1.2	1.5	3.0
Osram ..	HL2/c	20,000	22	.1	1.1	—	—	—
Eta ..	BY1814	14,000	18	.12	1.3	3.0	—	—
Cossor ..	210D-c	13,000	15	.1	1.15	—	—	7.5
Six-Sixty	210LF	12,500	10.6	.1	.85	5.4	4.5	7.5
Cossor ..	210LF	12,000	10	.1	1.1	3.5	3.0	4.5
Mullard	PM1LF	12,000	11	.1	.9	3.0	4.5	7.5
Six-Sixty	217D	10,700	13.5	.17	1.25	7.0	4.0	7.0
Mullard	PM2DX	10,700	13.5	.2	1.25	3.0	3.0	6.0
Eta ..	BY2010	10,000	20	.12	2.0	4.0	1.5	3.0
Lissen ..	L210	10,000	10	.1	1.0	3.5	3.0	7.5
Marconi	L2/b	10,000	15.5	.1	1.55	4.0	—	—
Osram ..	L2/b	10,000	15.5	.1	1.55	4.0	—	—
Mazda ..	L210	10,000	15.5	.1	1.55	5.0	2.5	4.5
Tungsram	LG210	10,000	10	.1	1.0	4.0	—	—
Six-Sixty	Z20P	4,800	7.2	.2	1.5	7.0	10.0	16.0
Lissen ..	P220	4,700	7	.2	1.5	5.0	9.0	15.0
Mullard	PM2	4,400	7.5	.2	1.7	4.0	7.5	12.0
Cossor ..	Z20P	4,000	8	.2	2.0	7.5	4.5	9.0
Cossor ..	215P	4,000	9	.15	2.25	—	3.0	7.5
Eta ..	BW1304	4,000	13	.2	3.2	6.0	1.5	4.5
Marconi	LP2/c	4,000	8	.2	2.0	10.0	—	—
Osram ..	LP2/c	4,000	8	.2	2.0	10.0	—	—
Mazda ..	P220	3,700	12.5	.2	3.4	11.0	3.0	6.0
Mullard	PM2A	3,600	12.5	.2	3.5	12.0	1.5	4.5
Tungsram	P215	3,300	5	.2	2.0	12.0	—	—
Six-Sixty	Z30SP	2,750	5.5	.3	2.0	32.0	12.0	23.0
Eta ..	BW303	2,700	3	.32	1.1	11.0	15.0	25.0
Mullard	PM252	2,600	5.4	.3	2.1	14.0	9.0	15.0
Marconi	P240	2,500	4	.4	1.6	12.0	15.0	24.0
Osram ..	P240	2,500	4	.4	1.6	11.0	16.0	24.0
Tungsram	SP230	2,500	5	.3	2.0	15.0	—	—
Lissen ..	PX240	2,000	4	.3	2.0	14.0	12.5	22.5
Eta ..	BW602	1,900	7	.5	3.7	18.0	6.0	13.5
Mazda ..	P240	1,900	7	.4	3.7	18.0	—	—
Marconi	P2/b	1,850	6.5	.2	3.5	15.0	—	—
Osram ..	P2/b	1,850	6.5	.2	3.5	15.0	—	—
Cossor ..	Z30XP	1,500	4	.3	2.3	18.0	12.5	22.5
Two-volt Screen-grid Valves								
Tungsram	S210	430,000	300	.12	.8	—	—	—
Mazda ..	215SG	400,000	450	.15	1.1	—	1.5	—
Cossor ..	215SG	300,000	330	.15	1.1	—	—	—
Eta ..	RY6	300,000	300	.15	1.0	2.5	—	—
Mullard	PM12	230,000	200	.15	.87	—	—	—
Six-Sixty	215SG	220,000	190	.15	.87	2.0	—	—
Cossor ..	220SG	200,000	320	.2	1.6	—	—	—
Lissen ..	SC215	200,000	180	.15	.9	—	—	1.5
Marconi	S215	200,000	170	.15	.85	—	—	—
Osram ..	S215	200,000	170	.15	.85	—	—	—
Two-volt Pentode Valves								
Lissen ..	PT225	64,000	90	.25	1.4	7.0	3.0	6.0
Six-Sixty	Z30PP	64,000	80	.3	1.25	17.0	6.0	10.5
Mullard	PM22	62,500	82	.3	1.3	10.0	6.0	12.0
Marconi	PT240	55,000	90	.4	1.65	9.0	6.0	9.0
Osram ..	PT240	55,000	90	.4	1.65	9.0	6.0	9.0
Lissen ..	PT240	22,500	45	.4	2.0	12.5	7.5	10.5
Cossor ..	Z30PT	20,000	40	.3	2.0	15.0	6.0	7.5
Mazda ..	Z30PT	—	—	.3	1.8	13.0	9.0	9.0
Four-volt Three-electrode Valves								
Cossor ..	410RC	60,000	40	.1	.66	1.0	—	1.5
Marconi	H410	60,000	40	.1	.66	.5	—	1.5
Osram ..	H410	60,000	40	.1	.66	.35	—	1.5
Lissen ..	H410	60,000	40	.1	.66	1.6	—	1.5
Six-Sixty	4075RC	58,000	37	.075	.64	1.35	1.0	1.5
Mullard	PM13A	55,000	38	.075	.66	3	1.5	1.5
Marconi	HL410	30,000	25	.15	.83	1.0	2.0	3.0
Osram ..	HL410	30,000	25	.1	.83	1.25	1.5	3.0
Lissen ..	HLD410	21,000	25	.1	1.2	2.5	1.5	3.0
Cossor ..	410HF	20,000	20	.1	1.0	1.75	1.5	4.5
Mullard	PM3	13,000	14	.075	1.05	2.0	3.0	6.0
Six-Sixty	4075HF	12,500	13.5	.075	1.1	7.0	3.0	5.0
Cossor ..	410LF	8,500	15	.1	1.76	3.2	3.0	6.0
Lissen ..	L410	8,500	15	.1	1.8	3.5	1.5	4.5
Marconi	L410	8,500	15	.1	1.76	3.0	2.0	4.5
Osram ..	L410	8,500	15	.1	1.77	3.5	3.0	4.5
Mullard	PM4DX	7,500	15	.1	2.0	2.0	3.0	6.0

Make	Type	Impedance	Amplification Factor	Filament Current	Minimal Conductance	Anode Current at 120 volts	Grid Bias at 100 volts	Grid Bias at 150 volts
Four-volt Three-electrode Valves—Continued								
Six-Sixty	410D	7,250	14.5	.1	2.0	8.0	—	3.5
Marconi	P410	5,000	7.5	.1	1.5	6.0	6.0	10.5
Osram ..	P410	5,000	7.5	.1	1.5	6.0	6.0	10.5
Lissen ..	P410	4,500	9	.1	2.0	5.0	6.0	12.5
Mullard	PM4	4,450	8	.1	1.8	6.0	7.5	12.0
Six-Sixty	410P	4,200	7.7	.1	1.85	18.0	6.0	9.0
Cossor ..	410P	4,000	8	.1	2.0	17.5	4.5	9.0
Marconi	P425	2,300	4.5	.25	1.95	14.0	9.0	16.5
Osram ..	P425	2,300	4.5	.25	1.95	14.0	9.0	16.5
Lissen ..	P425	2,250	4.5	.25	2.8	28.0	12.5	19.5
Cossor ..	415XP	2,000	4	.15	2.0	18	12.0	22.5
Osram ..	425XP	2,000	7	.25	3.5	—	6.0	13.5
Mullard	PM254	2,000	4.2	.18	2.1	10.0	13.5	22.5
Six-Sixty	420SP	2,000	4	.2	2.0	4.0	12.0	22.0
Mazda ..	P425	1,950	3.5	.25	1.8	26.0	14.0	26.0
Cossor ..	4XP	1,100	3	.6	2.75	20	15	30
Marconi	PX4	1,050	3.5	.6	3.3	30.0	13.0	23.0
Osram ..	PX4	1,050	3.5	.6	3.3	30.0	13.0	23.0
Four-volt Screen-grid Valves								
Mullard	PM14	230,000	200	.075	.87	—	—	—
Six-Sixty	4075SG	220,000	190	.075	.87	3.0	—	—
Cossor ..	410SG	200,000	200	.1	1.0	—	—	1.5
Marconi	S410	200,000	180	.1	.9	3.5	1.5	1.5
Osram ..	S410	200,000	180	.1	.9	3.5	—	—
Lissen ..	SG410	200,000	180	.1	.9	—	—	1.5
Four-volt Pentode Valves								
Six-Sixty	SS4Pent.	53,000	83	.275	1.55	17.0	10.0	14.0
Marconi	PT425	50,000	100	.25	2.0	8.0	4.7	7.5
Osram ..	PT425	50,000	100	.25	2.0	8.0	4.0	7.5
Mullard	PM24	28,000	62	.15	1.75	16.0	6.0	12.0
Six-Sixty	415PP	27,000	60	.15	2.2	—	6.0	10.5
Mullard	PM24A	25,000	50	.275	2.0	15.0	6.0	21.0
Lissen ..	PT425	22,500	180	.25	2.0	15.0	7.5	10.5
Cossor ..	415PT	20,000	40	.15	2.0	14.0	6.0	9.0
Mazda ..	425Pen.	—	—	.25	2.0	14.0	14.0	14.0
Six-volt Three-electrode Valves								
Mazda ..	H67	90,000	40	.07	.45	1.0	.8	1.5
Cossor ..	610RC	60,000	50	.1	.8	1.0	—	1.5
Lissen ..	H610	60,000	40	.1	.66	1.0	—	1.5
Marconi	H610	60,000	40	.1	.7	—	1.5	1.5
Osram ..	H610	60,000	40	.1	.7	.35	—	3.0
Six-Sixty	6075RC	58,000	42	.075	.7	1.1	—	1.5
Mullard	PM5B	53,000	40	.075	.75	2.5	1.0	1.5
Marconi	HL610	30,000	30	.1	1.0	1.0	1.5	1.5
Osram ..	HL610	30,000	30	.1	1.0	.9	1.5	3.0
Marconi	LS5B	25,000	20	.8	.8	—	—	—
Osram ..	LS5B	25,000	20	.8	.8	—	—	—
Lissen ..	LHD610	21,000	25	.1	1.2	2.5	1.5	3.0
Cossor ..	610HF	20,00						

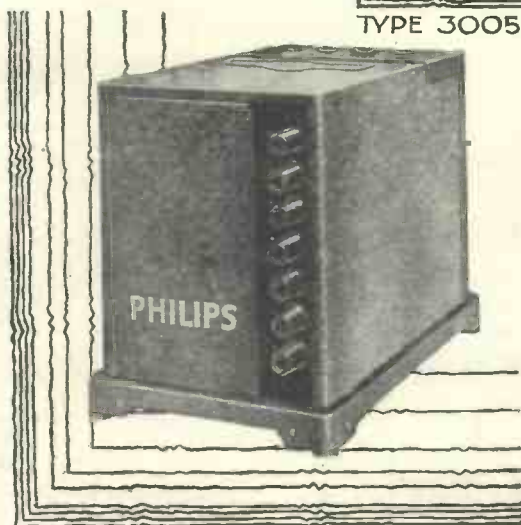


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VALVES TO USE IN YOUR SET—Continued

Make	Type	Impedance	Amplification Factor	Filament Current	Mutual Conductance	Anode Current at 120 volts	Grid Bias at 100 volts	Grid Bias at 150 volts
Six-volt Screen-grid Valves								
Six-Sixty	SS6075SG	210,000	190	.075	.9	—	—	—
Cossor ..	610SG	200,000	200	.1	1.0	—	—	1.5
Mullard	PM116	200,000	200	.075	1.0	—	—	—
Osram ..	S610	200,000	210	.1	1.05	4.0	1.5	—
Six-volt Pentode Valves								
Marconi	PT625	43,000	80	.25	1.85	10.0	6.0	15.0 (at 250v)
Osram ..	PT625	43,000	80	.25	1.85	—	—	—
Six-Sixty	SS617PP	28,500	54	.17	1.9	35.0	8.0	14.0
Mullard	PM26	25,000	50	.17	2.0	—	9.0	15.0
Lissen ..	PT625	24,000	60	.25	2.5	14.0	7.5	15.0
Cossor ..	615PT	20,000	40	.15	1.5	14.0	—	—
A.C. Screen-grid Mains Valves								
Six-Sixty	SS4SGAC	1,330,000	1,000	1.0	1.0	—	—	—
Mullard	S4V	909,000	1,000	1.0	1.1	—	—	—
Eta ..	DW6	800,000	1,000	1.0	—	—	—	—
Mazda ..	AC/SG	800,000	1,200	1.0	3.0	5.0	.5	.5
Marconi	MS4	500,000	550	1.0	1.1	2.2	1.5	1.5
Osram ..	MS4	500,000	550	1.0	1.1	2.2	—	—
Mullard	S4VA	430,000	1,500	1.0	3.5	1.7	—	—
Cossor ..	41MSG	400,000	1,000	1.0	2.5	2.0	—	1.5
Mullard	S4VB	257,000	900	1.0	3.5	4.0	1.5	1.5
Eta ..	DW2	200,000	240	1.0	—	2.5	—	—
A.C. Three-electrode Mains Valves								
Eta ..	DW4230	23,000	40	1.0	1.75	2.5	—	1.5
Cossor ..	M41RC	20,000	35	1.0	1.75	2.4	1.5	3.0
Tungram	G150	20,000	10	.5	.5	—	—	—
Tungram	R150	18,000	25	.5	1.4	1.5	—	—

Make	Type	Impedance	Amplification Factor	Filament Current	Mutual Conductance	Anode Current at 120 volts	Grid Bias at 100 volts	Grid Bias at 150 volts
A.C. Three-electrode Mains Valves—Continued								
Six-Sixty	SS4GPAC	14,500	35	1.0	2.4	3.0	—	3.0
Cossor ..	M41HF	14,000	32	1.0	2.3	2.5	1.5	3.0
Tungram	AR4110	14,000	33	1.0	2.0	1.5	—	—
Mazda ..	AC/HL	13,500	35	1.0	3.0	4.5	1.5	3.0
Mullard	354V	11,700	35	1.0	3.0	2.0	2.0	3.0
Marconi	MHL/4	8,000	20	1.0	2.5	5.0	3.0	6.0 (at 200v)
Osram ..	MHL/4	8,000	20	1.0	2.5	5.0	3.0	6.0
Tungram	AG4100	8,000	16	1.0	2.0	5.0	—	—
Cossor ..	M41LF	7,900	15	1.0	1.9	4.5	4.5	6.0
Eta ..	DW1508	7,500	15	1.0	2.0	5.0	3.0	6.0
Six-Sixty	SS4D-t.	7,000	16	1.0	2.3	7.5	3.5	8.0
Osram ..	AC	6,650	16	1.0	2.4	5.0	4.5	6.0
Mullard	M41P	5,000	10	1.0	2.0	6.5	4.5	7.5
Cossor ..	DW704	4,500	7	1.0	1.5	10.0	6.0	13.5
Eta ..	L190	4,200	10	.9	2.4	8.0	12.0	16.5
Tungram	DW1003	3,300	10	1.0	3.3	12.5	7.5	13.5
Marconi	ML4	3,000	9	1.0	2.0	9.0	10.0	22.0 (at 200v)
Osram ..	ML4	3,000	9	1.0	2.0	9.0	10.0	16.0
Six-Sixty	SS4PAC	3,000	10	1.0	3.3	10.0	5.0	8.0
Mullard	AC104	2,850	10	1.0	3.5	—	—	10
Mazda ..	AC/P	2,650	10	1.0	3.75	14.0	6.0	12.0
Tungram	P190	2,500	6	.9	2.4	8.0	—	—
Eta ..	DW702	2,250	7	.23	3.2	18.0	10.0	17.0
Eta ..	DX502	2,100	5	.15	2.4	12.0	4.5	15.0
Cossor ..	M41XP	2,000	4	1.0	2.0	15.0	12.0	19.5
Mazda ..	AC/PI	2,000	5	1.0	2.5	25.0	15.0	25.0
Mullard	AS064	2,000	6	1.0	3.0	15.0	9.0	14.0
Eta ..	DW302	1,800	3.5	1.0 ⁷	1.95	33.0	—	20.0
Mullard	AC044	1,150	3.4	7	3.5	17.0	16.5	28

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Per doz.	No. 1.	No. 2.
Jars (waxed) ..	1	3
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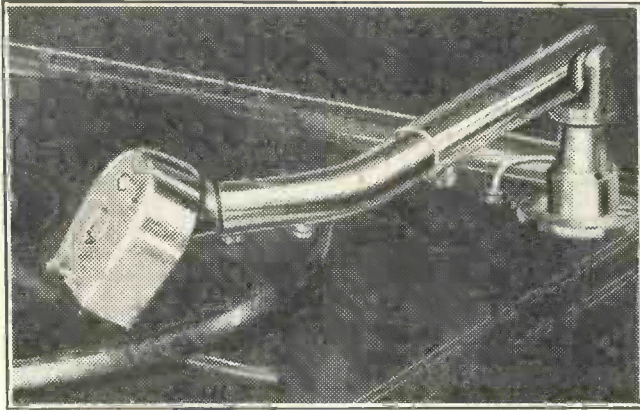
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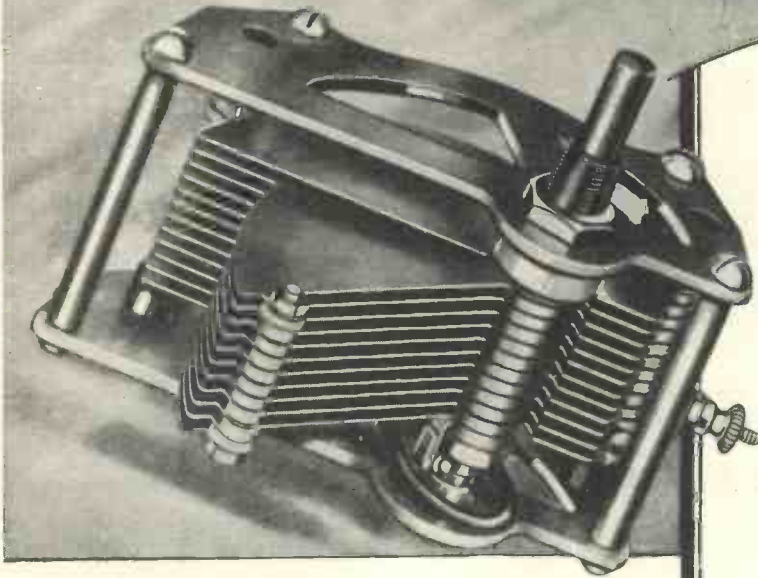
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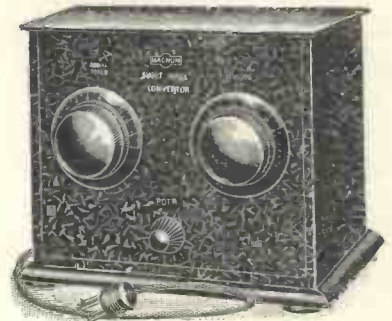
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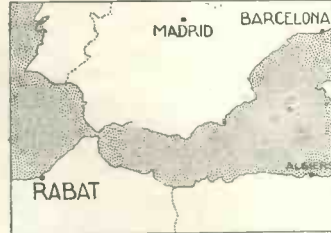
Broadcast Identification Sheets

For the benefit of readers we are publishing each month a series of panels specially compiled for the WIRELESS MAGAZINE by Jay Coote.

In these, readers will find a ready means of identifying foreign stations. To prevent any confusion in a.m. and p.m., the times are given on the Continental twenty-four-hour system. Example: 8 a.m.=8.00; 8 p.m.=20.00.

In the event of alterations in wavelength, power or call, a special panel bearing the alteration will be published at the earliest opportunity.

These identification sheets should be cut out and filed either alphabetically or in order of wavelength as they appear.



720 miles from London.

268m.
(1,121 kc.)

Power: 10 kw.

BARCELONA
EAJ 13 RADIO CATALANA
(Spain)

Standard Time: Greenwich Mean Time.

Announcer: Man.

Opening Call: *Aqui Estacion radio telefonica (EAJ13) de la Radio Catalana en Barcelona instalada en el edificio de la Fabrica Industria Espanola de Perlas Imitaciones*, abbreviated between items to *Radio Catalana, Barcelona*.

Main Programme: G.M.T. 20.00, studio concert, news and gramophone records.

Closes down with time signal and peal of bells.



1,070 miles from London.

312.8m.
(959 kc.)

Power: 16 kw.

WILNO
(Poland)

Standard Time: Central European (G.M.T. plus 1 hour).

Announcer: Woman.

Opening Signal: Three hoots.

Call: *Uwaga* (phon: oo-var-gha) *Polskie Radio Wilno*.

Interval Signal: Cuckoo call.

Main Programme: Mostly relays Poznan, Cracow, and Warsaw. G.M.T. 19.30 main evening entertainment when broadcasting from own studio.

Closes down as other Polish stations (for example, Warsaw, q.v.).



647 miles from London.

364.1m.
(824 kc.)

Power: 1.13 kw.

BERGEN
(Norway)

Standard Time: Central European (G.M.T. plus 1 hour).

Announcer: Man.

Call: *Dette er Bergen Kringcaster*, abbreviated between items to *Bergen her*.

Main Programme: G.M.T. 09.30 sacred service relayed from Cathedral (Sun.); 19.00 main evening entertainment; 21.00, news, dance music (Sun., Wed., Fri.); 21.30 or 22.00 relay of foreign transmissions (Tues., Sat.). Frequently relays Oslo programmes.

Closes down with the words: *Bergen Kringcaster lukker ni for taften, Godnat, Godnat*, followed by a few bars of *Ja vi Elsker* (Norwegian National Anthem).



449 miles from London.

372m.
(806 kc.)

Power: 1.7 kw.

HAMBURG
(Germany)

Standard Time: Central European (G.M.T. plus 1 hour).

Announcers: Male and female.

Opening Call: *Hier Norag, Hamburg fuer die Norddeutsche Sendergruppe* or *Hier die Norddeutsche Sendergruppe Hamburg, Kiel, Hannover, Bremen, und Flensburg*.

Interval Signal: Morse letters H A (... -) and, at times, metrophone.

Main Programme: G.M.T. 05.20, Time, weather; gram. records; 08.00 concert relayed from inner harbour (Sun.); then transmissions throughout day until 19.00, main evening entertainment; 22.30 dance music or concert until 23.00 or 23.30.

Closes down with: *Damit ist unser heutiges Tagesprogramm beendet. Wir wuenschen allen unsern Hoerern eine recht gute Nacht. Auf wieder hoeren Morgen frueh zur gewoehnlichen Stunde.* (With this item we end our day's programme. We wish all our listeners a very good night. To our next hearing early to-morrow at the usual hour.) Plays *Deutschland ueber Alles* (German National Anthem).

Relays: Flensburg, 218 m (1,373 kc); Kiel, 232.2 m (1,292 kc); Bremen, 270 m (1,112 kc); Hannover, 566 m (530 kc).



1,165 miles from London.

1,200m.
(250 kc.)

Power: 16 kw.

REYKJAVIK
(Iceland)

Standard Time: G.M.T. less 1 hour (that is, 11.0 a.m. when mid-day G.M.T.).

Announcer: Woman.

Call: *Utvarysstaed Islands* (phon: Iss-lands).

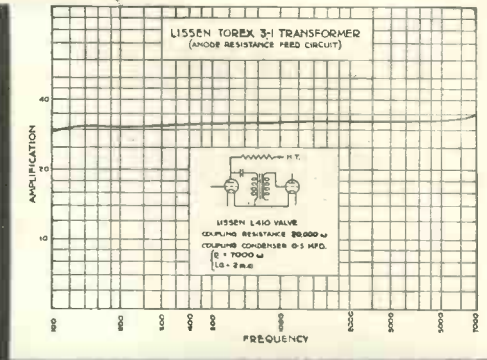
No interval signal.

Time Signal: (when closing down) clock and chimes.

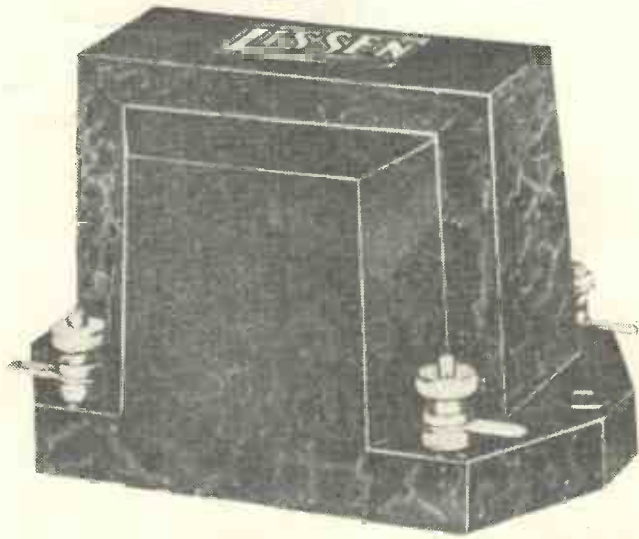
Main Programme: G.M.T. 18.30, sacred service (Sun.); news, concert or gramophone records. 22.00, dance music (Sat.).

Closes down with Danish National Anthem.

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for **5/6**



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The **TRANSFORMER**
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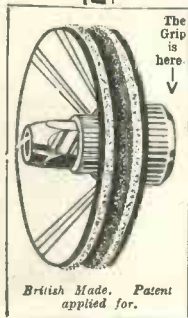
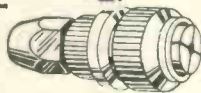


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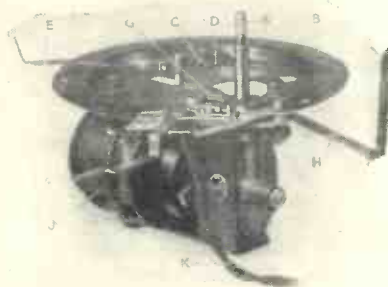
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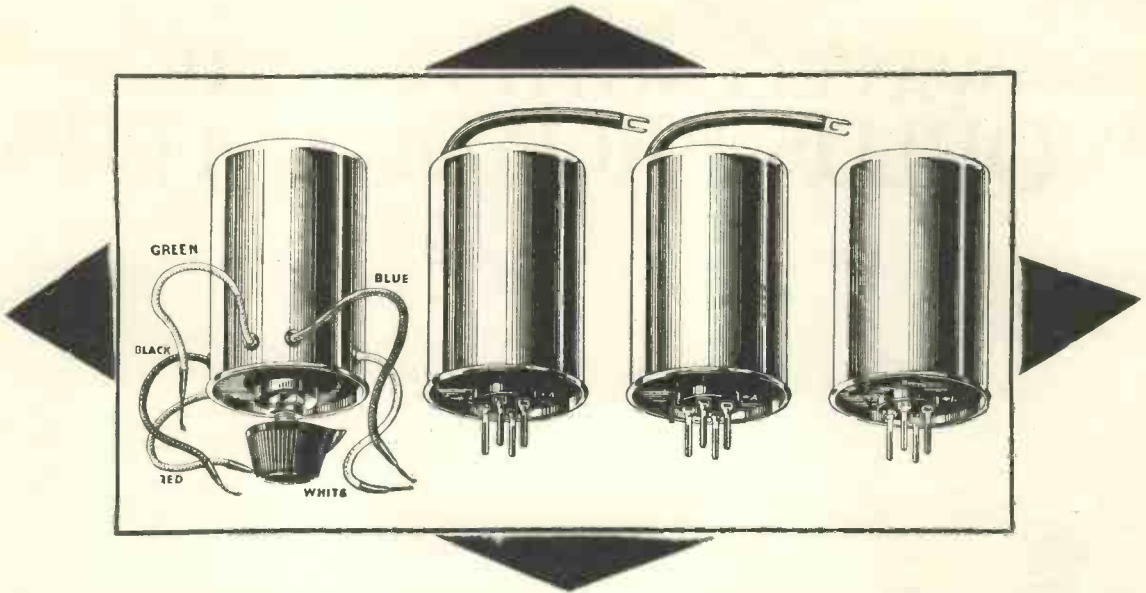
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WAVELENGTHS OF THE WORLD'S BROADCASTERS

Wave-length	Name of Station	Dial Readings	Country	Wave-length	Name of Station	Dial Readings	Country
172.5	St. Quentin		France	338	Poznan		Poland
200	Leeds		Great Britain	342	Brussels (No. 2)		Belgium
206	Antwerp		Belgium	345.2	Brunn		Czechoslovakia
216	Verviers		Belgium	349	Strasbourg		France
	Radio Conference Brussels		Belgium	351.7	Barcelona (EAJ1)		Spain
216.3	Chatelneau		Belgium	356.3	Graz		Austria
218.5	Königsberg		Germany	360	London Regional		Great Britain
219	Salzburg		Austria	363.4	Mühlacker		Germany
221	Flensburg		Germany	364	Algiers		North Africa
223	Helsinki		Finland	365.1	Bergen		Norway
224.5	Fécamp		France	368	Frederiksstad		Norway
225	Cork (IFS)		Irish Free State	370	Seville (EAJ5)		Spain
227	Strasbourg		France	372	Radio LL (Paris)		France
	Cologne		Germany	376.4	Hamburg		Germany
230	Münster		Germany	385	Manchester (2ZY)		Great Britain
	Aachen		Germany	390	Lvov		Poland
232	Malmö		Sweden	399	Radio Toulouse		France
234	Kiel		Germany	394	Frankfurt		Germany
235	Lodz		Poland	398.9	Bucharest		Roumania
	Kristiansand		Norway	403	Glasgow (58C)		Great Britain
237.2	Nimes		France	405.5	Berne		Switzerland
239	Bordeaux-Sud-Ouest		France	405.8	Sottens		Switzerland
240.6	Nürnberg		Germany	408	Tartu		Estonia
241	Beziers		France	413	Katowice		Poland
	Stavanger		Norway	416	Dublin (2RN)		Irish Free State
242	Oporto		Portugal	418	Radio Maroc		North Africa
244	Belfast (2BE)		Ireland	424	Berlin		Germany
	Basle		Switzerland	426.3	Madrid (EAJ7)		Spain
244.7	Cracow		Poland	428.3	Kharkov		Russia
246	Ghent		Belgium	430.5	Belgrade		Yugoslavia
	Cassel		Germany	436	Stockholm		Sweden
249	Linz		Austria	441	Rome		Italy
249.6	Juan-les-Pins		France	447	Paris (Ecole Sup. PTT)		France
251	Schaerbeek		Belgium	452	Danzig		Germany
253.4	Barcelona		Spain	453	Bolzano (1BZ)		Italy
256	Gleiwitz		Germany	453.2	Klagenfurt		Austria
257	Toulouse (PTT)		France	453.2	San Sebastian		Spain
259	Hörby		Sweden	459	Helsinki		Finland
261.3	Leipzig		Germany	466	Porsgrund		Norway
263.8	London National		Great Britain	473	Zurich		Switzerland
265	Moravska-Ostrava		Czechoslovakia	479.2	Lyon-la-Doua		France
266.7	Lille (PTT)		France	487	Langenberg		Germany
269.8	Barcelona (EAJ13)		Spain	494	Midland Regional		Great Britain
272	Bremen		Germany	501	Prague		Czechoslovakia
276.5	Rennes		France	509	Nidaros		Norway
278.3	Heilsberg		Germany	517	Milan		Italy
281	Bratislava		Czechoslovakia	525	Brussels (No. 1)		Belgium
	Copenhagen		Denmark	533	Vienna		Austria
283	Magdeburg		Germany	542	Riga		Latvia
	Stettin		Germany	550	Munich		Germany
284.7	Berlin		Germany	559.7	Sundsvall		Sweden
286	Innsbruck		Austria	566	Budapest		Hungary
288.5	Lisbon		Portugal	570	Kaiserslautern		Germany
	Radio Lyons		France	574.7	Augsberg		Germany
291	Montpellier		France	579.6	Hanover		Germany
	Newcastle (5NO)		Great Britain	580	Freiburg		Germany
294	Swansea (58X)		Great Britain	680	Ljubljana		Yugoslavia
294.6	Stoke-on-Trent (6ST)		"	680	Hamar		Norway
296	Sheffield (6LF)		"	720	Lausanne		Switzerland
299	Plymouth (5PY)		"	760	Moscow		Russia
	Liverpool (6LV)		"	770	Geneva		Switzerland
301	Hull (6KH)		"	800	Ostersund		Sweden
	Edinburgh (2EH)		"	824	Kiev		Russia
304.3	Dundee (2DE)		"	837.5	Sverdlovsk		Russia
	Bournemouth (6BM)		"	937.5	Kharkov		Russia
306	Bradford		"	1,000	Leningrad		Russia
309.9	Newcastle (5NO)		Finland	1,071	Oslo		Norway
313.2	Tampere		Finland	1,103	Scheveningen-Haven		Holland
315	Kosice		Czechoslovakia	1,153	Moscow Popoff		Russia
316	Limoges		France	1,200	Kalundborg		Denmark
317.3	Turin		Italy	1,228	Reykjavik		Iceland
318.8	Hulzen		Holland	1,234	Istanbul		Turkey
319	Radio Idzerda		Holland	1,250	Boden		Sweden
322	Aberdeen (2BD)		Great Britain	1,304	Tunis Kasbah		North Africa
323	Falun		Sweden	1,348	Moscow		Russia
329.5	Bordeaux (PTT)		France	1,380	Motaila		Sweden
330.5	Zagreb (Agrani)		Jugoslavia	1,411	Bakou		Russia
	Cardiff (5WA)		Great Britain	1,442	Warsaw		Poland
	Genoa		Italy	1,445.7	Moscow (Kom)		Russia
	Wilno		Poland	1,540	Eliff Tower, Paris		France
	Natan-Vitus		France	1,554.4	Ankara		Turkey
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	Marseilles (PTT)		France	1,725	Norddeich		Germany
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1 Completely assembled Frame Aerial to specification	1	7	6
1 Polished Ebonite Panel, 12 in. by 8 in. by 3/16 in., drilled to specification	4	0	
1 Baseboard	1	0	
1 Set Wearite Screened Super-het Coils, as specified	2	10	0
1 Formio .0002-mfd. Mikadenser	6		
2 Telsen .001 Fixed Condensers	2	0	
5 T.C.C. 1-mfd. Fixed Condensers, type 50	14	2	
2 Ormond .0005-mfd. R/426 Slow-motion Variable Condensers	12	0	
1 Read-Rad Grid-leak Holder	6		
9 Telsen 4-pin Valve Holders	9	0	
8 Belling-Lee Wander Plugs	1	4	
2 Spade Terminals, red and black	3		
2 Read-Rad Link Resistances, 15,000 and 20,000 ohms	2	6	
1 Read-Rad 1-meg. Grid Leak	10		
1 Igranic 50,000-ohm Potentiometer	6	0	
1 Telsen "Ace" Transformer	8	6	
1 Read-Rad 3-point wave-change Switch	1	6	
1 Packet Jiflinx for wiring up	2	6	
1 Terminal Strip, 2 1/2 in. by 1 in., fitted with three 6B.A. terminals	9		
6 Mullard Valves, 2 S.G., 2 H.F., 1 L.F., 1 Power	3	16	0
Screws, packet Cortabs De Luxe, etc.	1	2	
TOTAL (including Valves, Cabinet, and ready-wound Frame Aerial)	£11.19.6		
KIT A Less valves and cabinet, but including ready wound Frame Aerial	£7.6.0		
Or 12 monthly payments of	13/3		
KIT B Including valves less cabinet	£11.2.0		
Or 12 monthly payments of	20/3		
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1 Bulgin 32-henry L.F. Choke	12	6	
2 Wearite "Binovave" Coils, type A and C, with ganging device	1	17	0
1 Read-Rad .0002-mfd. Fixed Condenser	10		
1 Read-Rad .0003-mfd. Fixed Condenser, with clips	10		
1 Dubiller .005-mfd. Fixed Condenser, type 620	2	3	
2 Dubiller 1-mfd. Fixed Condensers	5	0	
2 Dubiller 2-mfd. Fixed Condensers	7	0	
2 Jackson .0005-mfd. Junior Log Condensers, with slow-motion dials	1	3	0
1 Lotus .00034-mfd. Reaction Condenser	5	6	
1 R.I. Varicap Condenser, .0003 mfd. maximum capacity	2	0	
2 Junit Terminal Blocks	1	4	
3 Telsen 4-pin Valve Holders	3	0	
1 Junit type HV Valve Holder	1	9	
7 Belling-Lee Wander Plugs	1	2	
2 Clix Spades, L.T. and	4		
1 Read-Rad 50,000 Link Resistance	1	9	
1 Read-Rad 100,000-ohm Link Resistance	2	9	
1 Graham-Farish "Megite" Grid Leak, 2 megohms	2	0	
1 Read-Rad 2-megohm Grid Leak and Holder	1	4	
1 Rotorohn Volume Control	6	0	
1 Read-Rad Screen, 10 in. by 6 in., with S.G. hole	2	6	
2 Read-Rad Panel Brackets	10		
1 Lotus Jack, type JK.5	3	0	
1 Lotus Plug	2	0	
1 Igranic Midget L.F. Transformer	10	6	
1 Packet "Jiflinx" for wiring	2	6	
4 Mullard Valves, as specified	2	7	6
Wire, Screws, etc.	1	4	
TOTAL (Including Valves and Cabinet)	£11.6.0		
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1 Read-Rad H.F. Choke	2	0	
1 Read-Rad .0002-mfd. Fixed Condenser	10		
1 Read-Rad .0005-mfd. Fixed Condenser	10		
2 T.C.C. 2-mfd. Fixed Condensers	7	8	
1 Read-Rad .0005-mfd. Variable Condenser	4	6	
1 Lotus .00034-mfd. Differential Reaction Condenser	6	0	
1 Sovereign Pre-set Condenser, .0003 mfd.	1	6	
1 Read-Rad Duograph Slow-motion Dial	6	6	
3 Junit Terminal Blocks	2	0	
3 Read-Rad Single Coil Holders	2	6	
1 Read-Rad Grid-leak Holder	6		
3 Telsen 4-pin Valve Holders	3	0	
1 Graham-Farish 30,000-ohm Resistance and Holder	2	6	
1 Read-Rad 3-megohm Grid Leak	10		
1 Harlie Volustat Variable Resistance	7	6	
1 Packet Jiflinx for wiring up	2	6	
1 Pair Read-Rad Panel Brackets	10		
1 Magnum Circuit Breaker	1	3	
1 Read-Rad On-off Switch	10		
1 Read-Rad 3-point Wave-change Switch	1	6	
1 Premier L.F. Transformer	5	6	
1 Telsen Radiogrand L.F. Transformer, ratio 3 to 1	12	6	
7 Belling-Lee Wander Plugs	1	2	
2 Clix Spade Terminals, L.T.+, L.T.—	4		
6 Belling-Lee Indicating Terminals, type "R"	1	6	
5 Tunewell Plug-in Coils, Nos. 25, 40, 60, 100, 200	9	3	
1 Set Atlas Short-wave Coils	10	0	
3 Valves to specification: 2 HL210, 1 P220	1	7	6
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PRICE 27/6

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See description in editorial columns



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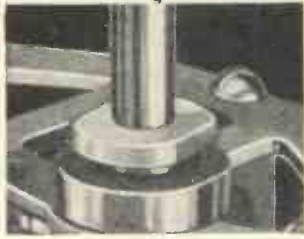
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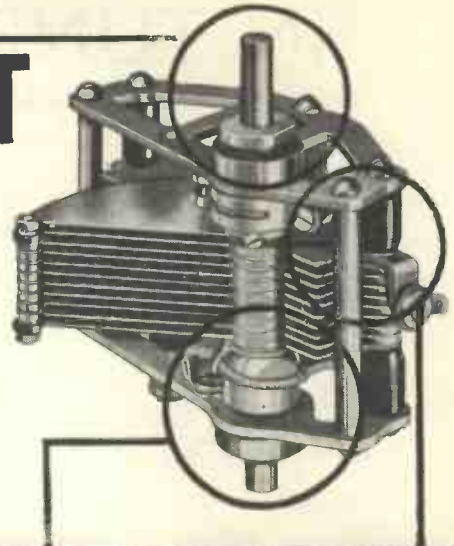
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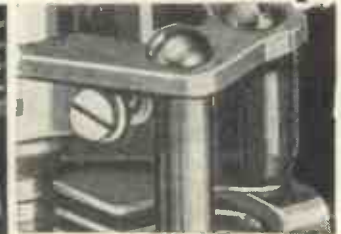


J.B. UNIVERSAL LOG CONDENSER

Prices:
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4-in. J.B. BAKELITE DIALS
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Ball-bearing steel centre spindle adjustable for length and particularly useful for ganging and attaching to Thumb or Drum Control. Pigtail connection to rotor.



Showing the well-known J.B. adjustable tension to centre spindle.

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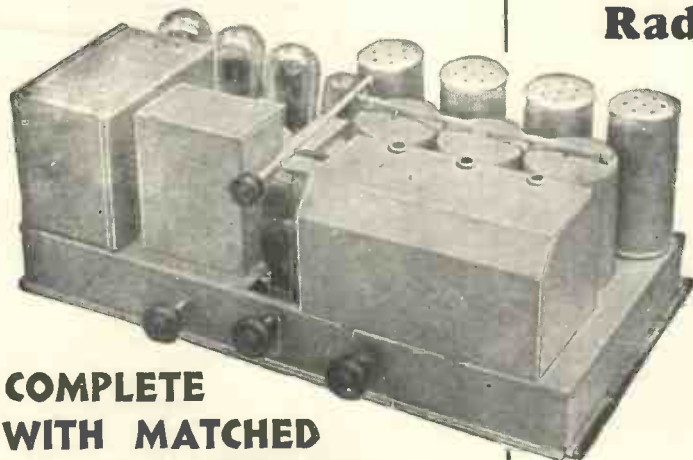
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YOU will be as interested as I was in the new W.B. moving-coil loud-speaker, described in an attractive folder just issued. This reproducer is of the chassis type and sells for as little as £4 10s.

A feature of the new model No. 2—you will already be familiar with its bigger brother—is that it is sensitive enough to be worked from an average two- or three-valve set.

Both the W.B. instruments have permanent magnets, which means that they can be connected to any existing set without difficulty and at no additional up-keep cost. Take my advice and send for the folder about this interesting production. **182**

DRYDEX H.T. BATTERIES

EXIDE have for so long specialised in accumulators for every branch of electrical work, and for cars, too, that I confess I was rather surprised when I saw an announcement to the effect that some dry batteries by Exide are now to be placed on the market.

I understand from Exide technical folk that experiments have been going on for a long time in the matter of dry high-tension and grid-bias batteries, and very many formulae were tried before the final decision was made for the new Drydex batteries. The result is that now there is a wide range of Exide dry batteries for high tension, grid bias and many other purposes.

Before you buy that new battery for the set I strongly counsel you to see the leaflet which Exide have produced, giving full details of the various ranges of high-tension batteries.

To précis the various types available,

the popular high-tension battery is the Red Triangle series, the double-capacity is the Green Triangle and the triple-capacity is the Orange Triangle. Blue Triangle high-tension batteries are available for many popular portable sets and grid-bias batteries are available in the Red and Green Triangle series. I need hardly say that the prices are right. **183**

A FINE GRAMOPHONE MOTOR

ALL the technical people in the "W.M." laboratory speak very highly of the Diehl Aristocrat gramophone motor, which is marketed in this country by Claude Lyons, Ltd. This motor is made by a well-known American concern specialising in small motor manufacture and embodies several novel features.

For one thing, it is of the induction type, which means that it operates only on alternating-current mains and that it causes the very minimum amount of interference with the gramophone amplifier. It has a bakelite turntable and to prevent any possibility of damaging the gears of the motor a single-plate cork clutch is fitted. There is, of course, an automatic stop.

It is, however, hardly necessary for me to describe in detail the full technical merits of these Diehl motors, for a new Claude Lyons folder gives every possible particular. As no electric gramophone can be complete without an electrically-driven turntable I think you should make a point of getting more information about Diehl motors. **184**

FOR SHORT-WAVE WORK

ONCE upon a time reception on the very short waves below 100 metres was considered to be a job only for the experts or very keen amateurs who had sufficient apparatus at their disposal and unlimited patience in tuning in. Moreover, there was—and to a certain extent still is—a suspicion that short-wave stations are most fickle folk to receive and that really the complicated control of the dials is hardly worth while.

I think that the growing popularity of various short-wave gadgets is helping to explode that myth. Short-wave reception is worth while, both on account of its greater technical interest and, to a growing extent, because of its programme value. Many foreign stations which owing to interference may be difficult to pick up on the medium waveband transmit also on the very short waves and this transmission may be picked up if you have simple short-wave apparatus.

But I had not intended to act as

publicity agent for the short waves, I merely want to draw attention to the Magnum Short-wave Converter, made by Burne-Jones & Co., Ltd., which, added to any type of set (except a mains-driven model or a reflex), enables you to tune in the short-wave stations. Full technical details of this simple converter are given in a new folder just issued. **185**

"THE ELIMINATION OF PONG"

THAT is the rather amusing title given to a little book which has just been produced by the Igranic Electric Co., Ltd. This is by H. J. Barton Chapple, a well-known fellow contributor to WIRELESS MAGAZINE, and is the outcome of tests which have been made on various types of valve holder.

It appears that the matter has been gone into very thoroughly indeed and a perusal of this little book "gives one furiously to think" that there is far more in this matter than one would suppose at the outset.

We all know, don't we, what annoying little bothers can be caused by valve holders which make bad contact and which fail to eliminate physical shocks disturbing the peace of the valve's filament.

As this "elimination of pong" book has been produced by specialising in valve-holder construction, it is obvious that something is being done about the matter and in the interests of proper valve support I advise you to get a copy of this publication through my free catalogue service. **186**

ALL ABOUT COILS

ON a previous occasion I have been very pleased to mention a fine booklet produced by Colvern, Ltd., giving a wealth of practical and technical coil information. Anybody who has any interest in home construction or in the improvement of a set will find this book very handy because, not only does it deal at length with general coil characteristics in a thorough manner, but it shows how ordinary standard types of coil can be used in many popular types of circuit.

The circuits are given in full and are bound to be a help in connecting up. Every type of tuner arrangement, from the plainest single-coil arrangement to a complicated but highly efficient bandpass "hook-up," is shown and even short-wave sets are dealt with.

Part of this book is a very handy catalogue of Colvern components and I should like to make another brief reference to the Colverstat wire-wound resistances, which appear to have very many uses in the average set. **187**

Make sure of getting the May issue of WIRELESS MAGAZINE—published on April 24. Besides including another special 16-page supplement, it will contain details of a portable edition of W. James' famous Super 60—a set that will enable you to tour all Europe wherever you may be!

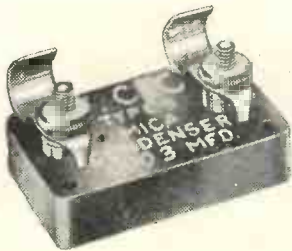
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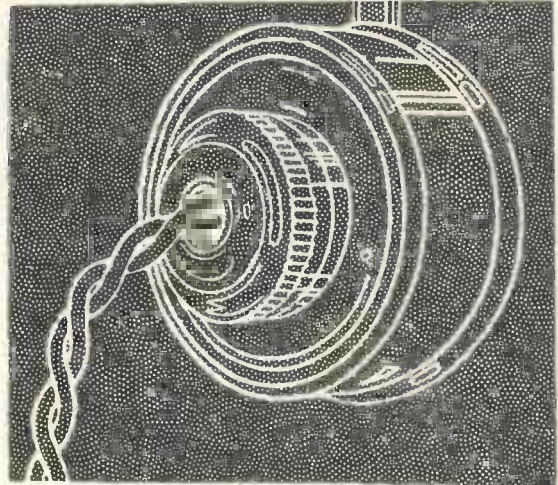
It is this same spirit of "doing one thing and doing it well" which has, for years, been behind all T.C.C. endeavour. That is why T.C.C. have never made anything but Condensers, and why T.C.C. Condensers are unmatched—for accuracy and dependability. The T.C.C. .0003 mfd. Flat type Mica Condenser is shown here. Price 1/3.



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These instruments represent the embodiment of the best that modern technique and skill can produce.

• All-Electric H.T. L.T. Grid Bias matched transformer-coupled moving-coil speaker, slow speed induction motor. Illuminated dials.

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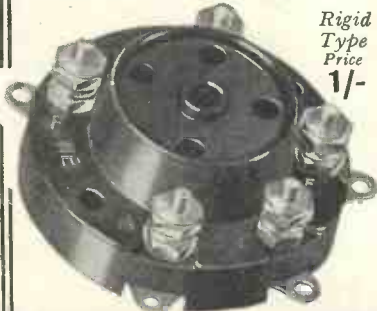
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NINE IN THE SUPER 60!

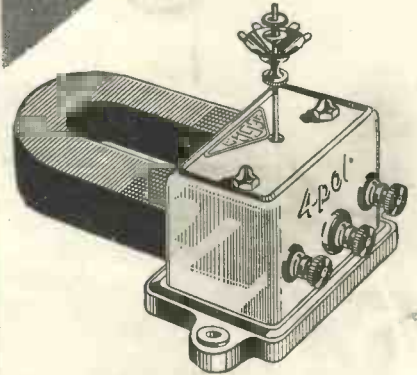
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Being a flat type of unit, the Hegra "E" is very useful for portables and other speakers where space is restricted.

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Unit alone, with clips .. 15/9

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An Editorial Word

IS THERE NEED FOR A NEW TYPE OF RADIO SOCIETY?

MOST people enjoy talking shop—if it is their .hop. Wherever wireless men congregate, there you hear the jargon. Experiences are exchanged; "straight tips" are offered and accepted and everybody enjoys himself. And yet the wireless societies and clubs which give opportunity for this interchange are, with certain outstanding exceptions, in a bad way.

They sprung up everywhere in 1922 and 1923, but in many cases their lives were short, in others difficult, and in only a few cases robust and long. Has the time come for a successful revival of the idea? One would think so. The interest in practical wireless matters was never keener than now, and surely this is the time to inquire why the old societies did not fill the bill and whether new ones would be likely to make a greater appeal.

The difficulty in arranging a good and varied programme and in keeping the members interested—that was, in my opinion, the biggest factor in the failure of many of the local societies. It is not given to every committee or secretary to know how to hold together a body of individuals of varying tastes and needs. Then, in addition, there was often antagonism between the old hands who, because they had been listening to morse for years, regarded themselves as "it" and the new ones, to whom, in their ignorance or innocence, morse was just a nuisance.

To-day we all want talk and song, and by means of co-operation it ought to be possible to arrange for bright programmes full of interest for everybody—the constructor, the experimenter, and the listener.

The ideal local society would have a permanent home—a room or two where certain essential apparatus could be kept in good condition. The membership subscription would be big enough to allow of the society renting such accommodation and there should be no difficulty on that score. There are plenty of people willing to spend money on their wonderful hobby and who could well afford the relatively small subscription that would allow of the society being run on proper lines. The society would have a few good measuring instruments and possibly a first-rate receiver, amplifier, etc.

The constructor would find a live society thoroughly worth while. There he would get ideas and give them; there he would show his handiwork and talk over improvements and modifications; he would discuss published designs of wireless receivers and their adaptation to individual requirements; he would inquire into the possible alteration of existing sets to bring them into line with up-to-date ideas; he might possibly indulge in the lending and borrowing of apparatus, but if this were thought to be difficult or dangerous he could without difficulty compare his apparatus with that of others.

He would give and take advice; ways of overcoming the unexpected snag would be arrived at with the help of the more experienced members, and any unexpected troubles could be diagnosed and put right.

All this is on the assumption that the society would attract members of all degrees of experience and skill—

the keen and well-informed amateur and constructor, possibly the local professional wireless men, and certainly a large proportion of set assemblers and mere listeners with no knowledge of wireless technicalities.

The listener, just the ordinary user of apparatus, could go along to the meetings of such a society and enjoy demonstrations and explanations of manufactured sets and units, and not only be led to a wise choice when he came to spend his money, but be given valuable information as to their operation and maintenance. Members would constantly be brought into touch with new developments, and many of the sets, components, and other apparatus described in his favourite wireless periodical he would be able to examine and have demonstrated to him at his society meeting.

He could bring along his loud-speaker, his pick-up, his mains unit, and try them out in comparison with those brought by his friends, the society providing a receiver, amplifier, and a choice of output transformers and valves.

Certainly the gramo-radio enthusiast ought to find the meetings of such a society remarkably attractive. He would there be able to try out pick-ups, records, and special attachments galore, and enter into endless discussions as to the rights and wrongs, the best and the worst ways of doing this, that, and the other.

The man with merely a broadcast interest, with no desire to delve into wireless but just to enjoy the broadcast programme, would find his place in the society. He would meet kindred spirits with whom he could exchange his appreciations and criticisms of the programmes and who, from a musical or aesthetic standpoint, would express their own views on that subtle thing "quality."

Their presence would do the gadget users and builders much good, and in return they would learn how to get the best from their apparatus.

In one respect we think we could help the movement forward—firstly, by providing space in our pages in which readers could exchange views as to the best way to organise and run such societies, and, secondly, by putting secretaries into touch with manufacturers willing to provide lecturers, demonstrators, and loan apparatus.

One of the difficulties of the past, as we have already said, was to provide a varied programme of interest, but with our columns in which the societies could air their views and with our practical assistance in obtaining the right programmes, we see every reason to believe that a revival of the kind suggested would be happy and successful.

But readers may not agree, and in that case I should like them to send me their opinions as to why the old local society often failed and as to what peculiar difficulties there may be in the way.

Bernard Jones

More Practical Points About the Already Famous

SUPER 60

W. JAMES Writes More About His Latest Design—A Six-valve Screened-grid Super-het That Has Set a New Radio Fashion

It is tuned to a frequency which is different from that of the oscillator, but at the same time its characteristics are such that the stability of the input circuit is much improved by tapping the frame and taking the tap instead of the end to the grid battery.

Balancing Condenser

An exact centre tap is not necessary. No doubt the addition of a balancing condenser, joined between the end of the frame marked 2 and the filament circuit, would still further improve the results in this part of the circuit under certain conditions. As



ONE of the points that is sure to interest the builder of this set is the method of connecting the oscillator and frame-aerial circuit.

The two ends of the frame aerial in use are taken to the tuning condenser. One side has no other connection, but the grid of the first valve, the first detector, is joined to the opposite end of the frame.

You will see this upon looking at the circuit diagram (on page 252), where the end of the frame going to the grid is marked 1. End 2 goes to the tuning condenser only.

Applying Oscillations to Grid Circuit

Normally this end would be taken to low-tension negative, but in this set we have to arrange for the oscillations from the oscillator to be applied to the grid circuit, as well as the actual signal being received.

A point, marked 3 in the diagram, is therefore taken to one of the coils of the oscillator, through which it is joined to the grid-bias battery. Oscillations induced in the coil are thus applied between the frame and the grid battery, with the result that the voltage of the grid of the first detector varies according to the strength of the oscillations.

Two Sets of Oscillations

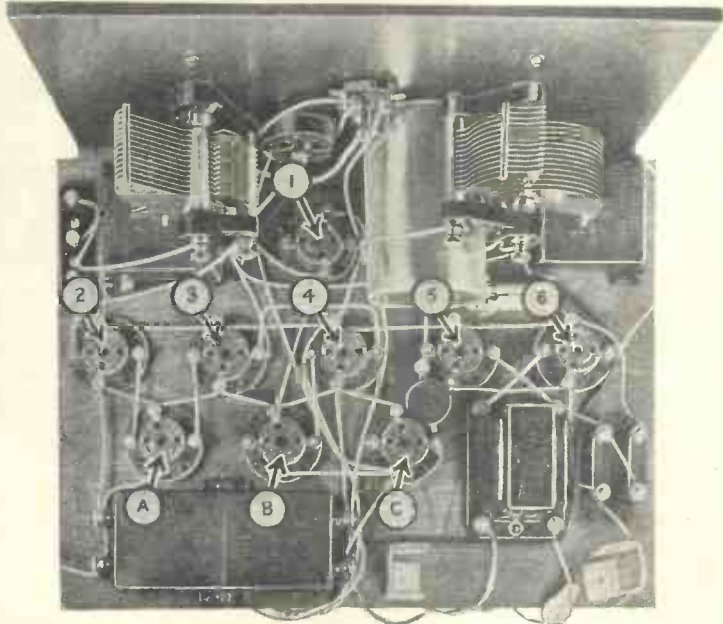
In the same circuit are the oscillations representing the signal to which the set is tuned, and so we have the two sets of oscillations in the grid circuit.

Now, for good results, the oscillations must be relatively strong. If they are weak the signal strength will be poor. A tapped frame aerial helps in this direction.

the set is arranged, however, there is little benefit.

The oscillator tends to produce its strongest oscillations when its tuning condenser has a small value. This is not a desirable condition for two reasons.

The first is that the amount of the anode current would increase to a large value, perhaps 15 milliamperes, and the second reason is that the sensitivity of the set would tend to vary widely over the tuning range.



HOW THE VALVES AND COILS ARE ARRANGED

Holder numbered 1 to 6 are for the valves—1, oscillator; 2, first detector; 3 and 4, screened-grid valves; 5, second detector; and 6, power valve. Holders A, B and C are for the three intermediate coils

An Amazing Screened-grid Super-het—Can Be

BUILT FOR £12

This Set Works with A Small Frame Aerial,
Has Only Two Tuning Controls and Takes
Less Than 15 Milliampere Anode Current

I therefore included in the anode supply to the oscillator a resistance of 15,000 ohms. This automatically regulates the strength of the oscillations within limits, because if the current tends to increase the voltage immediately tends to drop. This restricts the current and helps to maintain a strength of about a constant value.

Best Oscillator Valve

A fair number of types of valves have been tried in the oscillator position and it is found that oscillations of sufficient strength are readily obtained.

The valve ought to be one which will take the bias without too much rectification. We have the same bias applied to the oscillator and first detector. The detector works on the anode-bend principle, so that a valve of a higher impedance class should be used in the detector stage than in the oscillator position.

There is a separate high-tension tapping for the

first detector, and this may be plugged into different sockets in the battery to determine by experiment which is the most satisfactory setting. The circuit is not critical by any means, but a little attention is worth while.

Remember that it is an anode-bend detector and that for a given grid bias there will be a value of high tension which best suits the valve.

The amount of noise obtained was very little with the valves recommended in the first article; in fact the set seems so quiet when you are off tune that you may well wonder whether it is disconnected. With some screened-grid valves there is a slight background when tuned.

How Noises may Originate

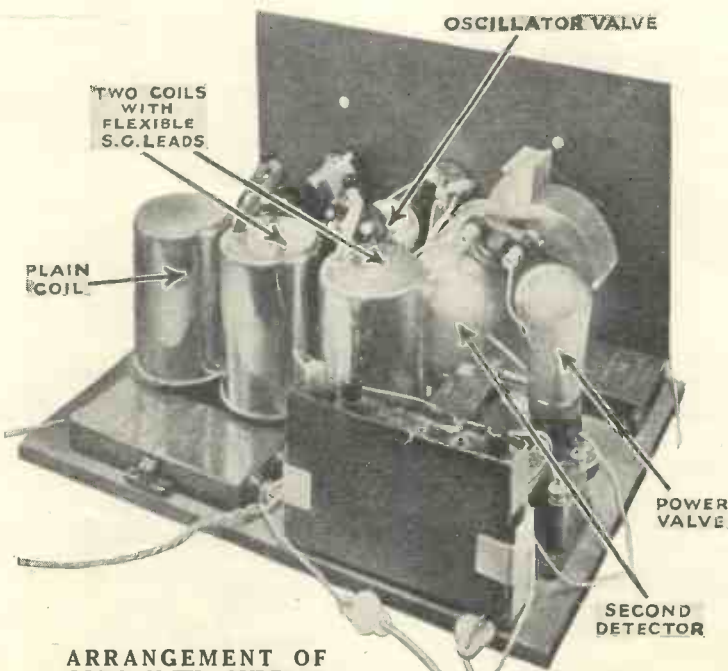
These noises may originate in the valves, or appear because of greater magnification. Actually, too great magnification is not needed—you cannot help but have a noisy background when the circuits are worked at their maximum.

I like to use the set in a perfectly stable condition, when you can place your hand upon the coil covers and valves without affecting the results. Then there is no background and the results are fine, the weakest of distant stations being brought in clearly and at loud-speaker strength.

Check up the Potentiometer

Be sure the volume control does not introduce noise or other difficulties. This is, of course, a potentiometer and is connected to the screened-grid valves. If the instrument is defective in any way the control is bound to be noisy and difficult.

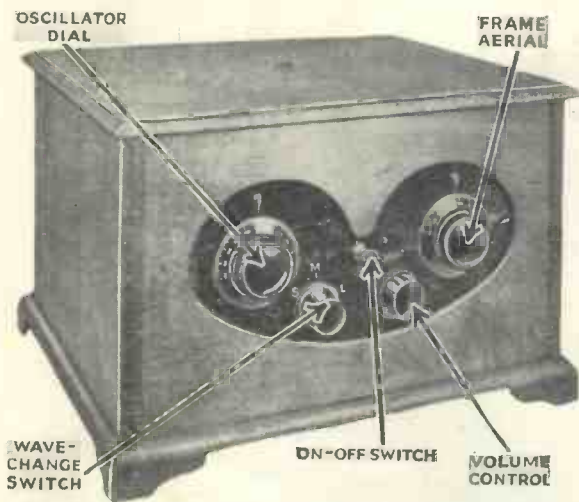
At the end of the amplifier is the second



ARRANGEMENT OF COILS IN THE SUPER 60

This photograph shows clearly the positions of the three coils plugged into the valve holders. As seen above, the set is all ready for use

PRACTICAL POINTS *about the* SUPER 60—Cont.



CONTROLS THAT ANYONE CAN MASTER

There are only two tuning controls on the Super 60 and it can be operated without difficulty by any member of the family

detector, a leaky-grid type. This is not designed to handle powerful signals for the reason that the power valve will be overloaded long before the detector itself is fully loaded.

Use of Volume Control

Now strong signals are produced by the set and the volume control must be tuned down on many stations to avoid overloading the second detector and power stage and so spoiling the quality.

If a big power valve can be used, so much the better results will be obtained. Those having a mains unit or accumulators for high tension will be able to take full advantage of this and to fit a big power valve.

In using a mains unit of good make there are no exceptional points to watch. The supply to the first detector ought to be adjustable and the second detector might also be supplied with a voltage of less than the maximum from the unit.

Detector Filter Circuits

Separate filter circuits to the mains unit for the first and second detectors are practically essential, but the other valves may be fed from the power tapping of the mains unit.

Thus three outputs are needed and one of them ought really to be adjustable for the best results. In the Regentone model W5, which I have used satisfactorily, there is an adjustable output, an output through a fixed resistance and, of course, the power output.

I did not notice any change in the selectivity of the set when changing from batteries to the mains unit, although I expected to, as the mains unit is joined to the supply, which is practically earthed on one side.

When tuning the set you will notice that the quality varies according to the exact setting of the oscillator. The station is heard over a part of a degree, but the quality is best when the oscillator is tuned exactly.

the local station and to work upwards or downwards from this point.

Note the setting of the dials for the local station and see how they compare with the published figures. Make any slight correction that may be needed to the printed readings, and then go ahead and fetch the stations in.

Identifying Stations

The published details are accurate and will help you in the identification of the stations heard. Then, when you have made your own list, you will be able at any time to go back to a particular station.

Be gentle when tuning. There is no need to hurry over it. If you do, the chances are that stations will be missed. With the volume control nicely set, you will doubtless be amazed at the sensitivity of the arrangement.

When tuning you cannot go wrong if you realise that there are two chief adjustments. First, you tune the frame to the station which you want to hear; secondly, you adjust the condenser of the oscillator.

Sharp Oscillator Tuning

In practice the tuning of the oscillator is sharper than that of the frame, so it happens that if you turn the condenser of the oscillator to the next degree a station will be heard. It will be brought up to full strength by moving the condenser tuning the frame aerial to the point of tune.

I expect you will find, as I found, that the direction of the frame does not matter very much. There is a position where the signal strength is the minimum, but there is no well-defined maximum.

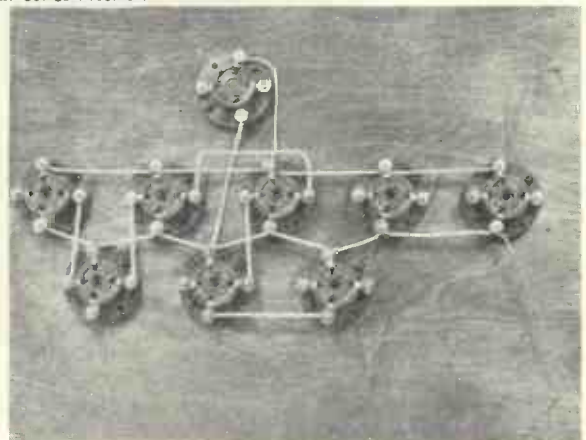


SIMPLE CONSTRUCTION

How the grid condenser for the second detector is fixed between the valve holders, thus forming a direct connection

Incidentally, if a heterodyne whistle is heard with the oscillator set in one position, you will probably find that with a fresh adjustment the station is heard clearly.

To tune in every station within the range of the set is something of a task, for if you allow four or five minutes for each the evening is gone before they are all heard. The best plan is to start from



WIRING CAN BE COMPLETED IN THREE HOURS
If desired the nine valve holders on the baseboard can be fixed and wired up first, as shown here

READ ABOUT THIS REVOLUTIONARY SET

This is all to the good. We do not want the position of the frame to be critical, as the tuning of the set itself is sharp enough for our purpose.

Low-resistance Aerial

A good low-resistance frame is of advantage. The one used is satisfactory and is not too large. With one having bigger dimensions the pick-up would be greater, but we do not want this.

The slow-motion condensers used are not expensive, but their movements are nice and sweet. If you propose fitting other types, be sure the action of the slow motion is satisfactory. And you will, no doubt, have to shift all the parts back a little from the panel. This will not affect the results.

Do not use longer flexible wires between the set and the frame than necessary; leave only enough for free movement of the frame. Longer wires are only likely to decrease the efficiency.

Action of Potentiometer

Reaction as we generally know it is not used in the set. With the volume control full on, the beat-frequency amplifier will oscillate, but the maximum amplification is obtained when the amplifier is just not oscillating.

Strangely enough, the quality is not poor when the set is in this condition.

There is a definite band-pass effect on the long-wave side and the effect of turning up the volume control is rather to make the peaks of the double hump in the tuning more noticeable.

The long-wave-length (intermediate) coils are tuned transformers. Both primary and secondary windings are tuned by

the makers and they are spaced to provide the right coupling. Changes of valves seem not to alter the tuning and the characteristics are such that all normal screened-grid valves are suitable for the beat-frequency stages.

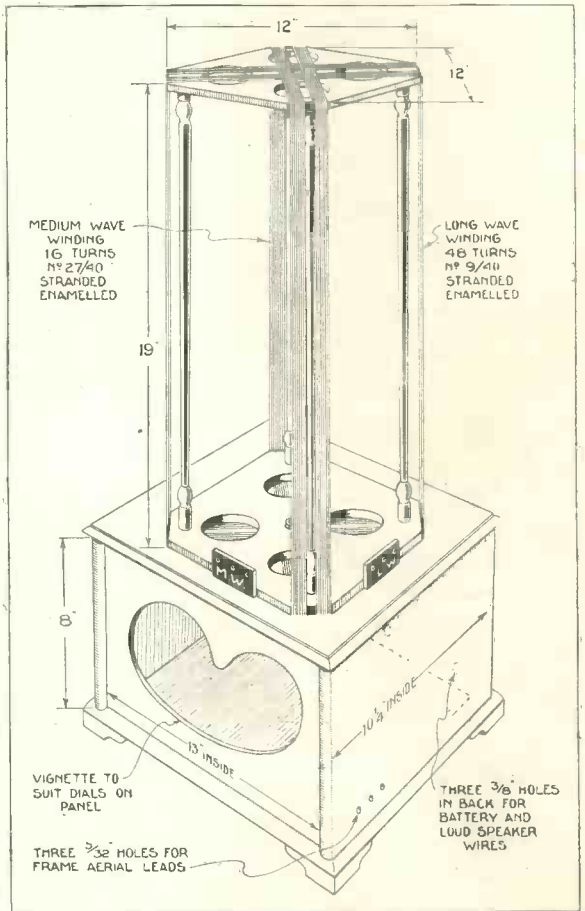
You will notice the valves are not screened and no screening is neces-

sary in the battery model. The coils are all carefully shielded. A special method of winding the coils is used.

The wire is laid on in such a way that the capacity and inductance are formed together. Then when the coil is finished it is adjusted in a testing set of great accuracy and the finished waxed coil is mounted. The coils ought always to remain constant.

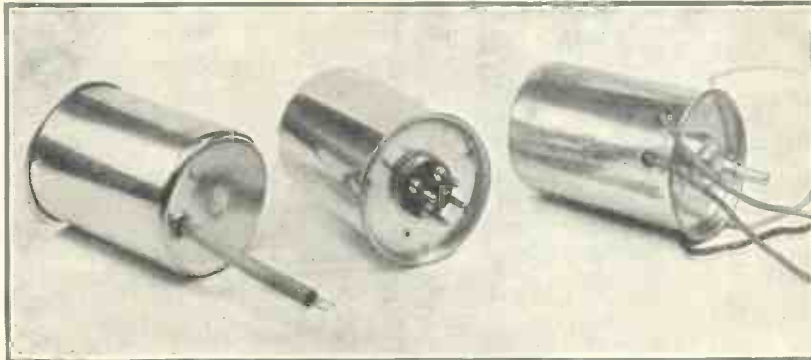
This has been a difficulty with super-heterodyne coils in the past—their tuning has not remained constant. After a time, therefore, the results have become poor. Tuning appears flat and sensitivity much below the normal.

With the method of winding used by the makers of the Super 60 coils, these troubles are avoided, as constancy is assured by the



CABINET AND FRAME-AERIAL DETAILS

Here you see details of the cabinet and frame aeri- als as supplied by Peto Scott. The aerial wire is stranded enamel and need not be Litz



SPECIAL SCREENED COILS USED IN THE SUPER 60

These are the Wearite super-het coils. On the left is a screen-grid intermediate, in the centre a plain intermediate; on the right is the three-range oscillator, mounted on the panel of the Super 60

method of winding and finishing the coils.

In the Super 60 we have a set which ought to work well for years. There is little to go wrong; no parts are strained and the layout is such that it is easy to go over the parts and connections occasionally. Be sure

describe the construction of a special portable set based on the Super 60, which is readily adapted to this form of design. He will also discuss short-wave reception with the original model. In the June issue an A.C. version of the Super 60 will be fully described.]

and put proper labels on the external connecting wires or use the recommended spade connectors and plugs having indications.

After a time you might forget the circuits to which the wires are joined and make a mistake when fitting a new battery.

[Next month W. James will

LENGTHS OF CONNECTING WIRES

Connection No. 1	3 1/2 in.
Connection No. 2	3 1/2 in.
Connection No. 3	2 1/2 in.
Connection No. 4	2 1/2 in.
Connection No. 5	3 in.
Connection No. 6	2 1/2 in.
Connection No. 7	2 1/2 in.
Connection No. 8	2 1/2 in.
Connection No. 9	2 1/2 in.
Connection No. 10	1 in.
Connection No. 11	1 in.
Connection No. 12	1 in.
Connection No. 13	2 1/2 in.
Connection No. 14	2 1/2 in.
Connection No. 15	3 in.
Connection No. 16	1 in.
Connection No. 17	1 in.
Connection No. 18	1 in.
Connection No. 19	2 1/2 in.
Connection No. 20	2 1/2 in.
Connection No. 21	1 in.
Connection No. 22	1 1/2 in.
Connection No. 23	1 1/2 in.
Connection No. 24	1 1/2 in.

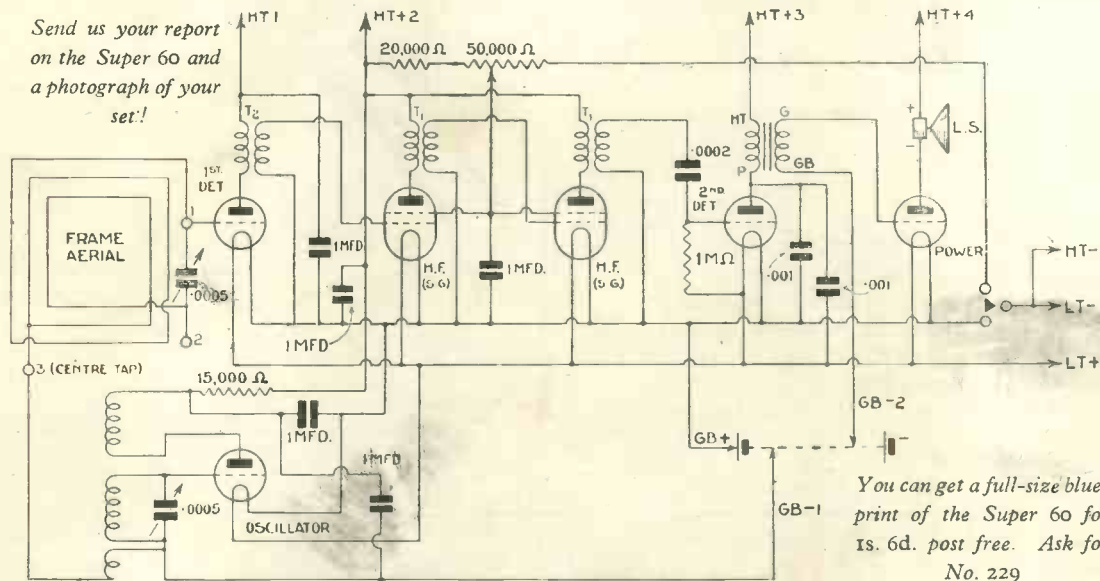
The length indicated against each number is that of the insulated sleeving needed for each lead. In all cases the wires should be cut about 1 1/4 in. longer than the sleeving to allow for screwing under terminal heads. Use No. 20-gauge tinned-copper wire. If either of the two flexible resistances is too short a piece of wire should be joined to one end to make up the length.

Connection No. 25	1 1/2 in.
Connection No. 26	4 in.
Connection No. 27	2 in.
Connection No. 28	1 1/2 in.
Connection No. 29	1 1/2 in.
Connection No. 30	1 1/2 in.
Connection No. 31	1 1/2 in.
Connection No. 32	2 1/2 in.
Connection No. 33	Flex to H.T.+1
Connection No. 34	Flex to H.T.+2
Connection No. 35	15,000-ohm flexible resistance

Connection No. 36	6 1/2 in.
Connection No. 37	2 1/2 in.
Connection No. 38	2 1/2 in.
Connection No. 39	Flex to G.B.+
Connection No. 40	Flex to G.B.-1, about 5 in.
Connection No. 41	Flex to G.B.-1, about 16 in.
Connection No. 42	Flex to L.S.-
Connection No. 43	Flex to H.T.+3
Connection No. 44	Flex to G.B.-2 about 6 in.

Connection No. 45	Blue lead from oscillator coil
Connection No. 46	4 in.
Connection No. 47	3 1/2 in.
Connection No. 48	Green flex from oscillator coil
Connection No. 49	Black flex from oscillator coil
Connection No. 50	Red flex from oscillator coil
Connection No. 51	White flex from oscillator coil
Connection No. 52	2 1/2 in.
Connection No. 53	20,000-ohm flexible resistance
Connection No. 54	3 1/2 in.
Connection No. 55	5 in.
Connection No. 56	5 in.
Connection No. 57	Flex to L.T.-
Connection No. 58	Flex from L.T.- to H.T.-
Connection No. 59	Flex from L.S.+ to H.T.+4
Connection No. 60	Flex to L.T.+

HERE IS THE CIRCUIT OF THE SUPER 60



Send us your report on the Super 60 and a photograph of your set!

You can get a full-size blue-print of the Super 60 for 1s. 6d. post free. Ask for No. 229

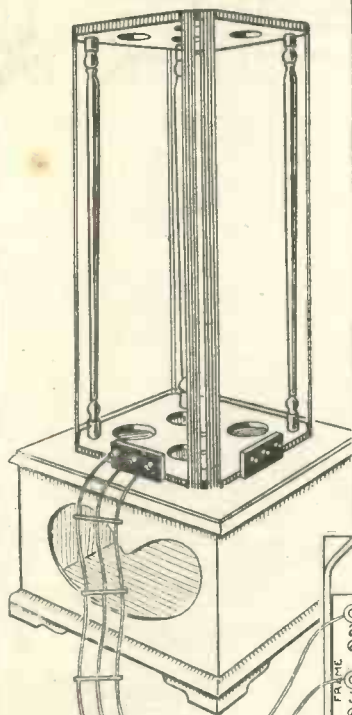
Six valves are used—an oscillator, first (anode-bend) detector, two screened-grid intermediate-frequency amplifiers, second (leaky-grid) detector and power stage. The anode-current consumption is between 10 and 15 milliamperes.

COMPONENTS NEEDED FOR THIS SET

- | | | | |
|---|---|--|--|
| <p>COILS
1—Set of 4 Wearite super-hot coils (one O2, two OT2, one OT1), £2 10s.</p> <p>CONDENSERS, FIXED
1—Formo .0002-microfarad, 6d. (or Ormond).
2—T.C.C. .001-microfarad, upright type, 3s. 8d. (or Dubilier, Telsen).
5—T.C.C. 1-microfarad, type 50, 14s. 2d. (or Dubilier, Franklin).</p> <p>CONDENSERS, VARIABLE
2—Ormond .0005-microfarad slow-motion, type R426, 12s. (or Polar, Jackson).</p> <p>EBONITE
1—Red Triangle panel, 12 in. by 8 in., 6s. (or Becol, Lissen).</p> <p>HOLDER, GRID-LEAK
1—Bulgin, porcelain type, 6d. (or Dubilier, Lissen).</p> | <p>HOLDERS, VALVE
9—Telsen, four-pin type, 9s. (or W.B., Lotus).</p> <p>PLUGS AND SPADES
8—Belling-Lee wander plugs, marked: H.T.+4, H.T.+3, H.T.+2, H.T.+1, H.T.-, G.B.+ , G.B.-1, G.B.-2, 2s. (or Clix, Ealex).
2—Belling-Lee spade terminals, marked: L.T.+ , L.T.-, 9d. (or Clix, Ealex).</p> <p>RESISTANCES, FIXED
1—Magnum 15,000-ohm, spaghetti type, 1s. 6d. (or Bulgin, Lewcos).
1—Magnum 20,000-ohm, spaghetti type, 1s. 6d. (or Bulgin, Lewcos).
1—Lissen 1-megohm grid leak, 1s. (or Dubilier, Watmel).</p> <p>RESISTANCE, VARIABLE
1—Rotorohm 50,000-ohm potentiometer, 6s. (or Regentstat).</p> | <p>SUNDRIES
Tinned-copper wire for connecting. Lengths of Sistoflex sleeving.
1—Set of Cortabs de Luxe.
1—Ebonite strip, 2 1/2 in. by 1/8 in.
3—Small brass terminals.
1—Pair Bulgin grid-bias battery clip, type G37, 9d.</p> <p>SWITCH
1—W.B. three-point 1s. 3d. (or Bulgin, Pioneer).</p> <p>TRANSFORMER, L.F.
1—Ferranti, type AF8, 11s. 6d. (or Telsen, Midget).</p> <p>ACCESSORIES
BATTERIES
2—Columbia 60-volt triple-capacity type 4780, £1 15s. (or Ever Ready, Pertrix, Drydex).
1—Columbia 9-volt, type 4756, 2s. (or Ever Ready, Pertrix, Drydex).</p> | <p>1—Eixde 2-volt accumulator, type ICZ3, 11s. 6d. (or C.A.V., Pertix).</p> <p>CABINET AND FRAME AERIAL
1—Peto-Scott, with dual-range frame aerial, £2 5s. (or Camco cabinet or Lewcos frame aerial).</p> <p>VALVES
OSCILLATOR
1—Marconi L2/b, 8s. 6d. (or Mullard PM11F, Osram L2/b).</p> <p>FIRST DETECTOR
1—Marconi H2, 8s. 6d. (or Mullard PM1HF, Osram H2).</p> <p>S.G. INTERMEDIATES
2—Cossor 215SC, £2 (or Mullard PM12, Osram S215).</p> <p>SECOND DETECTOR
1—Marconi HL2/c, 8s. 6d. (or Mullard PM1HF, Osram HL2/c).</p> <p>POWER
1—Mullard PM2, 10s. 6d. (or Cossor .215P).</p> |
|---|---|--|--|

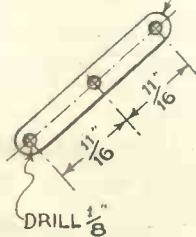
LAYOUT AND WIRING DIAGRAM OF THE SUPER 60

FRAME AERIAL

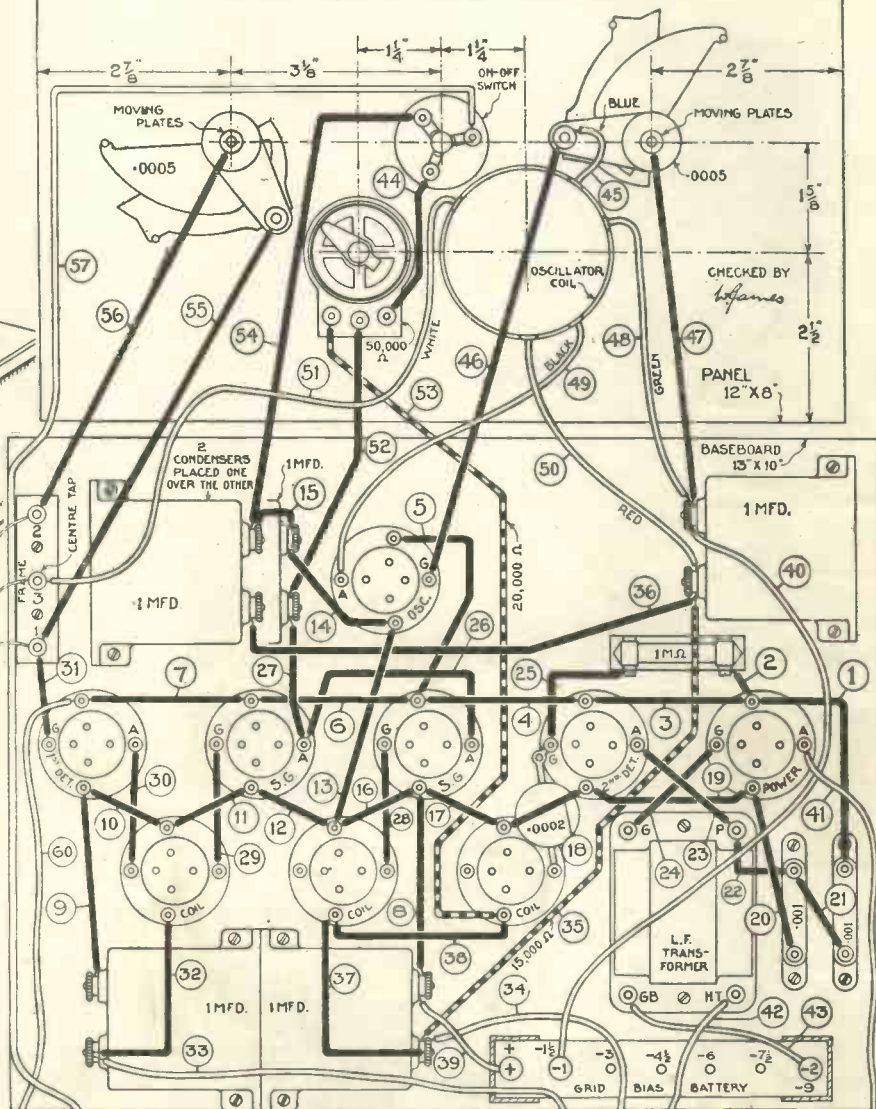


TO CENTRE TAP

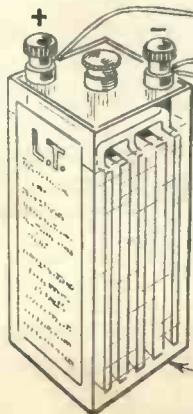
EBONITE SPACERS



Details of the frame aerial will be found on page 251

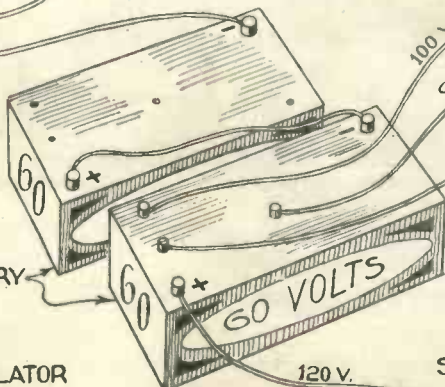


Large-capacity high-tension batteries should be used

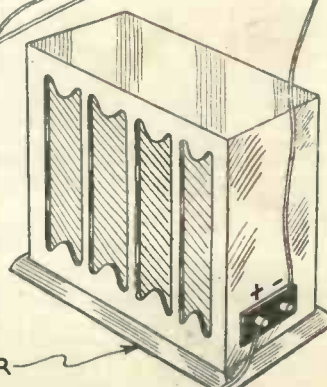


L.T. ACCUMULATOR

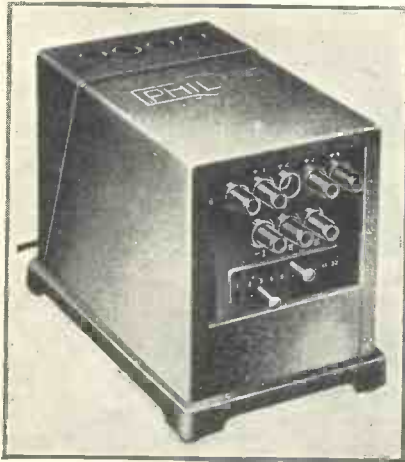
H.T. BATTERY



LOUD SPEAKER



POINTS THAT ARE ASKED ABOUT THE SUPER 60



The Philips type 3009 unit gives high tension and grid bias for the Super 60. The price is £5 15s.

Is the quality of reproduction as good with the Super 60 as with an ordinary "straight" set?

Yes, with the components used in the original design the quality is everything that can be desired. The rising curve of the Ferranti AF8 transformer helps to compensate for any loss of high notes caused by the selective intermediate stages and the overall response is satisfactory in every way.

Can an output filter choke be added to the Super 60 so that the anode current does not pass through the loud-speaker windings?

Certainly an output choke can be added; in fact, it will be an advantage if a larger power valve than that originally specified is used. Alternatively, an output transformer can be utilised.

In Cornwall the Brookman's Three has to be used with a pentode to give sufficient volume. Will the Super 60 be more sensitive?

There is no question that the Super 60 is very much more sensitive than the Brookman's Three and we think good signals will be obtained without resorting to a pentode.

How can a pick-up be added to the Super 60?

Mr. James is of the opinion that a pick-up switch would spoil the efficiency of the set for radio reception and does

not recommend the addition. If the constructor desires to do so at his own risk, however, a pick-up can be switched into the grid circuit of the second detector valve in the ordinary way. It is a much better plan to use a separate gramophone amplifier.

Is the Super 60 a satisfactory receiver for all-round house entertainment?

In our opinion this set has a greater entertainment value than any other set yet described in these pages. Literally dozens of stations can be received at good loud-speaker strength.

Is it a practical proposition to build the Super 60 for use with indirectly-heated A.C. valves?

There are a number of snags about this, due chiefly to the greater magnification obtained with A.C. valves in the intermediate stages. Decoupling resistances are es-

essential, for instance. Mr. James is at present working on an A.C. edition of the Super 60 and it is hoped to publish full details in the June issue of WIRELESS MAGAZINE. The A.C. edition will make provision for connecting a pick-up.

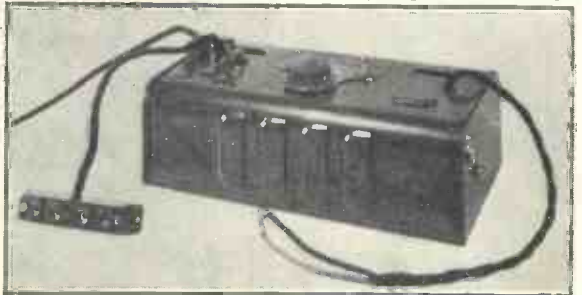
I am going to use with the Super 60 an A.C. unit that must be earthed to prevent hum. As the set has no earth

the directional properties of the frame.

Can the Super 60 be built up in portable form?

Yes, there is no difficulty about this owing to the compact nature of the original design. A portable edition will be fully described in the next issue of WIRELESS MAGAZINE.

Can you give me details for



Another unit suitable for supplying the set with high tension is the Regentone model W5, price £5 17s. 6d. This incorporates a trickle charger

connection will this be in order?

The mains unit should be earthed. If there is no earthing terminal on the unit, take the connection to high-tension or low-tension negative at any convenient point. Earthing the set may affect

winding the coils for the Super 60?

No, the design of the coils is proprietary and they can be obtained only from the specified makers.

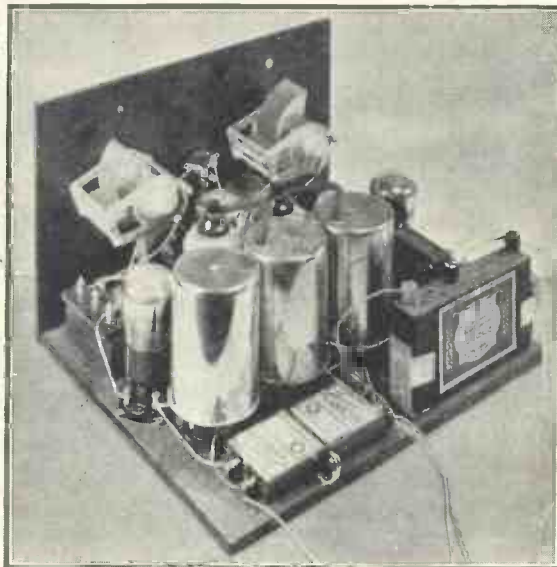
Can you recommend a mains unit for use with the Super 60? My supply is A.C., and I only want to get high tension.

Mr. James has tested the Super 60 with a number of A.C. mains units and among those that can be recommended are the Regentone W5 (which incorporates a trickle charger as well), the Junit type 150/4 A.C., the Philips 3009 (which gives grid bias as well), the Atlas type A.C. 188 and the Ekco 1V30. No doubt there are many other suitable models.

Can the Super 60 be used with a moving-coil loud-speaker? What modifications are needed, and will the quality be good?

The only modifications recommended by Mr. James are a larger power valve than that originally specified (he suggests a Mullard PM252 or PM252A) and an appropriate output transformer to give the necessary impedance matching. The quality is everything that can be

AN "ALTERNATIVE" SUPER 60



The Super 60 built up with alternative parts, as described on page 256

desired if the valves used are those utilised in the original set.

In London you get sixty stations on the Super 60. In North Wales reception conditions are very bad; do you think I ought to be able to obtain a performance at least proportional to what you claim?

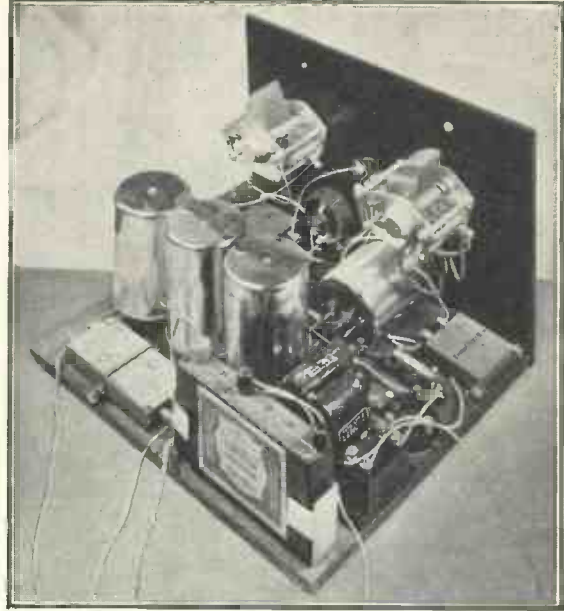
Of course, it is impossible to guarantee the reception of sixty stations under bad

fications will be necessary and that only a short-wave coil will be needed.

The .0005-microfarad aerial tuning condenser presents some difficulty, however, unless it is provided with a low-g geared slow-motion control.

As I am situated in the swamp area of Brookman's Park I can get no other stations on my present four-valve set, as the transmitters are only two miles away. What sort of results shall I get on the Super 60?

A member of the "Wireless Magazine" staff has tried out the Super 60 at the home of a radio manufacturer about a mile from the transmitting station. He also had been unable to pick up any other transmissions on his own set. With the Super 60 more than twenty-five medium-wave stations were heard at good strength during a short test; no long-wave reception was tried. This manufacturer—and several of his friends who were present during the test—is now building his own Super 60.



For a description of this Super 60, which is built up with alternative parts, see the notes on page 256

TEST REPORTS

on the Super 60, received just as this issue closes for press, appear on **PAGE 322**

conditions and Mr. James made no such extravagant claim. We are certain, however, that you will get better results from the Super 60 than from any other constructor set yet produced. Look out for reports from readers in future issues.

How can I use an outdoor aerial with the Super 60?

The set is not intended for use with an outdoor aerial and certain modifications would be necessary. You will get all you want with the frame aerial.

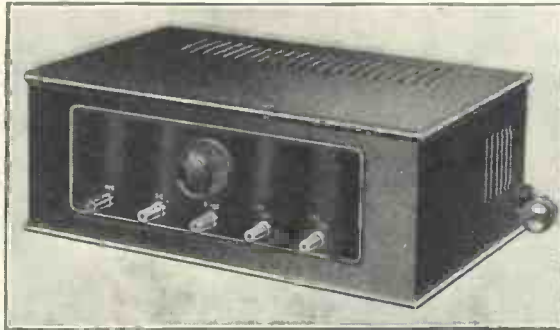
I see that the oscillator coil used in the Super 60 has a position for ultra-short wave reception. What alterations to the set are needed to pick up such signals?

Mr. James is trying out the set for short-wave reception and is preparing some notes on the subject for publication next month. It seems at present that no internal modi-

fications will be necessary and that only a short-wave coil will be needed. The .0005-microfarad aerial tuning condenser presents some difficulty, however, unless it is provided with a low-g geared slow-motion control.

anodes of the screen-grid valves fed from H.T.+2 through the primaries of the coils. The wiring diagram shows these fed from H.T.+2 via the 20,000-ohm resistance and the potentiometer and no provision for supplying the screen grids.

There is no discrepancy. The H.T.+2 lead on the wiring diagram goes direct (through lead No. 37) to the primaries of the coils before going to the 20,000-ohm resistances. The screen grids are fed from the potentiometer, which is also in series with H.T.+2 as shown in the circuit.



The Ekco type 1V30 unit has been tested with the Super 60 for high-tension supply from A.C. mains. The price is £5 15s.

Will a transformer of 1-5 or 1-7 ratio be suitable in place of that specified?

Yes, such an instrument

I have a mains unit giving 120 volts at 20 milliamperes that I want to use for supplying high tension to the Super 60. It has two fixed tappings and one variable tap controlled by a series resistance of the carbon type. Will this be suitable?

The use of such a unit is likely to result in motor-boating. It is desirable that the "S.G." or variable tapping on any unit for use with the Super 60 should be taken from a potentiometer and not from a series resistance. A number of recommended units are mentioned in another reply for these pages.

While studying the circuit and layout diagrams of the Super 60 it struck me that there was a discrepancy. The circuit diagram shows the

I live in Cornwall, where reception conditions are very bad. Have you had any reports from readers using the Super 60 in this district?

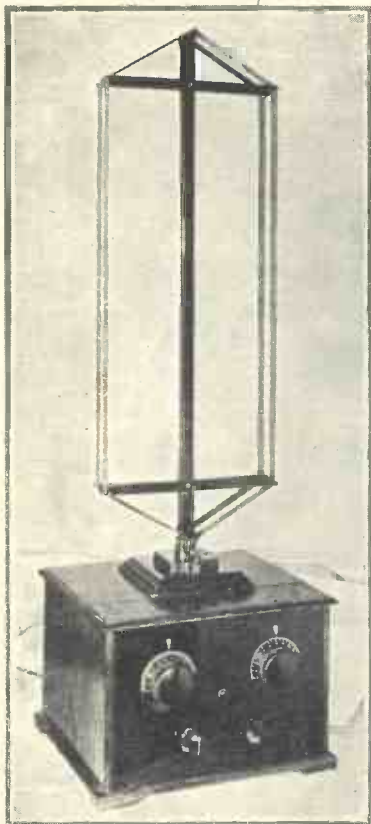
Very few reports from readers have yet been received for the reason that these pages have to go to press a few days after the publication of the March issue. Many readers who have started to build the set have promised to send reports when they have had some experience of its capabilities.

I am very much struck by the possibilities of the Super 60 but do not want to build it myself. Where can I buy one already assembled?

A number of advertisers in "Wireless Magazine" can supply a completely assembled set. Details will be found on other pages of this issue.



High tension for this set can also be obtained from an Atlas unit, type AC188, price £6



A FINE COMBINATION

Here is a version of the Super 60 built with alternative components and used with a Camco cabinet and a Lewcos frame aerial, which is now provided with a centre tap

ONE of the outstanding features of the Super 60 is that it easily lends itself to the use of alternative components. This means that the constructor can build it at low cost by utilising many of the parts that he already has on hand.

In order to prove that the Super 60 when built with any good standard components is equally as efficient as the original model I had built up in the WIRELESS MAGAZINE laboratories a special version of the set, using some of the parts recommended as alternatives.

Approved by Designer

I may say that all the components actually employed were chosen in consultation with W. James, who has no objection to reasonable departures from the original specification.

The results prove that the "alternative" model is quite as good as the original. In the course of a test between 7 and 7.25 p.m. on February 21, I picked up no less than thirty-nine stations on the medium wave-band at good loud-speaker strength.

In my version of the Super 60

BUILDING THE SUPER 60 WITH ALTERNATIVE PARTS

In these notes D. SISSON RELPH explains what happens when W. James' famous super-het is made up with different parts from those utilised in the original model. Thanks to the straightforward design, the results are excellent in every way

Mullard valves are used throughout, the types used in the various positions being as follows: Oscillator, PM1LF; first detector, PM1HF; intermediate stages, two PM12's; second detector, PM1HL; power valve, PM2.

The batteries I am using are the two Columbia 60-volt blocks originally specified, and the four high-tension leads are tapped off as follows: H.T.+1, 78 volts; H.T.+2, 108 volts; H.T.+3, 72 volts; H.T.+4, 120 volts. The bias applied to G.B.—1 is 3 volts and 9 volts is applied to G.B.—2.

Under these conditions the anode-current consumption, as measured on

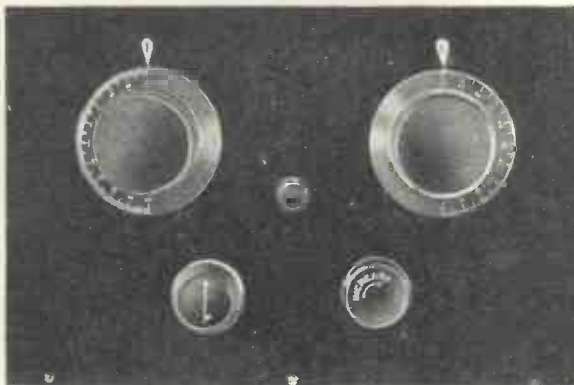
components used in this version of the Super 60. The frame aerial is that made by Lewcos, which is now supplied with a centre tap on the long-wave winding. There are thus three terminals on the base and they are numbered to correspond with the frame-aerial connections shown on the original wiring diagram.

Satisfactory Switching

With this aerial a centre tap from the long-wave winding is also satisfactory for medium-wave reception, as for this purpose the two windings are switched in parallel.

The following is a list of the parts

used in my Super 60, all the other components being as originally specified: Dubilier .0001-microfarad fixed condensers, Polar Ideal variable condensers, Regentone potentiometer, Franklin 2-microfarad condensers, W.B. rigid valve holders, Lewcos LFT3 low-frequency transformer, W.B. three-point switch, Bulgin spaghetti resistances, and a Camco cabinet.



NEAT PANEL LAYOUT

As the Camco cabinet has no fretted front, the components have been spread uniformly over the panel

a Ferranti meter, never exceeds 12 milliamperes and in the case of many stations received at exceptional strength the use of the volume control reduces the consumption to a little under 10 milliamperes!

It will be appreciated from these figures that the Super 60 is extraordinarily economical in running costs. It should further be noted that this low current consumption is obtained without any sacrifice of volume, for I am using with the set a Wates 18-in. double-coke chassis and a Blue Spot 14-in. chassis with the 66P unit.

Now for a few words about the

The last has no fretted front and therefore the components have been spread out more uniformly over the ebonite panel; you will see the effect from one of the photographs reproduced on this page.

Go Ahead!

It will be seen that there is nothing to prevent constructors going ahead with the Super 60 and utilising many of the components they happen to have on hand.

I have only one further thing to say about my Super 60—I would not change it for any other receiver, home-constructor or commercial!

WHAT IS REACTION?

Very few listeners really understand what reaction is and in this article J. H. REYNER, B.Sc., A.M.I.E.E., explains a number of points of importance to every constructor



Don Bradman listens on a McMichael portable

IN the majority of sets, either of the home-constructed or the manufactured variety, there is included a reaction control, and those sets which do not incorporate such a fitting usually achieve a somewhat similar result by other methods. It is interesting to consider just what this reaction is, and why it should be so universally used.

Other Names for Reaction

Reaction is a device by means of which circuits can be brought within measurable distance of a state of continuous oscillation. It is known by various other names, such as regeneration, or feedback. All three names are self-explanatory in that they acquire a significance when one understands the process, although they do not, perhaps, explain to the uninitiated what that process is.

Let us consider the circuit shown in Fig. 1, where we have a simple valve circuit, the batteries being omitted for simplicity. Across the grid and filament of the valve is a tuned circuit, and if we are receiving a signal this tuned circuit will set up voltages across the grid and filament.

Voltage to Spare

These voltages are amplified by the valve, so that we have considerably greater voltages in the anode circuit. This being so, we can afford to spare a small proportion of the energy in the anode circuit and feed it back into the grid circuit.

This is done in the circuit under consideration by coupling the anode coil L2 to the grid coil L1. The currents in the anode circuit then induce

voltages back into the grid circuit.

Now these feedback voltages will, of course, mix with the voltages already in the grid circuit, and their effect will depend upon what we term the phase difference. If they happen to coincide exactly with the existing voltages then they will either add or subtract.

If they do not coincide then they will add at certain parts of the oscillation and will subtract at other parts, and the net result will be anything from a complete addition to a complete subtraction, according to the circumstances.

It is possible, indeed, to have no effect whatever, the voltages adding during part of the time and subtracting for an equal amount of time, so that a circuit of the character shown in Fig. 1 does not necessarily produce the effect we call reaction, although it undoubtedly produces feedback.

What we normally term reaction is the process where the feedback voltage is additive and so increases the voltage already existing in the grid circuit. If the voltages are in the opposite direction we usually speak of it as reversed or negative reaction,

and in this case the signal strength is decreased.

The next question that arises is how far this process may be carried. Suppose we have reaction arranged to increase the signal strength, is there any limit to this process? Can we

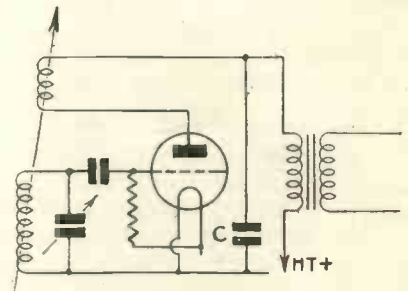


Fig. 2.—Reaction circuit with variable coupling between anode and grid coils

not just continue to increase the signals indefinitely?

As a matter of fact the signal strength can be varied enormously by the use of a reaction control.

During some tests which I was making recently on the performance of completed receivers I found that the output power could be varied anywhere between 1 and 50 milliwatts by a simple variation of the reaction control, and, indeed, a large percentage of the sets of simpler variety depend for their sensitivity almost entirely on the reaction control.

We cannot, however, continue the process indefinitely because we reach a state of continuous oscillation.

Normally, if we cut off the incoming signal by some suitable means,

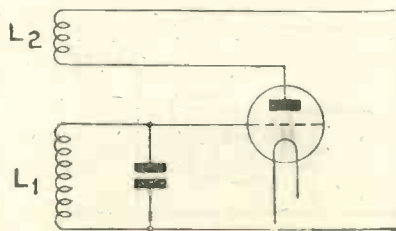


Fig. 1.—Simplest form of reaction circuit with anode coil coupled to grid coil

WHAT IS REACTION?—Continued

the currents die away almost at once and the circuit becomes dead. In a state of continuous oscillation, however, we can remove the incoming signals entirely and the circuit will

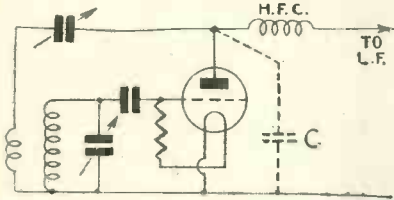


Fig. 3.—In this circuit reaction is controlled by varying the capacity

still continue oscillating on its own account.

An oscillation started in a circuit is caused to die away by the losses due to damping resistance and similar effects, but if we feed back sufficient energy to make up for these losses, then the currents will never cease, but will continue indefinitely.

This is the limit to the reaction, and it will be seen to be quite a definite one. Under normal correct working conditions the currents cease if the input is withdrawn and, for that matter, if the strength of the incoming signal varies, the current also varies in a similar manner.

Continuous Oscillation

If the reaction is increased beyond a certain point the currents which are circulating in the circuit become independent of the input, and will continue even if the incoming signal ceases, so that we no longer have a faithful amplifier, and the arrangement is not practicable.

So much for the essential principles of reaction. Let us now see how we obtain these effects in practice. A simple circuit, such as shown in Fig. 1, does not give us any possibility of controlling the reaction. In order to do this we must either vary the coupling between the two coils, or vary the currents flowing through the anode coil. The former method is what is known as swinging-coil reaction, and a typical arrangement is shown in Fig. 2.

The important point to note is the necessity for the by-pass condenser *c*. Reaction is nearly always applied around the detector circuit, that is to say from the anode circuit of the detector valve back on to the grid circuit, either of the same valve or of some preceding valve.

Now the anode circuit of the detector valve contains both high- and low-frequency currents, and the high-frequency currents are not required after this point. It is, therefore, desirable to provide a quick and easy path to earth for the high-frequency currents, and this not only enables the detector to operate more effectively, but also prevents the high-frequency energy from passing into the low-frequency stages where it is liable to cause difficulties.

In the case shown in Fig. 2, we require to use the high-frequency currents immediately they leave the anode of the valve in order to produce reaction effects and we therefore allow them to pass through the reaction coil, but after this has been done they are by-passed to earth by the condenser *c*.

This arrangement gives a more or less constant and satisfactory by-passing action, the extent of the reaction effect being controlled by moving the anode coil relative to the grid coil. The condenser *c* is anything from .0002 to .001 microfarad, depending on the circumstances. It should be large enough to provide an adequate by-passing action without seriously cutting off the upper audio frequencies.

There are various other ways of controlling the reaction effect, most of which use the second of the two possible principles, that of controlling the amount of current through the reaction circuit.

Fig. 3 shows the capacity-controlled reaction so popularly in use. Here, the low-frequency and high-frequency currents are separated straight away. The low-frequency current passed through a high-frequency choke to the low-frequency stages, the high-frequency choke serving to bar the high-frequency currents to a large extent.

These latter currents, therefore, must have an alternative route, and

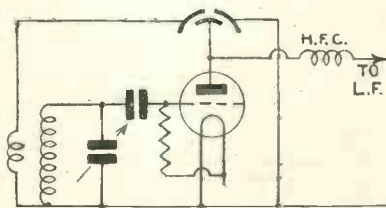


Fig. 4.—How a differential reaction condenser is connected

this is provided through the reaction circuit, which will be seen to consist of a coil coupled to the grid coil, the circuit being completed through a variable condenser.

Increased Capacity

If this condenser is made small, the whole circuit presents a fairly high impedance to the current, and only a small amount of current passes through the reaction circuit. As the condenser is increased more and more current flows through the circuit, thus increasing the reaction effect, and bringing the whole circuit near the oscillation point.

The very explanation of this method shows up its defect, namely, that in order to obtain a small reaction effect the impedance of the reaction circuit has to be increased. We have just seen, however, that for the circuit to operate efficiently it is necessary to provide an adequate by-passing action for the high-frequency current.

These two conditions are contradictory, and it is, therefore, desirable

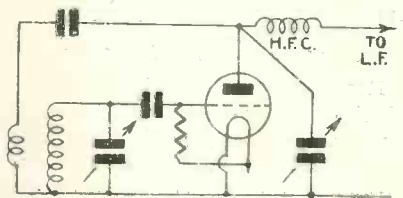


Fig. 5.—“By-pass” control of reaction or feedback

to connect an additional by-pass from the anode direct to low-tension as shown dotted in Fig. 3.

Contrary to what one might imagine, this does not prevent us from obtaining the necessary reaction effect. On the other hand, it makes the detector operate more efficiently and it tends to adjust the phase of the feedback currents so that they add to the grid currents more effectively.

Many readers will have noticed that some reaction controls work very smoothly and enable one to creep right up to the oscillation-point, with consequent good distance-getting properties, while others “plop” into reaction some distance before the full efficiency has been obtained.

This is due very largely to the fact that in the latter case the phase of the reaction is not correct, and the use of

J. H. REYNER ANSWERS THE QUESTION

a by-pass condenser assists in overcoming this defect.

Another arrangement which is often employed is that shown in Fig. 4, where a differential reaction condenser is employed. This component is one having two sets of fixed plates and one set of moving plates. Thus, as the capacity on one side is increased that on the other side is decreased.

Constant By-passing

One half of the condenser is used to control the reaction effect, while the other half provides the by-pass action necessary. The sum of the capacities on each side is the same, so that where there is a small condenser in the reaction circuit, we have a large by-pass condenser and vice-versa, the combined by-passing action of the two together being practically constant.

On the face of it this seems a much more scientific and therefore better arrangement than that shown in Fig. 3, but in practice there is little to choose.

A point which enters into any discussion on reaction is the type of condenser to be used for controlling the oscillation. It is often assumed that the efficiency of the reaction condenser does not matter, and for this reason paper-dielectric condensers are employed. A paper-dielectric condenser has quite an appreciable resistance when used towards its minimum position, where the figure may approach 50 to 100 ohms. The impedance of a .0003-microfarad reaction condenser at 300 metres is a little over 500 ohms, so that the added resistance due to the inferior quality of dielectric will be quite appreciable.

Simple Test

The reader can easily test the point for himself when he will find that less capacity is required to make the circuit oscillate when an air-spaced reaction condenser is used than when a paper-dielectric component is employed. This difficulty may be minimised by using a small reaction coil, the condenser being worked towards the maximum position, where the effective series resistance is not so large.

The circuits already discussed are only a few out of the many possible ones. There are various other means of controlling the reaction effect, and

we may perhaps refer to that shown in Fig. 5, where the usual order of things is reversed.

Here the condenser in the reaction circuit is fixed while the by-pass condenser is variable, and consequently as the by-pass condenser is increased, the reaction effect is reduced. For this purpose a variable condenser of at least .0003 microfarad and possibly .0005 microfarad should be used to control the reaction, while the series condenser in the reaction circuit should not exceed .0001 microfarad.

As has already been pointed out, the use of a relatively large-capacity by-pass from anode to low-tension is useful in obtaining smooth reaction, and consequently this circuit is one which is capable of giving very pleasant results.

Where one uses a screen-grid valve as the detector, there are other possibilities which have not by any means

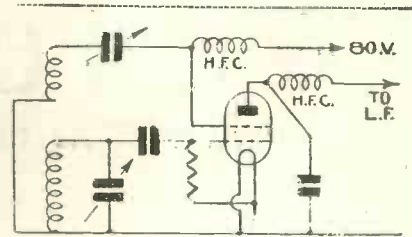


Fig. 6.—Special form of screen-grid detector circuit with reaction

been fully explored. An interesting circuit which we have tried out at Elstree is that shown in Fig. 6, where reaction is obtained from the screen-grid instead of from the anode circuit.

There is a high-frequency choke in the feed to the screen-grid and the high-frequency current is by-passed through a reaction circuit instead of straight to earth as is usually the case.

THE WIRELESS ELECTION

Three candidates put up for the Election,

A large Loud-speaker, blaring hour by hour,
An Amplifier, promising perfection

To voters if he were returned to Power,
And, last of all, a humble little Grid

Whom his opponents sneered at as "that kid!"

The Amplifier spoke of food taxes,

"Currents will cost you more, you'll shortly find!"
Loud-speaker and his friends brought out their axes

Which they with Frequency began to grind;

The little Grid worked hard and murmured then:

"'Watt' can I do to help my fellow men?"

The meetings were all held at such High Tension,

The air the most Electric ever known,
The Buzzers buzzed, and, I regret to mention,
Egg Insulators, rotten ones, were thrown;
The Choke, who took the chair, began to choke
With indignation as each "Egg"-shell broke.

Voters' opinions Oscillated daily,

Loud-speaker boldly shrilled "I shall get in!"

The while the Amplifier broadcast gaily

His absolute conviction that he'd win;

At length excitement grew beyond Control—

The little Grid, 'twas found, had topped the "Pole"!

LESLIE M. OYLER.

We Test Those Sets

Read These Independent Reports Before You Buy!

EVERY month we receive a large number of sets in the laboratory from "W.M." manufacturers. All these sets are tested in the laboratory and are then taken to the home of a member of our staff living in south-west London. There they are subjected to further tests of a non-technical nature. Sets are put into operation under conditions similar to those that would obtain in the home of the prospective set-buyer, for whom this feature of WIRELESS MAGAZINE is primarily run.

This double-test system enables us, firstly, to weed out the sets that do not come up to our standard and, secondly, to see how the sets accepted in the laboratory behave under ordi-

nary domestic conditions.

The aerials used in the laboratory are numerous, but we have a standard wire of approximately 80 ft. total length and an inside wire of 40-ft. length. At the south-west London location a 60-ft. indoor wire is used. This, at a distance of twenty miles from Brookman's Park, gives the sets tested a fair chance to exhibit selective properties.

We realise that some of the sets tested under these conditions will be installed by the set-buyer much closer to a broadcasting centre. But it must be true that the proportion of all listeners in the



vicinity of Brookman's Park is small. In all our tests we endeavour to visualise the common needs of the greatest number.

The laboratory tests enable us to determine the cost of running the sets. For example, we can measure the total anode current taken from the high-tension battery when a battery-operated set is working. From this figure we can then say whether a single-, double-, or treble-capacity battery will be necessary for economical working.

We also determine the

work out the additional charge to the electric-light bill attributable to the installation of the set.

For example, a two-valve all-electric set might take a power of 20 watts from the supply. Knowing that the unit of electricity is the kilowatt hour, and knowing the price of a unit of electricity, one can determine the number of hours running for the price of one unit by dividing one kilowatt hour, that is 1,000 watts an hour, by 20. In this example 50 hours running could be obtained for the price of a unit.

In the tests under domestic conditions we take particular note of the ease of operation. Sometimes a set that has passed the laboratory tests has to be rejected because in our opinion it is unnecessarily difficult to operate.

Considerable test work goes on behind the scenes and we should like readers to realise that the reports they see in print are the result of a very careful sifting process and are not merely "write-ups" of any sets that happen to arrive at the laboratory.

On this page will be found details of our free-advice service. All recommendations are

FREE ADVICE FOR BUYERS

To help readers of WIRELESS MAGAZINE to select suitable sets we conduct a Set-Buyer's Advice Bureau. To take advantage of this free service the reader is asked to state:

(1) The maximum price and whether this is for the set alone or inclusive of accessories; (2) where the set will be used; (3) what stations are desired, whether local or foreign; (4) whether a self-contained set or an ordinary set with external accessories and aerial is preferred; and (5) whether battery or mains operation is wanted; if mains operation, whether D.C. or A.C. mains.

A stamped-addressed envelope for reply is the only expense. Write to Set Selection Bureau, WIRELESS MAGAZINE, 58/61 Fetter Lane, London, E.C.4.

power consumption in watts of the all-electric sets tested. This figure is given at the beginning of the test reports and readers can quite easily

made from actual experience. Where the choice is between a set that tests have shown to be good and a set not yet tested we choose the former.



PHILIPS RADIOPLAYER

A novice should not have much difficulty in mastering the operation.

Makers.—Philips Lamps, Ltd.

Price.—£25 complete with valves and loud-speaker.

Power Supply.—A. C. mains. The set can be connected to supplies between 40 and 100 cycles. Tappings are provided for all voltages between 100 and 250 volts. The makers recommend the dealer to adapt the set for the voltage required, although the adjustment is greatly simplified by the use of a very clear explanatory diagram.

Power Consumption.—21 watts.

Valve Combination.—This set includes one stage of high-frequency amplification, followed by a detector valve transformer-coupled to a pentode power valve. Mullard valves are used for these three positions. A Philips 506K rectifying valve is employed for converting the A.C. current into direct current for the anode supplies of the three receiving valves.

Controls.—As is usual with Philips sets, the Radioplayer has conveniently arranged control knobs, which are mounted at each side of the moulded container. Immediately below the opening of the loud-speaker, on the right, is a small window, behind which is the tuning scale. To the left is the mains switch, and all the other controls are mounted on the sides of the case.

The most used controls are the knobs on the right-hand side. One is the tuning control and near by is a smaller knob for fine tuning adjustments. Near these two tuning controls is the reaction control. At the other side is the volume control and wave-change switch.

What might appear to be a multiplicity of controls is actually the minimum for good efficiency in a three-valver. Thus it is essential to be able to reduce the volume of powerful local stations; and

just as necessary to be able to boost up the strength of distant stations with reaction.

We found all the controls exceptionally smooth in action. Tuning is virtually a one-knob business. Many stations were heard without altering the fine tuning control, which was needed only as a final "booster" when receiving distant stations. One can search for these distant stations by rotating the main tuning knob without reference to the fine tuning knob.

The wave-change switch provides three distinct ranges. The first is from 200 to 450 metres, the next from 400 to 950 metres, and the third from 900 to 2,100 metres. Reception on the waveband desired is obtained by turning the switch so that the small arrow points towards the corresponding figures clearly engraved on the knob. This three-range distribution of wavelengths is useful, since it is possible to space out stations more evenly than is possible with a more restricted tuning range.

The volume control was very effective; it provided what few volume controls do provide, namely a good range of audibility. Reaction was a little fierce but could be readily controlled owing to the smooth mechanical action of the knob.



ORIGINAL IN CONCEPTION

A photograph of the rear of the set, showing how well it is designed

In general, we found control of the Radioplayer quite easy and commendably flexible. A novice should not have much difficulty in mastering the operation of this set.

Tests on our standard 60-ft. aerial in south-west London showed that the Radioplayer can provide a very good selection of foreign stations at good loud-speaker strength. In the 200- to 450-metre range we obtained an exceptionally good log. Rome 160 was enormously strong. So was Stockholm 157, just clear of the Rome transmission.

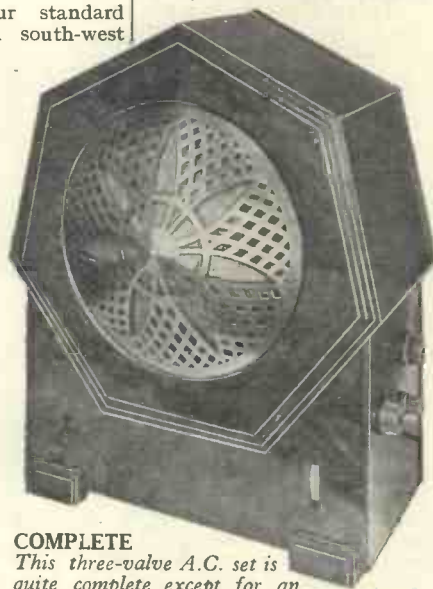
Berlin 138, Glasgow 132, Frankfurt 136, Toulouse 124, Strasbourg 100, Bordeaux 85, and Hilversum 81, were all logged as well worth listening to. The 400- to 950-metre range enabled us to bring in several stations above the Midland Regional.

Switching over to the 900- to 2,100-metre range we logged seven concert-strength signals. These were Hilversum 130, Radio Paris 112, Daventry 105, Warsaw 80, Motala 76, Moscow Trades Union 70, and Kalundborg 55.

Selectivity.—From tests we can say that the Radioplayer has average selectivity. Quite a useful amount of clear space is noted between the London National and Regional transmissions. London National, maximum at 65, spread to 55 and 75. London Regional, maximum at 110, spread to 125 and 100. Beyond these limits

many stations of continental origin were logged at full loud-speaker strength, clear of local-station interference.

We could not get Zeesen clear of Daventry and Radio Paris, but as this German



COMPLETE

This three-valve A.C. set is quite complete except for an aerial and earth

station was very strongly received when Daventry was not working, we think a short aerial can be justifiably recommended, both for long-wave and medium-wave selectivity.

Quality.—The reproduction, as noted on the self-contained cone loud-speaker, had a generally pleasing effect upon us. Speech was notably clear and incisive. One quickly grows accustomed to the brilliant tone of the music, probably because this brilliance goes hand in hand with quite a fair bass-note response. Gramophone records were reproduced with better quality on this set than would be possible on any mechanical machine.

Appearance.—Strikingly original, the Philips Radioplayer is housed in an attractive Philite moulding.

Summary.—This is a very convenient form of receiver, self-contained except for the aerial and earth. This set suits modern conditions; it brings in a good number of medium- and long-wave stations at entertainment quality.



McMICHAEL MAINS THREE

... Controls have been exceptionally well thought out ...

Makers.—L. McMichael, Ltd.

Price.—20 guineas (special 25-cycle model at 21 guineas).

Power Supply.—A. C. mains (no D.C. model).

Power Consumption.—30 watts.

Valve Combination.—High-frequency amplifying valve, detector and transformer-coupled pentode valve.

Controls.—This set is specially interesting in that its controls have been exceptionally well thought out with a view to simplifying operation. For example, tuning is done by means of a large knob fitted immediately beneath a wide calibrated tuning scale. Rotation of this knob actuates the two variable condensers of the two tuning circuits. Also it moves a pointer horizontally along a centre line engraved on the scale.

When the set is in operation this scale is well illuminated by means of a lamp fitted behind it. Undoubtedly, the tuning scale of this set is the best we have yet come across, not only because it is calibrated along the top in medium waves and along the bottom in long waves, but because the pointer moves so clearly along the scale.

Below the main tuning knob are two subsidiary controls. That to the left is very ingenious, combining the functions of waveband switch, gramophone pick-up switch and volume control. Half the rotation of this knob controls the volume on medium waves and the other half the volume on long waves. This control of volume, which was found very effective during tests, comes before the H.F. valve. To the right of this is another large knob for the control of reaction. On the right-hand side of the cabinet is a neat push-pull switch for the mains.

Sensitivity.—We were able to judge the sensitivity of this set by connecting to it

our standard 60-ft. aerial and then setting the tuning pointer to the calibrated wavelengths of the stations required. With great facility we successively tuned in Budapest, Vienna, Brussels,

Motala, Moscow, Kalundborg, and Oslo. These were all heard at full loud-speaker strength and as the long waves do not fade we were able to enjoy a wide variety of programmes.

Judging by the sensitivity of the set when used with our modest aerial we think a big aerial is quite unnecessary. For those who have any special difficulty in erecting an aerial, either indoors or outdoors, a mains-aerial connection is also provided in the McMichael set. With this connection we were able to obtain quite a fair selection of foreign stations at loud-speaker strength.

Selectivity.—The selectivity in this set is good in view of the great sensitivity. The London National 261-metre station spread to 250 metres and 260 metres, a total swamping effect of 20 metres. The London

Regional 356-metre transmission spread to 365 and 345 metres, a spread of 20 metres. On the long waves the selectivity is above the normal, because Zeesen, on 1,635 metres, was tuned in practically clear of Daventry on 1,554 metres.

and Milan, before coming to Midland Regional. After that we got Lyons, Paris, Rome, Stockholm, Berlin, Dublin, Katowice, Glasgow, Bucharest, Frankfurt, and Toulouse before coming to the London Regional.

Below that we found Strasbourg, Göteborg, Genoa, Bordeaux, Hilversum, Bratislava, and Heilsberg, all well worth hearing before reaching the London National. Below that we got Juan les Pins, Belfast, Keil, Cork, and Königsberg. Altogether an exceptionally good log for a three-valver, especially in view of the fact that the stations mentioned were heard at really good loud-speaker strength.

On the long-wave range the set behaved even better than on the medium-wave range, enabling us to log Hilversum, Radio Paris, Zeesen, Daventry, Eiffel Tower, Warsaw,

The makers define three conditions of reception; the first is for full loud-speaker strength.

The second reception condition is for medium strength, either due to the low power of the station received, or to the great distance of that station from the set. Greater strength can then be obtained by keeping the volume control at its maximum and increasing reaction.

The third condition of reception is for weak or distant stations requiring the full use of reaction and volume set at its maximum. The point to note is that under this third condition the selectivity is at its minimum. But as all the stations worth hearing from a programme point of view can be received on this set without using the maximum amount of reaction, we think the selectivity is more than adequate.

Since stations can be heard when there is still some reserve of power, one can take liberties with the volume control, a decrease of which causes an increase in selectivity.

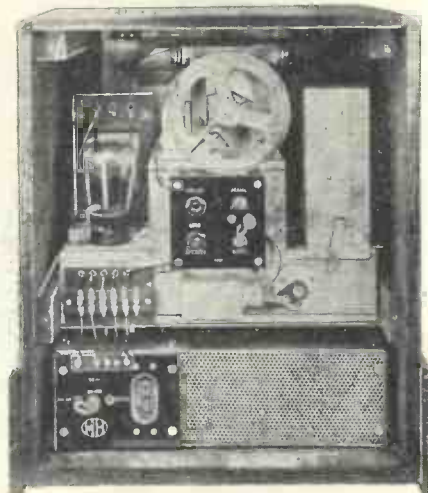
Quality.—Both on radio and gramophone reproduction, the quality was found to be pleasing. As a pentode output valve is used it is necessary to be careful in choosing a suitable loud-speaker. To allow for the rather high impedance of the pentode the makers have provided a tapped output choke. With any given loud-speaker it is advisable to try the two alternative tappings provided.

Summary.—This is a first-class broadcast receiver for operation from A.C. mains. It requires a very modest aerial for its operation. If an aerial cannot be erected the mains connection provides satisfactory reception. The set is self-contained except for the loud-speaker and aerial-earth system. In its well-finished walnut cabinet the McMichael Mains Three is extremely attractive.



A GOOD SET WITH SIMPLE CONTROLS

Note the special tuning scale, which is calibrated in wavelengths for easy operation



NEAT AND WELL MADE

This photograph shows how well arranged is the McMichael receiver



AMPLION TWO-VALVE A.C. SET

Reproduction was undeniably pleasing

Makers.—Graham Amplion, Ltd.

Price.—£15 15s.

Power Supply.—A.C. mains. Provision is made inside the set for an adjustment on the power transformer, so that supply voltages of 100 to 110 volts, 200 to 220 volts and 230 to 250 volts can be readily utilised. Corresponding models for D.C. mains and battery operation are not available.

Power Consumption.—20 watts.

Valve Combination.—In this set is included a four-volt indirectly-heated detector valve, which is transformer coupled to a four-volt directly-heated pentode power valve. The valves actually specified are Mullard 354V and PM24A for the detector and power positions respectively.

This combination is capable of giving excellent results from near-by stations.

Controls.—There is a centre escutcheon plate carrying two slow-motion dials. These read from 0 to 100 degrees and are intended to be actuated by the thumb.

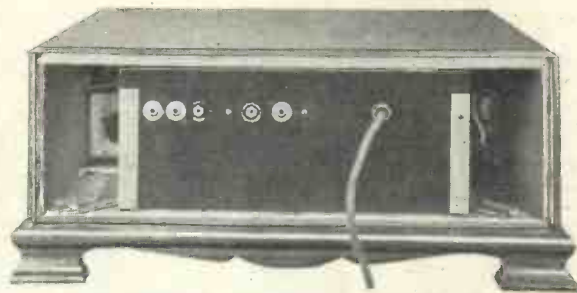
The left-hand dial is for varying the tuning circuit, and the right-hand dial for increasing reaction, the application of which considerably increases the strength of the stations received. But during tests we found reaction was unnecessary for the reproduction at good loud-speaker strength of the two Brookman's Park stations. The smooth, mechanical action of the tuning and reaction controls pleased us.

Besides these controls are two switches, one mounted at the left and the other at the right. The main switch on the left has a very fine action. The set is brought into use by pulling down this switch. Its on-off positions are very clearly engraved. The waveband switch on the right is equally precise in action. Its engravings show that in the left-hand position it provides medium-wave tuning and in

the right-hand position long-wave tuning.

So much for the controls, which have to be considered with the aerial connections, two alternatives being provided. In general, the aerial terminal A1 is recommended by the makers and this connection *must* be used if the 261-metre London station is wanted. The provision of aerial terminal A2 takes into account very poor aerial situations and conditions, where selectivity is not of great importance. The use of terminal A2 under normal conditions, as for example, when the set is used within the service area of a regional station, with an aerial of 60 ft. total length, results in considerable volume but rather unselective tuning.

Altogether, control of this set is simple, and so is the installation; such connections as the aerial, earth and loud-speaker leads are facilitated



VERY SIMPLE INTERNAL CONSTRUCTION

There is nothing complicated about the back of this Amplion mains set

With a sufficiently long aerial to provide good signal strength this set, tested twenty miles south of Brookman's Park, was found to be more selective than is usual for its type. Using terminal A1, as recommended, we got the London Regional at 53 degrees and it had disappeared at 45 and 60 degrees, a total spreading effect of only 15 degrees.

As a matter of interest, we then tried the reception of the London Regional with the aerial terminal A2. This station was received at 37 degrees, but could still be strongly heard down to 15 and up to 65 degrees, a considerable spread of 50 degrees. Reverting to the aerial terminal A1 we got London National at 30 degrees and it quickly disappeared at 25 and 35 degrees, a total spread of only 10 degrees. We consider the selectivity performance using terminal A1 is above the average.

Sensitivity.—In view of the limited number of stages of amplification in this set, the listener can rely only on the local stations for entertainment. For such reception the Amplion two-valver is ideal. With our standard 60-ft. aerial the strength of both Brookman's Park stations was more than adequate. On the long waves Daventry at 68 degrees was also good. The use of aerial terminal A2 on this waveband did not result

in such unselective tuning as on the medium band. We were thus able to get Zeesen at 62, Warsaw at 41, Oslo at 15, Radio Paris at 71 and Huizen at 85 degrees on the dial at moderate loud-speaker intensity.

Tests show that the medium waves offer scope for searching with this set among the foreign transmissions, but it must be clearly understood that these distant stations are not programme alternatives of the two local stations. We were able to get at least six stations on the medium waves at fair loud-speaker strength, including Vienna 92, Brussels 84, Rome 64, and Stockholm 60.

Quality.—As a pentode output valve is used, the makers recommend that the loud-speaker be of high resistance. For our tests of quality we used the Amplion type AB6 cone loud-speaker, which is provided with high, medium and low loud-speaker impedances. The quality had a characteristic brilliance due to the use of a pentode power valve, but this was balanced by the natural low pitch of the loud-speaker. The overall reproduction was undeniably pleasing.

On the right-hand side of the cabinet is a jack into which can be fitted a plug attached to a high-resistance gramophone pick-up. As the amplification from the two valves is fairly considerable, a volume control must be used between the pick-up and the set.

Summary.—This is a handsome two-valve A.C. set, especially suitable for the reception of regional broadcasting with an indoor or outdoor aerial of moderate size.



A HANDSOME COMBINATION

The Amplion two-valve set with the Amplion AB6 loud-speaker (price £4 10s. in oak)

by the provision of clearly marked plug-sockets at the back of the cabinet.

Selectivity.—In testing the Amplion set for selectivity we were guided by the thought that to fulfil its function it had only to separate the two local regional transmissions.



GECOPHONE ALL-ELECTRIC FOUR

Maker.—General Electric Co., Ltd.

Price.—£30. This includes the valves but not the loud-speaker or aerial and earth system, which together would cost another £5 to £10.

Power Supply.—A.C. mains. There is no corresponding model available for D.C. mains or for battery operation.

Power Consumption.—55 watts. This compares with the 60 watts of a bright electric-light bulb. At 6d. per unit this set would give about 20 hours service for 6d.

Valve Combination.—Four valves are arranged in the sequence of two high-frequency amplifiers, detector, and power output. MS4 screened-grid valves with A.C. filaments heated at 4 volts are used for the high-frequency stages. The detector is an MH4, transformer coupled to the PX4 power valve. We like the power valve, but would have preferred a detector valve capable of handling more power. The rectifier for supplying high-tension current from the A.C. mains is the Uro valve.

Controls.—Greatly simplified due to the presence of very considerable high-frequency amplification. Tuning is by a single knob at the left-hand end of the cabinet. This rotates a three-gang condenser and a dial, illuminated when the set is switched on. The dial is calibrated in wavelengths, from 250 to 550 metres and from 1,000 to 2,000 metres. Non-expert users would find this dial a great help in logging distant stations, providing the wavelengths were known.

The only control on the front of the cabinet is the mains on-off switch, just a little awkward in action. Near the tuning knob are the range switch and the volume control. The range switch works with great precision and very smoothly. The volume control is a series aerial condenser, which not only reduces vol-

ume but in doing so increases selectivity.

A reaction-control knob is fitted at the right-hand end of the set but from our tests we do not think reaction is needed in the reception of most foreign stations. Nevertheless, it is a useful standby when conditions are bad.



HANDSOME MODERN DESIGN

Many listeners will be attracted by the modern cabinet of this Gecophone receiver

Sensitivity.—Tested during an evening in February, starting at 8.45 p.m., we did all our logging with reaction set at zero. The two high-frequency amplifying valves confer on the set a degree of sensitivity all too rare in this country. With such great sensitivity and one-knob tuning the logging of distant stations is an extremely simple process.

Starting on the medium waves, Budapest was terrific at 99. Vienna at 93 was unusually good. Milan at 80 was too strong and the volume control had to be used. Prague at 88 was clear of Midland Regional, a great achievement, in our opinion.

The Midland station at 86 needed a drastic application of the volume control. Langenberg at 84.5 needed a little reaction, not for strength but to clear it from the Midland station. Lyons at 83 was nearly as strong as Rome at 78. Stockholm at 77 was equally good. Katowice at 69.5, Bucharest at 67, Toulouse at 55 and Ham-

burg at 61.5 were all good, especially Toulouse.

The London Regional was a terrific signal at 57, overloading the detector unless the volume was reduced. Barcelona at 52, Brussels at 51, Paris PTT at 46.5, and Bordeaux at 41 were all identified before Turin was received at terrific strength at 38.

Just before the National at 25 came another loud signal—Rennes at 29.5. Hörby was good at 23 and Leipzig at 21 was excellent. Juan Le Pins came in with exceptional strength at 19. The last three stations were Germans, Nürnberg at 15, Cologne at 12, and Flensburg at 4. Thus finished a remarkable log, remarkable because reaction was not needed and only one knob had to be turned.

If the medium waves were remarkable, the long waves were no less so. One can get six or seven stations on the long waves with any good three-valver. But not many sets we have so far tried reproduce the long-wavers with

ala at 50 was strong but not quite so good as Kalundborg at 32. Oslo was fine at 22. Leningrad was strong at 4. These stations were received without reaction.

Selectivity.—With its three tuned circuits, the Gecophone four-valver is very selective. London Regional, maximum at 57, had disappeared at 60 and 54. The National, maximum at 25, had disappeared at 28 and 21.

Langenberg was quite clear of the Midland Regional. Hamburg was also received clear of the London Regional. Rome and Stockholm were well separated. Zeesen was clear of the interference usually experienced from Paris and Daventry.

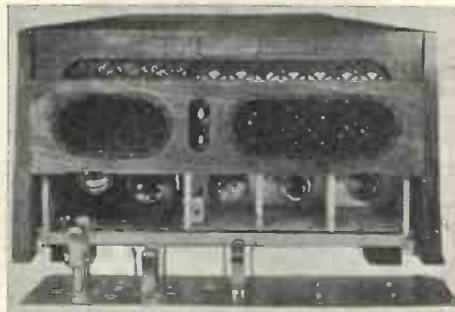
Quality.—As noted on a linen-diaphragm loud-speaker and on a Ferranti permanent-magnet moving coil, quality was first-class. The PX4 brings out a rich bass tone. No variation in the quality was appreciable with volume variations. When the signal is very strong quality is impaired unless the volume control is used.

Appearance.—Exceptionally fine-looking cabinet, built on advanced lines as illustrated.

Summary.—The Gecophone All-electric Four is a deluxe set for the listener requiring really first-rate reproduction of a large selection of home and foreign broadcasting stations. The use of two screened-grid A.C. valves for high-frequency amplification has resulted in a great simplification of control.

Since there is so much signal amplification before detection the application of reaction is unnecessary for the

reception of most worthwhile stations. This means that to go from one station to another involves the rotation of only one knob. And as this actuates an illuminated dial calibrated for both medium and long wavelengths, station selection is reduced to the last degree of simplicity.



STOPPING VALVE VIBRATION

This photograph shows the back of the set; note the anti-vibrating clips that hold the valves steady in their sockets

such strength and clarity as this Gecophone set.

Huizen at 86 was not quite so strong as Radio Paris at 76. Zeesen at 72 was really strong and quite clear of Radio Paris and Daventry, which came in at 67. Eiffel Tower at 59 was clear and Warsaw at 56 was fair. Mot-



MARCONIPHONE MODELS 220 AND 221

Maker. — Marconiphone Co., Ltd.

Prices. — A.C. model, £11 10s.; battery model, £8.

Power Supply.—For model 220, A.C. mains of 100 to 110 volts and 200 to 250 volts. For model 221, high-tension, low-tension, and grid-bias batteries.

Power Consumption. — A.C. model, 20 watts. For the battery model a double-capacity high-tension battery is recommended.

Valve Combination.—In model 220 is an MH4 detector valve and an ML4 output valve. In addition to these two valves for receiving, there is a U10 rectifier.

In the battery model one has a choice of 2-volt or 6-volt valves. If 2-volts are used an HL210 is recommended for the detector and a PT240 for the pentode output valve. Among 6-volt valves the makers have chosen the L610 for the detector and the PT625 for the pentode output. Although 6-volt valves are recommended we obtained excellent results when we tested the set with the 2-volt valves specified.

Controls. — The arrangement of the controls is the same in the model 220 for A.C. mains as in the model 221 for battery operation. Mounted at the top in the centre of the front of the cabinet is a smooth-working tuning control. This is a thumb-operated disc moving horizontally instead of the more usual way, which is vertically. The sideways movement of the thumb-operated dial is very much more handy than the more common up-and-down movement.

To the left and right of the

tuning control are two knobs, reaction being controlled by the left-hand knob and selectivity by the right-hand knob. We found that the selectivity control enabled us to sharpen the tuning very considerably.

As the set is made more selective the reaction demand becomes less, so the selectivity control is very helpful as a vernier control of reaction.

Immediately below the tuning dial is arranged the wavelength switch. For stations on the medium band of wavelengths, such as the London Regional, this switch should be pushed upwards as far as it will go. For stations on the long wavelengths, such as Daven-



SIMPLE TO WORK
The controls of models 220 and 221 are identical

try 5XX, it should be placed in the central position.

For the reproduction of gramophone records this switch is placed in its lowest position.

Selectivity.—One of the most remarkable features of this Marconiphone product, in the battery model as well as in the mains model, is the "knife-edge" selectivity. Using our standard aerial we tuned in the London National

maximum at 42 degrees, had gone completely at 38 and 46 degrees, a total spread of only 8 degrees.

This is exceptionally sharp tuning in view of the fact that there is only one tuning variation. In order to prevent any deterioration in the quality, the selectivity control is brought into play for the reception of the local stations. The tuning can by this means be rendered less sharp.

The above readings refer to the A.C. model 220. We found the readings for the battery model very little different. For example, London National came in at 24 degrees and had disappeared at 20 and 28 degrees, a spread of 8 degrees. London Regional, maximum at 46 degrees, had gone again at 41 and 49 degrees.

Sensitivity. — In testing model 220 for sensitivity we had to bear in mind that this

type of set is primarily designed for the reception of local stations. As the Marconiphone model fulfilled this condition so admirably, in that it gave full loud-speaker reproduction of the Brookman's Park stations, we were tempted to try for some of the more powerful foreigners. Nor were we disappointed, as the following log shows:—

Kiel 18, Hörby 20, London National 21, Heilsberg 25, Hilversum 30, Brussels No. 2 35, London Regional 42, Stockholm 57, Rome 58, Langenberg 63, Midland Regional 64, and Brussels 70. Of these stations the London National and London and Midland regional stations were at concert strength. Of the remaining stations logged, Brussels, Rome, and Langenberg were quite strong, while the others were moderate in intensity. On the long wavelengths the set was not so sensitive, although Daventry 5XX came in well at 63. Radio Paris at 72, and Eiffel Tower at 55 were moderate.

Due to the use of a pentode output valve in the battery model, we were able to get quite a number of foreign stations on model 221, as well as the local stations.

Quality. — We tried the model 220 with the Marconiphone moving-coil loud-speaker; the quality of reproduction with this combination was very satisfying. The battery model gave good results with a linen-diaphragm type.

Summary. — Marconiphone models 220 and 221 provide excellent reception if used within regional broadcasting areas.



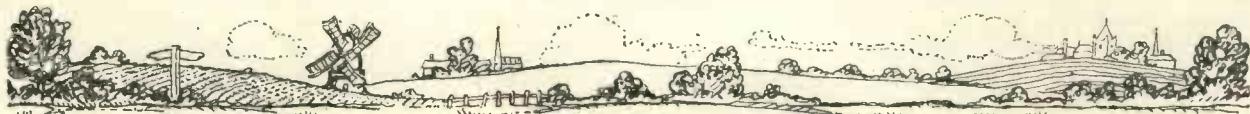
ARRANGED FOR BATTERY OPERATION

This is model 221. Note the plug-in grid-bias battery between the two receiving valves

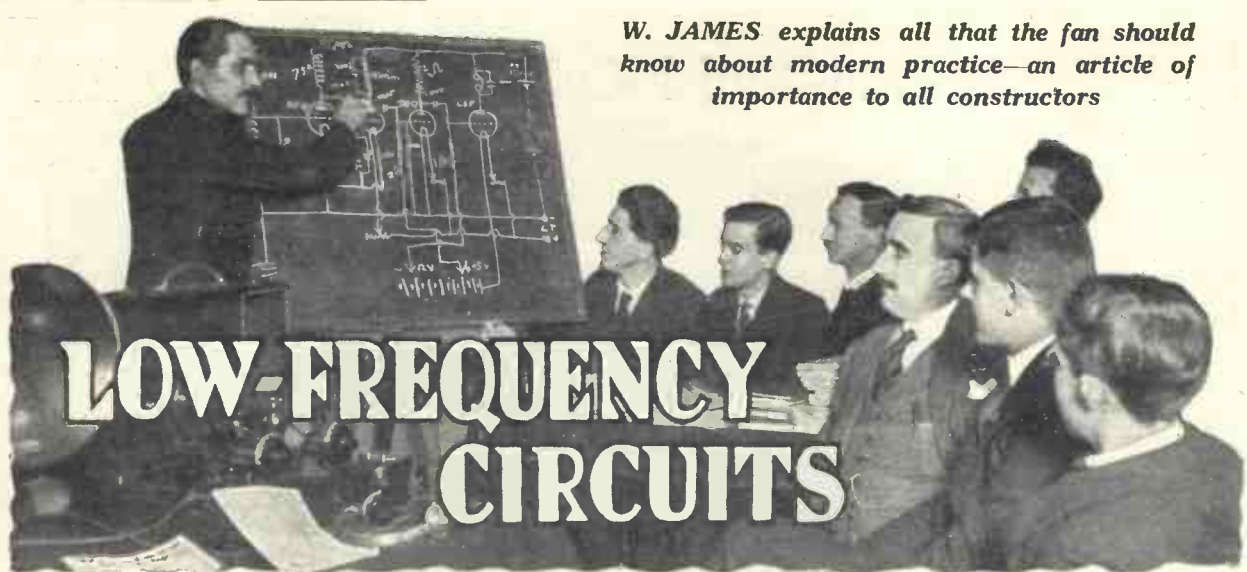


HERE IS THE A.C. MAINS VERSION

Above is a photograph of the back of model 220. The rectifying valve is in the centre.



W. JAMES explains all that the fan should know about modern practice—an article of importance to all constructors



LOW-FREQUENCY CIRCUITS

THE results to be obtained from a set cannot be foretold with accuracy, as a rule, because we have not complete information at our disposal.

Low-frequency circuits are usually

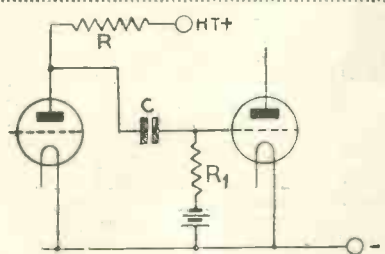


Fig. 1.—Valve with resistance-capacity coupling

considered fairly free from difficulties, but, as a matter of fact, there are numerous effects which no doubt pass without notice in many instances.

Troubles arise from many causes. Thus valves have capacity; high-tension supplies have resistance and the parts of the circuits are influenced by each other.

Simple Resistance Coupling

Let us take first, as an example, a valve having a resistance coupling, as in Fig. 1. We have the anode resistance R , through which the current passes to the valve itself. Between the anode of the first valve and the grid of the second is a coupling condenser C , and a grid leak R_1 is joined from the grid to the bias battery.

The voltage of the anode is less than that of the high-tension supply because of the loss in the resistance. With 1 milliampere of current and a resistance of 75,000 ohms, the loss

amounts to 75 volts. If the high tension is of 120 volts, the actual voltage of the anode is 45 volts.

Now a current of 1 milliampere is not very much, and the voltage of 45 is low. Our valve cannot, therefore, deal with a very strong signal. Further, its anode impedance is greater than that stated by the valve makers, who normally give the impedance of an average valve with an anode voltage of 120 volts.

The point to note is that, having connected a resistance to the anode of the valve, the voltage of the anode is less than that of the supply. With the reduced voltage the characteristics of the valve are different from when the greater voltage is applied.

Hence it follows that if you made a calculation of the amplification of the stage using the average characteristics of a valve of the type employed, the result is wrong.

The amplification at a favourable frequency is obtained by multiplying the amplification factor of the valve by $\frac{R}{R+R_1}$, where R is the value of the resistance unit and R_1 the actual impedance of the valve. With R of

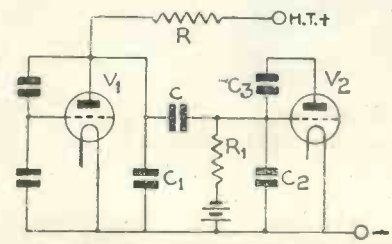


Fig. 2.—Internal valve capacities are represented by C_1 , C_2 and C_3

75,000 ohms and R_1 of 50,000 ohms, .6 of the maximum value of the amplification is obtained, or with a valve whose working amplification factor is 20, the actual magnification is 12.

This value is, strictly, only approximately correct, for the condenser C and grid leak R_1 (Fig. 1) are joined in parallel with the anode resistance. But, with a grid leak having a

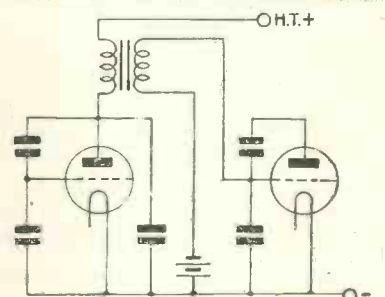


Fig. 3.—Single stage with low-frequency transformer coupling

resistance of several times that of the valve, the effect is not serious.

Now let us look a little further into the matter. The anode has capacity to the filament, as at C_1 (Fig. 2), and there are the other capacities, particularly that represented by C_2 , between the grid and filament of the second valve.

Weakening the Top Notes

These condensers, as you can see, are, in effect, across the anode resistance. Now everybody knows that when you connect a condenser across the anode resistance of a resistance-capacity-coupled stage there is a weakening of the higher notes.

What happens is that instead of the anode circuit having a resistance of, say, 75,000 ohms (the ohmic value of the resistance unit), its impedance is less, depending upon the frequency.

As the frequency is increased, so the impedance falls off and, therefore, the amplification falls. Now the total value of the capacity may be thought to be small; so small, in fact, as to be not worth worrying over.

But actually the capacity may well be of the order of .0001 microfarad, because the working value is so much greater than the value which is obtained by measurement when the valves are not amplifying. Valve v2 is amplifying, and the value of c2 depends upon the magnification provided by this valve, as well as the capacity of the electrodes, wiring, etc., measured with the filament not heated.

Thus the capacity varies with the characteristics of the load joined in the anode circuit of valve v2.

If this is a resistance, the capacity remains fairly uniform over the audio-frequency range.

Perhaps a loud-speaker is connected, however, and the anode-circuit impedance is varying all the time with the frequency. Then the capacity may also vary with the frequency. This effect is, perhaps, not so important when the coupling is a resistance, but may affect the results materially when a transformer coupling is used.

The presence of condenser c3 indicates feedback from the anode to the grid, and this may affect the results. Feedback is always a nuisance unless under control, and here, in this example, it is not under control.

Effect of Capacities

When we come to consider a single stage having a transformer coupling (as Fig. 3) we see that the capacities may affect the results considerably.

Some makers give curves so prepared that the effect of the capacities is avoided. Much depends upon the transformer, naturally, and personally I feel that some of the new transformers having cores of special high-permeability steel are much too sensitive.

Having relatively little wire in their construction, the resistance of the windings is low. Sometimes when

the valve connected to the primary is removed a squeal is heard from the loud-speaker. This shows that there is a peak in the frequency range of the transformer.

The circuit oscillates when the damping provided by the valve is removed from the primary.

When the valve is connected the circuit does not oscillate, but all the time we may have undue emphasis of notes about a certain frequency. The particular range of frequencies about which the emphasis occurs may well vary with the load connected to the second valve (Fig. 4).

Here we have in the anode circuit a loud-speaker having, no doubt,

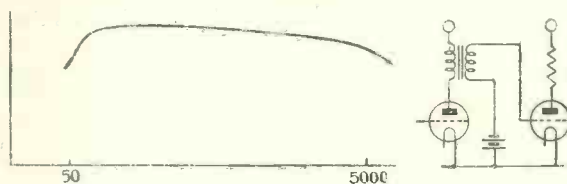


Fig. 5.—Curve with transformer connected to valve having resistance load. It will be seen that the strength of the top notes falls off considerably

several natural frequencies. Owing to the self-capacity of the valve and to the fact that the transformer is of fairly low resistance, there is a tendency for the circuit to oscillate at these particular frequencies.

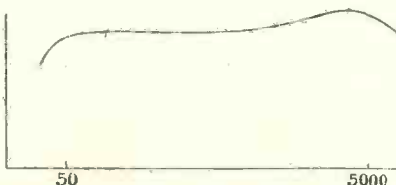


Fig. 6.—Curve with transformer connected to valve having loud-speaker in anode circuit

When taking measurements of low-frequency transformers I have been struck by the fact that the amplification obtained over the frequency range varies according to the type of output valve and the type of loud-speaker connected to it.

In some tests a resistance is connected in the place of the loud-speaker (Fig. 5). But as in practice we use a loud-speaker, we ought to know how the amplification characteristic varies with frequency with various loud-speakers. Peaks occur and, in fact, the upper part of the curve may change entirely with the loud-speaker (Fig. 6).

When using a valve having a good

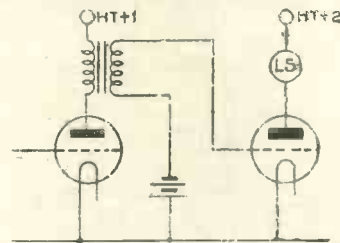


Fig. 4.—Emphasis of certain frequencies varies with load on second valve

slope in the power stage, the matter is one of greater difficulty, because the feedback effect is more pronounced than when a valve having, say, a slope of one is used.

There are difficulties in the way of preventing the feedback, but that it exists must not be lost sight of.

Looking for Trouble

The above facts are such that, personally, I look for trouble when some types of transformers are used. You cannot be sure of the characteristics and bad quality, such as roughness and too much treble, is often experienced. The overload characteristics are poor, too. A little grid current dampens the signals considerably, because the arrangement is sensitive instead of being almost neutral, such as a resistance-capacity stage.

When a resistance feed is employed (as in Fig. 7) the troubles are partly avoided. In the first place the damping effect of the anode-circuit resistance adds to that of the valve and the tendency is for peaks in the amplification-frequency curve to

be smoothed out.

Secondly, as there is no polarising current, this being avoided by the anode resistance and stopping con-

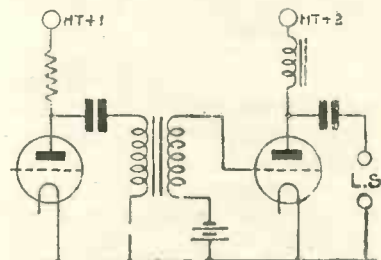


Fig. 7.—Resistance feed to low-frequency transformer

LOW-FREQUENCY CIRCUITS—Continued

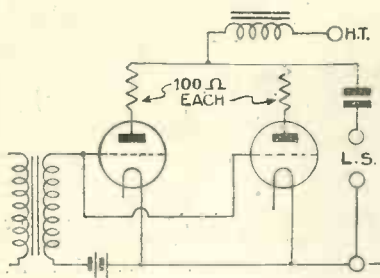


Fig. 8A.—Output valves connected in parallel

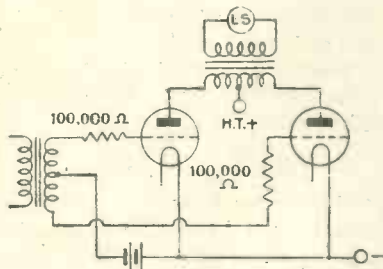


Fig. 8B.—Output valves connected in push-pull

denser, the leakage of the transformer is reduced. High-note resonances are, therefore, minimised.

The capacities of the valves still play a part, however, and unless the published curve is a copy of one taken under working conditions, the actual results which we obtain may be much different from what we would be led to expect.

It should be noted that the usual filter-feed circuits must be employed and that the effects which we are discussing are not to be confused with troubles arising through a high-tension supply of high resistance used without the proper precautions.

Too-good Components

There can be no doubt but that much poor quality is to be traced to the use of modern steep-slope valves and to sensitive transformers and chokes. They may form a combination which almost oscillates.

When a pentode is used the troubles tend to increase because of the capacity of the valve and its sensitivity. With a pentode we normally use an output filter to reduce the relative strength of the high notes. But extra care ought to be taken in the choice of the coupling transformer or poor results will be obtained.

Various precautions may be taken

to prevent the short-wave oscillations which tend to occur when efficient valves are used. With valves in parallel and in push-pull we may use resistances as in the diagrams Figs. 8A and B.

These will prevent the short-wave oscillations and not materially reduce the low-frequency output.

When a single output valve is used the tendency to oscillate is not so great, but a resistance may be included as a precaution. A small choke could be used, but a resistance is cheaper.

In one transformer having a core of high permeability metal, the secondary winding is of a resistance wire. This avoids the peaks referred to and the result is a transformer free from the defects of some others having the same type of core.

Small transformers having a stallo core are also sensitive. Probably the best transformers are those having materials of such proportions that their amplification-frequency characteristics do not vary much with the capacities and feedbacks met with in practice.

There are good transformers and poor ones, the poor ones having bad curves under practical conditions and having poor overload characteristics. Some distort badly because of the

bad quality core used. This, again, is not shown by the usual published curves.

Wiring ought always to be carefully arranged. Long wires ought always to be avoided. Remember that the capacity actually existing across the grid-filament circuit of a valve varies with the magnification factor of the valve and the load connected to it. The actual value is often many times greater than that assumed from the figures obtained when the valve is not amplifying.

Capacity effects are serious, more so now that steep-slope valves are used in low-frequency circuits. In mains sets the grid leads may pick up hum.

Broken Grid Circuit

When a grid circuit is broken a hum or noises will usually be heard quite loudly in a mains set. The apparatus connected to the valves ought to remove this hum or noise by reducing the sensitivity of the valves to stray fields. With long leads and poorly-placed parts, there may be a residual of noise which is troublesome.

The parts must sometimes be shielded and earthed, the object being to shield the parts electrostatically as well as magnetically

MR. SPEAKER

*Our "Mr. Speaker's" been a friend
To us for years and years;
He's made us smile, he's made us laugh—
Reduced us all to tears;
And sometimes (when the H.T. cell
Is low) he's made us cuss as well.*

*As a family friend he's got his points,
And rarely does he bore us;
Dear Aunt Jemima likes his "talks"
And Uncle John his "chorus";
But I prefer him for his knack
Of never answering anyone back!*

C. P. P.



WE found ourselves on the horns of a dilemma when we had to find a name for this set. It is another addition to the famous range of "Brookman's" receivers that have been described in WIRELESS MAGAZINE during the past eighteen months and for that reason we wanted to keep the word "Brookman's" in the title.

But this set is a four-valver and we have already published details of a Brookman's Four, a set described in January 1930, which comprised two screened-grid stages, a detector and a power valve.

Based on Famous Design

Obviously we could not call this set the Brookman's Four, because it would be too misleading to readers. Hence we hit on the obvious title, the Brookman's Three-plus-one, for this set is essentially the original Brookman's Three with an additional low-frequency stage.

In other words, this new set employs one screened-grid high-frequency amplifier, leaky-grid detector, a stage of resistance-coupled low-frequency amplification, and a final transformer-coupled power stage.

The "Brookman's" sets need no

introduction to regular WIRELESS MAGAZINE readers. They are all based on original designs by W. James and make use of the special Binowave coils which he specially produced for WIRELESS MAGAZINE.

Here it will be enough to point out to new readers that the range of "Brookman's" sets is the most popular series ever produced by this journal, and thousands and thousands are in use all over the country. Some proof of their popularity will be found in the reports from readers published on other pages of this issue.

We may usefully say a few more words about the Binowave coils, however; they are probably the most efficient dual-range coils yet produced for home constructors. The chief feature is their high magnification combined with complete stability in operation, but great magnification does not mean that they lack selective properties.

On the contrary, they give particularly sharp tuning and any set incorporating them can safely be used even within a short distance of a high-power regional transmitter.

During the past eighteen months we have received hundreds of letters praising the Brookman's Three, a set

that will do everything required of it by the average listener.

There are places in the country, however, where reception conditions are extremely poor, and in such circumstances the need is felt for an extra stage of amplification. It is primarily for this purpose that we have produced the Brookman's Three-plus-one.

For Use with Pick-ups

There is another advantage about the new set, though, and that is its greater utility for record reproduction. Pick-ups giving a comparatively low voltage output need the magnification of two low-frequency stages to give good loud-speaker results and in this set a special jack is arranged so that the pick-up can be plugged in the circuit, when required, immediately in front of the two low-frequency valves. In this way adequate volume for all ordinary purposes is assured.

The act of pushing the pick-up plug into the jack on the panel automatically switches the first two valves out, so that there is no possibility of a radio programme breaking through and interfering with the record reproduction.

THE BROOKMAN'S THREE-PLUS-ONE—Cont.

COMPONENTS FOR BROOKMAN'S THREE-PLUS-ONE

CHOKE, HIGH-FREQUENCY

1—Telsen, 2s. 6d. (or Igranic, Ormond).

CHOKE, LOW-FREQUENCY

1—Bulgin 32-henry, 12s. 6d. (or Varley, Lotus).

COILS

1—Pair of Binowave coils, types A and C, with ganging device, £1 17s. (Wearite).

CONDENSERS, FIXED

1—Dubilier .0002-microfarad, type 620, 1s. 8d. (or Magnum, Lissen).

1—Dubilier .0003-microfarad, type 620, with insulating clip, 1s. 8d.

1—Dubilier .005-microfarad, type 620, 2s. 3d. (or Magnum, Lissen).

2—Dubilier 1-microfarad, type BB, 5s. (or Lissen, Hydra).

2—Dubilier 2-microfarad, type BB, 7s. (or Lissen, Hydra).

CONDENSERS, VARIABLE

2—Jackson .0005-microfarad, Junior log type, with slow-motion dials, £1 3s. (or Utility, Lissen).

1—Lotus reaction .00034-microfarad, type RC/34, 5s. 6d. (or Bulgin, Peto-Scott).

1—R.I. Varicap pre-set, .0003-microfarad maximum, 2s. 6d. (or Lewcos, Igranic).

EBONITE

1—Becol, 18 in. by 7 in. panel, 6s. 11d. (or Lissen, Red Triangle).

2—Junit terminal blocks, 1s. 4d. (or Belling-Lee).

HOLDERS, VALVE

3—Lotus, type VH/27, 3s. 9d. (or Benjamin, Clix).

1—Junit S.G. type, 1s. 9d. (or Parex, W.B.).

PLUGS AND SPADES

7—Clix wander plugs marked: H.T.+3, H.T.+2, H.T.+1, H.T.-, G.B.+ , G.B.-1, G.B.-2, 1s. 2d. (or Belling-Lee, Elex).

2—Clix spade terminals marked: L.T.+ , L.T.- , 4d. (or Belling-Lee, Eelex).

RESISTANCES, FIXED

1—Bulgin 50,000-ohm, flexible type, 1s. 9d. (or Magnum, Lewcos).

1—Bulgin 100,000-ohm, flexible type, 2s. 9d. (or Magnum, Lewcos).

1—Graham Farish 2-megohm, 2s.

1—Dubilier 2-megohm, 1s. 9d. (or Lissen, Watmil).

RESISTANCE, VARIABLE

1—Clarostat volume control, 6s. 6d.

SCREEN

1—Parex 10 in. by 6 in., 2s. 9d. (or Ready Radio, Peto-Scott).

SUNDRIES

Glazite insulated wire for connecting.

Length of rubber-covered flex (Lewcos).

1—Pair Lissen panel brackets, 8d. (or Bulgin, Camco).

1—Lotus jack, type JK/5, 3s.

1—Lotus jack plug, 2s.

TRANSFORMER, LOW-FREQUENCY

1—Igranic, midget type, ratio 1 to 3, 10s. 6d. (or Lissen, Lotus).

ACCESSORIES

BATTERIES

1—Ever Ready 120-volt, type PP120, £1 7s. (or Siemens, Drydex).

1—Ever Ready 16-volt, type GB2, 8s. 6d. (or Siemens, Drydex).

1—C.A.V. 2-volt accumulator, type 2AG0, 13s. (or Lissen, Exide).

CABINET

1—Osborn, table model 15s. (or Kablock, Pickett).

VALVES

1—Mullard PM12, £1 (or Six-Sixty 215SG, Cossor 220SG).

1—Mazda H210, 8s. 6d. (or Six-Sixty 210RC, Cossor 210RC).

1—Mazda HL210, 8s. 6d. (or Six-Sixty 210HF, Cossor 210HL).

1—Mazda P220, 10s. 6d. (or Six-Sixty 220P, Cossor 220P).

condenser is the pick-up jack, which shows in the photographs simply as a small bushed hole. The use of this has already been explained.

Wave-change Switch

Between the jack and the aerial-tuning condenser is the wave-range switch that controls both the Binowave coils by means of a special coupling bar. When the knob is turned to the left the set is adjusted for reception on the medium waves, while in its right-hand position long-wave reception is accomplished.

In spite of the fact that there are six controls on the panel, the Brookman's Three-plus-one is not at all difficult to operate. Once the wave-range switch has been adjusted for the desired band, it is only necessary to turn the two large dials; many stations will be received without the use of reaction in normal circumstances, provided that the low-frequency volume control is set at its maximum position (that is, turned as far to the right as possible).

Record Reproduction

For the reproduction of gramophone records the set is even more simple to operate. Once the pick-up plug has been pushed into the jack the only adjustment that need be made is to the volume control at the right.

In the past jacks for pick-up switching have not been very popular among constructors, chiefly, we believe, because in many cases it is

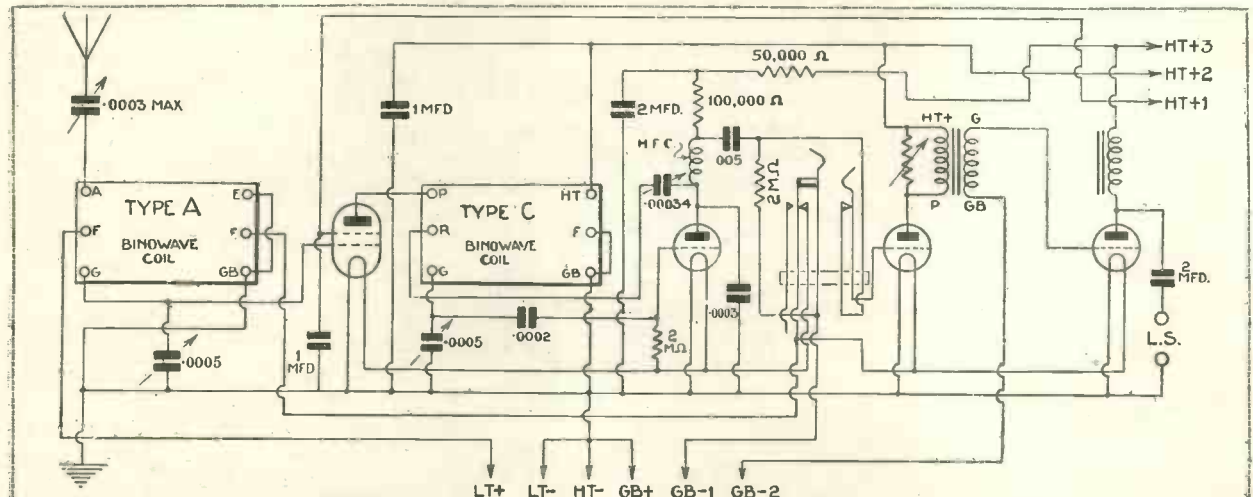
This set is provided with a volume control that operates both for radio and gramophone reproduction. It is a high variable resistance placed across the primary of the low-frequency transformer.

To some the knobs on the front panel may look rather formidable, but actually the set is very simple to operate. The two large dials, which have a very smooth combined fast

and slow motion, are for tuning the aerial (left) and high-frequency transformer (right) respectively.

The knob towards the top of the panel, mid-way between the two large dials, is that of the reaction condenser; this can be used as a volume control during the reception of broadcast programmes, but not for record reproduction.

Immediately under the reaction



A STRAIGHTFORWARD SET THAT WILL GIVE GOOD RESULTS

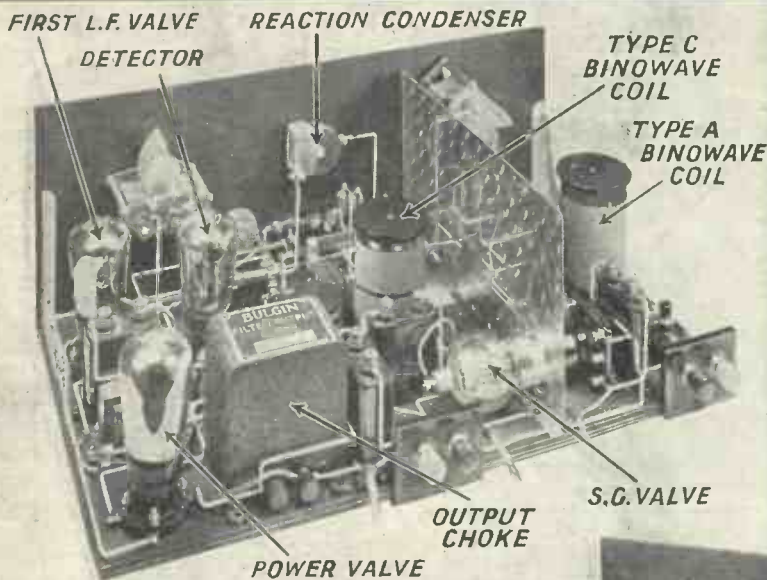
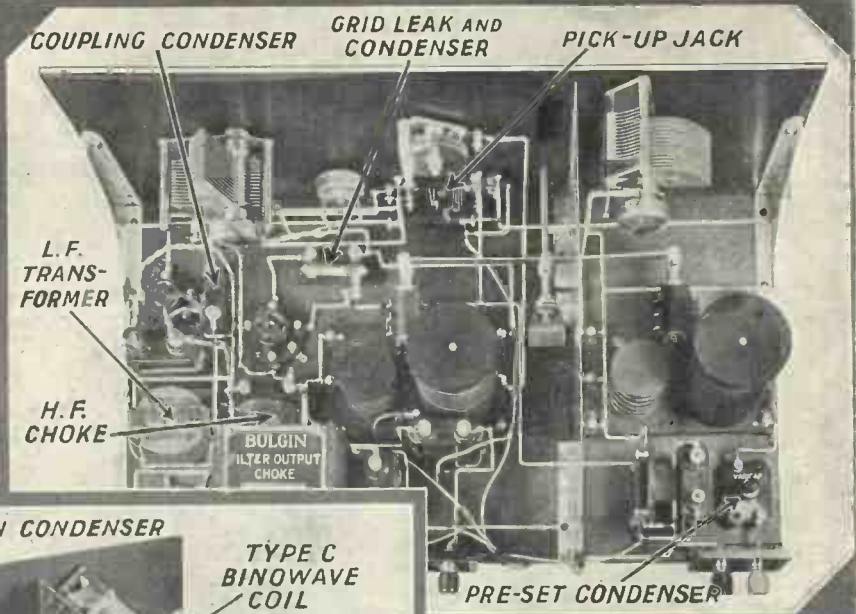
The valve combination of the Brookman's Three-plus-one is a screened-grid stage, leaky-grid detector, resistance-coupled low-frequency valve and transformer-coupled power valve

These Pictures Explain the Construction of the Brookman's Three-plus-one—A Fine Four-valver

ONLY ONE WAVE-CHANGE SWITCH

The straightforward layout of the set is clear from the photographic plan view on the right. The two Binowave coils are so placed that the switch spindles can be screwed to either end of the special coupling bar, which is controlled by a single knob on the panel. The pick-up jack is in the centre of the panel immediately under the reaction condenser.

The only shielding required in the set is an ordinary vertical screen in which a hole is cut for the projection of the screened-grid valve. The type C Binowave coil is provided with two sockets on its base into which a plug can be inserted; try both tapings as one will give better results than the other.



USING A MOVING-COIL LOUD-SPEAKER

In order to protect the loud-speaker from possible damage due to excessive anode current, and also to give good quality, a filter-output choke is used in the anode circuit of the last valve. If it is intended to use a moving-coil loud-speaker with the set this choke (and its associated by-pass condenser) can conveniently be replaced by a tapped output transformer.

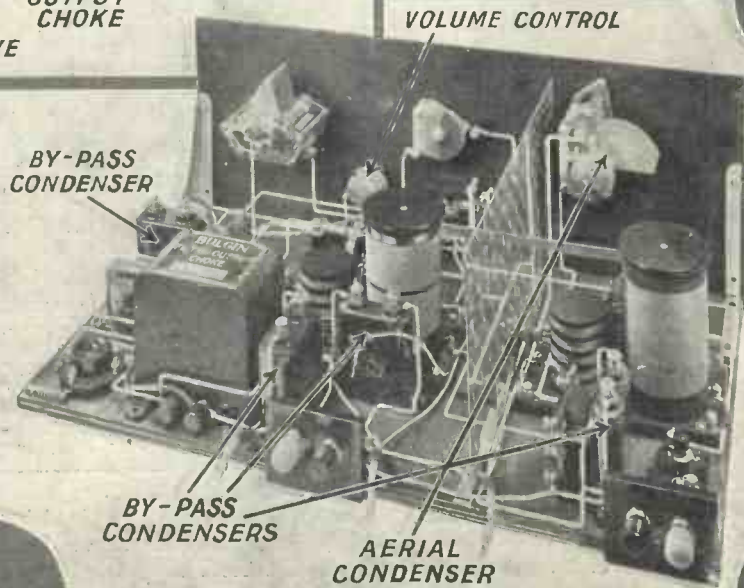
The power valve should be chosen so that its consumption is well within the capacity of the high-tension source to be utilised.

SELECTIVE PROPERTIES OF BINOWAVE COILS

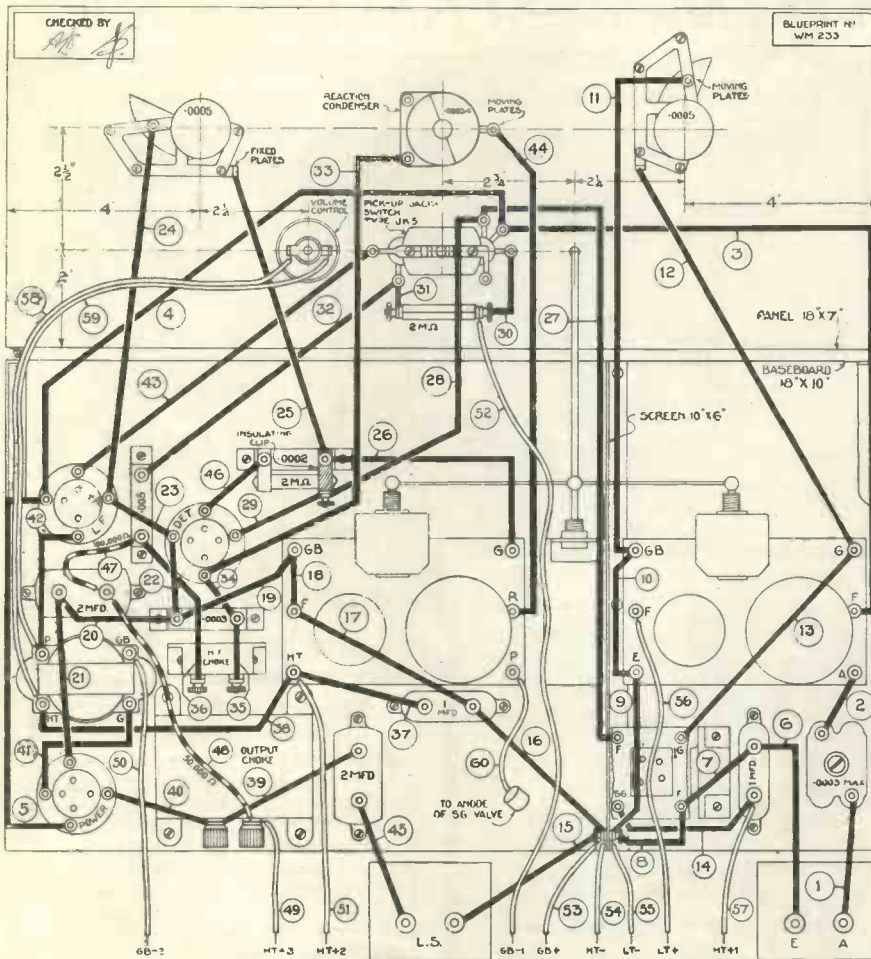
So selective are the type A Binowave coils that in many cases the pre-set condenser in the aerial lead will not be needed as a selectivity control; particularly is this the case during long-wave reception.

All the battery connections are made by means of rubber-covered flex leads taken direct to the terminal points on the set. Two terminal blocks are provided, one for the aerial and earth terminals and the other for the loud-speaker terminals.

A pleasing feature of the original design is the large and easily-operated condenser dials, which greatly facilitate the tuning of the set.



THE BROOKMAN'S THREE-PLUS-ONE—Cont.



LAYOUT AND WIRING GUIDE OF THE BROOKMAN'S THREE-PLUS-ONE

This quarter-scale layout and wiring guide shows all the essential points in construction. A full-size blueprint (No. WM 233) can be obtained for half-price, that is 9d., post free, if the coupon on the last page is used by April 30

difficult to solder connections to the tags, which are usually bunched close together and are often inaccessible when a jack is mounted in position on a panel.

This trouble does not arise in the Brookman's Three-plus-one because the particular type of jack utilised is provided with terminals which are spread out in such a way as to be easily accessible.

Simple Construction

The construction of the set is so straightforward that it needs no detailed description. When the panel has been drilled, the rod for the wave-change switch should be pushed through the panel and connected to the centre of the coupling bar. The two coils should then be placed in such a position that the ends of the coupling bar can be fixed easily to both

spindles. After this the coils and the support for the main spindle can be screwed firmly in position on the baseboard.

Apart from this, everything is straightforward and follows standard practice. Note, however, that one end of the detector-grid condenser is provided with an insulating clip to hold the grid leak.

Wiring can be accomplished without any soldering except in the case of the two leads that go to the low-frequency volume control mounted on the panel. This is provided only with soldering tags, but all the other components in the set are provided with terminal nuts so that connections can be screwed in position.

A quarter-scale layout and wiring guide is included in these pages, but many constructors will prefer to work from a full-size blueprint. One of

these can be obtained for half-price, that is 9d., post free, if the coupon on the last page is used by April 30. Send the coupon together with a postal order to Blueprint Department, WIRELESS MAGAZINE, 58-61, Fetter Lane, London, E.C.4, and ask for No. WM 233.

Flexible Resistances

One further point to note about the wiring is that two of the connections (Nos. 47 and 48) are actually formed by flexible or spaghetti resistances.

On this set there are nine battery connections and in order to avoid a long strip of terminals, which can conveniently be dispensed with, the external connections are brought straight out from the set and provided with spade tags or wander plugs, according to their use.

These flexible leads can be conveniently twisted together in three groups. First twist the two low-tension leads together; then the three grid-bias leads; and finally the four connections that go to the high-tension battery. In this way the external connections can be made conveniently and quickly.

The valves need not be too critically chosen, but it is preferable that the screened-grid valve should be of approximately 200,000 ohms impedance, as this is the value for which the Bino-wave coils were designed.

As the detector valve is resistance-coupled to the first low-frequency stage it must be of relatively high impedance; in fact, between one-half and one-third of the actual anode resistance used. We recommend a 100,000-ohm resistance and a valve with an impedance between 30,000 and 50,000 ohms.

Low-frequency Valves

The first low-frequency valve should be of the medium-impedance class so that it does not pass too much anode current; one with an impedance between 15,000 and 25,000 ohms will be satisfactory.

We will say no more about the choice of a power valve than that its impedance should be as low as is possible consistent with the capacity of the high-tension source.

INDEPENDENT TEST REPORT ON THE BROOKMAN'S THREE-PLUS-ONE

Power Consumption.—With the valves specified below, I found the total anode-current consumption was 12 milliamperes. A double-capacity high-tension battery is therefore advisable in the interests of economical working. The filament consumption was .6 ampere. Thus a 30-ampere hour accumulator would give about 50 hours use per charge.

In measuring the anode-current consumption H.T.+3 was taken to the 120-volt tapping of the battery, H.T.+2 to 80 volts, and H.T.+1 to 60 volts.

Valves Used.—For the test of this set a Mullard PM12 screened-grid valve was used in the high-frequency stage, a Mazda HL210 for the detector, a Mazda L210 for the first low-frequency stage, and a Mazda P220A for the output stage.

Operation.—After a short time, I found it easy to tune in stations with this set. The two tuning dials need a certain amount of getting used to. The best way to get the relationship right is to set the left-hand dial at, say, 100 degrees, to turn the small centre knob controlling reaction half-way towards its maximum setting and then to turn the right-hand dial until either a squeal or a rushing sound is heard. This will indicate that the tuning circuits are adjusted to the same wavelength. Then the left- and right-hand tuning dials can be successively turned one or two degrees at a time.

As will be seen from the station log, there is a discrepancy between the two tuning dials of 10 degrees or so. It is probable that the left-hand readings of the reader's set will be different from those of my log, since to some extent the aerial has an effect upon the setting of this dial. But the right-hand

readings should be fairly constant.

The wavelength switch has to be turned to the left for the medium waves and to the right for the long waves. Reaction I found to be very smooth, probably owing to the fact that a low value of high-tension voltage was applied to the anode of the detector valve. The volume control worked well, cutting down the strong signals from the local station to the point of inaudibility.

I think that if a rather short aerial is used reception on the long waves may require the connection of the aerial lead directly to the

Stockholm 119 and 133, Berlin 115 and 127, London Regional 90 and 106, Brussels No. 2 80 and 94, Göteborg 76 and 88, Bordeaux 70 and 79, Turin and Hilversum 63 and 75, London National 44 and 58, Nürnberg 28 and 40. I hope these readings will be of some use to readers in locating the more powerful foreign stations. Take more notice of the right-hand readings than of the left-hand readings.

On the long wavelengths, cutting out the pre-set condenser altogether, I got six good loud-speaker signals as well as several others that were passed over through hetero-

National came in at 44 and 58. Keeping the dials in step, I found that this station could be tuned out at 60 and 73 above the maximum tuning point and at 30 and 40 below. Thus the London National had a spread of 30 and 32 degrees.

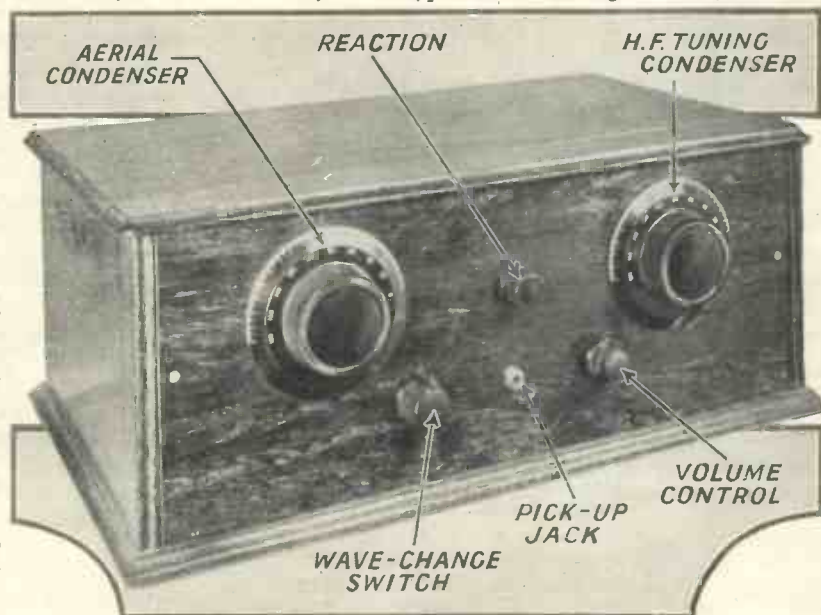
London Regional, tuned in at its maximum at 90 and 106, disappeared more quickly at 103 and 113 above, and 84 and 95 below it, a total spreading effect of 17 and 18 degrees.

Langenberg at 131 and 144 was quite clear of Midland Regional 134 and 146. Rome and Stockholm were also received clear of each other.

These readings prove that the set is capable of being worked within the service area of a regional broadcasting centre so that the twin transmissions can be separated with ease; and furthermore, that distant stations of approximately equal strength and working on adjacent frequency channels can be fairly easily separated from one another. These remarks apply to the medium wavelength band, for on the long waves Zeesent, between Daventry and Radio Paris, could not be received clear of its adjacent stations.

In conclusion, I should say that this set has a considerable reserve of power and that this reserve of power does not interfere with the selective properties of the tuning coils. With quite a short indoor aerial I feel sure this set can bring in a very fair selection of foreign stations at good loud-speaker strength. A.S.H.

[All constructors of the Brookman's Three-plus-one are invited to send us test reports of their own receivers. Remember that half a guinea is paid for each photograph of a home-constructed WIRELESS MAGAZINE Set published in these pages].



HOW THE OPERATING CONTROLS ARE ARRANGED

This photograph shows clearly the controls on the Brookman's Three-plus-one

"AE" terminal of the aerial tuning coil. With my 60-foot aerial connected in this way I obtained fine results on the long waves, although not quite so good as on the medium waves, which were exceptionally good.

Sensitivity.—Although I was able to log about thirty stations on the medium wavelengths, I made a note only of those stations that have an entertainment value. Budapest 153 and 166, Munich 147 and 159, Vienna 145 and 157, Brussels No. 1 140 and 155, Midland Regional 134 and 146, Langenberg 131 and 144, Lyons 129 and 143, Rome 120 and 135,

dynes or morse jamming. Radio Paris 145 and 145, Daventry 130 and 130, Eiffel Tower 120 and 118, Warsaw 110 and 107, Kalundborg 90 and 80, Oslo 78 and 65.

Selectivity.—In view of the fact that there is considerable amplification after the detector, this set exhibited very selective properties. At the present time the London National station is coming in more strongly at my home than the London Regional. As I am twenty miles south of Brookman's Park this fact should be borne in mind when considering the following figures:—

As already stated London

RADIO IN REVIEW

THE growth in so-called "community" wireless offers some interesting possibilities. Broadly speaking, the scheme consists in using a central receiving set, designed on the most up-to-date lines, for relaying the programme along wires to a number of local subscribers.

The rectified or low-frequency current from the relay receiver is supplied at sufficient strength to enable each subscriber to plug in a loud-speaker directly on to the supply line, without requiring any amplifier or other terminal apparatus.

Low Cost of Reception

The cost of reception is accordingly limited to the service charge made by the owner of the local relay station, which usually includes the loan of a suitable loud-speaker. In addition, however, the subscriber must take out the usual receiving licence.

At first sight one is inclined to wonder whether the game is worth the candle, and whether it would not be cheaper in the long run to install one's own set and enjoy a greater freedom of choice as regards programmes.

As against this, the listener who lives in a town is often subjected to persistent interference from electric trams or trains or other electrical apparatus, which it is extremely troublesome to get rid of. In most cases it is a problem which is best left in the hands of an experienced radio engineer, and it should be part of his duty to see that the relayed programmes are sent out free from any kind of interference. Provided this can be done, there are many listeners who would, no doubt, be glad to take advantage of a relay service and who would consider they were getting good value for money.

Licence Problems

It has recently been decided that all subscribers to such a service must take out a separate licence from the Post Office, in addition to whatever charge is made for supplying the programmes. This may come somewhat as a surprise to many people, though it is fair enough when one comes to think about it. Otherwise, if the relay system were widely adopted,

By **MORTON BARR**

the B.B.C. might find their revenue shrinking to very small dimensions.

The same conditions apply to those modern service flats which are wired with a broadcast plug in each room, fed from a single receiving set which supplies the whole building. Here, too, each tenant must take out a separate licence.

It is the same with the sub-tenant of a house, and even with a lodger. Any householder can install more than one set, for the use of himself or his family, and be covered by a single licence; but if there is a lodger in the house, then he is expected to take out a separate licence if he wants to receive the programmes in his own room.

Again, suppose that the owner of a wireless set offers to supply his next-door neighbour with sufficient "juice" to feed a loud-speaker. If he does the neighbour should take out a separate licence. Altogether the P.M.G. takes a strong line against any listener getting "something for nothing." He insists on extracting the usual annual tribute in each case.

The only exception appears to be in favour of the family group and, of course, those who come under the general concession given to the blind.

Although there are far more houses without an electric supply than there are connected up to the mains, the gap is gradually closing in, so that before long the boot may be on the other leg.

When that time comes, the more enterprising of the companies may be prepared to supply mains-driven receivers, either on loan, or on the hire-purchase plan, as they do at present electric fires, kettles, irons, and other electrical appliances.

Of course, the actual load taken by any wireless set from the mains is, comparatively speaking, so small that the company would not regard the proposition as a paying one from this point of view alone. But there are other inducements. For instance, when the family is listening to the evening programme, it keeps later hours than it might otherwise do,

and meanwhile the electric lights are burning. This is what the supply companies like.

Again, the desire to run a mains-driven set, provided it could be obtained on terms from the electric company, would in many cases prove the deciding factor in having the house wired up in the first instance.

Once wired up, the electric "habit" would grow, and cookers, kettles, and all kinds of labour-saving devices would probably follow up the entry gained by the wireless set.

To Be Kept in Mind

Altogether it is a point which the more go-ahead supply companies would do well to keep in mind. They ought not to lose in the long run, whilst many listeners would be only too glad to avail themselves of the opportunity of installing a mains set, especially if a reasonable maintenance service were thrown in.

When using a set designed to receive on both wavebands, it is often useful to try the effect of altering the high-tension voltage on the detector valve after switching over from the medium to the long-wave setting. If the set is working at its best, say, on the medium-wave range, it may get slightly overloaded on the longer waves, and so give rise to distortion.

One reason is that the effective impedance of the grid condenser alters with the signal frequency and tends to shift the correct point on the curve at which the valve should operate.

"Dual" Rectification

If this should happen the valve will start to operate partly as an anode-bend rectifier as well as through the leak grid. The two rectified components are then out of phase and will give rise either to a noticeable decrease in signal strength, or else to a certain degree of distortion.

The required adjustment of the voltage on the detector plate is usually of a small order, so that the full benefit is not easily secured when the high tension is taken from a battery, because here the plugs are usually separated by gaps of 15 or 20 volts.

Wireless Magazine GRAMO- RADIO SECTION

A Special Supplement of value to All Gramophone Users and Those Interested in the Electrical Reproduction of Records



How many gram-radio enthusiasts take the trouble to compare their electrical reproduction of records with ordinary mechanical reproduction? It is often worth while

TWO-DISC CLASSICS

THE great measure of appreciation I have had from my friends when I have played to them that heroic example of chamber music, *St. Saën's Septette* for trumpet, piano and strings (Parlophone, two discs, E11087-8, at 4s. 6d. each), has drawn my attention to the extreme suitability of high-class musical compositions that can be got through in seventeen minutes or so for playing to a mixed audience.

More Than Mere Sample

They are long enough to leave a trained musician feeling that he has had more than a mere sample and yet not so long as to prove irksome to beginners.

In my files I find the following works, all recorded on two discs:—

HARPSICORD AND STRING ORCHESTRA.—Harpichord Concerto in G (Bach). Parlophone, two discs, E10879-80, at 4s. 6d. each. The recording of the strings fully favours the double-basses and is rich in tone and the harpsichord recording is the best I have.

STRING ORCHESTRA.—I have no better example of Elgar's writing than in *Introduction and Allegro for Strings*, H.M.V. C1694-5, 4s. 6d. each.

PIANOFORTE.—Luckily there is an example of supremely good piano recording. Beethoven's *Moonlight Sonata*, played by Carol Szritu. Parlophone, R771-2, 3s. each.

GRAND ORGAN.—A fortunate recording, with clear 16 ft. tone in it, is Bach's *Passacaglia and Fugue in C minor*. H.M.V. D1765-6, 6s. 6d. each. It is played by Marcel Dupré on the Queen's Hall organ.

FULL ORCHESTRA.—No better recording has been done, particularly of the kettle drums, than in *Flying Dutchman Overture*. Parlophone E10761-2, 4s. 6d. each. Music from *Die Meistersinger* is equally good. Parlophone E10633-4, 4s. 6d. each. Wagner is often heavy with the violins and one can safely use a cut-off down to 6,000 cycles with both these records.

THE CASALS TRIO.—An example of their beautiful work within most people's reach even in these hard times is *Trio in G major* (Haydn), H.M.V. DA895-6, at 6s. 6d. each. This is the work that concludes with the well-known "Gipsy Rondo."

'CELLO AND STRING QUARTETTE.—Old-fashioned chamber music will be found on *Sonata en Concert No. 5 in E minor* (Vivaldi), N.G.S. 131-2, 6s. 6d. each.

LEIPZIG GEWANDHAUS ORCHESTRA.—There is a magnificent rendering of Weber's *Der Freischutz Overture* on Parlophone E11039-40, at 4s. 6d. each.

H. T. B.

HOSPITAL GRAMOPHONES

HOSPITALS do not really get a place in our life until we become a patient in one of them, and then we try to forget about the days of evil as soon as possible. This is obvious from the things which are sent into hospitals for the amusement of the patients. When in a hospital recently I was ashamed that I had belonged to those who were outside, claiming to be friends.

Scrappy Old Machines

Charity supplies many things. Among them are gramophones and records. The afternoon I was able to go about from ward to ward I made it my business to have a look at the gramophones and records there. Without a single exception, there was not one gramophone that would be tolerated in our homes. They were scrappy, old, squeaky, weak-sprunged, and they moved like the surface of a mountain range.

The records, too! There were some made by firms that have been out of business for years. There were many bearing the mark of a company which I understand to have gone out of business twenty years ago.

E. B. R.

Records in the Making

TO-DAY'S gramophone record possibly provides more hours of amusement, considering its cost, than any other form of entertainment. This, combined with its apparent simplicity, tends to make us overlook the scrupulous care exercised in its manufacture and the numerous processes which combine to produce the finished article.

A Tour Round the Works

By the courtesy of the Vocalion Gramophone Co., manufacturers of Broadcast records, I hope that, metaphorically speaking, we can make a tour of their recording studios, where the latest recording apparatus by the Marconi Company is used. The Vocalion Company

All record users will be interested in this article explaining how gramophone discs are made by the modern electrical process

necessary, right over the windows.

The damping is very important, since a large volume of sound in a room gives rise to all kinds of echo and transient effects.

Studio damping is arranged to prevent resonance, but according to the class of music that is being recorded, so the damping can be varied by pulling aside the "damping curtains."

Here I would point out that the average gramophone soundbox and record are arranged to cut off the

"blasting." Their views are more than justified by the quality of reproduction I listened to during a "play back."

Further, a microphone of the type in question does not suffer at all from one of the most annoying microphone troubles, that is, induction of the microphone line, which is very prevalent in some systems, the wire from the microphone picking up all kinds of extraneous noises from electric lifts, motors, etc.

Shielded Wire

To avoid this trouble, the wire is usually shielded by a flexible metal casing, the casing being earthed. It will be appreciated that the capacity between the metal earthed case and the actual microphone wire, in the case of a long lead, can equal a condenser of sufficiently large capacity to by-pass the higher frequencies, and in some cases this is a very undesirable state of affairs.

On the contrary, I am told that the Marconi microphone functions perfectly on 200 ft. of ordinary lighting flex, and having had something to do with the other type, I rather envy the engineers in charge.

We can now follow the microphone lead into the engineer's den. This department is entirely "sound" insulated from the studio proper. Our lead passes first into a microphone fader unit, or volume control, where, if more than one microphone is used, the various inputs can be "mixed" at the engineer's discretion. From the microphone fader our lead goes to the microphone transformer and thence to the amplifier.

Straightforward Amplifier

The Marconi amplifier used seems a very straightforward proposition, and consists of five stages of resistance-capacity coupling. I can see everybody wondering why five stages are necessary. Here let me explain that the first two stages are used mainly for what is known as "line correction," in other words, accentuating the high frequencies or the bass frequencies, in order



IN THE RECORDING STUDIO

Here you see a band making a record in the Vocalion studios, where the well-known Broadcast discs are produced

have the exclusive right of the Marconi Company's process of electrical recording, which is the result of a specialised study and a subsequent careful compromise of all the many "snags" that are encountered.

Let us start right away with the studio. The atmosphere of the studio can usually be described as depressing to a degree; this is brought about by heavy damping in the form of curtains made of cotton-like material hung from ceiling to floor, sometimes across the ceiling itself, and even, if

high-frequency notes at about 4,700 to 5,000 cycles.

I do not think there is much point here in referring to open-air recording, except to state that it is largely a matter of luck, owing to weather conditions, since wind blowing across a microphone very often gives a great deal of trouble.

The Vocalion Company, after much experiment, pinned their faith to the Marconi-Reisz microphone, which is not at all sensitive, and the engineers in charge assure me that, owing to its lack of sensitivity, they have no trouble with

that the resultant curve may be as flat as possible, or varied according to the demands of the studio.

The earlier stages of the amplifier derive their current from batteries. The remaining stages require a high-tension supply varying from 400 to 1,000 volts, which is, of course, supplied by a generator, great attention being paid to the smoothing, since no hum or ripple must find its way into the amplifier and thence to the cutter.

Low tension and grid bias are still supplied by batteries and the low-tension consumption of the last stage, which consists of a number of very "super-power" valves, is no less than 25 amperes.

Minimising Feedback

The earlier stages derive their high tension from an entirely different supply, and this greatly minimises any difficulty with regard to back-coupling. Nevertheless, precaution is taken in every conceivable way, and high-frequency stoppers are included in the grid circuit of each valve in the last stage, and the whole amplifier is very thoroughly shielded.

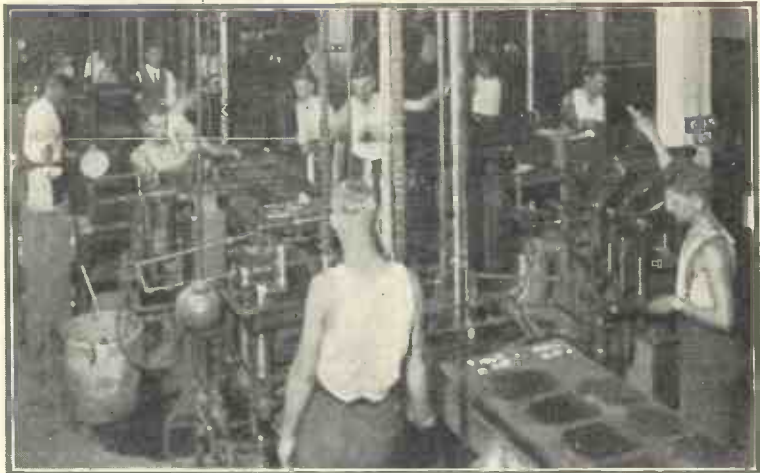
Milliammeters are, of course, arranged in the anode circuits, and a microammeter is included in the grid circuit of the last stage, in order that a check may be placed on any flow of grid current, which must not take place.

The output of the amplifier feeds to the cutter *via* a colossal output transformer. I should like to be able to give the exact dimensions and characteristics of this piece of apparatus, but all I can say is that it looks so massive one feels the average amateur's output transformer must only be a toy by comparison.

Controlling Output

The output is measured and maintained at an average strength by means of a thermo-ammeter and volume control, whence it goes to the cutter, which is rather like an outside pick-up.

This has many gadgets for varying its weight on the wax master and the consequent depth of cut, and also for the damping of what we shall have to call the armature, which carries a sapphire cutter, instead of the gramophone needle in our pick-up. To put it crudely,



PRESSING THE RECORD BLANKS

Part of the battery of pressing machines used for turning out Broadcast records

the cutter is really a loud-speaker unit with a sapphire attached to its armature, instead of a cone.

The wax master is placed on the cutting table and arranged to run at a dead constant speed. Towards this end a dead-weight system of driving the mechanism seems to be necessary, since a very high degree of accuracy of speed has to be obtained, and some of us might remember that we are not doing the recording people justice in the way we look after our speed regulators and neglect to oil the governor pads on our gramophone.

When the cutter is lowered on to the wax, the table is arranged to

move in such a manner that the sapphire cuts a spiral groove from the outside to the inside of the wax; at the same time, the vibrating armature causes the sapphire to cut the sound track, or what we should call waves in the grooves, according to the output of the amplifier.

"Vacuum Cleaner"

In close proximity to the cutter is arranged—for want of a better term—a miniature vacuum cleaner, whose duty is to remove any small wax shavings from the surface of the master, and prevent any dust from finding its way on to the sound track. X. Y. Z.

FADING IN AND OUT

IT is rather a contradiction to speak of "fading-in"; I suppose one really ought to say "swelling-in" and "fading-out," but that would be cumbersome language and, after all, so far as radio is concerned, the word "fading" has come to have a double meaning.

I wish to point out to all who reproduce records on radio gramophones the advisability of *invariably* using the volume control at the beginning and ending of *every* record.

One should start the record with the control in the position for minimum tone so that no annoyance is caused by needle-changing noise or by the extra noisy surface found quite frequently on the first few unrecorded groove turns of the record.

Wait until the *music* starts before

turning the volume control knob, so as to come gradually up to the desired tone volume.

At the end of a record, on the cessation of music, the control should be turned right off, perhaps gradually in the case of a quiet ending where it is necessary to reduce surface noise, or perhaps instantly, when the music is working up to a climax of final crashing chords.

Praise for Your Set

If you will observe this little refinement carefully you will be surprised to hear from your friends the praise they will give your reproduction; even if you have been playing relatively rough records quite likely they may tell you that your machine gives "no surface noise at all." H. T. B.

Choosing Your Records

Sacred Music

★O Saviour of the World, Choir of H.M. Chapels Royal, 3s. H.M.V. B3711

This is one of Goss's most beautiful anthems. I am delighted that it has been recorded. Spohr's *As Paus the Hart* is on the other side. Everything is excellent except for the organ, which is ineffectively played and does not record well. The boys are excellent in both works.

Classical Orchestral Music

★Bartered Bride, Berlin State Opera Orch. (d.s.), 3s. H.M.V. B3501

Very well done. Smetana's music is Czech through and through; the whole overture is one of the most exciting things in orchestral music. It is very cheap at 3s.

★Euryanthe, Orchestre Poulet (d.s.), 3s. 6d. DEC KF554

I do not know much about the "Chicken Orchestra" (the only translation I can see for *Orchestre Poulet*) but their rendering of Weber's popular overture is not quite perfect. With a good reproduction I think it will be found satisfactory. Anyhow, 3s. 6d. is cheap for a well-played *Euryanthe* overture, and that is why I recommend it.

Grand Opera and Classical Arias

Senta's Ballade (Wagner), Elisabeth Rethberg, sop., with orch. (d.s.), 6s. H.M.V. DA1115

This is from Act II of *The Flying Dutchman*. Elisabeth Rethberg's voice is only moderate when recorded; I am sure she is much better "in the flesh." But the rendering has much to commend it, especially in the softer themes. What lovely music it is!

La Donna e Mobile, Lenghi Cellini, ten., with orch., 1s. 6d. PIC 250

Verdi's immortal tune (from *Rigoletto*) receives quite good treatment here. I have heard better—and worse. But 1s. 6d. for a respectable operatic record is not amiss. He sings *Addio Mignon* on the other side quite effectively.

Chamber Music

Caprice Viennois, Herbert Wethmar, violin, with orch., 2s. 6d. ZONO 5810

A very acceptable rendering of an attractive work. His tone is

Here are reviews of the latest releases by WHITAKER-WILSON, the "W.M." Music Critic. Read them carefully before buying your next batch of records. Outstanding records are indicated by an asterisk (*) against the title.

small but very pure. Violinists who like the work should hear this. Massenet's *Meditation* is the companion.

★(a) Prelude No. 4, Op. 28. (b) Etude in C Major, Op. 10 (Chopin), Lener String Quartet, 3s. COL DB360

I hate transcriptions of Chopin as a rule, but a rendering by the Lener Quartet cannot be passed by. Chopin is certainly here revered by those admirable players, and the result is most effective. Any prejudice I had when I read the label has disappeared. The record must go down as a fine piece of chamber music.

Light Opera & Songs

Areadians, Anne Welch, sop., Norton Collyer, ten., Victor Conway, bar., with orch. (d.s.), 3s. 6d. DEC K564

Very good and contains all the tunes by which we remember their tuneful work. The chorus, especially, is good.

Awake, Stiles-Allen, sop., with piano; 1s. 6d. WIN 5199

She can sing (forgive me!) in so many styles that I wonder she bothers to do this sort of thing! Why not sing something worth hearing; these ballads are stale and tame in the extreme.

★Caro mio Ben, Van de Sande, with orch. PHONY 95

This is really excellent; in fact it is the best disc by this firm which I have thus far heard. He sings *Ombra's Mai Fa* (Handel's Largo) on the other side.

Form Fours, War Song Medley, Big Four, with orch. (d.s.), 4s. 6d. COL DX207

It is very well produced and contains everything I did not want to hear. For those who like these war songs, I can certainly recommend the disc.

★Funiculi Funicula, Cav. Joseph de Vita, 1s. 3d. IMP 2405

Sung in Italian, which gives it a pleasant turn. It has a male chorus. I am very taken with it. Ask to hear it.

Horatio Nicholls' Inspirations, Scala Concert Orch. (d.s.),

1s. 6d. WIN 5201

The first time I knew he ever had any; having listened to them I have concluded that he never did. Poor stuff, well recorded, is my verdict on this.

Harry Lauder Melodies, Jock MacGregor, with orch. (d.s.), 1s. 6d. WIN 5193

Most of the best known ones. The patter is much as Lauder used to give it. Quite a good record.

I Love the Moon, Megan Thomas and Herbert Thorpe, with orch., 2s. 6d. ZONO 5802

Quite good—but I am sick of it—so is everyone! Not worth hearing, in my opinion.

I Miss a Little Miss, Frank Crumit, ten., with orch., 3s. H.M.V. B3722

He misses some of his words also. Otherwise no complaints. He sings *Three Little Words* on the other side.

★I Shall Return, Tito Schipa, ten., with orch., 6s. H.M.V. DA1147

This is a red label; red label records with operatic tenors generally blast horribly, but



TITO SCHIPA

this is an exception. It is a fine voice, and the song—his own—is made to fit. Very effective.

I'm Just Wearing Out My Heart for You, Jack Burke, 1s. 3d. IMP 2419

This is really rubbish but he has a personality that makes the song live. You may enjoy him; I suggest you ask to hear the record.

Betty Bolton, with orch., 2s. DEC F2137

She may be, but she has also worn out her voice for someone else. These comediennees are safer on the stage; they rarely suit a microphone. I mean nothing insulting by this, but I feel they should keep to their safer sphere.

Let Me Sing and I'm Happy, Three Cinx, 2s. DEC F1993

Very good "darky" material. Ask to hear them; they are excellent.

Loving You the Way I Do, Gwen Henry, with orch., 1s. 6d. WIN 5205

A vocal fox-trot and quite useful for dancing. Is Gwen the sex a Gwen ought to be? His



GRACIE FIELDS (one of her humorous records is reviewed on page 280)

(or her) voice is of the adenoidal style, but it suits the song. *What Good am I Without You?* mystifies me still more. You want television with this record!

My Sunshine Came on a Rainy Day, Jack Gordon, with orch., 1s. 3d. **IMP 2418**

Rather "ballady" and sentimental; likewise *Tears* on the other side. I do not see much point in this sort of stuff. Others may, of course.

Sing Hallelujah, Frank Robeson, with piano. **PHONY P99**

I am very keen on these bendable, non-breakable, twistable records. I have a pretty green one before me with Robeson singing the above and also a delightful essay about a *Chair of Tobacco and a Little Drink*.

Sometimes I Feel Like a Motherless Child, Marian Anderson, con.

PHONY 94

She sings the negro spiritual very characteristically. The surface of this record is amazing.

Star of My Soul, George Baker, bar., with orch., 3s.

H.M.V. B3546

Very well sung, as is *In the Shade of the Sheltering Palm* on the other side. George Baker always makes a satisfactory record.

Sunny Days, Layton and Johnstone, with piano, 3s. **COL DB372**



LAYTON AND JOHNSTONE

They are up to their usual standard, especially in the *Kiss Waltz* on the other side.

Veterans of Variety, Scala Concert Orch. (d.s.), 1s. 6d. **WIN 5194**

I think many people would enjoy these old tunes again. The recording is outstandingly good. A very cheap record, in my opinion.

Walther's Prize Song (Wagner), David Leslie, ten., with orch., 1s. 6d. **PIC 701**

Not up to the work; I do not want to be rude, but his voice is not good enough for Wagner. He would be better in less ambitious music.

Whoopie, London Orch., 2s. 6d. **ZONO 5796**

A very good selection with another from *Love in the Rough* on the other side. Very good surface.

Why Shouldn't I? Morlais Morgan, bar., with piano, 1s. 6d. **WIN 5200**

I don't know, I'm sure, but I wish you hadn't! These ballads seem to me useless. They are out of date and miserable things from the musical standpoint. In this one the writer suggests dropping someone into the sea, having put him into a barrel, or barrow, I couldn't decide which the gentleman said. No good, in my opinion!

You Will Remember Vienna, Sam Browne, with orch., 1s. **RAD 1446**

Quite well done, the recording especially is good. It is a good tune and, of course, well known. *I Bring a Love Song*, on the other side, is quite attractive.

Military Bands

Belphegor, Bandmaster Sellma Band, 2s. **DEC F2156**

Decca, your recording is a bit fierce! It can always be toned down, but I think a little gentler treatment would improve all your records. This is an excellent little record of the military band type.

Bosnia March, Phony Com. Mil. Band **PHONY 93**

A splendid military band record for anybody who wants one. I am now keeping these military band records separate.

I do not see much in this to recommend; it is rather wish-wash. From the recording point of view I notice an improvement in the matter of the bass. The playing, from an organic point of view, is negligible. It is difficult to give it a fair and honest review. Ask to hear it and disregard what I have said.

Great Day, organ, Terence Casey, 3s. **COL DB381**

Introducing *Great Day*, *Without a Song*, *More than You*



TERENCE CASEY

Know, etc. On the other side, *Love in the Rough*, which title describes some of the playing, in my opinion. But it should be popular amongst lovers of this type of organ music. I have heard worse, certainly.

Piano Solo

Scherzo No. 3, in G Sharp Minor, Op. 39 (Chopin), Mischa Levitzki, piano (d.s.), 6s. 6d. **H.M.V. D1814**

One of Chopin's finest Scherzos. The playing is a little too virile in some of the softer passages, to my way of thinking. To those who, like myself, play the work, I suggest a hearing of



MISCHA LEVITZKI

this record; it is worthy of a little consideration.

Spoken Record

My Job, James Agate, 3s. **H.M.V. B3677**

James Agate defends the position of a dramatic critic, and very sound his arguments are. I think theatregoers should buy this and ask their friends to pass it round. *Great Nights in the Theatre* is an entertaining and historical review. It is very well done but the other side is the more valuable.

Light Orchestral Music

Carmen, Athenaeum Symphony Orch., 1s. 6d. **PIC 684**

The Prelude to *Carmen* and the overture to *Stradella* for 1s. 6d. is not expensive. With a good machine, this record will reproduce quite well.

Cavalleria Rusticana, Sir Henry J. Wood and his Symphony Orch., with organ, 4s. 6d. **COL DX194**

This seems a small orchestra; it says *his* (i.e., H.W.'s) orchestra and also that it is recorded in "a" concert hall. The recording is not up to standard and the whole effect is rather dull. I am



SIR HENRY J. WOOD

not struck with Lt. Jarnfelt's popular *Praeludium*, on the other side, is much better.

Drifting and Dreaming, Bud Billings and Carson Robison, with orch., 2s. 6d. **ZONO 5809**

This is very effective indeed. As light vocal music with a "guitarish" accompaniment it is delightful. *Somewhere in Old Wyoming*, on the other side, is as good—perhaps even better.

Espana (w.), Villina Carne and Orch. **P92**

This is a guitar waltz, not suitable for dancing. It is an excellent piece of light orchestral music.

Hungarian Rhapsody, No. 2, Gandino and his Orch. (d.s.), 1s. 3d. **IMP 2407**

Well—I don't know what to say. The band is not big enough for Liszt's *Hungarian Rhapsody*. It sounds thin; also the tempo is all wrong. No, on second thoughts, it is very bad—I hate it.

Liebstraume Nocturne, Viennese Symphony Orch., 1s. 6d. **PIC 113**

Of many arrangements of Liszt's famous pianoforte work that I have heard, this is certainly one of the best. The orchestra is quite well balanced. It makes acceptable light orchestral music in this form.

Mefisto Waltz, London Symphony Orch. (d.s.), 6s. 6d. **H.M.V. D1928**

This is no dancing waltz; it rightly comes under the heading of light orchestral music. Liszt is Liszt and no one else; in this case he is harmonic rather than melodic. But do not be put off by that—ask to hear it.

Organ Music

Andante Pastorale, Herbert Dawson, organ, 3s. **H.M.V. B3547**

By Sullivan (*The Light of the World*). It is very fair but the organ does not come out to good advantage, owing to the bad choice of solo stops. Lully's *Rigaudon*, on the other side, is not very satisfactory; the reeds are coarse. The playing is fair only; Dawson is evidently not a great executant. His choice of stops errs on the vulgar side.

At the Temple Gates, organ, Gatty Sellars (d.s.), 3s. **COL DB392**

CHOOSING YOUR RECORDS—Continued

★Memories of Johann Strauss, J. H. Squire Celeste Octet (d.s.), 4s. 6d. COL DX203
This includes such works as *Wine, Women, and Song; Morn-*



J. H. SQUIRE

ing Leaves; *Blue Danube; Tales of Vienna Woods*, etc.—and very welcome, too! A very good record. The recording is admirable.

★Molly on the Shore, Pierre Foly and his Salon Orch., 2s. DEC F2145

This is a very good version of Grainger's popular work, with a good arrangement of the *London-derry Air* on the other side. An excellent record.

★My Cradle is the Desert, Radio Melody Boys, 1s. 6d. WIN 5203

They are always good, and never better than here. Ask to hear this; it will appeal to you as being good lunch-hour music.

★Perpetuum Mobile (Strauss), Vienna Philharmonic Orch., 3s. H.M.V. B3149

This is most exciting and a fine achievement from the gramophonic standpoint. I sincerely recommend it; you will like the piccolos in it.

Post Horn Galop, Band of H.M. Grenadier Guards, 3s. COL DB364

A splendid military band record. If you like such things, I can sincerely recommend this disc.

★Raymond Overture, Hastings Municipal Orch. (d.s.) 3s. 6d. DEC K561

By Ambrose Thomas. The recording is a bit fierce—you will have to tone your loud-speaker down. But the rendering is good and the music is very pleasant. A good light orchestral record.

★Slavonic Rhapsody, Op. 114, Hastings Municipal Orch. (d.s.), 3s. 6d. DEC K567

Friedmann's *Slavonic Rhapsody*, arranged by Woodhouse, makes an outstanding record. As light orchestral music, rather of the Liszt type, it is excellent. A passage given to a solo clarinet on the first side shows the excellence of the reproduction.

Southern Rhapsody, Eldridge Newman and his Symphony Orch. (d.s.), 1s. 6d.

WIN 5198
Not a bad band! The Rhapsody is pleasant light orchestral music. Personally, I enjoyed it, but I suggest you ask to hear it.

Humorous Records

Burlesque Election (Beaton) (d.s.), 2s. DEC F2182
Supposed to be humorous, I think. I am not sure, though; you had better hear it and judge. I have preserved an independent stolidity of countenance throughout.

Fred Fannakapan, Gracie Fields, com., with orch., 3s. H.M.V. B3595

I think Gracie must have left her voice in the Fields; she seems very hoarse. The song is sheer rubbish in my judgment—another decoration for the humorous column!

★Icicle Joe the Eskimo, Leslie Sarony, with orch., 1s. 3d. IMP 2417

Excellent and very rhythmic. It is also very characteristic of Sarony, who is one of the best of our comedians.

Pass! Shoot! Goal! Albert Whelan (d.s.), 1s. 3d. IMP 2404

Rather amusing and very realistic. The song, bearing on the football match, is not so good as Whelan's patter. It is quite humorous in places.

Please, Percy, Elaine Rosslyn, with orch., 1s. 3d. IMP 2420

A very jolly fox-trot tune, but the words are decidedly on the vulgar side. Those of *He's not worth Your Tears* may be likewise but I cannot hear them, so am unable to judge. I suppose it has to be put amongst the humorous records.

Seven Veils, Norman Long, with piano, 3s. COL DB383

His diction is remarkable and the record is consequently ex-



NORMAN LONG

ceedingly attractive. The song is quite original in design. *Dear Old-fashioned Thing*, though its lines are a little vulgar, is quite passable. It is the sort of thing you want to hear once and forget.

★There's a Good Time Coming, Tommy Handley, com., with orch., 3s. COL CB375

Good, as usual. His personality, so well known on the wireless, comes through very easily. He does *Put Your Worries* on the other side.

Weddin' of Sandy MacKay, Jock MacGregor, with orch., 1s. RAD 1444

Rather reminiscent of all other Scotch songs of this type. The patter does not amuse me, but others may see something to laugh at in it.

Dance Music

Beyond the Blue Horizon (f.), Savanna Players, 2s. DEC F2179

An Eastern flavour pervades this, which is by no means unpleasant. I like it very much. Ask to hear it.

Bitter Sweet (w.), Scala Salon Orch., 1s. 6d. WIN 5195

A good rendering, and of *Frederica*, an attractive waltz on the other side.

Dancing on the Ceiling (f.), Jay Wilbur and his Orch. 1s. 3d. IMP 2411

A good rendering of it, with *Elizabeth*, a taking fox-trot, on the other side.

Does a Puff-puff go Choo Choo? Million-Airs, 2s. DEC F2163

Very amusing; it ought to be popular—a thoroughly good "rag" fox-trot with which to end a jolly dance.

Get Happy (f.), Spike Hughes and his Orch., 2s. DEC F2150

And *Doing Things*. Both are excellent fox-trots and suitable for dance purposes. Recording rather brilliant, but that makes them useful for dancing.

★Go Home and Tell Your Mother, Radio Imps, with orch., 1s. 3d. IMP 2419

Very good version and also of *My Baby Just Cares for Me*. If you like these two popular numbers, ask to hear this record. Excellently produced with amusing patter.

Heavenly Night (w.), Dave Frost and his Orch., 2s. DEC F2197

The recording spoils this. It is a good tune but it is not up to standard from the gramophonic point of view. *Dark Night*, a fox-trot, on the other side, is better in this respect. The voice is adenoidal in each case.

Here Comes the Sun (f.), White Star Syncopators, 1s. 6d. PIC 707

Very fair; the recording is not blameless by a long way. Come on, Piccadilly; some of your recording is excellent. This is not your best!

Highway to Heaven (f.), Rhythm Maniacs, 2s. DEC F2008

I am not struck with it, though I can recommend it on rhythmical grounds. *When Love Comes in the Moonlight* is the title of another fox-trot on the back. I prefer it melodically, but I think the rhythm a little disturbing. Good recording.

Hunting Tigers Out in India, Leslie Sarony, 1s. 6d. IMP 2361

And *Cheer Up and Smile*. Both excellent.

★I Haven't Heard a Single Word from Baby (f.), Rhythm Maniacs Orch., 2s. DEC F2175

An outstanding dance record. The Maniacs make an excellent

job of it, and of *You're Gonna be Young* on the other side.

I Still Get a Thrill Thinking of You (f.), Rhythm Maniacs, 2s. DEC F1999

I rather like this; it is new to me. It makes a good dance number (moderate pace). *Rocky Springtime* is again the order of the day on the other side.

★I Want a Little Girl (f.), Jack Payne and his B.B.C. Dance Orch., 3s. COL CB208

The dance records of Columbia



JACK PAYNE

are improving each month. Ask for this; you will not be disappointed.

I'm Doing that Thing (f.), Savanna Players, 2s. DEC F2147

The power of the recording recommends this for dance purposes. It is also a good fox-trot (moderately quick), *Sing* on the other side.

I'm Still at Your Beck and Call (f.), Rhythm Maniacs, 2s. DEC F2015

This is quite a good tune with dancing qualities. *She's My Secret Passion* is on the other side. I consider this a good dance record.

★In My Heart, It's You (f.), Paul Whiteman and his Orch., 3s. COL CB210

This is an excellent dance record, beautifully produced. On



PAUL WHITEMAN

the other side, *A Big Bouquet for You*. I sincerely recommend it.

★Just a Little Closer (f.), Jock McDermott and his New Carlton Players, 1s. 6d. PIC 703

A slow fox-trot. This is very well done and exceedingly useful for dance purposes. I sincerely recommend it.

Just Imagine (f.), Jay Wilbur and his Orch., 1s. 3d. IMP 2409

SPECIAL REVIEWS BY WHITAKER-WILSON

Quite a good record, with *Loving You the Way I Do* on the other side. Wilbur always gives a clear rhythm.

★ **Laughing at Life (f.)**, Ted Lewis and his Band, 3s. **COL CB204**

A very useful dance record, with *Home Made Sunshine* on the other side. This band is improving.

Lorette (w.), Rhythm Maniacs, 2s. **DEC F2009**

A pleasant waltz, a trifle on the quick side, or so it seems to me. I like *By Your Side*, a fox-trot, which is on the other side.

★ **Love is Like a Song (f.)**, Al Stewart and his New Mexicans, 1s. 6d. **PIC 706**

A quick fox-trot, and very well produced. It is a cheap record but it is quite good for dancing and electric reproduction.

★ **Love is Like That (f.)**, Eddy Wallis Orch. **PHONY 103**

Very well produced. I consider it an outstanding dance record.

★ **Loving You the Way that I Do (f.)**, Ambrose and his Orch., 3s. **H.M.V. B5965**

An outstanding dance record. On *a Little Balcony in Spain*, on the other side, is as attractive as its title sounds read in a London fog.

★ **Make Yourself a Happiness Pie (f.)**, Rhythmic Eight, orch., 2s. 6d. **ZONO 5813**

A jolly fox-trot; it pleased me very much. I also like *Tap Your Feet*, on the other side. An outstanding dance record.

★ **Masks and Faces (tango)**, Geraldo's Los Cauchos Tango Orch., 2s. **DEC F2199**

Very nice! Its rhythm is pleasing in the extreme. I also like *Barrio Reo* on the other side.

Misty Mornin' (f.), Spike Hughes and his Dance Orch., 2s. **DEC F2166**

This is a useful slow fox-trot; if you want one, ask to hear it. The other side is *Everybody Loves My Baby*, which goes much faster and is an outstandingly ugly tune.

My Baby Just Cares for Me (f.), Jack Harris and his Orch., 2s. **DEC F2064**

Very good versions and useful as dance records (*Go Home and Tell*, etc., on the other side).

My Bluebird was Caught in the Rain, Florence Starr, sop., with Ray Ventura and his Collegians, 2s. **DEC F2031**

B.B.C. SYMPHONY CONCERTS Items of Which There Are Records

The concert of April 29 includes Schubert's "Rosamunde" Overture. This has been recently issued by H.M.V. (G1873), and is excellent. Also Strauss' "Dance of the Seven Veils," from the opera "Salomé," is done by Columbia, with Bruno Walter conducting the Berlin Philharmonic Orchestra, on LX39.

The last concert of the season is on May 6, and I may as well include it here. Weber's Overture to the opera "Euryanthe" has not long been issued by H.M.V. (D1767), and very good it is. The orchestra, in this instance, is the Berlin Philharmonic. Elgar's "Enigma Variations," with himself as conductor, are produced by H.M.V. on D1154-7. As far as I know, these are the only records of it. **WHITAKER-WILSON.**

A very pleasant song in fox-trot rhythm; indeed, it might be danced to. The other side contains *Eleanor*, a song in waltz rhythm by the same people.

Never Swat a Fly (f.), Savanna Players, orch., 2s. **DEC F2178**

The heavy recording makes this eminently suitable for reproduction in large rooms and upon powerful machines. *Say Something Simple* is the companion.

Nobody Cares if I'm Blue (f.), Al Stewart and his New Mexicans, 1s. 6d. **PIC 705**

Quite good, though not so good as some of the other dance records by this firm. Still, it deserves a trial. *You Will Remember Vienna* on the other side.

★ **Okay, Baby, Blue Jays**, 1s. **RAD 1448**

A splendid fox-trot on the quick side. Don't miss this!

Pantomime Favourites (1931), Million-Airs (d.s.), 2s. **DEC F2155**

Specimens; *Cheer Up and Smile*; *Emily Brown*; *There's a Good Time Coming*. Very well produced. There are three complete records apparently; I have only parts 5 and 6 here.

Paul Jones, Ye Band of Rustics, orch. (d.s.), 2s. **DEC F2143**

I am not struck with it and I am sick of all the tunes it plays, but it may be useful for the purpose for which it is evidently written.

Sittin' on a Five-barred Gate, Chris. Hall, with Harry Hudson's Melody Men, 1s. **RAD 1449**

Rather amusing and quite a good tune. The patter will bar it from being suitable for dance purposes. *Over the Hills and Far Away*, on the other side, is a splendid fox-trot tune—and suitable for dancing. The patter is rather poor stuff.

Stolen Moments (f.), Rudy Vallee and his Connecticut Yankees, orch., 3s. **H.M.V. B5951**

An effective slow fox-trot with *You're Driving Me Crazy* on the other side. This is an exceedingly good dance record.

★ **Sunny Days (f.)**, New Mayfair Dance Orch., 3s. **H.M.V. B5956**

An outstanding dance record; on a big machine it would fill a large dance hall. *I'll be Good Because of You* is the companion; it, too, is highly suitable for dancing.

Sweet Jennie Lee (f.), Jack McDermott and his New Carlton Players, 1s. 6d. **PIC 702**

Quite a good tune and a good band. I think this could be useful as a quick fox-trot (on a good loud-speaker) for dance purposes.

'Tis I Myself (w.), Buckingham String Players, 3s. **COL CB198**

An old-fashioned waltz, very well played. The recording is not perfect, perhaps, but the effect is, in the main, pleasing.

Underneath the Lovers' Moon, Maurice Elwin, bar., with orch., 2s. 6d. **ZONO 5800**

His voice is good enough to use properly. He sounds as though he is running a risk of degenerating into an adenoidal singer. He sings the words so well, too! *Kiss Waltz* on the other side.

★ **Underneath the Spanish Stars (w.)**, Radio Melody Boys, 1s. **RAD 1447**

Deserves every recommendation as being amazing value for a shilling.

Way I Feel To-day (f.), Spike Hughes and his Dance Orch., 2s. **DEC F2193**

A good dance orchestra! This record is very suitable for dancing. The tune is also attractive, perhaps more so than *Without a Song*, on the other side.

Wedding Bells are Ringing for Sally (w.), San Remo's Dance Orch., 1s. 3d. **IMP 2410**

I have not heard this before; it is a pleasant and rhythmical waltz. The recording is especially good. The other side is *Here Comes the Sun*, of which it is a very good version.

★ **Within My Heart There's Only Room for One Love (f.)**, Rhythm Maniacs, orch., 2s. **DEC F2184**

I sincerely recommend these dance records by the Rhythm Maniacs. They have an outstanding rhythmical quality. You need have no hesitation in buying this.

★ **You Will Remember Vienna (w.)**, Debroy Summers' Band, 3s. **COL DB200**

An outstanding waltz record, with an attractive fox-trot (*I Bring a Love Song*) on the other side. The recording is splendid.

Orpheus Dance Band, 2s. 6d. **ZONO 5815**

Very good rendering. Also of *I Bring a Love Song*.

You're Driving Me Crazy (f.), Jack Albin and his Hotel Pennsylvania Dance Orch., 1s. 3d. **IMP 2408**

This is more rhythmical than melodic, but it is quite effective. *Sweet Jennie Lee*, on the other side, is an effective dance piece.

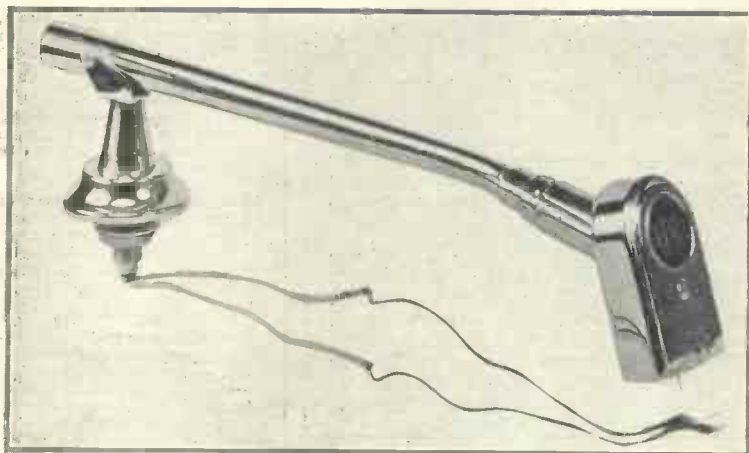
★ **You're Lucky to Me (f.)**, Billy Cotton and his Band, 3s. **COL CB206**

An outstanding dance record. Ask to hear it—and you will buy it!

ABBREVIATIONS USED IN THESE PAGES

bar.	baritone	orch.	orchestra
COL	COLUMBIA	PHONY	PHONYCORD
com.	comedian	PIC	PICCADILLY
con.	contralto	RAD	RADIO
DEC	DECCA	sop.	soprano
d.s.	double-sided	ten.	tenor
f.	fox-trot	w.	waltz
H.M.V.	HIS MASTER'S VOICE	WIN	WINNER
IMP	IMPERIAL	ZONO	ZONOPHONE

A COMBINATION AND ALTERATION



A NEW COMBINATION OF PICK-UP AND ARM
The revised Limit pick-up is now supplied on a special type of arm

THE new Limit pick-up has already attained such popularity by reason of its big all-round volume, fine definition and full bass that it is worthy of note that the thumb-screw previously fitted to the damping regulator has been replaced by a wide screw, slotted at

the top, so that it may be turned on the insertion of a sixpence.

This is an improvement because one's friends, not knowing the secret, perhaps, are less likely to monkey the tension in order to see what will happen.

At the same time the makers

have taken to issuing it combined with a thoroughly well-designed arm, in which the weight of the pick-up and arm are compensated by a combination of weight and spring force, at the inclusive price of £1 11s. 6d. H. T. B.



EASY ADJUSTMENT
The damping of the Limit pick-up is varied by means of the "sixpence" screw at the side

AVERAGE PICK-UP OUTPUTS

WHAT is the average voltage generated by ordinary sensitive pick-ups?

The B.T.H. instrument, I see, is said by the makers to provide at least half a volt at 1,000 cycles. Another pick-up, the Pacent, which has oil damping, gives 4 volts output.

Its frequency range is said by the makers to be from 46 to 8,000 cycles!

What a wide frequency range, and how sensitive! With a transformer coupling stepping up the voltage by, say, 3 to 1, and a pentode valve, good loud-speaker results will be obtained.

A one-valve gramophone set!

With outputs of the order of half a volt a two-valve set is needed—with a volume control for

the purpose of avoiding overloading on numerous occasions.

For some reason or other people seem to expect more volume from records than the wireless. When the same output valve is used, as it always is, the amount of the volume to be obtained without overloading is equal in both instances.

Record wear, it is agreed, is less

when using a pick-up than a sound-box. This used not to be true, but modern pick-ups are well designed. And when the carrying arm is itself of good construction, perhaps having a spring or a balanced weight, wear is quite negligible.

Of course, the apparatus must be properly assembled and suitable needles must be used.

A cheap motor is of no value, the driving torque not being constant enough. With an electric motor care must be taken to obtain good running and freedom from noise. Electric motors have not been, on the whole, entirely satisfactory.

Some are not very suited for the work they are called upon to carry out. But there are types satisfactory in all respects. W. JAMES.



MAKING A TALKIE
A typical scene in a film recording studio. Note the microphone in the left foreground

RADIO HELPS THE SICK

In Hospital—When the Receiver Is Working!

AS the result of a motor accident I found myself in a large hospital under the kind care of doctors and nurses. After some days, when the bandages were removed from my eyes, I saw a loud-speaker high on the wall opposite me. As I was not conscious of having heard any music or anything else I waited a day or two, but nothing came. It was mute.

After nine days I asked a nurse if the loud-speaker was in working order. Her reply startled me. That loud-speaker had not been heard for very many months. She did not know why and, as she said, that was not really her business.

In the subsequent conversation I had with her and other nurses I discovered that there was not a single objection to wireless. On the other hand, the patients loved it. It cheered; it helped; it had not only a whiling-away-of-the-time purpose, but it also was healing in its ministry.

Amazing Interlude

Two doctors told me the same thing. They had not the least objection to wireless. They both encouraged it. Then to my amazement and that of all in the ward of twenty-five beds, a few minutes before eleven on the morning of Armistice Day a man came into the ward and connected a gadget. The service from the Cenotaph came through clearly. But that was all. After that there was silence again.

It was obvious that the set was in working order, yet the patients had no wireless. The moment I was discharged from the hospital I made



A JOY THAT HAS PASSED . . .

This photograph was taken in a hospital where radio can no longer cheer the sick because the receiver is not in working order. What is happening in your local hospital?

inquiries and found an alarming state of things.

The hospital concerned has more than five hundred beds and some four years ago wireless was installed in every ward at considerable expense to various subscribers through a national newspaper. The installation was opened with great pomp and joy, and for a few weeks there was music to while away weary hours and lighten heavy hearts. Nobody suggested that it should be stopped or dismantled.

But for more than a year no sound has come from the loud-speakers in many of the wards. The ward I happened to be in got more wireless than all the other wards together. The whole thing baffled me until I came across those who were in charge. Then the story became a different one.

After the installation the whole thing was left in the hands of a boilerman who knows all there is to know about boilers and heating apparatus, but who knows next to nothing about wireless. He has tried hard, but he's failed. He was appointed to look after the boilers, not after wireless.

As soon as things began to go wrong he had not the knowledge to put them right. When he asked for aid, it could not be given because it would mean money. The hospital committee did not feel like paying wireless bills. After all, wireless was a luxury and not really as necessary for the treatment of patients as X-rays were.

Voluntary wireless experts gave a helping hand for a time, but they got tired, and finding themselves with plenty of other work on hand, gave it up.

And there is the installation going to rack and ruin for want of the help that a few skilled constructors could so easily give.

On the Trail

But that only led me on a trail. If it was true of a fairly big hospital that it could not keep its wireless in repair what was the lot of lesser hospitals in which wireless had been installed? I visited the three largest hospitals within a radius of fifty miles, and in each case there was a similar state of things.

There was no recognised authority to set wrongs right; there were no additions to sets put in four and five years ago; batteries had run down and were ruined. And the patients were asking invariably why they could not get wireless. E. B. R.

Are You A Listener



THIS is a serious matter. I am asking you a plain question, and I trust you will give yourself a plain and truthful answer. Are you a LISTENER or do you devote your evenings to the noble art of KNOB-TWISTING?

Since I have been music critic to WIRELESS MAGAZINE, most people of my acquaintance imagine that I know all there is to know about wireless sets. The real facts of the case are that I could write down all I know about a wireless set on the sticky side of an ordinary postage stamp.

Still A Mystery

I possess a set—an all-electric set—but I did not build it. I know nothing about its inside and could not distinguish the output choke from the clutch if my life depended on it. If it goes wrong, I bring it up to Fetter Lane and more or less burst into tears; then one of the kind people on the staff here puts it right immediately, and I go away happy.

My job on this staff is to review music, not sets, a matter I am quick to explain to my friends, who expect me to give them advice of a technical nature. If I ever build a set it will be capable of reaching four stations at once, thus giving the permanent effect of British contemporary music of the ultra-modern type.

Many Knob-twisters

I have many knob-twisters amongst my acquaintances. I am thinking of one in particular now. He is, admittedly, a man of rather shallow mentality and is, as far as I can judge, neither interested in wireless

-or A Knob-twister?



WHITAKER-WILSON, the "W.M." Music Critic, Asks a Plain Question.

from the mechanical side nor in music as an art.

He comes home for his evening meal, after which he turns on the wireless, his entire interest being centred in finding out what fifty stations, at least, are doing.

He spends the whole evening twisting the knobs on his set (to the great annoyance of his family) and does not reckon to listen to a station for a longer period than that required to boil an ordinary London egg.

Occasionally, he has a mechanical evening and takes the set to bits; I believe the family prefers this to the

other. Admittedly, he is a very bad example, but I am convinced there are many like him.

Another man of my acquaintance—a man of great learning this time—is a real wireless enthusiast. He has built himself a fine set and takes an intelligent interest in all wireless matters.

Quality Before Matter

He is a bit of a knob-twister all the same, but he keeps himself well in hand for the sake of his wife, who is musical. His main interest, though, is in the quality of the reception rather than the value of the matter that is being broadcast.

Now let us look at the listeners. First of all there are those who say, "I wonder if there is anything on the wireless!" Strangely enough, there generally is. Having found the

Regional, they continue their conversation through whatever Gershom Parkington is trying to do for them,

These good people are the direct descendants of the artistic Victorians, who used to ask a guest to play "some of Chopin's stuff" at one of those atrocities known as a musical evening, at the first chord of which everybody began to talk very loudly.

Listener-readers

Then there is the listener-reader, who can spend a couple of hours over a light novel with the B.B.C. Symphony Orchestra going full-blast at the same time; the fact that he (or more often, she) cannot obtain the slightest benefit from either is of no consequence whatever.

Far be it from me to disparage

Listening in any form; one indifferent listener is worth two good knob-twisters any day, but I do feel inclined to point out that the habit is a thoroughly bad one. The brain is being taxed in rather a stupid way; it is impossible to grip a good book and a good symphony at the same time. Neither is it necessary.

Television No Help

The very fact that we cannot see those who broadcast is a danger in itself; even when television comes it will be no better, because we shall still realise that *they* cannot see *us*. Therefore no question of politeness or good manners on our part arises.

We can talk, read, leave the room and return to it—anything we wish—while a symphony concert is in progress at the Queen's Hall.

On the other hand, if we actually go to Queen's Hall for a symphony concert we know quite well that if we are as much as one minute after eight o'clock in arriving we may be kept in the corridor for twenty minutes or more, that is, until the conclusion of the first item.

Having at last gained admittance, we may not talk or walk about; we have to behave ourselves in a seemly fashion in order not to annoy other people. In fact, we are expected to *listen*, strange as it may seem.

I maintain that knob-twisting is a vicious pastime; searching the ether, raking the atmosphere—whatever you like to call it—is a poor game at the best, but it is very little worse than limiting one's interest to the quality of the reception only.

I am persuaded that set-building, fascinating as it must be, is far too frequently productive of a mechanical type of enjoyment to the detriment of anything approaching artistic and aesthetic enjoyment. It is all wrong in my opinion.

Lunch-time Music

It is one thing to turn on hotel music at lunch time and eat and converse through it (plenty of quite sensible people do that), but it is quite another to turn on a violin recital by a first-class player and tone down the broadcast out of recognition in order to hear what our partner calls at bridge.

Only last Sunday night I listened to the symphony concert with my wife and two friends. We did the thing properly; we switched off the light, stoked up the fire, and settled down in comfortable chairs.

As far as I remember, no one spoke, even when the announcer could not be found to announce the last item.

I take it that each of us was busy with his or her thoughts; I know I was.

I maintain that listening to good music in that fashion is something the whole nation should learn to do; it *will* learn in time, but not until some members of the community have been put away in a knob-twistery to be cured of their bad habits.

The act of concentration—a very simple act when listening to good music—is one which every one should practise. It is one of the most strengthening mental processes it is possible for a human being to experience. If people only realised the storage power that is given them during elementary concentration of that kind they would do more of it.

If you concentrate on some difficult problem you are likely to become unduly fatigued, simply because you have been fighting to overcome an opposing force.

No Opposition to Music

With music, unless you are performing yourself, there is no such difficulty; you are not opposed at all, but are—or should be—carried along by the sound waves that assail your ears.

In these hard days, when everybody seems depressed because everybody else is depressed, anything that has the power to distract the attention and free us from worldly considerations for a brief space is, to my mind, worth thinking about.

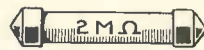
I feel that music has done so much for me that I should like to think it did something for everybody. The wireless has given everybody a chance of hearing the best the art has to yield; and as Art yields so readily, it seems a pity not to extract the last ounce of good out of it.

Now will you look at these illustrations? These two pictures were taken specially by the staff photographer.

In the first the Technical Editor (J. H. Reyner) and myself are supposed to represent two types of listener. He is the listener-reader for the moment, while I am trying to convey that I am really listening. In the second picture you see him as an arch-knob-twister; also you will notice the effect it has on me.

Well, what about it? Are you a listener or are you a kn . . . ?

THOSE RESISTANCES

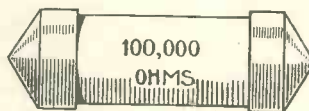


GRID LEAK

RESISTANCES of one kind or another are to be found in almost every radio set, and it will therefore be of interest to review briefly the different types.

Above is shown the ordinary "grid-leak" type of fixed resistance, made in values between 100,000 ohms and 5 megohms (5,000,000 ohms).

These resistances can only be used in circuits that pass very little current. They are sometimes used in anode circuits where a resistance-capacity coupling is employed.



WIRE-WOUND RESISTANCE

When smaller values of resistance are needed to carry larger currents—say, from 3 to 20 milliamperes—resistances of this type are employed. They are wound with wire which will carry the particular current required without overheating.

It is most important in the case of mains units, where such resistances are often used for voltage regulation, to see that the types used will carry the necessary current or they will break down.

Both of the types illustrated above are used in some kind of spring clip.



SPAGHETTI RESISTANCE

A comparatively new form of fixed resistance is the flexible or spaghetti type shown above. Here the wire is wound round a core of cotton and the whole protected by a flexible insulating covering.

In general, these resistances can be substituted for the larger type previously discussed, but they do not carry quite as much current.

A great advantage of these resistances is that they take up no space in the set—they can be used in place of a connecting wire between two components where required. D. S. R.

Putting cells into large containers to form
Siemens high-tension batteries

Before being sealed each batch of Siemen-
cells is tested with a meter



LOOKING AFTER YOUR BATTERIES

THE battery problem is one which is always with those of us who do not employ mains drive for our receivers. This being so, some remarks on the subject of batteries will be useful.

Let us consider the low-tension battery first. The type almost universally employed for this purpose is the lead-acid accumulator. In its simplest form this consists of two plates of lead in a vessel containing dilute sulphuric acid.

It is found that if current is passed through this arrangement a chemical change takes place, and lead oxide is formed on the positive plate.

This in itself is not very remarkable, for if we pass a current through a liquid containing acid or dissolved salts chemical changes do take place, often accompanied by a change in the character of one or both of the electrodes. Electroplating is simply a development of this electrolysis, as it is called.

Potential Difference

In the case of the lead cell, however, it is found that when the current is switched on the arrangement has now a potential difference of something like 2 volts, and that if we connect the two plates together, through a suitable resistance, it will give up the current which was stored in it previously, by the positive and negative plates becoming converted into lead sulphate.

When this has taken place the cell is said to be discharged, and requires to be recharged by passing current through it again. Thus an arrangement of this sort will act as a reservoir of electricity, or an accumulator as we call it.

Batteries are the life-blood of any set with which they are used and every listener should know certain things about them.

This easily understood article by

J. H. REYNER,
B.Sc., A.M.I.E.E.,

explains how to get better service and more satisfactory reproduction with any ordinary battery-operated receiver.

In practice simple lead plates are not used, but grids of lead are employed which are filled with suitable oxides of lead in the first place. This is necessary because, with the simple lead plates, it is necessary to charge and discharge the cell a number of times before the plates become properly formed and before they are capable of holding a reasonable charge.

This difficulty is overcome by anticipating the chemical changes which would take place during the forming process, and filling the plates with the oxides of lead into which the plates would have been converted at the end of that time.

Then when we charge the accumulator again one of the oxides becomes converted into a peroxide, or superoxide as it were, while the other one is reduced to ordinary lead.

As we have seen, during discharge the oxides become converted into lead sulphate. It is important not to discharge the battery beyond the point at which this readjustment of the chemicals has been obtained, because

after this point the sulphate which forms is of a different character and will form whether the cell is in use or not. This sulphate appears all over the plates as whitish deposit, which is ruinous to the health of the accumulator, and should never be allowed to form.

Fortunately we are able to determine exactly the point at which it becomes dangerous to discharge the cell further. As the cell is used the voltage gradually falls, at first very slowly, but afterwards with increasing rapidity, and it is found that this white sulphate begins to form if the voltage falls below 1.8 volts.

Since the accumulator is normally rated to give 2 volts there will be a distinct falling off in the output from it, which will probably be noticeable in the reception as soon as the voltage begins to fall in this manner, but it is more than likely that if the battery runs right down and gives out, as it sometimes does, the voltage has fallen distinctly below the 1.8 figure.

Preventing Damage

This in itself will not cause any appreciable damage if the cell is not allowed to remain in this condition, and it should immediately be recharged to save it from damage. The use of a pocket voltmeter, however, usually repays itself, since it always enables one to check the voltage of the cell.

Another method of checking the performance of a cell is by a hydrometer. All liquids have a certain specific gravity or density. If, for example, one drops a small pebble into a pond it will fall to the bottom straight away. If we dropped the same pebble into a can of oil it would

take an appreciable time to reach the bottom, owing to the fact that oil is much more dense than water.

There are certain subjects which will float in oil and which will sink in water. Owing to the chemical changes which take place in the accumulator when it discharges, the composition of the liquid itself varies according to the state of charge of the accumulator.

Converted to Water

In a fully charged cell we have lead oxide on the positive plate, and the liquid is dilute sulphuric acid. When the cell is discharged both the plates become converted to lead sulphate and the liquid turns to almost pure water.

This fact is made use of in various ways. In the scientific world we use what is known as a hydrometer, which consists of a little tube weighted with lead and having attached to it a stem on which are a number of graduations.

Finding Specific Gravity

If it is placed in water it sinks until just the top is projecting. If we put it into some denser liquid, such as sulphuric acid, it will not sink quite as far, and we are able to read off what we call the specific gravity from the graduations on the stem.

From the specific gravity of the acid we can tell the state of charge in the accumulator.

Another method is to use two small balls of material, both of which will float in sulphuric acid, but only one of which will float in water. When the cell is discharged one of the balls will sink to the bottom, and this will give us an indication of the state of charge of the accumulator.

There is much more one could say

about accumulators. The construction of the plates is different in different types according to the use to which the cell is put.

For wireless purposes it is becoming customary to use only one positive and one negative plate, these being made very thick and containing a large quantity of active material, since this form of accumulator is found to be best for the relatively slow intermittent discharge which is demanded by a wireless set.

On the other hand, in many cases one uses a number of positive and negative plates interleaved rather like plates of a condenser, and kept apart by separators. Both types, however, are subject to the danger of sulphating if they are allowed to discharge too far and remain in that condition, and great care should be taken to treat them well.

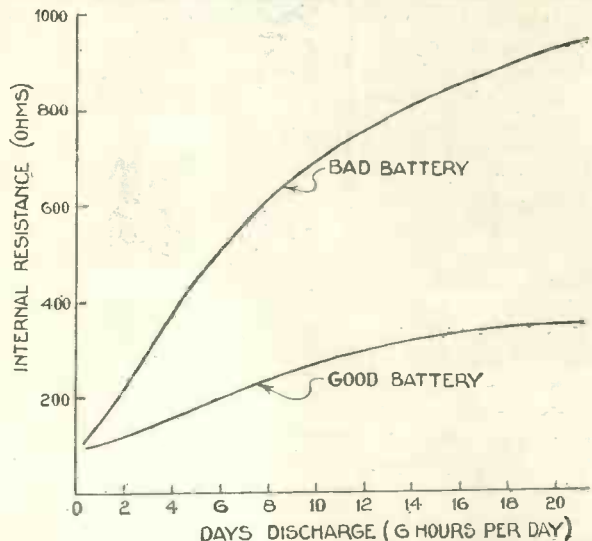
Fortunately, if an accumulator is allowed to sulphate and has not gone too far, it can be reconditioned very effectively by use of the material known as Dar.

High-tension Supplies

Let us now turn our attention to the high-tension side. One can, of course, use accumulators here, although this is somewhat expensive, because an accumulator only gives 2

volts, and as we require anything from 120 to 200 volts, we need sixty to a hundred cells.

It is possible to produce small cells specially for this purpose at prices between 6d. and 9d. a volt, and provided one is able to recharge these accumulators about once every four or five weeks they are quite satisfactory.



How the internal resistance of a poor high-tension battery rapidly increases during discharge. The resistance of a good battery remains almost constant

Dry Batteries

It is more usual to employ what are known as dry batteries for the purpose. These have cells consisting essentially of zinc containers which act as a negative electrode, in the centre of which is a positive carbon rod.

In between the two is a space made up of salammoniac, manganese chloride or other active agent mixed with suitable filling material, while around



Filling Siemens battery containers with insulating wax



Making the zinc cells for Siemens high-tension batteries

LOOKING AFTER YOUR BATTERIES—Cont.

the centre rod is a sack containing a composition known as a depolariser, usually manganese dioxide.

The reason for this is that the cell in use tends to accumulate a thin layer of hydrogen gas around the carbon rod owing to the chemical action which takes place inside the cell when current is being taken from it. This acts as an insulator and polarises the cell, preventing it from delivering any more current.

The depolariser is a chemical which has a strong affinity for hydrogen and therefore absorbs it as soon as it is formed, allowing the cell to work on uninterruptedly.

Batteries of this type have the property that their voltage falls almost continuously as they are being used. Sometimes the fall is fairly gradual over the great part of their useful life, becoming steep at the end of this period and, indeed, the battery manufacturers endeavour to maintain the voltage at a high value as long as the cell is in a satisfactory condition, and to produce a sharp cut-off afterwards in order to indicate that the end of the useful life has arrived.

Length of Life

The length of the useful life depends essentially upon the current which is taken from the cell. It is possible to take too small a current from a battery, because there are certain chemical actions which take place even when a cell is standing idle.

It is not necessary to dwell on this point, because 90 per cent. of the abuses to which modern batteries are subjected arise from overrunning. The current which a battery will deliver, of course, depends upon the load which is placed across it. If we connect a set taking 15 milliamperes across a battery which ought to give



NOVEL CARRIER

A new type of Pertrix accumulator with a permanent acid-proof carrying handle and floating charge indicator

7 milliamperes, it will deliver 15 milliamperes for a time. The voltage will rapidly fall, however, and this is the important point.

Let us suppose that the battery is capable of lasting for 200 hours at its proper rate of 7 milliamperes. One imagines, then, that if it is called upon to supply double the current it would last for 100 hours. Actually, it will not do so, and will only last somewhere about 70 or 80 hours.

The proper thing to do in a case like this is to use what is known as a double-capacity cell, which contains twice the amount of active material. This cell is not double the size of the standard cell, because a proportion

of the space in any ordinary cell is taken up with material which is not really active in supplying electricity, and does not cost anything like twice the price of the standard battery, yet it will last twice as long.

A similar argument applies to the use of triple- and quadruple-capacity batteries. The cost does not rise in anything like the same proportion as the capacity, and it pays time and again to use the correct size of cell. As a general guide it may be assumed that a standard-capacity battery should not deliver more than 7 to 8 milliamperes. Double-capacity batteries will deliver approximately twice as much, and so on.



FOR HIGH TENSION AND GRID BIAS

An ingenious system of tappings enables this 99-volt battery to be used for high tension and grid bias up to 9 volts

There is yet another reason why the judgment of the battery by its voltage is misleading. It is possible to have two batteries, both of which give very much the same performance when tested on a given discharge through a resistance. That is to say that after a certain number of hours use the voltage will be approximately the same on both batteries.

Good Quality or Distortion?

Yet one battery may give pleasant handling and good quality on a set, while the other battery will cause instability and distortion.

The difference lies in the internal



QUITE UNSPILLABLE

This Young two-volt accumulator is unspillable and has a solid electrolyte

resistance, which is not shown up to any appreciable extent by the discharge curves. The diagram shows a case in point taken from an actual test. The two batteries both gave somewhat similar discharge curves, so that at first sight they appeared to be equally good.

Yet it will be seen that in one case the internal resistance rose rapidly to several hundred ohms and remained there, whereas the other battery maintained a low internal resistance and only rose quite slowly throughout the whole of the discharge.

The internal resistance of a battery should not exceed 200 or 300 ohms for satisfactory working with the average set, while some sets will not stand more than 100 ohms. Otherwise the fluctuating currents from the set produce a varying voltage across the battery quite apart from the steady high-tension voltage; this will cause whistling and instability.



LOUD-SPEAKERS

CHOOSING, USING AND BUILDING
EXPLAINED IN SIMPLE TERMS

CONTENTS

	<i>Page</i>
Choosing a Good Loud-speaker	2
How the Moving Coil Works	3
Making a Linen Loud-speaker with Single Diaphragm ..	4
Output Valves and Your Power Needs	7
A Simple Loud-speaker Tone Control	8
Is Your Output Circuit Right?	10
About the Inductor Loud- speaker	11
Notes on Loud - speaker Chassis	12
Things to Know About Units	14

**Forty-five Illustrations in Dia-
gram and Photograph**

The photograph at the top of the page shows a group of schoolboys inspecting a Marconiphone public-address outfit. On the left is a Mullard Orgola receiver incorporating a Mullard type H cone loud-speaker



CHOOSING A GOOD LOUD-SPEAKER



This Hegra Dynamic model is not a moving-coil loud-speaker, but has an efficient balanced-armature type of drive. Price £2 16s.

EVERY listener wants to obtain the best quality of reproduction within his means; to-day this want is fully satisfied with a wide variety of loud-speakers. But because there are so many loud-speakers the ordinary listener is apt to be bewildered when faced with the problem of choosing.

Two Factors

Two factors will eventually narrow down the final selection. One is the price limit and the other is the set. A latter-day proverb might well be "a set is only as good as its loud-speaker."

If the set has cost a lot of money it is false economy to buy a cheap loud-speaker; one might as well use a cheap set. The converse of our proverb is equally true; a good loud-speaker can give faithful reproduction only if the set is well designed.

Abilities of the Set

So the first thing to do in an attempt to choose the right loud-speaker (that is to say, one that best suits the set to which it is to be connected) is to find out the inherent abilities of the set. In considering quality of reproduction the most vital part of the set is the output stage. The last valve and its power supply determine the power output of the set.

Small and large power valves are employed for undistorted outputs varying

from about 350 milliwatts to 1,000 milliwatts. For small outputs the balanced-armature cone type of loud-speaker housed in a cabinet, or designed as a wall plaque, is usually suitable; equally good is the inductor dynamic or linen diaphragm type of loud-speaker. For larger output valves the moving-coil type of loud-speaker is generally recommended, but balanced-armature cones and inductor dynamics are by no means unsuitable.

Some broad distinctions between the different types of loud-speaker available, with examples to indicate prices, will be helpful to listeners choosing a new model.

First of all we will discuss cabinet cones, because they form the bulk of the loud-speakers on the market and at the present time they are undoubtedly the most popular. Most cabinet-cone loud-speakers are driven by balanced-armature units, although a few of the cheaper models employ a simple reed mechanism. Most of the cabinet cones are also of high resistance, which means that they will work in conjunction with the average power valve without a step-down transformer.

The average price of a good quality cabinet cone is in the region of £5, but we have tested and approved some excellent models at prices as low as 2 guineas. The Amplion model ACS is certainly good value for money at 2 guineas and is suitable for the average two-valver.

Another inexpensive loud-speaker is the Celestion type D10, price £3. This is sensitive and capable of handling average volume. The D.C. resistance of the winding is 2,000 ohms. The Gecophone Stork loud-speaker at £3 5s. is sensitive and capable of good reproduction with two- and three-

valvers. Another outstanding cheap loud-speaker is the Graham Farish cabinet cone, price 2 guineas.

As already mentioned, the average price for a cabinet cone type of loud-speaker is £5. An example is the Amplion model AB6, price £4 10s. This incorporates a balanced-armature unit and the winding is tapped so that the loud-speaker can be worked with most power valves on the market without the need for a special transformer.

Brilliant "Top"

The Blue Spot model 29K includes the well-known Blue Spot unit and chassis, providing great sensitivity and brilliant top notes. The price is 5 guineas. The Celestion model D12 gives a good even response, has a D.C. resistance of 2,000 ohms and is listed at £5.

For those whose resources are restricted the plaque type of loud-speaker is sometimes preferable to a cheap cabinet cone. Plaque loud-speakers are the least expensive and provide clear speech and tolerable quality of reproduction with music. They can be used with success for two-valvers of moderate power.

Wall Plaques

The Marconiphone model 30 plaque at £1 10s. can be rested on the table or hung on the wall. The Amplion guinea cone has a bakelite surround and is supplied with a brown silk cord for hanging on the wall. The Mullard plaque at £2 10s. includes a tone filter. It is very sensitive and handles good volume.

Many listeners have shown a liking for the brilliant tone of loud-speakers making use of a stretched linen diaphragm. Originated in America, this principle was introduced to this country by WIRELESS MAGAZINE and *Amateur Wireless*. The Ultra model U99, price £4 10s., is a commercial version of the linen-diaphragm model.

Inductor Type

A new development is the inductor dynamic, the principle of which is explained elsewhere in this supplement. The inductor dynamic provides a very near approach to moving-coil quality. Several loud-speakers employing the Farrand inductor (Continued on Page Sixteen)



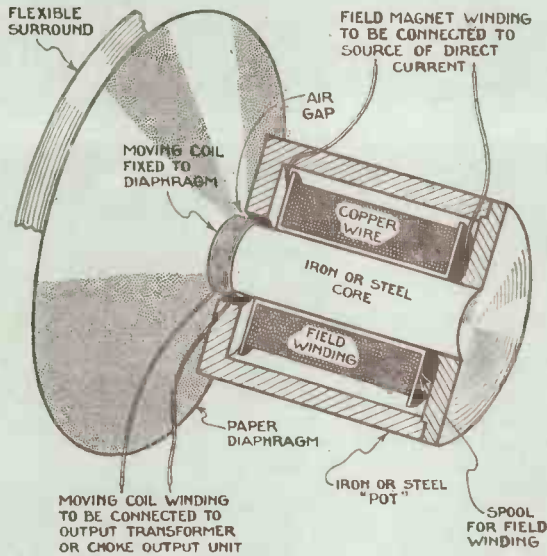
A new type of enclosed cone loud-speaker made by the Mazda people. It is model E and sells at £2 10s.

HOW THE MOVING COIL WORKS

IT is generally agreed that the moving-coil type of loud-speaker provides the nearest approach to perfection in broadcast reproduction. The modern moving coil is not only responsive to high, medium and low notes but has also a high degree of sensitivity. That is to say, it produces even reproduction of the audible frequencies, with a good volume of sound, when fed with a moderate power of, say, 1,000 milliwatts.

resonance of the baffle board or cabinet (unless these are badly designed) but are due to the moving coil actually vibrating at the low frequencies in question. The tone of the bass is appreciated in moving-coil reproduction, whereas so-called bass-note reproduction in less efficient loud-speakers is more truly reminiscent of someone thumping a tub.

If moving coils are almost universally good in bass-note reproduction the same cannot



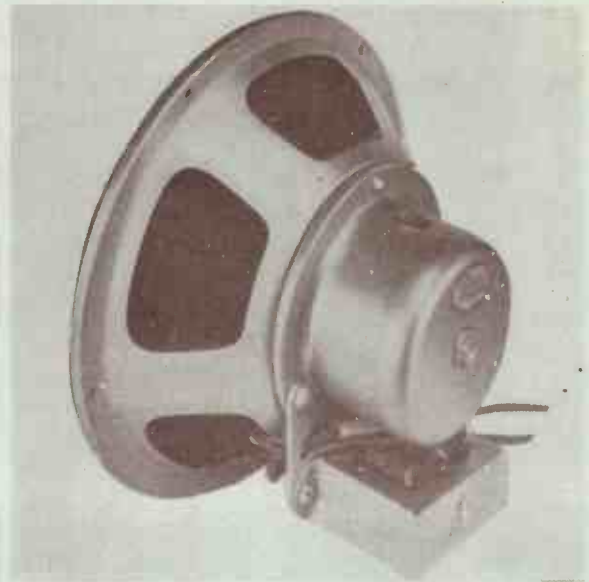
This diagram shows the construction and action of a moving-coil loud-speaker of the type with an energised field

The characteristic that strikes the listener hearing a moving coil for the first time is the natural reproduction of the bass notes, as distinct from the artificial bass reproduction produced by certain other types of loud-speaker housed in cabinets, many of which are purposely made to resonate at low notes.

Bass Boom

The bass-note reproduction due to box resonance can always be distinguished from the true bass-note reproduction of a moving-coil loud-speaker. For although the cabinet accentuates the low notes it does so at one particular frequency. By standing some distance away from the loud-speaker a reiterated boom can be readily detected.

The bass notes produced by a moving-coil loud-speaker are not due to any



A new moving-coil loud-speaker sold by Lichtenberg. Its price is £3 5s. for D.C. Mains Working

be said of the high notes, which for a variety of reasons are apt to sound cracked and "papery," at least in poorly designed moving coils. In the best examples this deficiency has now been overcome and there is no need to tolerate a deficiency of top notes.

Due to the presence of ample bass in the reproduction the effect is often low-pitched, especially in speech. One soon grows accustomed to the slightly unnatural quality of speech, especially as this is more than

compensated by the pleasure of listening to really well-balanced musical reproduction.

Simple Principle

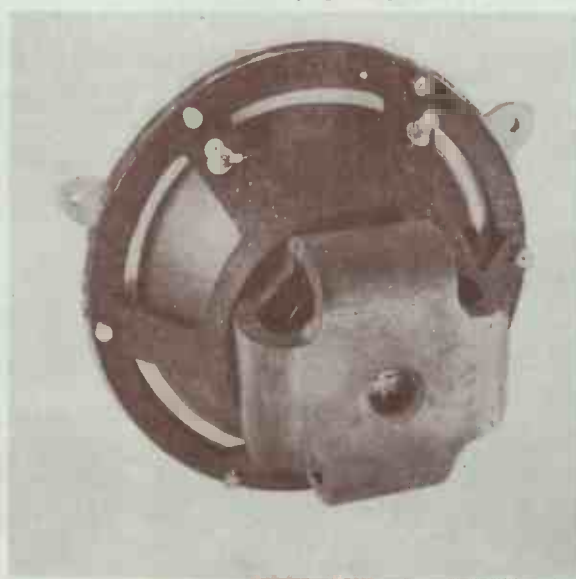
Although its mechanical interpretation is beset with pitfalls for the unwary, the general principle of the moving coil is quite simple. The first moving coils (and many of the existing ones) consisted of an electromagnet having two outer poles of the same polarity and a centre pole of the opposite polarity.

Current sent through the winding of this electromagnet creates a strong magnetic field. Within this field, actually in the space between the poles, is supported a small free-to-move coil. This coil is wound around the apex of a conical-shaped diaphragm made of some fibrous material, such as drawing paper.

Magnetic Effect

The coil fitted to the diaphragm has no magnetic properties and shows no tendency to move. But as soon as current from the last valve of the set is passed through this coil it becomes a miniature electromagnet. As the current from the power valve fluctuates in sympathy with the signal variations, so the magnetic effect on the diaphragm coil changes.

These changes in coil magnetism are occurring in the strong magnetic field (Continued on Page Sixteen)



This is an Epoch type B4 permanent-magnet model. The price is four guineas



Here you see the linen-diaphragm loud-speaker mounted in a Camco Mayfair cabinet, which costs £5 10s., in mahogany. The height is 40 in. and the depth 13 in.

LINEN - DIAPHRAGM loud-speakers were first introduced to the British public by WIRELESS MAGAZINE and *Amateur Wireless* two and a half years ago. They immediately became extremely popular, both because of their simplicity of

construction and the excellent results obtained with inexpensive materials.

Indeed, many readers have gone so far as to say that a well-made linen-diaphragm reproducer is as good as many moving-coil instruments. Even if this is some-

MAKING A LINEN LOUD-SPEAKER

with Single Diaphragm

Ever since they were introduced to British listeners two and a half years ago by "Wireless Magazine" and "Amateur Wireless," linen-diaphragm loud-speakers have proved to be extraordinarily popular. Here we present details of a new and simple type that can be constructed in a few hours at low cost

what of an exaggeration, there is no doubt that the quality is first-class even when the cheapest driving units are utilised.

The instrument illustrated in these pages, which has only a single diaphragm, can be completely constructed and put into operation in three or four hours, including the time taken for the dope to dry out.

Cabinet Model

Previous models of linen-diaphragm loud-speakers described in WIRELESS MAGAZINE have been in chassis form, but so many constructors have enquired about suitable cabinets that this particular model has been specially designed to fit the handsome pedestal cabinet illustrated on this page.

This does not mean, of course, that such a cabinet is essential and the instrument can be mounted in any convenient way.

Construction can be undertaken in easy stages and will present no difficulties even to those who have had little experience with tools.

We may point out that

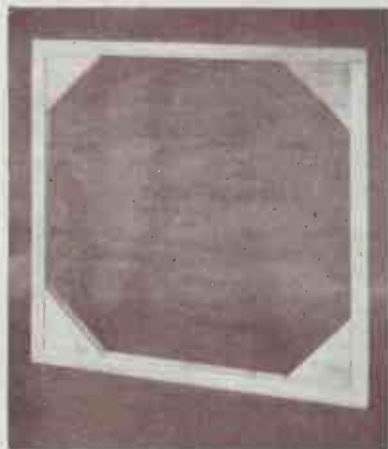
complete kits of material for this loud-speaker can be obtained from one of the firms advertising in this issue.

The first stage in construction is to build up a square framework of $\frac{3}{8}$ -in. square-section timber, as indicated by the drawing on Page Six. This framework is then strengthened by means of four triangular corner pieces. A photograph of the complete skeleton appears in the bottom left-hand corner of this page.

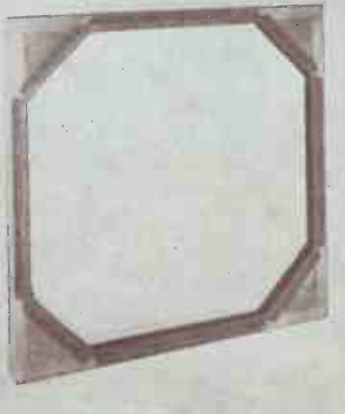
The second step is to fix rubber beading all round the framework, as illustrated in the centre photograph at the bottom of this page. This beading is in one length and the join should be made at one of the eight corners.

Fixing the Beading

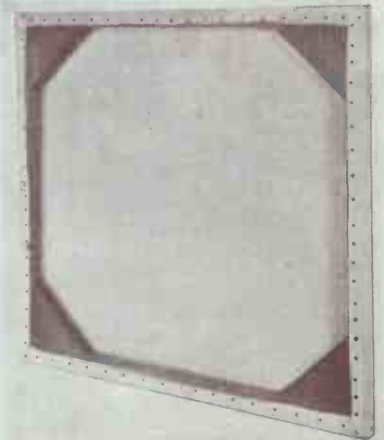
For fixing the beading in position ordinary tinnacks can be utilised, each tack being placed about 1 in. from the next. The beading should be so fixed that the circular part projects a short distance over the inside edge of the framework.



The first step in construction is to build up a square framework strengthened at the corners with triangular blocks



This photograph shows how the rubber beading is fixed round the framework and held in position with tinnacks



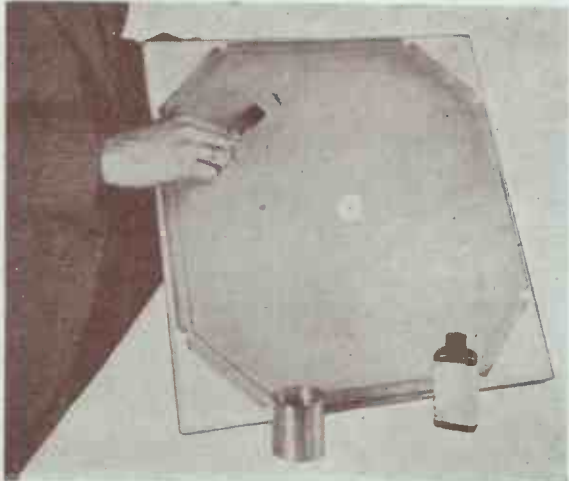
The back of the framework after the linen has been tacked in position and surplus material cut away

Next take a large piece of linen and place the framework in the centre, with the rubber beading downwards. See that the linen is laid out quite flat and then turn over one edge and tack it all along one side of the framework. Now take the opposite end of the linen and pull it taut; turn it up over the edge of the frame and tack down the opposite side.

Even Tension

The same process is repeated for the remaining two

Having fixed the linen to the framework the centre point of the diaphragm must be found. Turn the frame so that the linen-faced side is upwards. Then with a yardstick or a long straight-edged piece of wood lightly mark with a pencil the exact diagonals on the surface of the linen. The point where the diagonals intersect is, of course, the exact centre of the diaphragm and a hole should be made here with a sharp-pointed instrument.



Doping the linen with one or other of the preparations made specially for the purpose. In the centre will be seen one of the linen discs used instead of buttonhole stitching to prevent the diaphragm from splitting

sides, so that the linen is stretched with an even tension over the whole framework. The linen should then be trimmed off with a pair of scissors along the inner edge of the framework so that the completed job appears as shown in the right-hand photograph at the bottom of Page Four. An old razor blade will make a neater job of this if one is available.

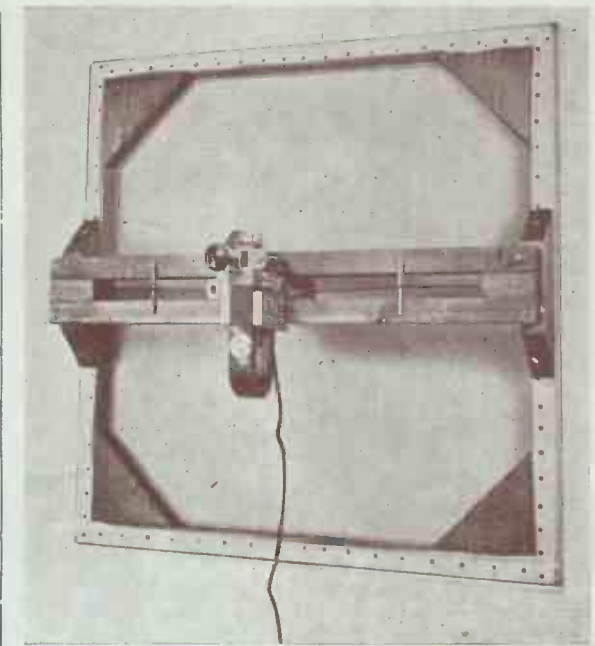
Linen to Use

Here we may usefully say a few words about the type of linen to be used. There are two alternatives. The first is to use ordinary fine-quality linen obtained from any drapers and dope it with one of the special preparations that are now available; the alternative is to obtain special linen that is already doped and which can be tautened by wetting it with water.

Individual Choice

Either of these methods is satisfactory and the choice must be a matter for the individual constructor.

In order to prevent the hole from becoming too large and the linen from splitting right across, it is necessary to do one of two things. The first is to bind the edges of the hole with button-hole



A back view of the loud-speaker when finished and ready for use. The diaphragm is tautened by pushing towards the centre the two brass rods that lever up the wire cable

stitching, but as this is rather difficult it is better to use another method.

This is to cut out two discs of linen about 1½ in. in diameter and cut fairly large holes at their centre points. If the linen is not already doped, then these discs should be treated before being placed in position.

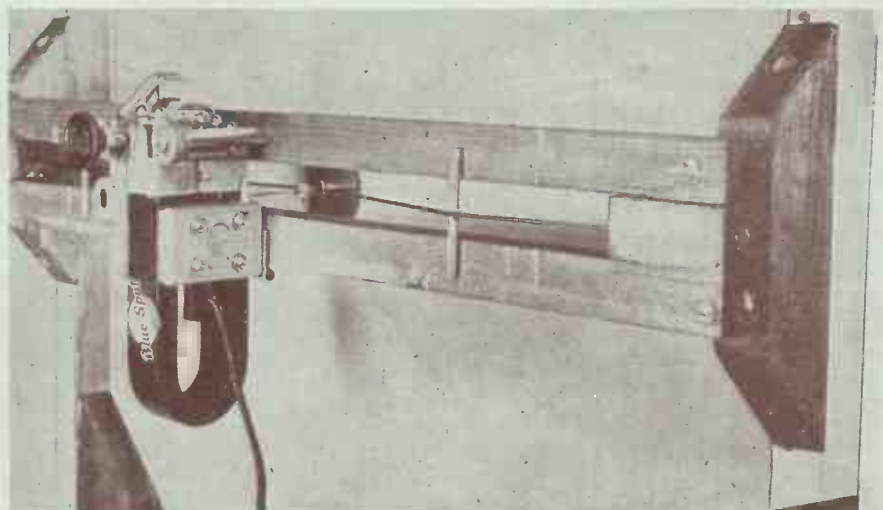
At this stage the doping of the whole diaphragm can be undertaken. If ordinary plain linen is used it should be thoroughly impregnated, at back and front, with the preparation supplied by

either Kone Dope or Weedon's. While this is being done the two linen discs can be fixed in the centre of the diaphragm, one on each side. It will be found that they are held in position quite well by means of the doping solution.

Effect of Dope

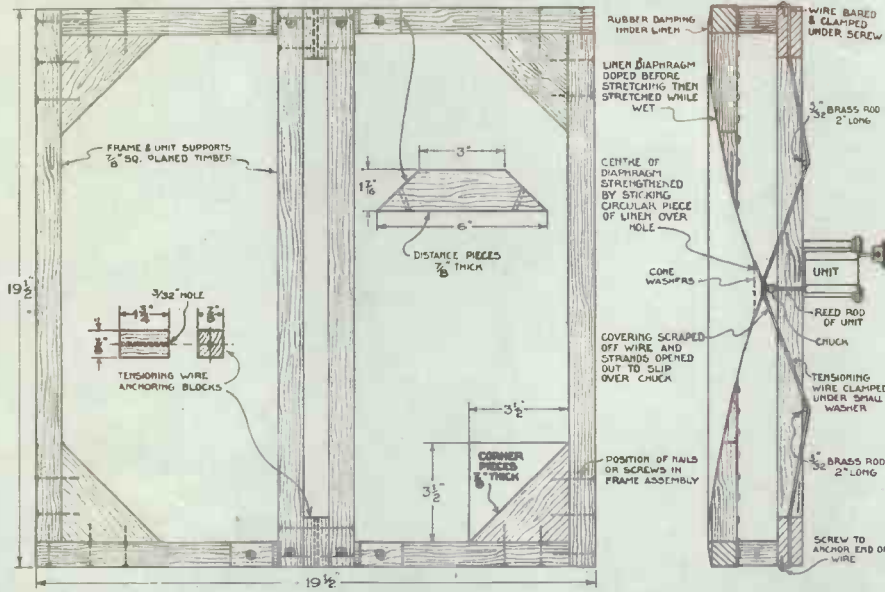
The object of this doping is twofold. In the first place it makes the linen diaphragm taut and, secondly, it is made impervious to the effects of damp.

If the special doped linen



This photograph shows clearly how the wire cable is anchored to the centre of the diaphragm and at one end of the struts. Any good class of unit can be used with the loud-speaker; that illustrated is a Blue Spot type 66R

MAKING A LOUD-SPEAKER:—Continued



This constructional diagram can be obtained as a half-scale blueprint for half-price (that is, 6d., post free) if the coupon on page 336 of this issue is used by April 30. Ask for No. WM235

is used for the diaphragm then it can be tautened by wetting it carefully with a damp sponge, ordinary water being used.

Whichever method of tautening the diaphragm is used, the whole framework should be placed on one side for an hour to allow the linen to dry thoroughly.

Carrying On

While the linen is still wet the remainder of the construction can be completed.

As will be seen from the top right-hand photograph on Page Five, the driving unit is held in position by means of two wooden struts, the dimensions of which will be clear from the diagram reproduced above.

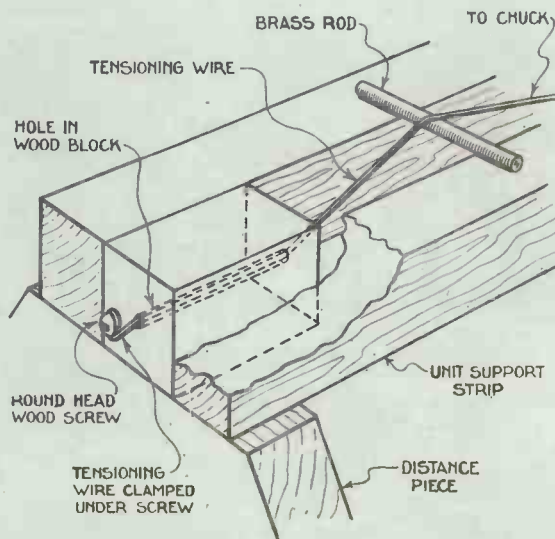
This WIRELESS MAGAZINE loud-speaker incorporates a new and very simple method of tensioning the diaphragm. This consists of a piece of seven-stranded covered Bowden cable fixed to a chuck at the centre of the diaphragm and held at each side of the framework by means of screws. The arrangement will be clearer from the photograph at the bottom of Page Five and the diagram alongside.

Fixing Blocks

At each side of the framework is a block of square-section wood, 1 3/4 in. long, held in position between the two long bars. A hole is

MATERIALS NEEDED FOR THE LOUD-SPEAKER

- 3/4 yard good quality 36-in. linen (any draper), or specially doped linen (Kone Dope).
- 12ft. 1/2 in. square-section planed timber.
- 1—Piece of timber, 12 in. by 12 in. by 1/4 in. for triangular blocks, etc.
- 4—1 in. No. 7 countersunk steel screws.
- 4—1 3/4 in. No. 6 countersunk steel screws.
- 1oz. 1 1/2 in. oval nails.
- 2ft. of Bowden cable.
- 2—2-in. brass rods, 1/4 in. diameter.
- 1—Tonax loud-speaker chuck, 1s.
- 1—Packet of Hookite rubber beading, 2s.
- 1—Bottle of dope (Kone-Dope or Weedon).
- 1—Blue Spot 66R unit, £1 15s. (or Undy, Tekade)



The method of anchoring the ends of the cable will be clear from this diagram, which should be consulted in conjunction with the photographs on Page Five

drilled lengthways through the centre of each block so that the Bowden cable can be threaded through and anchored by a screw in the end of one of the struts. The method of assembling this tensioning device will be described in detail in the following paragraphs.

Fitting the Cable

While the linen is still wet take the frame and place it linen-side downwards on a flat board, having first fitted a chuck at the centre point. Take the piece of Bowden cable and cut the covering away at the centre point for a distance of about 2 in.

Then separate the wires into two groups and pass the chuck through the opening. When the nut is screwed back in position the Bowden cable will be anchored firmly to the centre point of the diaphragm.

Next place the struts, screwed together with the small wooden blocks between them, across the framework, but omit the two distance pieces. Thread each end of the Bowden cable through the holes in the wooden blocks and pull taut. Bare the ends of the cable in the same way as rubber-covered flex is bared for connecting.

At each end place an anchoring screw in one or other of the struts, but drive them only half-way home to begin with. Now pull the cable taut and twist the bare end round the anchoring screw, which can then be driven right home. In this way the cable will be anchored firmly at both ends, but in order to make it more secure still the wire can be soldered to the head of the screw at each end.

Brass Rods

Now take two pieces of brass rod and lever up the Bowden cable as shown in the two right-hand photographs at the top and bottom of Page Five. The pieces of brass rod should be towards the extreme ends of the struts. After this pull up each end of the struts in turn and slip the distance pieces in position at both ends. This operation should be carefully carried out to avoid splitting the diaphragm.

The distance pieces should be screwed to the main framework and the ends of (Continued on Page Sixteen).

OUTPUT VALVES AND YOUR POWER NEEDS

QUALITY of reproduction depends upon many factors, such as the loud-speaker, the set, and the power supply. With the power supply is intimately connected the output power valve. It is the power valve that finally controls the effect of the wireless signal upon the loud-speaker.

Power Handled

The power valve accepts a voltage input and interprets this as a variation in the power supply. The amount of power handed to the loud-speaker from the set is entirely dependent upon the power valve. It is a little unfortunate that the valve manufacturers have not yet seen fit to index their power valves by the output as expressed in undistorted A.C. milliwatts.

Heat Dissipated

We speak of a PX4 being a 10-watt power valve; but this figure is merely the electrical equivalent of the heat dissipated at the anode of the valve. The power output when the grid is taking the maximum peak voltage of, say 60 volts, is quite another matter; actually it is little over 1 watt. This undistorted A.C. power output is obtained only when the load, that is to say the loud-speaker, has a certain impedance value. For the PX4 this load is 2,800 ohms. Until valve makers provide the ordinary listener with

two facts, (1) maximum undistorted A.C. power in milliwatts and (2) output load needed to give this result, he will have to guard against poor quality in the output stage by choosing a power valve sufficiently large to work the loud-speaker at the required volume and to see that the input grid voltage does not overload the valve.

Overloading in power valves is the most frequent cause of distortion. A power valve can provide only a certain maximum undistorted power output. The better the valve the smaller will be the input voltage needed to produce this output. If the input is in excess of the voltage required to cause the maximum undistorted power output changes, the power valve will distort.

A power valve such as the Marconi P240 gives 400 milliwatts undistorted output with a loud-speaker load of 5,500 ohms. It gives this

put to give the desired volume the P625A power valve, rated at 800 milliwatts, could be used.

This valve needs 80 volts peak grid swing to load it fully. From this it might be assumed that a large power output inevitably implies a large grid swing. This certainly applies to three-electrode power valves but does not apply to pentodes. The Osram PT425, for example, gives 700 milliwatts A.C. power for a peak input voltage of only 15 volts.



A "super" super-power valve—the Mullard DO25

was more widely used when the only power valves capable of providing a large power output needed at least 400 volts anode supply. But to-day there is a good selection of large power valves working at a maximum of 200 volts.

Series Impedances

In push-pull amplification it is necessary to remember that the two power valves are in series so far as their impedances are concerned. In other words the use of two push-pull valves with individual impedance of 2,000 ohms is, so far as the matching of the loud-speaker is concerned, equivalent to the use of one valve with an impedance of 4,000 ohms.

Valves in Parallel

The practice of connecting power valves in parallel is not so common now that power valves have been specially designed for large outputs. But if two power valves are connected in parallel it should be remembered that the impedance of the two paralleled valves, provided they are similar, is half that of the individual valves.

Paralleled valves are just as susceptible to overloading as a single power valve.



A famous power valve—the Osram LS5

The danger of overloading is considerably greater with a pentode than with a normal three-electrode power valve. In practice the use of a pentode power valve implies only a moderate amount of low-frequency amplification prior to the output. The only time when considerable amplification is justified before a pentode is when the incoming signal voltage is very small, as from a long-distance station.

One of the ways of avoiding distortion due to overloading in the last stage is push-pull amplification. This system involves the use of two similar power valves so connected that the pair can take twice the signal input of either used separately.

The chief advantage of push-pull amplification is that a large power output can be obtained with a comparatively low high-tension voltage. This system



Another super-power pentode—the Marconi PT625

output with a peak input grid swing of 48 volts, for the grid bias is 24 volts. It is useless to attempt to get more power from this valve by increasing the input voltage.

Such a plan would merely cause distortion. If the loud-speaker needs double this undistorted power out-



This Osram P625 is a super-power valve



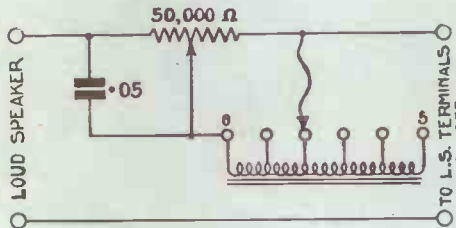
This unit can be used in conjunction with any set that does not include an output transformer and with any high-resistance loud-speaker. It gives an effective control of tone for the most pleasing reproduction

EVERYBODY knows that no two makes of loud-speaker sound exactly alike when used with the same radio set. It nearly always happens that one instrument gives higher-pitched reproduction than the other and it is very largely because of this that one loud-speaker is better for speech than music, while another may be good for music and rather "woolly" for speech.

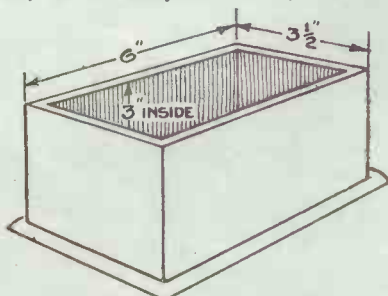
The pitch of a loud-speaker does not depend entirely on its actual construction and an over-predominance of either high or low notes (that is, high or low frequencies) may be due solely to the de-

terminations of better tone balance, but in most cases the operator will not have the necessary knowledge.

It is for this reason that



There is nothing complicated about the circuit, which comprises only three small components—a fixed condenser, a wire-wound potentiometer, and a tapped low-frequency choke



Here are indicated dimensions of a simple box that will accommodate the tone-control unit

sign of the receiving set. Some experienced set constructors will know how to make internal alterations to their sets in order to give a

the WIRELESS MAGAZINE Technical Staff has assembled the simple tone-control unit illustrated in these pages. This can be used in conjunction with any ordinary high-resistance loud-speaker, whether an output filter choke is incorporated in the set or not.

It is only necessary to remove the loud-speaker from the terminals on the set and connect in its place two of the terminals on the tone-control unit. The loud-speaker is then connected to the remaining two

terminals on the tone control. To improve the bass response it is necessary to turn the knob on the unit to the left (that is, in an anti-clock-

A SIMPLE LOUD-SPEAKER TONE CONTROL

Many loud-speakers do not give as good a tone balance as listeners desire, but the trouble can be rectified by adding to the set one of the simple units described in this article. It enables the operator to get a perfect tone balance with almost any set and high-resistance loud-speaker

wise direction). If, on the other hand, the bass normally tends to be over-emphasised, the knob on the unit should be turned to the right (in a clockwise direction) to improve the high-note response.

Limitations

This unit is not recommended for use with a low-resistance loud-speaker, or in cases where the receiving set incorporates an output transformer.

As can be seen from the photographs and diagrams of the unit reproduced in these pages the construction is extraordinarily simple. All the parts required are a wire-wound resistance, a small tapped low-frequency choke, a fixed condenser, four terminals, a small piece of ebonite and a wooden box.

The circuit arrangement is indicated on this page. It will be seen that the fixed condenser has a capacity of .05 microfarad; the resistance is of 50,000 ohms; and the

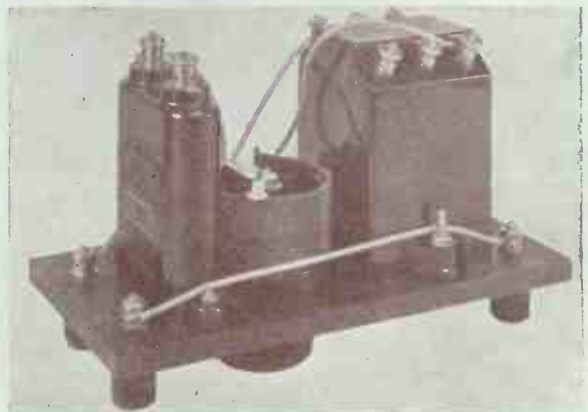
low-frequency choke has a maximum inductance of 3 henries. All these parts are standard and can be easily obtained from a radio dealer.

COMPONENTS REQUIRED FOR THE TONE - CONTROL UNIT

- CHOKE, LOW-FREQUENCY**
1—Varley 3-henry tapped, type DP18, 8s. 4d.
- CONDENSER, FIXED**
1—Dubilier .05-microfarad, type B775, 5s. 6d. (or T.C.C.).
- EBONITE**
1—Becol panel, 6 in. by 3 in. (or Lissen, Red Triangle).
- RESISTANCE, VARIABLE**
1—Colvern 50,000-ohm potentiometer, 5s. 6d. (or Regentstat, Rotorohm).
- SUNDRIES**
Insulated wire for connecting. Small wooden box (dimensions as indicated).
- TERMINALS**
4—Belling-Lee, marked : L.S. (2), 2 plain, 1s. (or Eelex, Clix).

There is little that need be said about the actual construction. At the top of Page Nine there is a layout and wiring diagram.

If desired a full-size blueprint can be obtained; the advantage of this is that the drilling points need not be measured out on the ebonite,



This photograph shows clearly how the components are mounted on a piece of ebonite. The construction can be completed in less than an hour

but can be marked through directly by using the blueprint as a template.

The full-size blueprint can be obtained for half price, that is 3d., post free, if the coupon on page 336 is used by April 30. Ask for No. WM234 and address your inquiry to Blueprint Department, WIRELESS MAGAZINE, 58-61 Fetter Lane, London, E.C.4.

Seven Wires

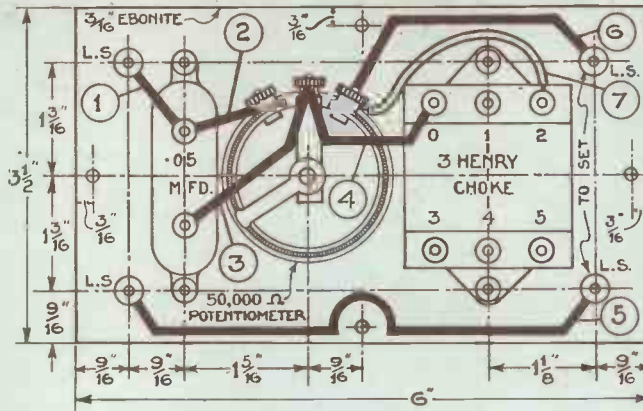
The connections are extremely simple, there being only seven wires in all. These are numbered separately on the wiring diagram and can be seen clearly in the photograph at the bottom of this page.

It will be seen that the low-frequency choke is provided with six terminals. These are tappings, numbered from 0 to 5. The beginning of the winding is at 0; tap 1 gives an inductance of .5 henry; tap 2, 1 henry; tap 3, 1.5 henries; tap 4, 2 henries; and tap 5, 3 henries. By tapping between terminals 1 and 5 a value of 2.5 henries can be obtained.

When the unit is first put in use wire No. 7 should be tried on the tappings 1 to 5 in turn until the best range of tone values is obtained.

Adjusting Tone

The method of working is as follows: put the lead No. 7 on terminal No. 1 of the choke and turn the variable resistance throughout its range. When it is turned to the left bass notes will be predominant, while when it is turned to the right treble



Layout and wiring diagram of the tone-control unit. This can be obtained as a full-size blueprint for half-price (that is, 3d., post free) if the coupon on page 336 is used by April 30. Ask for No. WM234

reproduction will be improved.

Depending upon the actual set in use and the characteristics of the particular loud-speaker, different tappings on the choke will produce a different range of tone values. It is for this reason that all the tappings should be tried in turn.

It will be found that reproduction becomes more brilliant as the high-note response is increased by using one of the higher taps on the choke and keeping the resistance knob turned towards the right. Many listeners prefer this type of reproduction for speech.

The effect of tapping down on the choke and keeping the resistance knob turned towards the left is to improve

with which it is to be used. Those who want to go a little deeper into the question of tone control should refer

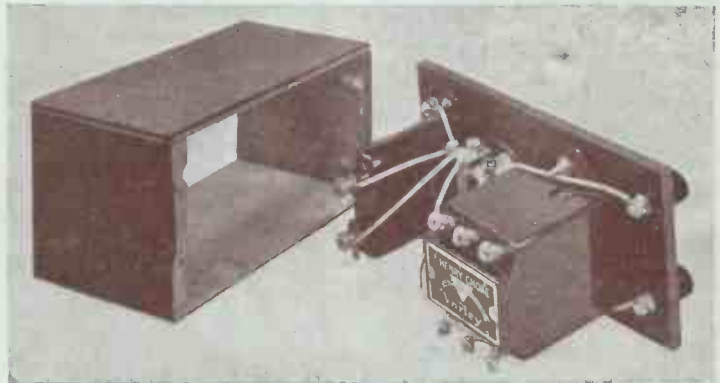
receiving a purely musical programme.

In practice it will not be necessary to keep on changing the choke tapping. A little experimenting will show which terminal gives the best tone range for the particular set and loud-speaker in use.

Simple Control

A sufficient graduation of tone will then be obtained by varying the value of the resistance by turning its knob.

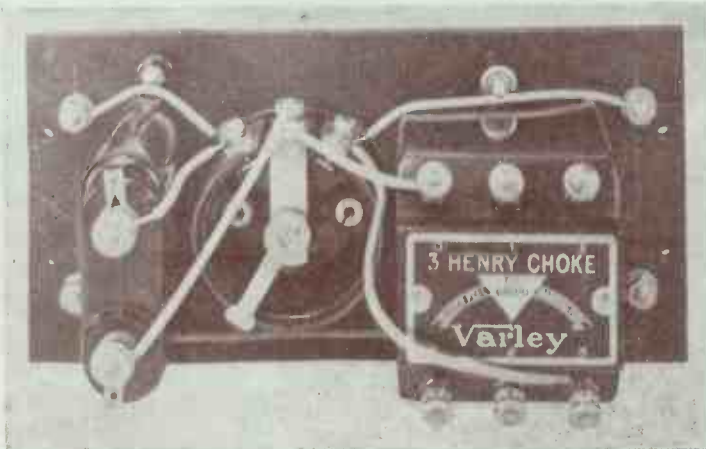
As shown here the unit is, of course, intended for external connection to the set, but there is no reason why, if sufficient space is available, it should not be built into the receiver



The tone-control unit can be conveniently mounted in a small wooden box of the type illustrated and placed in some convenient position near the set and loud-speaker

the bass response and make the reproduction more mellow; this is the condition that most people prefer when

to the article by J. H. Reyner in the February issue of WIRELESS MAGAZINE, on page 62.



The simple construction of the tone-control unit is clear from this photograph, which shows clearly the seven connecting wires

THIS IS THE SIXTH

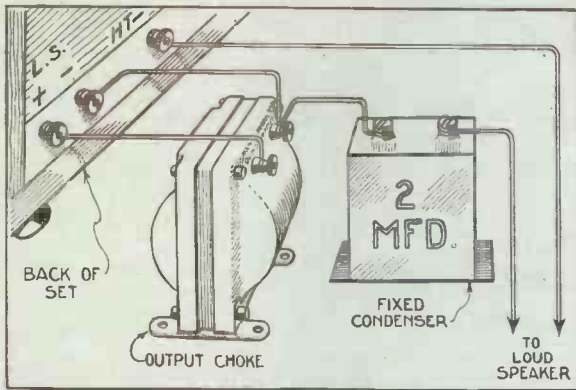
special supplement on tinted paper to be presented with WIRELESS MAGAZINE. Previous Supplements have been: (1) Easy Steps in Radio (November); (2) All About Loud-speakers: 135 to Choose From (December); (3) The Pick of the New-Year Sets (January); (4) The Trusty Twelve: Reader-tested Sets to Build (February); and (5) The "W.M." World's Broadcasting Guide (March).

A limited number of copies of these issues is available from the Publisher for 1s. 3d. each, post free. Address your inquiry to the Publisher, WIRELESS MAGAZINE, 58-61 Fetter Lane, E.C.4.

Another supplement will be given with the next issue, published on April 24. It will explain everything that listeners want to know about radio gramophones.

ANOTHER ON APRIL 24!

IS YOUR OUTPUT CIRCUIT RIGHT?



How an output choke and by-pass condenser can be connected to the loud-speaker terminals of an existing set without difficulty

IN these days the loud-speaker is seldom connected directly in the anode circuit of the power valve. It is now standard practice to insert one of the two output arrangements shown by the diagrams between the power valve and the loud-speaker.

Choke Output

The simplest output arrangement consists of a low-frequency choke and a fixed condenser. The choke should have a value of not less than 20 henries at the anode current passed by the power valve. The condenser can be of 2 or 4 microfarads.

The choke winding takes the place of the loud-speaker winding, being inserted between the anode and the anode supply. Through this choke winding flows the anode current, and as this is the power valve current, it may be fairly considerable.

The condenser and loud-speaker are connected in series across the choke. The direct current from the high-tension supply cannot pass through the condenser and is therefore prevented from flowing through the loud-speaker winding.

Heavy Currents

This is an advantage, since in modern sets the anode current is often sufficiently great to do damage to the loud-speaker winding if allowed to flow through it for an appreciable time.

Although the loud-speaker is thus isolated from the high-tension supply, it receives the low-frequency signal variations, which are barred from passing through the choke owing to its high impedance.

The condenser, on the other hand, offers no appreciable barrier to the passage of this varying low-frequency current.

NEXT MONTH

The seventh special supplement will be presented with the May issue of WIRELESS MAGAZINE. It will tell you all you want to know about RADIO GRAMOPHONES in simple language and with many illustrations. There will be a big demand for this number; make certain of getting your copy on the day of publication—Friday, April 24.

The signal current is therefore diverted at the anode end of the choke through the condenser and loud-speaker.

Such a filter system offers protection for the loud-speaker windings and completely isolates the loud-speaker from the live parts of the set.

But since the impedance of the choke is common both to the loud-speaker and power valve this form of output is useless for matching up loud-speakers and power valves of greatly dissimilar impedances.

For example, a low-resistance moving-coil loud-speaker would not work properly with a 2,000-ohm power valve followed by the usual choke and condenser filter. For such a combination an output transformer would be essential.

The use of a transformer isolates the loud-speaker

winding from the direct current and high voltage of the power valve just as effectively as the choke and condenser system.

Its further advantage in reconciling dissimilar impedances of valve and loud-speaker has led to its very wide adoption in modern sets.

Many output transformers are designed with a tapped secondary winding so that the nearest approach to correct matching of the loud-speaker and the power valve can be obtained by trial and error. Usually one particular secondary tapping provides the best all-round quality of reproduction.

There is, unfortunately, a lack of information regarding the impedance of the loud-speakers on the market. It is thus somewhat difficult to

stant, but increases almost directly with frequency. Thus any information on the impedance of a loud-speaker is useless unless one knows at what frequency the impedance was measured.

At Low Frequency

For various reasons it is generally considered that for practical impedance matching the impedance of a loud-speaker should be taken at some low frequency, say between 200 and 400 cycles.

It is generally agreed that the maximum power output is obtained when the loud-speaker impedance is the same as the valve impedance. But in practice it is found that distortion is introduced if we attempt to obtain the maximum power output in this way.

With ordinary power valves it is necessary to make the ratio of loud-speaker impedance to valve resistance at least two and sometimes three. This ratio means a certain loss in power output but it prevents distortion of more than about 5 per cent.

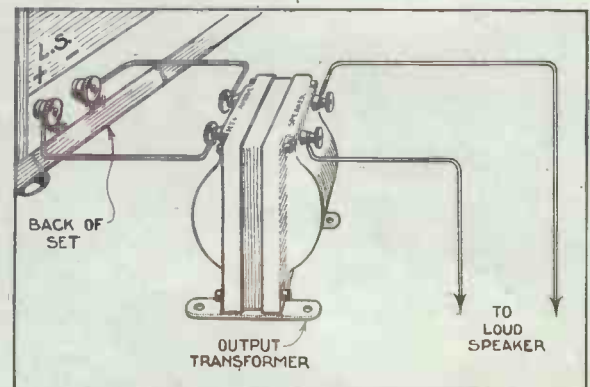
One well-known make of output transformer has a secondary providing three alternative ratios, namely, 9 to 1, 15 to 1, and 25 to 1. Transformers are also made with 1 to 1, 2 to 1 and other ratios.

Aural Test

Due to the lack of information on the impedance of loud-speakers at specified frequencies the use of a tapped output transformer is often advisable, so that matching can be carried out by an aural test, the several ratios being tried in turn until the best quality reproduction is noted.

work out the correct ratio of the transformer needed to match the loud-speaker to the power valve.

The impedance of the ordinary balanced-armature type of loud-speaker is not con-



Above are shown the connections for adding an output transformer (which may be tapped) to a set

ABOUT THE INDUCTOR LOUD-SPEAKER

These notes will give the beginner a good idea of how the new inductor type of loud-speaker works and what results may be expected with it. The inductor is the nearest loud-speaker in commercial form and has created very great interest among listeners on account of the excellent quality that can be obtained. Many people are of the opinion that an inductor instrument is as good as many standard moving-coil reproducers.

ONE of the most outstanding developments in loud-speakers introduced to radio enthusiasts during the past few months is the inductor type, invented by Farrand.

In essence the inductor loud-speaker consists of an iron armature moving in a magnetic field produced by two horseshoe-shaped magnets with their polepieces facing. It is similar in action to a moving coil, except that the iron armature replaces the coil.

Parallel Motion

The chief advantage of the inductor is that the armature has a parallel motion with respect to the polepieces. In other words, no matter how great the amplitude of movement the armature will never hit against the polepieces and so give rise to chatter during the reception of extra powerful signals.

There is no question that a well-made inductor loud-speaker is the closest approach to a moving-coil reproducer yet produced. Indeed, many listeners are of the opinion that the inductor is better, if only for the fact that it is likely to have a perfectly silent background, which is not always the case with moving-coil loud-speakers of the energised-field type.

Appearance

In appearance the inductor loud-speaker is similar to an ordinary cone instrument driven by a balanced-armature unit, but all of those at present on the market are provided with tappings so that the impedance can be matched up with any particular output valve to give the best quality of reproduction.

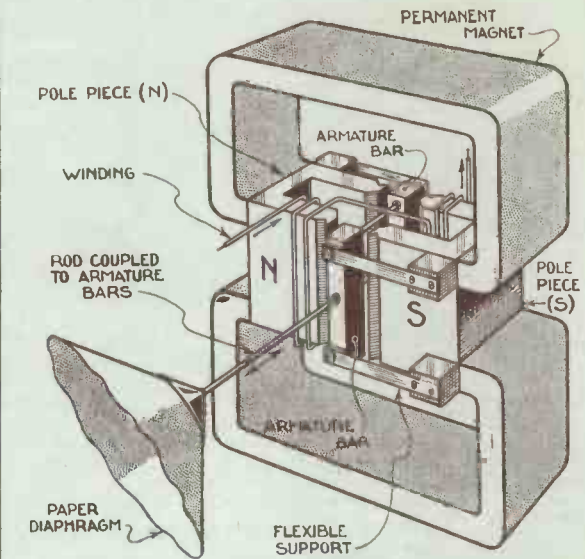
There is one important feature of the inductor that must

not be overlooked. Any direct current applied to it will draw the armature over to one side, even when no signals are being received.

If this happens the armature will not be able to move properly; it should travel an equal distance backwards and forwards from a central "zero" position when an alternating signal current is applied to the windings.

For this reason it is essential to use the inductor loud-speaker in such a way that the direct current flowing in the anode circuit of the output does not pass through the loud-speaker windings. This is best accomplished by using a standard choke-filter output circuit or an output transformer of 1-to-1 ratio.

The sensitivity of this type of reproducer compares very favourably with the average cone driven by a balanced-



This diagram shows the principle of operation of the inductor type of loud-speaker, which is similar in action to a moving-coil instrument

armature unit and most types can be worked satisfactorily from an ordinary broadcast receiver employing only two or three valves.

On all of the inductor loud-speakers tested in the WIRELESS MAGAZINE laboratory there have been four terminals so arranged that the windings can be arranged in series or parallel, according to the type of output valve to

be used. Most makers supply a special model for use with pentodes.

Magnet Positions

The first models of the inductor loud-speaker available in this country (it was developed in America some time before it was introduced to the English market) were arranged with the two magnets in line with the axis of the cone diaphragm.

This meant that the dimension from back to front was somewhat on the large size and now there are available models with the magnets arranged at right angles to the cone axis (that is, spread out in a plane parallel to the front opening of the cone).

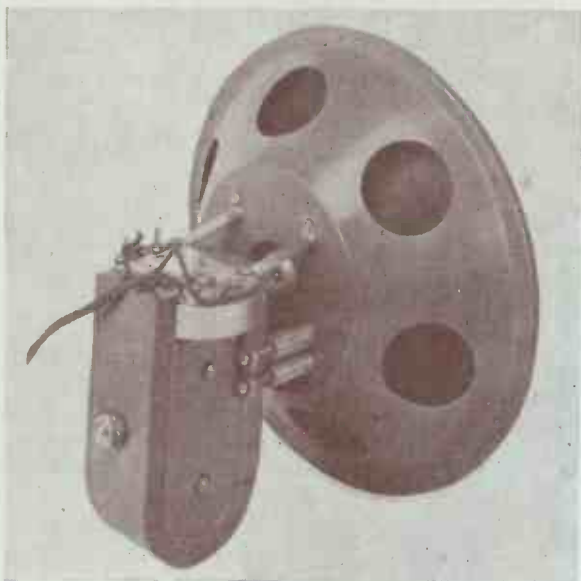
This type is specially intended for use with portable receivers, but even with the new arrangement of the magnets they are somewhat on the large size for this purpose. They are, however, particularly convenient for use in radio gramophones where a large amount of the space available may be occupied by a mains unit or batteries.

Baffle Essential

In order to get the best results from the inductor type of reproducer it is essential to use a baffle board of reasonably large dimensions. In this respect the inductor type is as critical as a moving-coil instrument.



This Realistic loud-speaker incorporates an N. & K. inductor chassis with a special wooden diaphragm which gives remarkable results. The price is 8 guineas



The Pantago Motor unit and chassis (supplied by Lichtenberg). The price is £3 10s. complete

DURING the past two years there has been a considerable increase in the number of loud-speaker chassis on the market, and their popularity is growing apace.

Many Types

The chassis itself is, of course, only a metal framework on which a suitable cone diaphragm and driving unit can be mounted. Many different sizes and types are available, and it is indeed a difficult matter to pick out any one make in preference to another, for all have special features that appeal in some way.

A few years ago it was a common practice for constructors to make their own cones from stout paper or light card and then to attach a driving unit. Unless the assembler was particularly skilled the results obtained were only mediocre. Nowadays it is a much more satisfactory proposition to buy a cone properly mounted in a rigid chassis so that a consistently good performance is obtained.

Diaphragms

It must also be borne in mind that manufacturers of such chassis spend a great deal of time and money in experimenting with various materials for their diaphragms and the result is a better product than the constructor can make with the ordinary kinds of paper that are available to him.

Some chassis are so designed that they can be used only with a particular

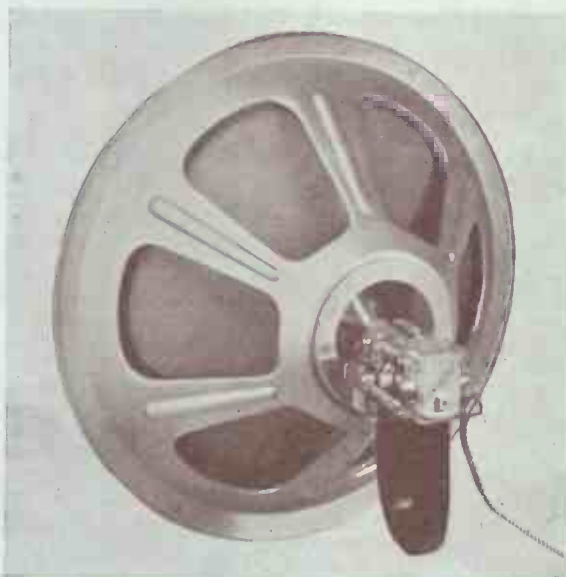
make of driving unit, in which case it is best to buy them with the unit already attached. Other chassis are so constructed that they can be used with units of different makes; such would appeal to the experimenter who wishes to try out different kinds of drive.

One of the principal features of the loud-speaker chassis is that it can easily be fitted into an existing cabinet, such as a radio-gramophone cabinet, for instance. Indeed, for the latter purpose it is a waste of money to buy a loud-speaker already mounted in a box.

So far we have assumed

NOTES ON LOUD-SPEAKER CHASSIS

Loud-speaker chassis enjoy great popularity among listeners. These notes will help beginners to choose the best for their purpose and also to get the best results. So many types are now available that the final choice between them is no easy matter—a practical demonstration is usually the best guide



This is a Hegra type F chassis with the Hegra type C unit. The chassis and unit cost £1 10s. 3d. complete



An Ormond Major chassis at 12s. 6d. with the Ormond driving unit, also priced at 12s. 6d.

that the only type of chassis available is that using an ordinary cone driven by a unit, usually of the balanced-armature type. It must not be overlooked, however, that a number of firms supply moving-coil loud-speakers in chassis form.

Many listeners buy a chassis type of loud-speaker because it is cheap. To get the best results, however, they should always be used on a baffle board or in a cabinet that gives a baffle-board effect.

Effect of Baffle

The difference that a baffle can make in reproduction must be heard to be appreciated. What sounds like a perfectly ordinary reproducer when used without a baffle becomes something really good when used under the proper conditions.

This leads us to the further

point that the loud-speaker must be fixed rigidly to the baffle and also to the fact that the baffle itself must be of heavy wood if the best reproduction is to be obtained. The ideal size for a baffle is a board 3 ft. square and $\frac{1}{2}$ in. in thickness. Preferably a piece of solid wood should be utilised, but good seven-ply will be suitable.

Mounting

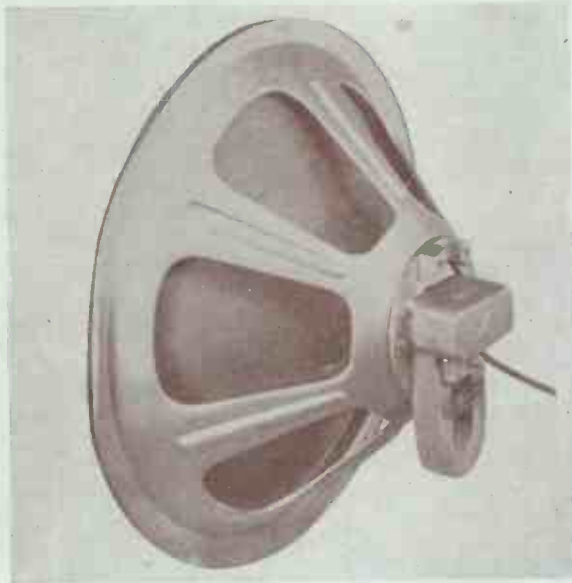
The chief objection to a baffle board is its size and the difficulty of mounting it in a convenient and unobtrusive way in a room. One satisfactory method is to hang it

If the unit is to be used inside a cabinet see that the latter is of fair size. The effect of using a small cabinet is to make reproduction rather woolly. Whatever the size of the cabinet used the back should be provided with some large holes, otherwise box resonance will be introduced and reproduction will tend to be "boomy."

Another point to watch is the size of the fretted opening of the baffle board or cabinet, as the case may be. It should be just the size of the internal diameter of the front of the chassis, but efficiency will not be impaired



This is the well-known Brown Vee chassis with the Vee unit. The price of the complete assembly is £2



A Hegra type F chassis with the Hegra type E balanced-armature unit, which sells at 15s. 9d.

to any great extent if it should be an inch or two smaller.

Most chassis intended for use with an ordinary driving unit of the balanced-armature type have only a single conical diaphragm, but there are special types available using two cones with their apexes fixed together.

The idea of this is that one cone (the pairs are normally arranged so that one is larger than the other) responds best to the low frequencies and the other to the high frequencies.

Before buying a chassis to be fitted into a radio gramophone be careful to check up

the dimensions of the actual space available. Some cones are very deep and when fixed in position may be found to foul a mains unit or other apparatus that must also be accommodated in the same compartment.

Portable Sets

This question of depth is somewhat of a snag when a loud-speaker chassis is needed for a portable set where space is necessarily limited. Very few suitable units are available and it is to be hoped that manufacturers will give their attention to this problem.

At the present time the most satisfactory way is to build up a cone and mount it on a board by means of a ring of rubber. The driving unit can then be mounted in the centre of the fret and inside the cone diaphragm. In this way the least possible space is occupied.

Buy Branded Goods

Very cheap unbranded chassis should be avoided. Many of them are built up from thin metal with rivets that soon work loose and produce nasty noises. Some of the best chassis are stamped out of a single sheet of stout metal and are therefore absolutely rigid and free from noises when not in use.

In this respect it may be fairly said that the best chassis are those which are extensively advertised and sold at a reasonable price. Very cheap chassis bought from cut-price suppliers are likely to prove a bad investment.

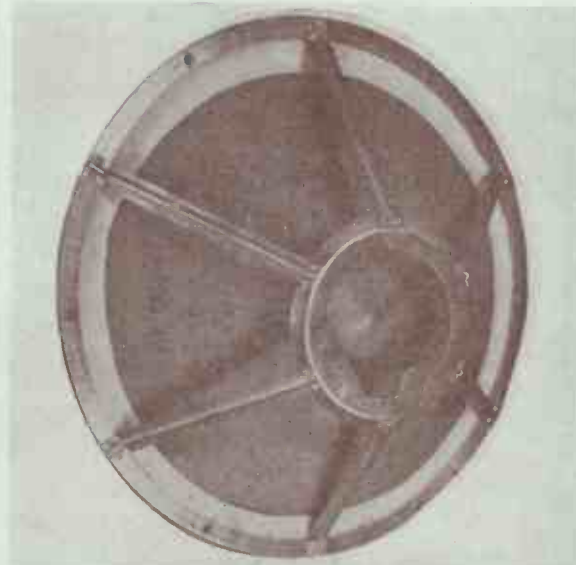
at picture-rail level across a corner of the room.

In order to achieve an airtight joint between the loud-speaker chassis and the baffle board or cabinet many of the best models are provided with a ring of felt. If this is not supplied with the chassis it is worth while to obtain a piece and carefully insert it in between the front of the chassis and the board when the loud-speaker is being fixed in position.

Avoiding Rattle

Any looseness in the mounting is likely to result in a rattle when very powerful signals are being received.

A recent innovation is a set of feet and a handle that can be fixed to a standard baffle for ease in moving it about from point to point in the house. Recently a complete set built up on such a baffle board was described in WIRELESS MAGAZINE.



A type B cone chassis made by the Bedford Electrical Radio Co., Ltd. It sells at 10s.



This unit is a Blue Spot type 66R. Its price is £1 15s.

FUNDAMENTALLY, all loud-speaker driving units work on the same principle. There is always some kind of armature actuated by signal currents passing through a coil. The coil, of course, is connected to the receiving set and the loud-speaker armature is connected to some kind of diaphragm, usually a cone of paper.

"Reed" Units

In the simplest type of unit, very often called the "reed" type, the armature is pivotted at one end and the other end only is moved in accordance with the fluctuations of signal currents flowing through the winding.

There are a number of drawbacks to this type of drive. In the first place it can handle only very small power and, secondly, the movement of the armature is not absolutely proportional to the strength of current.

Balanced Armatures

An improvement is made by pivoting the armature at its central point and applying the electromagnetic force at each end. In this way considerably greater current can be handled and the response to signals is very much improved. This type of drive is known as a balanced-armature movement, but this name is often incorrectly applied to multi-pole units in which the armature is pivotted at one end only.

The simplest type of loud-speaker unit employs only one magnet, usually of the horseshoe type, and it is

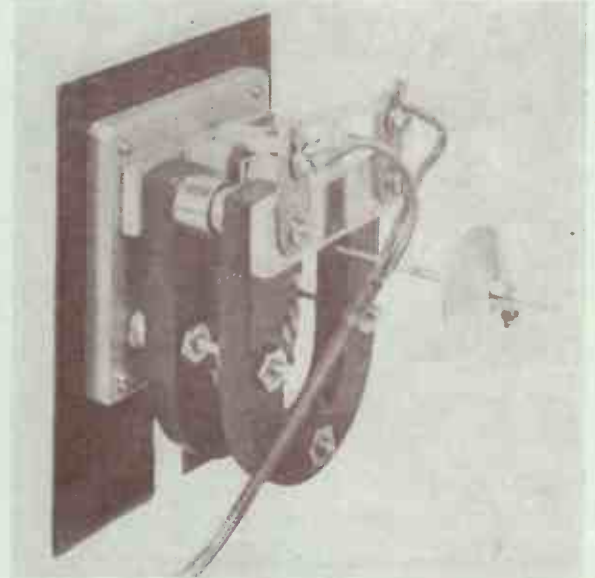
therefore a two-pole instrument. Larger units have sometimes two horseshoe magnets and they are then called four-pole units.

There are on the market loud-speaker units said to have as many as sixty poles. In most cases such a statement merely means that the magnets are built up of laminations, the total number of which is sixty. Strictly speaking, each set of laminations can only be considered as one pole. All the same, there is no question that some of these units, whether they are said to have sixty poles or sixty laminations, are among the best available.

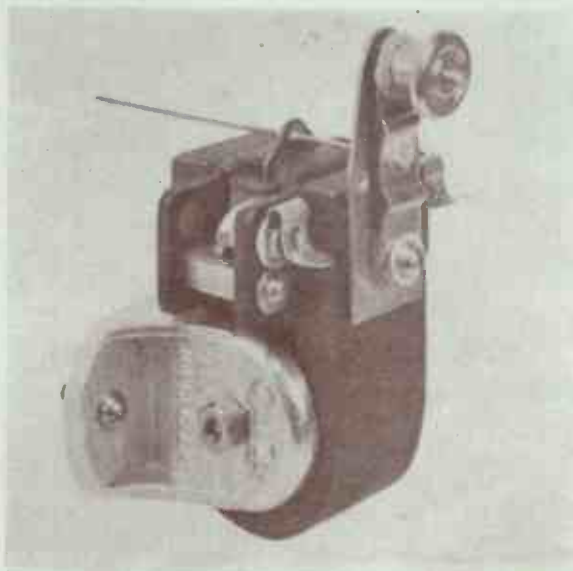
THINGS TO KNOW ABOUT UNITS

Beginners will find numerous points of interest about loud-speaker units in the following notes. Read them carefully—they will help you to get the best value for your money

It is not an easy matter to lay down any rules that can guide the reader in the choice of a loud-speaker unit specially suitable for his individual requirements. The driving unit is only one part of a loud-speaker and the diaphragm is of equal, if not greater, importance. A good unit should be sensitive and yet capable of handling considerable power without the armature hitting



Another well-known unit is the Wates Star, which is provided with two adjusting screws. The price is £1 5s.



A simple unit of the "reed" type, the Watmel. It costs only 18s. 6d.

against the pole faces and thus causing chattering noises on loud passages. The only really satisfactory way of choosing a unit is to hear one demonstrated, if possible under similar conditions to those in which it will eventually be used.

For instance, a unit that gives good results on a particular combination of chassis and cone diaphragm might not be as effective when used with a linen diaphragm.

Adjustments

Most units now on the market are provided with some form of adjustment that alters the relative positions of the armature and magnetic windings. This is a most valuable feature, provided that the adjustment "stays put" when once it has been set. With some cheap units it is found that the



The Amplion type BA2 unit has a single magnet and costs one guinea

adjustment screw shakes loose when the unit is in use and needs constant readjustment. This sort of thing, however, is having the closest attention from manufacturers and is a fault almost entirely extinct with the better-class units.

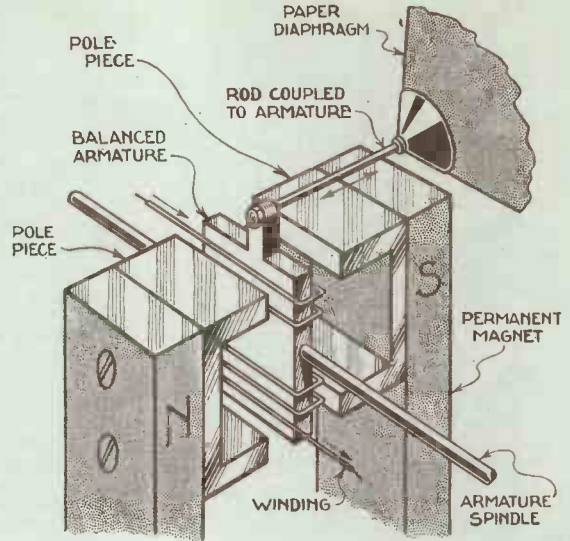
Diaphragms

It is most important when choosing a unit to consider carefully the type of diaphragm with which it is to be used. Some chassis are drilled so that only one particular make of unit can be fixed to them and if a unit is being bought for use for a particular make of

chassis this point should not be overlooked.

In the case of linediaphragm loud-speakers there is much greater latitude. For instance, with the particular loud-speaker described on Pages Four, Five and Six of this supplement almost any standard type of unit can be used. It is a simple matter to adjust the distance of the fixing bars to accommodate any drive.

The choice of a driving unit for use in a portable set, where the loud-speaker has often to be mounted in an extremely small space, is a matter of considerable difficulty in most cases.



This diagram shows clearly the principle of operation of a balanced-armature unit

In spite of the large number of units of different types on the market there is a dearth of good units small enough to be accommodated in the ordinary portable cabinet.

There is no doubt that there would be good sales for an efficient midget type of drive for this purpose, and it is to be hoped that some enterprising manufacturer will give the problem early consideration, for the portable season will soon be upon us.

It is, of course, a well-known fact that some units give better bass response than others, but here again the results are not absolutely dependent upon the unit, for

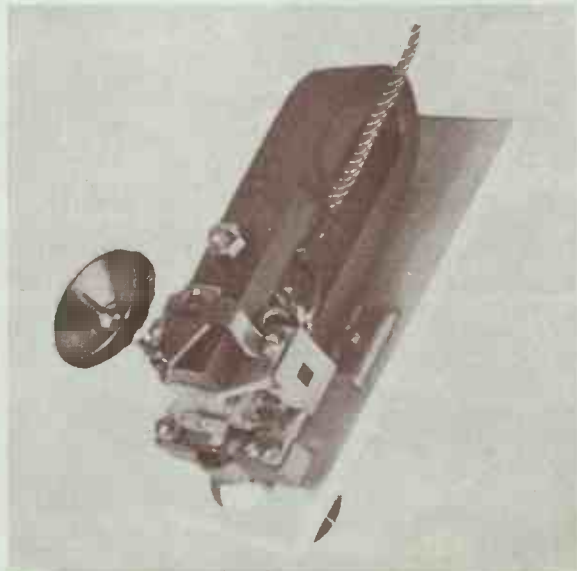
the size, shape and material of the diaphragm have a considerable effect on the frequency characteristic.

Proper Connections

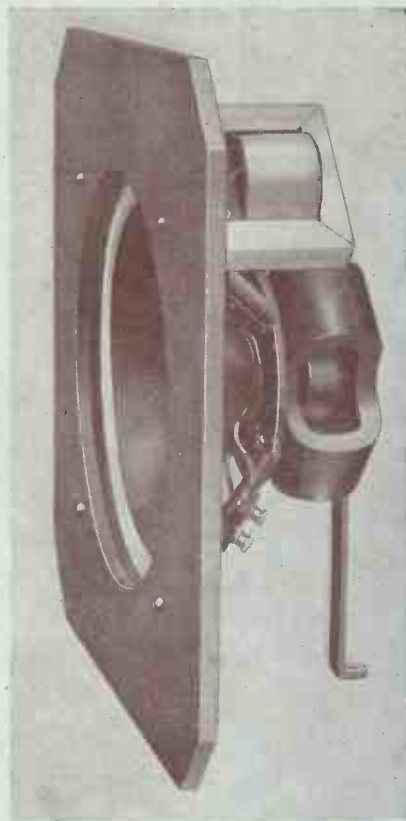
One last point about loud-speaker units should not be overlooked—that is the proper way of connecting the two leads to the loud-speaker terminals on the set. On practically every pair of leads one is either marked with a positive sign or with a red thread in the covering; the lead marked in this way should always be connected to the positive loud-speaker terminal on the set, to avoid weakening the magnets.



This Blue Spot unit is the type 66P. Its price is £1 7s. 6d.



A Tekade Motor unit, well made and robust. It is type S5 and costs £1 2s. 6d.



A PERMANENT-MAGNET JOB

This is the new Edison Bell permanent-magnet moving coil in chassis form. The price is £5 12s. 6d.

CHOOSING A GOOD LOUD-SPEAKER

(Continued from Page Two)

dynamic patent in chassis form. There is the Lamplugh, price £3 10s.; the Membra, £3 10s.; and the N. and K., also £3 10s. These three chassis were tested and approved recently.

We have left moving coils until last. These are undoubtedly capable of giving the finest quality of reproduction, but they need a good set. The average price of a moving-coil chassis for A.C. mains operation is about £10. Examples are the Philips type 2063, price £12 10s.; the Marconiphone model 130, price 12 guineas; the Hegra type A3, price £6; the Epoch type 101H, price £11 5s.; and the Baker SPAC, price £9 10s.

Permanent-magnet moving-coil loud-speakers, which do not require any external excitation, are now widely produced. Examples are the Ferranti type MR, price £12 10s.; the Ediswan RK, price £6 15s.; the Celestion type D100, price £9; and the K.B. type 208, price 10 guineas.

MAKING A LINEN LOUD-SPEAKER

(Continued from Page Six)

the struts should also be screwed to the distance pieces. In this way an extremely rigid construction is easily obtained.

It is now time to fix the driving unit in position and when this is done great care should be taken to see that the driving rod coincides with the centre point of the diaphragm. In the case of some units provided with short rods it may be desirable to use the Weedon extension rod, which is provided with a ball-and-socket connector and

gives automatic centring.

Before the loud-speaker is actually put into use the diaphragm should be tautened to its fullest extent by pushing both of the brass rods that lever up the cable towards the centre of the diaphragm. The closer these rods are to the centre of the diaphragm the tighter it will become, and the better will be the results obtained. Do not place these rods nearer than 4 or 5 in. from the centre, however.

When the rods have been pushed towards the centre there will be some tendency for them to roll back, so causing the diaphragm to slacken off slightly. This can be prevented either by cutting notches along the back of the struts or by filing two flat faces at the ends of the brass rods that bear on the wooden bars.

HOW THE MOVING COIL WORKS

(Continued from Page Three)

created by the electromagnet surrounding it. As a result of these changes the coil tends to move backwards and forwards in the electro-magnet's field. In so doing the diaphragm is moved also and thus air vibrations are set up.

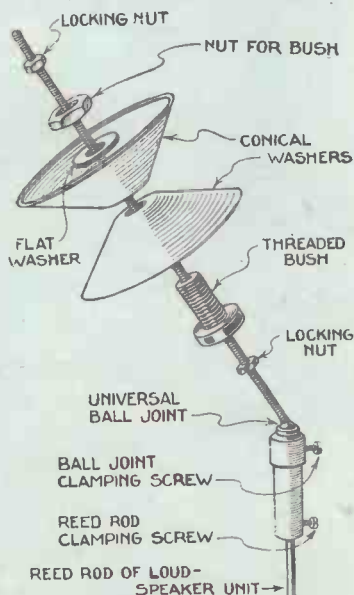
An important point to note is that a baffle board must be arranged to surround the panel of the front of the diaphragm. Otherwise there is a cancellation of sound waves and little or no bass-note reproduction is obtained.

As already indicated, the advantage of the moving coil is that the movement of the diaphragm (connected to the moving coil) is proportional to the input current over a wide range of frequencies.

The powerful magnetic field in which the diaphragm coil is made to move was, until recently, always produced by the use of electromagnets, which have to be energised by some external source of power, such as a 6-volt accumulator or from the A.C. or

D.C. electric-light supply. Where a 6-volt battery is used the winding of the electromagnet usually passes from .5 ampere to 1 ampere current but a much smaller current is sufficient where a potential of 200 volts is available, as from A.C. or D.C. mains.

If the supply is A.C. it must be converted to D.C.

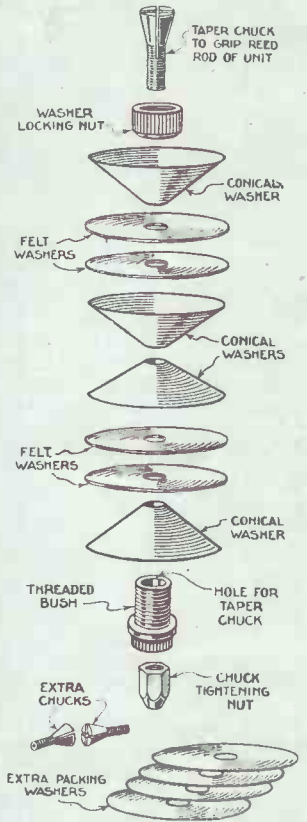


SELF-CENTRING ROD

A useful gadget for the constructor is the Weedon self-centring extension rod

Some moving coils include a valve rectifier for this purpose, thus providing a 200-volt output which, incidentally, does not have to be smoothed. Other A.C. moving coils employ a metal rectifier giving 6 volts at 1 ampere, corresponding to the D.C. supply of an accumulator.

In all-electric installations the need for some external source of power for energising the winding is not irksome, but for owners of



LOUD-SPEAKER CHUCK

Another useful gadget for the constructor is the Tonax chuck shown in detail here

high-class battery sets or sets worked from an external mains unit the ordinary moving coil has its drawbacks.

Lately we have seen tremendous strides in the development of cobalt-steel magnets. These have a high degree of permanent magnetism and there is no necessity for external energising. Some of the latest permanent-magnet moving-coils are just as sensitive and capable of giving just as great a power output as moving coils requiring external excitation.



A RADIO FAN'S CAUSERIE

Build or Buy?

I LIKED the point of view put forward by the Editor of WIRELESS MAGAZINE on this question last month. In my own notes I drew attention to the case of Mr. T. O. Clements, of Norbury, who has built himself a set after having had experience of four commercial productions.

I expressed the hope that Mr. Clements would tell us why he made the change and am glad to have had a second postcard from him. He indicates his commercial models as A, B, C and D.

A Tale of Woe

Set A was a six-valve A.C. job with two screened-grid stages and (apparently) a turntable for gramophone, but no loud-speaker or aerial in the cabinet. This was noisy below 300 KH.

Set B, also A.C., was self-contained with loud-speaker and aerial, and had two screened-grid stages. This gave coarse reproduction.

Set C was a "much advertised" A.C. four-valver with two screened-grid stages. It used an open aerial, was not selective and gave poor quality.

Set D was a five-valve open-aerial set, again with two screened-grid stages. This again gave poor selectivity and coarse reproduction.

Now, all this is something of a problem to me, for Mr. Clements adds that the prices ranged from 30 to 35 guineas. But as I reported last

month, this stickler for quality is getting satisfactory results with a home-constructed four-valver. He seems to have bought his experience dearly!

A Radio Lecture

Seated in his home at Oxhey (Herts), at one o'clock on a Friday morning, Mr. C. C. Paterson, who is president of the Institution of Electrical Engineers, gave a lantern lecture to members of the Engineering Institute of Canada gathered together at Montreal at 8 p.m. on Thursday evening.

The distance from Oxhey to Montreal is approximately 3,000 miles, and Mr. Paterson's address was sent by radio telephony. At the appropriate moments lantern slides were changed in Montreal; they had been sent across beforehand.

The route taken by the message was by ordinary telephone from Oxhey to the Post Office station at Rugby and the Bodmin beam station; thence by radio to the Canadian Marconi station at Yamachiche; and again by land line from Yamachiche to Montreal.

This is an achievement of which British radio engineers can well be proud.

Gramophone Motors

Although I am as keen on radio gramophones as anybody, I have not yet fitted my outfit with an electric motor.

The reason is that I am cursed

with D.C. mains and cannot make up my mind which of the few motors available for these supplies is the best.

I shall be grateful to any reader who can give me details of his experiences with D.C. gramophone motors, especially if anybody has tried more than one make.

Features I am interested in particularly are freedom from noises in the amplifier and easy speed control—the latter because I am interested in home recording at a higher speed than that at which one normally reproduces.

Interlude

I must tell you about an adventure that befell Mr. Reyner a week or two back. He was at Hendon and had arranged to be met with his car and taken back to Elstree, which is about seven miles distant.

However, a thick fog descended and brought all traffic to a standstill. Nothing daunted, the Technical Editor of WIRELESS MAGAZINE set out to walk home but—he was wearing a pair of shoes.

Quite a normal thing, I admit, but these were new shoes and after three miles they became quite unbearable. What would you have done?

Well, Mr. Reyner solved the problem in his own way and if you had been about Elstree that foggy night you might have met a man walking in the road on his bare feet—his shoelaces were knotted together and the shoes were hanging round his neck!

RADIO MEDLEY—Continued

Mains Enthusiasm

"Everyone seems to be writing to you about their sets," says Mr. E. I. Vaughan, of Birkenhead, who goes on to explain that he is using a Fanfare Three with a D.C. unit for high tension. In his "workshop-cum-den" he also has a single-valver for experiments and a two-valve short-waver.

Next comes a two-stage D.C. amplifier, with two P625A's in push-pull. A Blue Spot pick-up and large Wates loud-speaker are used.

All this in spite of the fact that Mr. Vaughan is at home only for week-ends. But he is a real fan and is trying out some circuits for a portable set to take away during the week.

Here I can let him into a secret. Mr. James is at present working on a portable edition of the Super 60 and—but 'nuff said, or I may get into trouble with the Editor!

A Doctor's Advice

I have received a useful hint (but not medical!) from Dr. A. C. Gemmell, of Brighton, who writes:—

"I have an H.T. eliminator made by myself working off direct current and I have a 6-volt accumulator floating between the mains, the current being reduced by appropriate carbon lamps (two 30 candle-power).

"I cannot understand why in all the published H.T. eliminators for D.C. mains no mention is made of this simple method of heating the filaments."

I must confess that I had completely overlooked this solution of the D.C. problem as regards filament heating. At lunch with Mr. James I took the opportunity of asking his opinion. He tells me that the idea is a good one but, if the mains happen to be bad, hum is introduced.

A Good Slogan

"Make more use of your mains," is the slogan of Mr. R. C. Mackie, of Aberdeen. Highest quality of reproduction has been his object and for this reason he uses a two-valve amplifier purely for local-station reception. It is D.C. mains driven, taking 50 milliamperes at 200 volts.

"Batteries are quickly charged off the mains through the electric radiator. With electricity at 1/2d. per unit domestic rate, what more

could one want!" adds Mr. Mackie. Lucky Scotsman!

Too Much Hum?

With 220-volt D.C. mains "ALL MAINS doubtful proposition—too much hum" is the verdict of BM/NMZH, who adds: "Have wired up many receivers and consider myself fortunate to be able to dispense with batteries for H.T. and to 'float' an accumulator for L.T., thus ranking myself equal to an all-mains enthusiast."

All we D.C. unfortunates seem to be in a bad way, but there is some

News Broadcasts

Most of the arguments put forward by newspaper interests for the restriction of news broadcasts strike me as being particularly weak and unconvincing.

Quite the best statement of the case I have seen comes from America. I think it is worth quoting in full:—

"It did not occur to the railways of twenty-five years ago that the development of motor buses and concrete roads would practically put out of business their suburban patronage in many communities. Yet just this thing has been done. . . .

"Imagine the railways doing nothing to protect themselves against this competition, but instead building the roads and supplying the buses with petrol and you will have something of a comparison with newspapers supplying radio stations with news and free publicity on trade names, which make their advertising medium saleable at such high rates."

Far-fetched?

To some this comparison may be a little far-fetched, but you must remember that the newspaper industry has millions of pounds of private capital at stake.

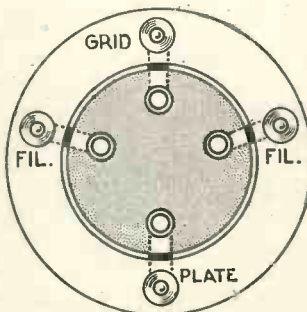
However, there will have to be a considerable change in the broadcast news service before any of us are willing to forgo our newspapers. I think it will be many generations before the spoken word supplants our need for written reports that can be digested at leisure—besides, what is news to some is a complete bore to others. The only news I ever listen to is election results.

"Are They Real?"

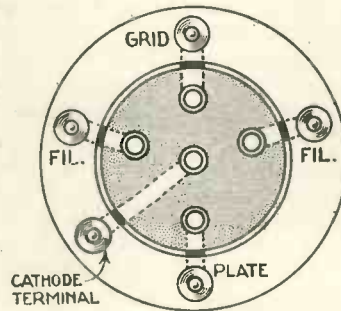
As a result of my recent note on flexible gramophone records, I have received a sample batch of Goodson discs. These included an album of nursery-rhyme records, which I was requested to pass on to Mr. W. James for "the use of the two very young members of his family who have been suspected of breaking the ordinary kind of record on occasion."

These records came just at the right time, in fact just as the James twins were celebrating their fifth birthday. Their father tells me that they were both very sceptical about these Goodson discs at first and were only convinced that they were real

VALVE-HOLDER CONNECTIONS



BATTERY VALVE-HOLDER



MAINS VALVE-HOLDER

These diagrams show the underneath connections of four- and five-pin valve holders

consolation in the following communication from Mr. J. Carpenter, of Ockley (Surrey):—

"We haven't any electric light in our village. My set and all the village sets are battery operated."

Few words—but how much they mean.

A RADIO FAN'S CAUSERIE

records when they heard them play!

I think they could not understand how real records could have pictures printed on them, a feature that must make these nursery-rhyme discs attractive to most kiddies.

Learning Young

By the way, although only just five years old, "Billy" James has already learnt that you are far less likely to get a shock from a mains switch if you kick it off with your foot!

I have borrowed a photograph of the twins from Mr. James' desk and you will find it reproduced in these pages. You will now know how to recognise a set designer when still very young.

Change of Tone

But to get back to flexible records, which I personally find very satisfactory in use.

This opinion is not shared by everybody, however. Capt. H. T. Barnett, whose pronouncements on gramophone matters command my greatest respect, told me, when I discussed the matter with him on one of his quick visits from Portsmouth to London, that flexible records quickly lose their tone.

His criticism is that the material is soft and that after a few playings a trumpet becomes a trombone, or the other way round. But this will not worry many of us, I imagine. How many radio fans know the difference between a trombone and a trumpet? I am afraid that I don't, for one.

Making a Talkie

Through the courtesy of Mr. Watts, of First International Pathé, I was able to visit the studio when a talkie "short" was made of Jack Hylton and his band.

It was all very interesting, but at first I did not think it would be possible to get order out of the chaos that seemed to be reigning. However, in the end everybody settled down and some real work was done.

The actual recording "box" was at one side of the studio well above the "set." By means of a pilot loud-speaker, the recordist is able to tell what is happening down below. On this occasion he popped outside twice, once to have a man with a whistle (Jack Hylton was playing *Choo Choo*)

moved further from the "mike" and the second time to have the violins brought nearer.

Perhaps you have seen the result in Eve's Film Review?

My Super 60

Last month I mentioned that I had been able to try out Mr. W. James' super-het—which I now see is appropriately called the Super 60—before publication. I noted my intention of running one off D.C. mains and adding a push-pull output stage.

Several correspondents have written to ask exactly how I have made the addition and want further details.

There is nothing for it but to confess that I have not yet had time to make the alterations and I am still using the standard design in conjunction with batteries. I hope to do the D.C. conversion and add push-pull within a fortnight; if so I will write more about it in the next issue.

Frames for the Future

I am going to make a prophecy—that there will be a rapid increase in the popularity of frame aerials during the next few months.

The only drawback to the frame has been the necessity of using many valves in it, but now that a good super-het can be built so cheaply—I refer to the new James set, of course—this objection can be ruled out.

Once you have used a frame you will never want to go back to the trouble of an outside aerial. Moreover, results on home-constructed sets used with frame aerials are likely to be much more consistent than is the case when ordinary open aerials are concerned—and that will be a boon to the set designer.

Radio at the Vatican

Have any of you short-wave enthusiasts yet heard the new Vatican station, which was erected under the personal supervision of Marchese Marconi?

I understand that it works on either 19.84 or 50.26 metres. The



BUDDING RADIO FANS?

Introducing the James twins—Billie and Alma—who have just celebrated their fifth birthday. It was hard to convince them that flexible records were "real"!

power available for telephony is 8 to 10 kilowatts of unmodulated carrier-wave energy to the aerial feeder system.

Tests have shown that good, clear speech can be heard in Australia, Argentina, Canada, India, South Africa, and the United States; and also in London, Berlin, Paris, Madrid, and other European cities.

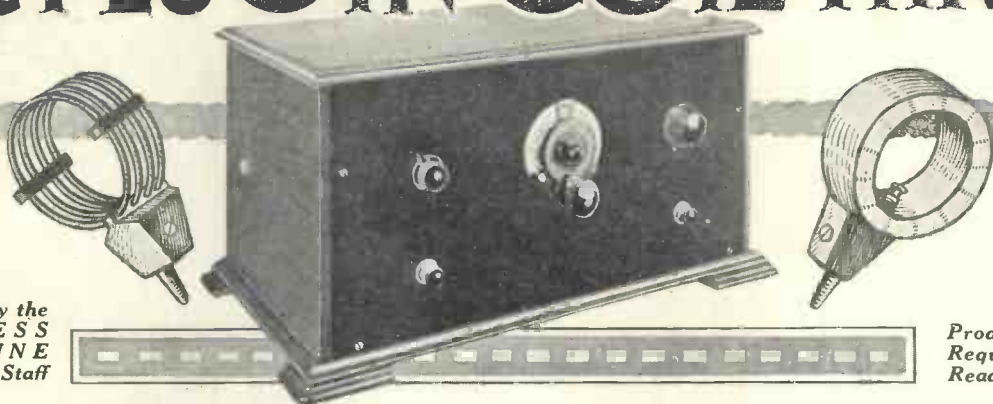
Another British Success

Another British-built station you should listen for is that at Sottens, in Switzerland. It was erected by Standard Telephones and Cables and has been well received in various parts of the country.

The power of the station is 25 kilowatts and the wavelength at present 430.5 metres.

Two days after the first test, when the engineer in charge asked for reports, more than 300 communications were received by the makers from British listeners. Who says listeners aren't keen on foreign-station reception? BM/PRESS.

The PLUG-IN COIL THREE



Designed by the
**WIRELESS
MAGAZINE**
Technical Staff

Produced at the
Request of Many
Readers

THIS set has been produced in response to a large and insistent demand from readers who want an up-to-date design using standard two-pin plug-in coils. The Plug-in Coil Three is presented as a cheap, yet efficient, receiver that can readily be adapted for reception on all wavelengths, that is long, medium, and short.

We do not claim that this set is the

best three-valver that can be produced for use under modern conditions, for in our opinion it is not possible to get a really adequate degree of selectivity with coils of the type utilised.

these reasons it meets the needs of many readers. There is one very great advantage in the use of such coils, and that is their adaptability for reception on any wavelength. Whereas a receiver using an ordinary dual-range coil can only cover wavelengths from about 200 to 500 metres and 1,000 to 2,000 metres, a set with plug-in coils can be arranged to respond to signals on any

are interested in the design, and who have not previously had experience of plug-in coils, we wish to make clear that it cannot be expected to get a large number of foreign stations when used close to a regional broadcasting transmitter. This is not because of any lack of power, but because the selectivity is not of a very high order and the local station is likely to spread well round the tuning dial, and so prevent the reception of a number of other stations.

Increasing Selectivity

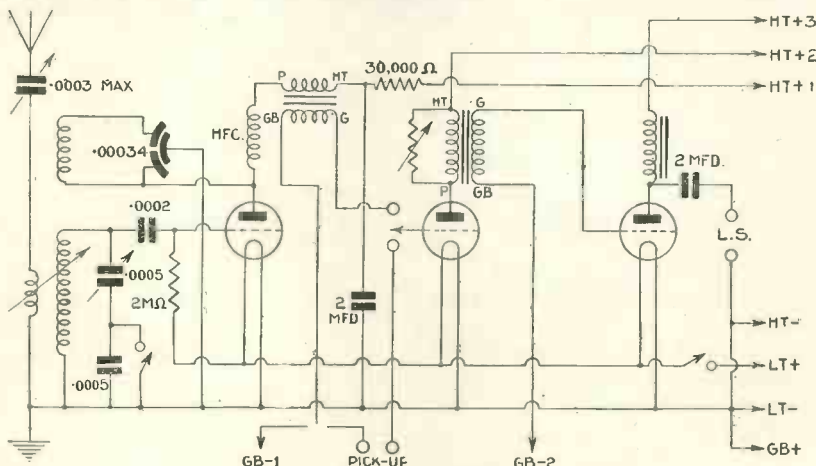
It is true that there are methods of increasing the degree of selectivity of sets using plug-in coils—for instance, series aerial condensers and tapplings on the coils—but they all have the drawback that they increase selectivity at the expense of sensitivity.

For this reason sets with a detector and two stages of low-frequency amplification are losing favour. This is as it should be, and we are not publishing details of the Plug-in Coil Three because we think it an ideal type of receiver. Rather are we forced to do so against our better judgment, but so many applications are received for such a design—no substitute will do—that we should be failing in our duty to our readers were we to withhold publication.

Having made clear the disadvantages, let us look on the brighter side of things and see what can be said in favour of the design.

Wavelength Adaptability

Its adaptability regarding wavelength range has already been indicated, but there are other features that should be borne in mind. For example, all the components used are standard parts and it may well be that hundreds of constructors already



CIRCUIT OF THE PLUG-IN COIL THREE

The valve combination is a leaky-grid detector followed by two stages of transformer-coupled low-frequency amplification. A pick-up switch is incorporated

best three-valver that can be produced for use under modern conditions, for in our opinion it is not possible to get a really adequate degree of selectivity with coils of the type utilised.

Modern Technique

We do claim, however, that the Plug-in Coil Three gets the best out of standard two-pin coils, and that it conforms in every way with the best principles of modern technique. For

wavelength from 20 to 2,000 metres, without a break if desired.

As this set is intended primarily for those constructors who want to use plug-in coils that they already possess in an up-to-date circuit, there is no need to go into details regarding the performance that can be expected from the Plug-in Coil Three; those who have previously used coils of the two-pin type will already know their capabilities in their own districts.

But for the benefit of others who

have the bulk of the necessary components lying about their shelves unused. These will be able to make up an additional "experimental" receiver at low cost—perhaps using it for short-wave reception only.

If the set is desired for use in some locality distant from any broadcasting station, then the selectivity difficulty is automatically overcome and the reception of a large number of foreign transmissions is assured in most circumstances.

Building Up Valuable Experience

For beginners also, the design presents some advantages. The construction is very simple and the cost of construction low, so it can be used as a base on which to build up valuable radio experience.

But we have generalised enough and must get down to the serious business of explaining exactly what the design is and how it works.

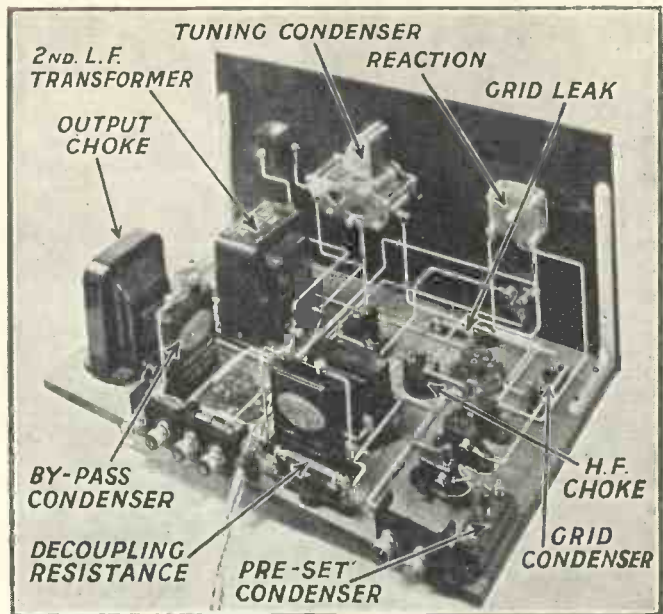
The first consideration is the aerial circuit. Here there is a semi-variable condenser (often called a pre-set condenser, because once adjusted it need seldom be touched), in series with the aerial lead. This is to improve selectivity, but only at the expense of sensitivity. It is the electrical equivalent of cutting down the length of the aerial and if the aerial is very short to begin with it will not be needed.

By screwing down the knob of this condenser, which is mounted on the baseboard, its capacity is increased and the set is in its least selective state. In practice the knob is unscrewed until the best compromise between selectivity and sensitivity is obtained.

How the Three Coils Are Used

Next we come to the tuning circuit and a glance at the photographs will show that three coils are used. The first of these, connected to the aerial, is an aperiodic or untuned primary coil, which picks up energy from the aerial-earth system and passes it on to the second coil, which is called the grid or secondary tuner.

Now the amount of energy transferred from the aperiodic coil to the grid coil (which is tuned to the



ADAPTABLE FOR ALL PURPOSES

By changing coils and turning a switch the set is readily adapted for short-wave reception. Any standard two-pin coils can be utilised.

required wavelength by means of a .0005-microfarad variable condenser) depends on the proximity of the coils one to the other. This fact gives us an additional control of selectivity, for if we move the aperiodic coil away from the grid coil less energy will be transferred to the grid circuit of the detector valve and the result will be an increase in selectivity.

Valuable Short-Wave Feature

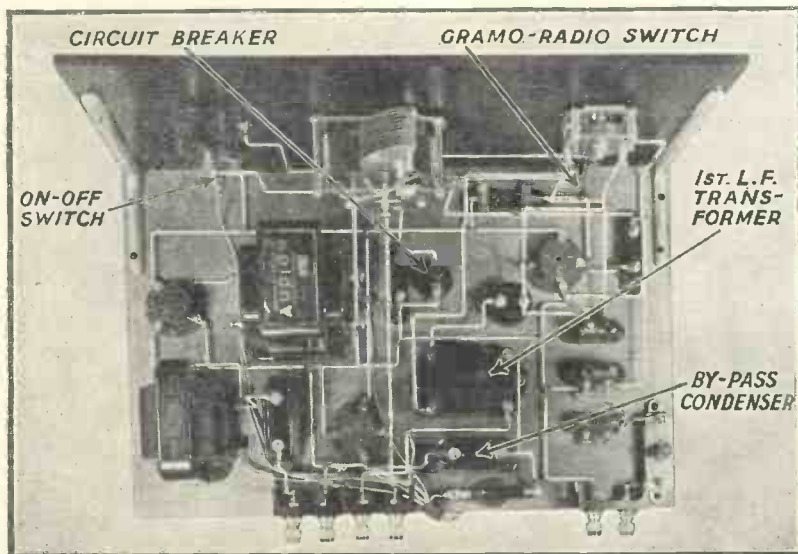
For this reason only one screw is used to mount the holder for the aperiodic coil on the baseboard; it can then be swung towards or away from the grid coil as conditions make it necessary. This feature is particularly valuable for short-wave reception.

Here we have to face another difficulty, but fortunately the solution is both cheap and simple. The difficulty is that whereas coils for the ordinary broadcasting wavelengths, that is for about 200 to 2,000 metres, can be tuned with a .0005-microfarad condenser, this value is too large for good results on the short waves from 20 to 150 metres or so.

Practical Solution

Actually short-wave coils are designed to cover a given waveband with a condenser of the order of .00025 microfarad. It is obviously impossible to take a .0005-microfarad condenser off the panel and substitute a .00025-microfarad model just for short-wave working; instead, a .0005-microfarad fixed condenser is placed in series with the .0005-microfarad variable condenser.

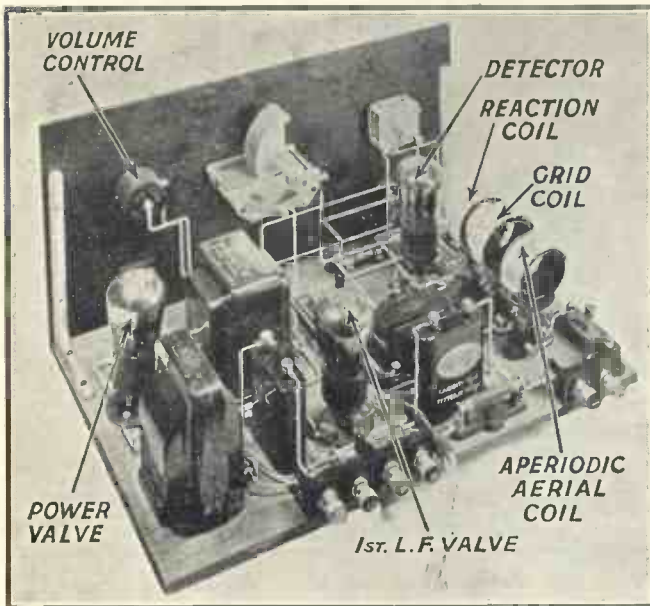
The effect of putting two condensers



STRAIGHTFORWARD CONSTRUCTION

This photographic plan view shows clearly the arrangement of the components in the Plug-in Coil Three. A layout and wiring diagram appears on page 295

THE PLUG-IN COIL THREE—Continued



IT PLAYS YOUR RECORDS AS WELL !

Besides giving radio reception, this set enables you to reproduce your records electrically. There is a special pick-up switch mounted on the ebonite panel

of equal capacity in series is to reduce the total circuit capacity by half, so in this case we get a total capacity of only .00025 microfarad, which is what we want.

In the Plug-in Coil Three we have used a simple type of baseboard-mounting switch that is called a "circuit breaker" by the manufacturers. When the circuit is made the effective capacity is .0005 microfarad, but when it is broken there is only .00025 microfarad across the tuning coil.

Those who intend to use the set solely for short-wave reception—a purpose for which it is especially useful, as there is no selectivity problem with which to contend on the very short waves—are recommended to use a .00025-microfarad variable condenser and omit the .0005-microfarad fixed condenser and circuit breaker.

Later Additions

On the other hand, if the set is not to be used for short-wave reception at all, these components can be omitted—or added at a later date when the operator changes his mind !

The third coil in the set is for obtaining a reaction effect and so increasing the strength of signals. This reaction coil is coupled to the grid coil and feeds energy from the anode circuit of the detector valve back into the grid circuit, the amount of feedback being controlled

by a .00034-microfarad reaction condenser. This condenser is of the differential type, that is, it has two sets of (separated) fixed vanes and one set of moving vanes. The total capacity is always .00034 microfarad and when reaction is applied the amount of unused capacity acts as a high-frequency by-pass between anode and filament of the detector valve and so improves its performance.

The low-frequency stages of the Plug-in Coil Three comprise two transformer couplings. In order to avoid feedback, which might result in low-frequency oscillation or "motor-boating," the first transformer is fed through a decoupling resistance of 30,000 ohms, associated with which is a 2-microfarad by-pass condenser.

Positions of Alternative Transformers

If two transformers other than those specified are used, the second should be that which will take the most current through its primary without causing a great falling-off in inductance.

As more and more listeners are turning their attention to the electrical reproduction of records, the Plug-in Coil Three is arranged for this purpose. A switch is provided that connects an external pick-up to the grid circuit of the first low-frequency amplifier. One end of the pick-up then goes to the grid of the valve and the other end to the grid-bias

battery.

Another refinement on this set is a low-frequency volume control that can be used for radio or record

COMPONENTS NEEDED FOR THE PLUG-IN COIL THREE

CHOKE, LOW-FREQUENCY

1—Lissen, type LN484, 12s. 6d. (or Igranic, Ferranti).

CHOKE, HIGH-FREQUENCY

1—Readi-Rad, 2s. (or Lissen, British General).

COILS

1—Tunewell No. 25 plug-in, 1s. 6d. (or Lewcos Atlas).

1—Tunewell No. 40 plug-in, 1s. 8d. (or Lewcos, Atlas).

1—Tunewell No. 60 plug-in, 1s. 8d. (or Lewcos, Atlas).

1—Tunewell No. 100 plug-in, 1s. 8d. (or Lewcos, Atlas).

1—Tunewell No. 200 plug-in, 2s. 9d. (or Lewcos, Atlas).

1—Set Tunewell short-wave, 6s. (or Atlas).

CONDENSERS, FIXED

1—Readi-Rad .0002-microfarad, 1s. (or Formo, Lissen).

1—Readi-Rad .0005-microfarad, 1s. (or Formo, Lissen).

2—Ferranti 2-microfarad, type C2, 7s. 6d. (or Lissen, Dubilier).

CONDENSERS, VARIABLE

1—Lotus 0005-microfarad, type LC5, 5s. 9d. (or R-adi-Rad, Jackson)

1—Lotus 00034-microfarad differential, type DC34, 8s. 6d.

1—Sovereign pre-set .0003-microfarad max., 1s. 6d. (or R.I., Lewcos).

DIAL, SLOW-MOTION

1—Lotus, type VD/10, 4s. 9d. (or Lissen, Jackson).

EBONITE

1—Lissen 18 in. by 8 in. panel, 7s. 1d. (or Becol, Red Triangle).

3—Belling-Lee terminal blocks, 2s. (or Junit).

HOLDERS, COIL

3—Lissen, 3s. (or Lotus).

HOLDER, GRID-LEAK

1—Lissen, 6d (or Junit).

HOLDERS, VALVE

3—Clix, terminal type, 2s. 6d. (or Lotus Benjamin).

PLUGS AND TERMINALS

7—Belling-Lee wander plugs, marked: H.T.+1, H.T.+2, H.T.+3, H.T.—G.B.+1, G.B.—1, G.B.—2, 1s. 9d. (or Clix, Ealex).

2—Belling-Lee spade terminals, marked: L.T.—, L.T.—, 9d. (or Clix, Ealex).

6—Belling-Lee terminals, marked: Aerial, Earth, L.S.—, L.S.—, Pick-up (2), 1s. 6d. (or Clix, Ealex).

RESISTANCES, FIXED

1—Graham Farish 30,000-ohm, with holder, 2s. 6d. (or Lewcos, Varley).

1—Dubilier 2-megohm, 1s. 9d. (or Lissen, Telsen).

RESISTANCE, VARIABLE

1—Harlie Volustat, 7s. 6d. (or Clarostat)

SUNDRIES

Glazite insulated wire for connecting (Lewcos).

Length of rubber-covered wire (Lewcos).

1—Pair Bulgin panel brackets, 1s. 6d. (or Camco, Peto-Scott).

1—Magnum circuit-breaker, 1s. 3d.

SWITCHES

1—Bulgin Junior on-off, 1s. 0d. (or W.B.).

1—Bulgin Junior 3-spring, 1s. 3d. (or W.B.).

TRANSFORMERS, LOW-FREQUENCY

1—Lissen Torex, 5s. 6d. (or Lotus, Igranic).

1—Graham Farish, ratio 1 to 3, 12s. 6d. (or Varley, Ferranti).

ACCESSORIES

BATTERIES

1—Pertrix 120-volt, standard type, 15s. 6d.

1—Pertrix 9-volt grid-bias, 1s. 6d.

1—Exide 2-volt accumulator, type CZG4, 13s. 6d.

CABINET

1—Pickett, table model, 16s. 6d.

VALVES

2—Cossor HL210, 17s. (or Lissen HL210, Mazda HL210).

1—Cossor P215, 10s. 6d. (or Lissen P220, Mazda P220).

The prices mentioned are those for the parts used in the original set ; the prices of alternatives as indicated in the brackets may be either higher or lower

A CHEAP ALL-WAVE RECEIVER

reproduction. It is a variable high resistance placed across the primary of the second low-frequency transformer. When the resistance is at its highest the maximum volume is obtained.

Special Output Circuit

In the anode circuit of the last (power) valve there is an output choke, associated with which is another 2-microfarad by-pass condenser. The purpose of this is to prevent the direct current from the anode battery from passing through the loud-speaker windings and so causing possible damage and, in time, demagnetisation. The low-frequency impulses caused by signals are passed to the loud-speaker through the 2-microfarad fixed condenser.

That covers the chief points about the circuit and we can now pass on to constructional considerations.

The set is not difficult to build, although from the photographs there appear to be a fair number of connecting wires. No trouble will be experienced in this connection, however, if the wiring guide is carefully followed.

Numbered Connections

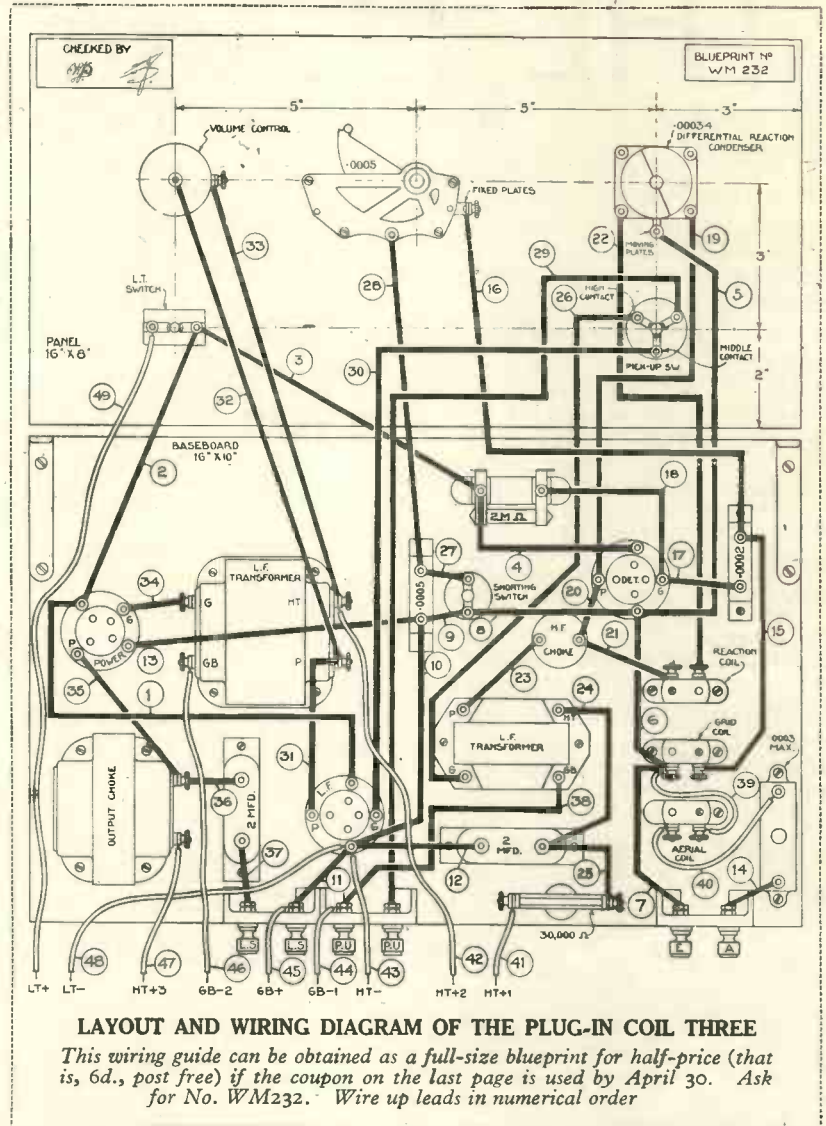
On the wiring diagram each lead is numbered separately in the best order of connecting. First put in position wire No. 1, then proceed with wire No. 2, and so on until all the connections are completed.

Although all the essential details are included in these pages, a large number of constructors will prefer to work from a full-size blueprint. One of these can be obtained for half-price, that is, 6d., post free, if the coupon on the last page is used by April 30.

Send your application, together with the coupon and a postal order for 6d., to Blueprint Department, WIRELESS MAGAZINE, 58-61 Fetter Lane, London, E.C.4; and ask for No. WM232. A copy will be sent by return post.

Sizes of Coils to Use

For ordinary broadcast reception, the coils indicated in the list of components will be required (covering wavelengths from about 200 to 500 on the medium waves and from 1,000 to 2,000 metres on the long waves). Intermediate wavelengths can be covered by additional coils.



LAYOUT AND WIRING DIAGRAM OF THE PLUG-IN COIL THREE

This wiring guide can be obtained as a full-size blueprint for half-price (that is, 6d., post free) if the coupon on the last page is used by April 30. Ask for No. WM232. Wire up leads in numerical order

For medium-wave reception the following coils should be inserted in respective holders: Aperiodic, No. 25; grid, No. 60; reaction, No. 40. For the long waves use: Aperiodic, No. 100; grid, No. 200; reaction, No. 60.

A special set of coils can be obtained for short-wave reception. They should be arranged so that the proportionate sizes are in the same positions as for ordinary broadcast reception.

The question of suitable valves is not a difficult one. The detector should be of the medium-impedance class, of the order of 20,000 to 30,000 ohms. A similar valve can be used in the first low-frequency position, but here the impedance can be as low as

10,000 to 15,000 ohms if desired. With many cheap transformers it is better to use the higher impedances, as less anode current is passed and the quality is less likely to be affected.

Choice of Power Valve

Choice of a power valve depends almost entirely on the source of high-tension voltage. The valve should have the lowest impedance consistent with an anode-current consumption within the limitations of the high-tension source. If batteries are to be used they should be at least of the double-capacity type.

In conclusion, we need only say that we shall be glad to receive test reports from readers.

THE LEAKY GRID

Not to Be Taken Too Seriously!

I HAVE been steaming open our unofficial postbag and I find that it contains much the same as that which the B.B.C. has to contend with. People will write poetry and expect it to get into print.

Out of many examples I give the one which appeals to me most; evidently the writer heard the recent Stravinsky concert. Here it is:—

LINES ON HEARING STRAVINSKY

O Stravinsky, Great Stravinsky,
Thy tuneskis do evinski
Such strange soundskis!
The Drummerovitch doth smite his drumski
And drown the pizzicato of the thumbskis
Till our brains do whirl aroundski.
O Stravinsky, Great Stravinsky!
F. E. D., Uppingham.

Then there are the inevitable open letters to broadcasters. There will be a libel action over one of these before long, the way they are going. Read this:—

TO AN ANNOUNCER

Sir,—Your English is a disgrace to the B.B.C. I distinctly heard you pronounce the second "l" in "alright."
Disgusted, Hackney.

TO CLAPHAM AND DWYER

Gentlemen,—You are irritating in the extreme. Which is which of you? How do I know which is the imbecile who keeps on stuttering? Why does he not take lessons in elocution before attempting to broadcast?

Lover of Real Humour, Clapham.

TO THE EPILOGISTS

Dear Singers,—Do let us have tunes we know! After having been to church and sung *Lead, Kindly Light* and *Abide with Me*, we like to hear you sing them before we go to bed. No one wants to learn anything new.

Ardent Nonconformist, Hampstead.

Dear Singers,—Cannot we have a change from the eternal *Lead, Kindly Light* and *Abide with Me*? Church people are so progressive that they like to learn something new each Sunday.

Fervent Protestant, Golders Green.

TO SIR HENRY WOOD

Dear Sir,—When you do those silly Prom Concerts next season please avoid doing the Beethoven Symphonies on a Friday night. That is my bath night; I always have it then whether I want it or not. And I always take my portable to the bath-room. Now, if you played the Stein Song I would give up the bath and come to Queen's Hall to hear it.

Constant Listener, Dorking.

TO MR. JACK PAYNE

Sir,—I think your band the rottenest combination of nerve-racking, ear-splitting, soul-destroying noises I have ever heard. I hate listening to you and wouldn't, only it is too much trouble to switch into the other programme. May you die early!

George P. Potter, Potters Bar.

Darling Jack,—I adore you. You are the biggest thing that ever happened since Hannen Swaffer admitted he didn't understand something. The very sun shines out of you. It is a crying shame you are not made a marquess and all your marvellous men knighted. May you live for ever!

Dora and Nora, Finchley.

My numerous correspondents are always asking me if I like this, that, and the other. What kind of dance records do I like? Am I in favour of loud or soft needles with a pick-up; do I like women or men as speakers on the wireless, and dozens of other questions of a more or less technical nature.

In these hard days when a three-halfpenny stamp is a consideration, I think I ought to make a clean breast of what I like and dislike, whether connected with wireless or not. I will say what I like first.

I like:—

A really good cat's concert, so long as the voices are well balanced; Sir Henry Wood's back view; trying to read headlines of newspapers upside down in the tubes; cyder; Clapham and Dwyer; everything Bach wrote; a good rag; good English; Mickey Mouse; chess; the odd-looking specimens of humanity who congregate in the Proms at Queen's Hall; more sun than we ever get in England; watching the country cousins manage the tube escalators; the fearlessness of Mussolini; ices; advertisements; shingled hair; being alone.

Have you read about W. James' latest set, the Super 60? It is really too good to miss —costs only £12 and gets sixty stations!

That is about all I really like in this world. Now what I do not like.

I dislike:—

People who have their front teeth removed and do not have others in (this is a scientific objection—I may say an astronomical objection: spaces belong to the firmament alone); people who say "nicely" at Lords every time the batsman makes a cut to the boundary; people who break records, except those of the Stein Song; all futurist art and hyper-modern music; whisky; people who talk about "Beethoven's stuff"; bowler hats; negro spirituals; people who, in silent films, insist on reading out the explanations of the pictures; Mahler's Eighth Symphony; being near a violin when it is being tuned; Americanised speech; most novels; sound films; greyhound racing; most of the wireless female singers; coffee as I find it in some of my friends' houses; people who take the matches; cutting my hedge; being kept waiting; cucumber; and a wet towel.

ANSWERS TO CORRESPONDENTS

I must make a hasty selection of the thousands that lie before me:—

Elsie, Bury St. Edmunds.—No, Elsie, you are not expected to hear the words of the songs. You must be reasonable. The B.B.C. engages artistes to sing, not to talk.

Geoffrey, Barmouth.—(a) At present the B.B.C. has no intention of acquiring the broadcasting rights of Gibbon's *Rise and Fall*. (b) We do not think *Bradshaw* has yet been dramatised.

Cissy, Cirencester.—We fear it is impracticable to suggest that the B.B.C. introduces Clapham and Dwyer into next season's Proms. You see, the applause has already been strongly censured as it is; if these gentlemen appeared the promenaders would *clapham ad nauseam*.

Mrs. H. F. D., Handsworth.—We are sorry you are annoyed by the whirring sound that precedes the announcer. On making inquiry at Savoy Hill we were informed that it is caused by the announcer suddenly changing his mind. W.-W.

The Month's Broadcast Music

WE are glad to see that programmes of late have included a larger proportion of orchestral music of the light and popular type, including excerpts from the universally known operas and oratorios.

The organiser-in-chief of these favourite entertainments is Joseph Lewis, assistant musical director of the B.B.C. Mr. Lewis was well known to Midland listeners as conductor and musical director of the original Birmingham Studio Orchestra before its disbandment. He is a staunch believer in giving listeners the best in music arranged in such a way that it is bound to be appreciated.

Many Requests for Similar Broadcasts

His concerts of popular excerpts from operas and oratorios, taking the form of well-known arias and choruses, are so liked by the general listener that the B.B.C. is always being overwhelmed with large numbers of requests for concerts of a similar style.

Another concert of these opera excerpts arranged for April 4 will include many favourite pieces from Gounod's *Faust*. It has been repeatedly urged in these pages for more light orchestral music to meet the needs of the ordinary listener, and it is hoped that this revival will continue. Mr. Lewis is certainly the right man for the work.

Operatic Relays

In the course of the last few weeks several operatic relays from provincial theatres have been broadcast. These have been enjoyable so far as it is possible to enjoy this type of operatic fare.

The average Britisher has no leaning towards opera as a whole. An excerpt is thoroughly enjoyed, but it is doubtful whether he listens to a complete broadcast of one act. Unless one is familiar with the opera there is little to recommend it as having real broadcast entertainment value.

At present no official announcement has been made concerning future relays from Covent Garden during the grand opera season. Here the difficulty may be offset by the fine

body of international artistes, whose excellent singing is the main attraction.

During the past month there have been several broadcasts of outstanding musical events. The most interesting was the visit to this country of Ernst von Dohnanyi, the famous Hungarian musician. He is, in the truest sense, an all-round musician, being

a composer of note, one of the greatest pianists of the day and a fine conductor. He appeared as pianist at one of the recent Queen's Hall concerts in the performance of Brahms Concerto No. 1 for pianoforte and orchestra, giving a rendering of the highest standard.

Genius

At a Sunday evening concert he showed his genius as a conductor and composer in conducting a contrasted programme including Vaughan Williams' beautiful fantasia on a Theme of Tallis (which will be played again at the Queen's Hall on May 6), and his own work *Ruvalia Hungarica*. The last mentioned composition gave the impression of Hungarian folk life. A pleasant concert, played and conducted well.

Dohnanyi made his first appearance in London as a pianist in 1898 under the conductorship of Richter, his success being so great that in the following year he gave thirty-two concerts in two months, eight of which were in London.

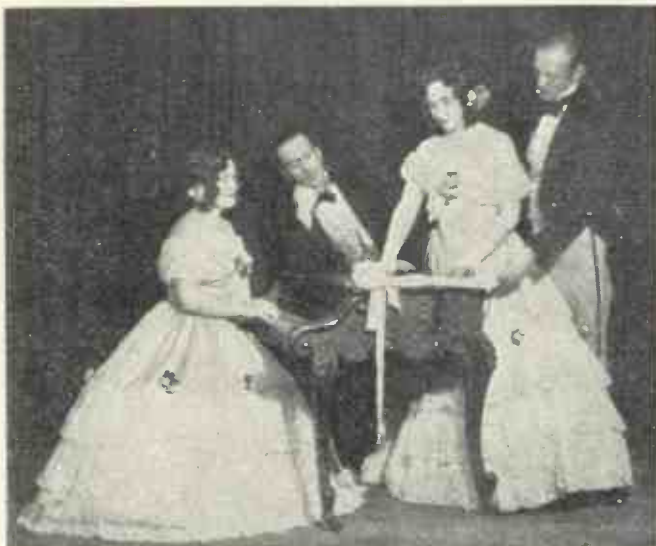
He is now musical director of broadcasting and conductor of the Philharmonic Orchestra in Budapest. This station is quite easy to receive on moderate-powered sets in this country, which enables his many admirers to hear him frequently.

"Music" from a Steel Works

An item which attracted attention was the first performance in this country of a new work, *The Factory (L'Usine)* by Alexandre Mossolov, a young Russian composer who, only completing his studies at the Moscow Conservatoire in 1925, already has many orchestral works and songs to his credit. *The Factory*, a



Gladys Colbourne, a clever artiste, is well known to Midland listeners



The Old Time Singers—Margaret Stephen, soprano; Edith Ashley, pianist; Edgar Elmes, bass; and Gilbert Bailey, baritone—have broadcast from provincial stations



An artiste who has recently formed his own trio, Livio Manucci

BROADCAST MUSIC—Cont.



Gilbert Bailey is the founder and manager of the Old Time Singers

same rhythm until the movement reaches a tremendous climax. The B.B.C. Orchestra under Dr. Adrian Boult played this remarkably well.

Amazing Percussion Effects

Among the percussion effects used was a large piece of sheet metal about 4 ft. wide by 6 ft. long, suspended on a wooden frame. This was used to represent the drumming of steel.

The work, which lasted only three or four minutes, was probably the noisiest that has ever been played in the Queen's Hall. Ravel's Bolero had the reputation for being the most exciting of modern music, but it has certainly been surpassed by the B.B.C.'s latest introduction of contemporary music.

Dr. Adrian Boult has won admiration from the Queen's Hall audiences by his fine conducting and precise handling of so large an orchestra. He is an able musician throughout. He successfully conducted Elgar's Symphony No. 2 in E flat without the use of any musical score of the work, showing he is a conductor of more than average ability.



Captain Featherstone recently conducted the Wireless Military Band

Elgar's symphony, which is dedicated as a tribute to his late Majesty King Edward VII, is a complicated structure demanding the full attention of both orchestra and conductor. It was played exceedingly well, but the main credit is undoubtedly due to the conductor. This is only one example; Dr. Boult frequently conducts large orchestral pieces entirely from memory.

The first performance of

a new Requiem Mass by Baron Frederick d'Erlanger by the B.B.C. deserves special mention. Comprising the usual sections of a Requiem Mass, it is essentially choral. This work should help to dispel the widespread notion that a Requiem Mass carries a gloomy atmosphere. On the contrary, it depicts feelings of a more pleasant type.

It was originally intended for Roman Church performance, but this idea was abandoned on account of the Papal Bull which prohibits any orchestral accompaniment. Baron d'Erlanger is perhaps better known for his association with the bankers of the same name.



Frank Lester, baritone, is frequently heard in Midland programmes



The popular director of Pattison's Salon Orchestra, Norris Stanley

More Vocal Items

The last group (Series D) in this season of B.B.C. Symphony Concerts differs from the previous concerts inasmuch as there are far more vocal items. The first concert is on Wednesday, March 25, and the second on April 15, and then at weekly intervals until May 6. Fritz Wolf, a famous German tenor, will sing during the concert on April 15, which will be devoted entirely to the works of Wagner. This singer, one of the outstanding successes at the Covent Garden Opera season in 1929, has now accepted the position of leading tenor at the State Opera House in Berlin.

This series will give listeners the opportunity of hearing several famous artistes of the day. Amongst the singers are Gota Ljungberg, a leading Swedish soprano, and Maria Olszewska, a singer who has appeared at Covent Garden almost every season since 1924.

The pianists will include Myra Hess, an English artiste, who is well known to listeners for her excellent broadcast recitals and Cortot, the French pianist. This series should prove to be in every way as



No introduction is necessary for Sir Henry Wood



A favourite singer heard recently, Barrington Hooper

A PROGRAMME REVIEW



Eric Parker, a naturalist, broadcasts every Tuesday afternoon

The special concert on Good Friday at the Queen's Hall, beginning at 7.30 p.m., will consist of a large part of the Good Friday music from Wagner's *Parsifal*. Full details of the soloists are not available at the time of going to press.

A notable concert will be relayed from the Albert Hall on March 29, on the occasion of its jubilee. The combined B.B.C., Royal Philharmonic, and London Symphony Orchestras will play, the conductors being Dr. Adrian Boult, Sir Thomas Beecham, and Dr. Malcolm Sargent. This concert should be one of the best of the season and well worth your attention.

A Disappointing Disbandment

The inevitable disbandment of the Northern Wireless Orchestra will definitely take place after March 31. This is bound to come as a disappointment to Northern listeners, as this orchestra was probably one of the greatest favourites in the programmes. It will be replaced by a studio orchestra of nine players which will be augmented from time to time for orchestral concerts requiring a larger combination.

In addition, the B.B.C. intends to relay light orchestral concerts from the principal northern resorts during the coming

popular, if not more popular, than the preceding ones.

Sir Henry Wood, who recently returned from a visit to South Africa, will conduct Handel's *Israel in Egypt* on April 22. Stiles Allen, Margaret Balfour and Frank Titterton will be the soloists and, in addition to the B.B.C. Orchestra, there will be the National Chorus of 250 voices.



A violinist who broadcast a recital from London, Seymour Whinyates

summer and also to continue its assistance to the northern symphony orchestras during the next winter season. Performances by the new B.B.C. Orchestra will be heard through the new Slathwaite regional transmitter.

Organ recitals from both church and cinema have again made an appearance in the evening programmes. There is no doubt that these recitals are an enjoyable feature and certainly deserve at least an established position in the evening entertainment. Need for these recitals has been emphasised in previous issues of WIRELESS MAGAZINE, and it is hoped that the seemingly revival will prove permanent. General items, on the whole, have been varied.

Surprising Sunday Introduction

A surprising introduction was the recent Sunday afternoon performance of Shakespeare's *Tempest*. Produced by Val Gielgud and E. A. Harding, it was quite a change from the usual run of Sunday programmes. Music provided by the B.B.C. Orchestra, under Leslie Woodgate, was well played.

There is more difficulty in arranging and producing vaudeville programmes than any other type of entertainment. Variety must be the keynote, for it



A popular tenor who broadcasts from Midland Regional, Geoffrey Dams

is certainly hopeless to broadcast an item of this type more than twice.

An example of a really extraordinary entertainment was that broadcast from Frankfurt some little time back. It was a carnival concert described as "220 minutes of Light Music—No Symphonies!—No Chamber Music!—Just Enjoyment." It began at 7 p.m. and lasted till nearly midnight. The B.B.C. has asked for suggestions. Would it consider this?

T. F. HENN.



Dohnanyi, the Hungarian musician, has just made one of his rare appearances in London



Lance Fairfax, an Australian baritone, has just broadcast for the first time



One of the best known of broadcasters, Frederic Collier, baritone

Power Noises That Spoil Reception

NOT long ago the WIRELESS MAGAZINE Set Selection Bureau helped a reader to choose a two-valve all-electric set; the sequel led to the writing of this article, for after the set was installed the calamitous discovery was made that the reception of the two Brookman's Park stations was completely ruined by some form of electrical disturbance.

A Charging Plant!

Investigations followed and the trouble was tracked down to its source—an alternating-current charger a few doors away. The neighbour was quite reasonable but, after all, he was there first!

It was at this point that I checked up my knowledge of B.B.C. procedure in such troubles; and the following notes show what has been done about electrical interference, and what can be done with a little co-operation and technical ability.

Any listener who finds himself suffering from severe interference is invited to write to the B.B.C. A special electrical interference questionnaire pamphlet has been prepared at Savoy Hill to assist listeners to diagnose all the common forms of electrical interference.

The troubled listener is asked to answer ten questions and if the B.B.C. considers the case justified it passes on a copy of the filled-in questionnaire form to the Post Office. From that department a local Post Office engineer receives instructions to call on the listener and if possible to set matters right.

What Kind of Set?

In the B.B.C.'s questionnaire the listener is first of all asked whether the set is a valve or crystal and then whether a battery eliminator is used. Next, has the set or aerial been altered in any way prior to the starting of the interference? These first questions sometimes give a clue as to whether the set itself is responsible for the alleged interference.

Then in question 4 an attempt is

By **ALAN HUNTER**

made to substantiate the listener's contention that the interference is extraneous. One is asked whether neighbours simultaneously suffer from the same interference and whether the proportion of interference is the same in neighbours' receivers.

In question 5 one is asked whether any local listener is known who suffers interference at greater strength than in the locality complained of. Question 6 switches back the listener to his set, for he is asked whether the interference ceases when the aerial and earth are removed. If it does it is fairly obvious that the interference is coming from some outside source.

Question 7 enumerates the main sources of interference, such as tram and electric-bus systems, electric signs, X-ray apparatus, refrigerating apparatus, accumulator-charging stations, cinemas and power stations.

One is asked whether any of these potential sources of interference are situated within 400 yards of the house.

The next question is easy, for one is asked to state when the interference is most pronounced. It often happens that friendly negotiations with the owner of the interfering apparatus lead to an alteration in the hours of working so as not to clash with broadcasting periods.

The last two questions are designed to elucidate still further evidence, for one is asked for the date when interference was first noted.

Post Office Steps In

The reader I referred to at the beginning of this article duly filled in the form and within a short time a Post Office engineer had called upon the owner of the charging station. It was found that most of the interference was being caused by the commutator sparking at the brushes of the alternator.



WHAT HAVE THEY TO DO WITH RADIO?

Well, trams and trolley-buses often cause interference with mains sets that is very difficult to eliminate

All one needs to overcome the trouble are two 4-microfarad condensers joined in series across the motor; at the junction between the two condensers a lead is taken to earth.

To prevent possible damage to the machine, as would be caused by the breaking down of one of the condensers, it is advisable to connect fuses in each lead.

The B.B.C. suggests that a good electrical earth for the machine is also a practical means of improvement. Many machines are mounted on dry concrete beds, an earth connection being obtained only through the mains feeding them.

Getting a Good Contact

A good earth contact can be made by clamping an earth lead under the head of a bolt on the machine, but the lead should be as short as possible, consisting either of copper strip or stranded wire.

I am glad to say that the fitting of the condenser completely stopped the interference complained of by the reader in question. As the cure is so simple and the annoyance so considerable I feel that reader has considerable cause to be relieved.

Unfortunately, interference is not always limited to electrical machinery. Another widespread source has been traced to tramway systems. Complaints have been received by the B.B.C. from many districts. So far no general remedy has been effected, although a recently issued report of the Post Office engineering department proves that considerable spade-work has been done.

Up to the time of the tests referred to in this report there was a fairly general belief that the tramway interference was caused by the sparking of the collector system passing over the points at each section of the line. Part of the work done relates to trials of a plate type of overhead collection, as extensively used on the Continent.

Interference Reduced

The local authorities contemplated the introduction of the plate collector with a view to reducing maintenance costs, but the B.B.C. and the Post Office were naturally interested from another point of view. For with the plate collector the arcing is greatly reduced and so therefore is the interference to broadcast reception.

A test was made at Blackpool with cars fitted with plate-type collectors

and the effect on reception was noted by the installation of a portable set some ten yards from the tram route. An important conclusion was formed from these tests, taken in conjunction with some previous tests at Birmingham; namely, that collector clicks were not the main source of tramway interference.

In the Blackpool tests a standard car and a test car, both fitted with plate collectors, in order not to confuse the tests by the introduction of overhead clicks, were run alternately over the same route. First tests

farad condensers in series, with their mid-point earthed.

Another important point about the test car was the transposition of the traction and compressor motor series coils from the low potential side of the motors. This sounds a complicated business, but in effect it meant that the series coils of the motors were utilised as high-frequency chokes between the motors and overhead collector wires.

Tests showed that collector noises could be greatly reduced where plate collectors are used and that such inter-



ELECTRIC SIGNS HAVE MUCH TO ANSWER FOR!

You may admire electric signs when you see them in the street, but when you are using a radio set near them!

showed that interference could be heard even when no cars were in sight. Moreover, the general background of interference gradually decreased as the trams returned to the depot at night.

This background noise built up considerably as any car passed the receiver point. It became evident that a collective effect of all the cars when in service is being heard.

As conclusive tests under these conditions were impossible, a test car and a standard car were run in the early hours of the morning, when all the other cars were in the depot.

The test car was fitted with a stopper circuit, tuned to 19,000 metres, in the down lead from the plate collector to the controller. This stopper consisted of a coil of 100 microhenries inductance shunted by two 2-micro-

ference is practically eliminated when the overhead system is fully adopted. Unfortunately, the greater proportion of tramway interference is not due to the collector system, but to a collective effect of the whole system.

The transposition of field coils is, according to the Post Office, quite easily carried out and as the collective effect is greatly reduced by this transposition it is suggested that if all cars operating in any town were so treated broadcast reception would be satisfactory.

Although it is true that some reduction of electrical interference can be effected by devices at the receiving end one must go to the source for really satisfactory elimination. Trouble from a local machine is usually susceptible to a cheap and speedy cure.



OVER FORTY STATIONS

This is the record of a Bagshot reader with the Brookman's Three seen here

BROOKMAN'S THREE

"*PURITY with selectivity*" is the experience of a reader at Bagshot with the Brookman's Three. He gets over forty stations on the loud-speaker. Read his comments:—

I hope the enclosed photographs will be sufficiently interesting and clear enough for reproduction in your magazine, for the interest of other readers.

I have made many of the sets described in "W.M.", all of which are efficiently simple and simply efficient, but the Brookman's Three suits my circumstances best of all.

It is a really good set in every way, giving purity with selectivity, and is easy to operate as well as build.

My version is built in a pedestal gramophone cabinet. A fourth valve is used for record reproduction.

In spite of cramping components, the set gets over forty stations on the loud-speaker.

Please accept the appreciations of any enthusiastic "W.M." reader.

INVITATION FOUR

ENTHUSIASM for the Invitation Four (WIRELESS MAGAZINE, July 1930), and the Outpost Four (WIRELESS Magazine, November 1929), as short-wave sets, is expressed by a reader in Rangoon:—

What prompts me to write to you is a conversation I heard between two disappointed radio fans. They claimed that it was really a matter of luck whether a set worked or not. I undertook to convince them that they were wrong, and succeeded.

Now they are both happy, one in the possession of the Inceptordyne and the other of the Outpost Four, both sets slightly modified to suit their respective components, and in perfect working condition, that is, they are all the "W.M." claims for them—and more.

Now for my report on two short-wave sets you described, the Outpost Four and the Invitation Four. The former

WHAT READERS ARE

Brookman's Three and Four :: Foursome

I built with components very similar to those of the Tobago reader—whose report appeared in the July, 1930, issue. In spite of the fact that I got very good results—my loud-speaker being badly overloaded—I was not satisfied.

In July, 1930, came the Invitation Four. I pounced on it and started right away. That same evening the set was ready. I got Saigon on 49 metres on the loud-speaker, Manila and Bangkok, too, I tuned-in, but the concerts did not interest me.

Now my set is a mixture of both the Outpost Four and Invitation Four. It is the latter, using the high-frequency circuit of the former. Results are superb.

My report should suffice to prove that sets described by the "W.M." staff are O.K. for the veriest amateur with a little common sense, and for a good few pros.

FIVE-POINT FOUR

A READER in the north of France gets excellent results with the Five-point Four (WIRELESS MAGAZINE, November, 1930), using ordinary plug-in coils:—

I am enclosing photographs of the Five-point Four, built for one of my friends. I have omitted the R.C. low-frequency stage, a set with only three valves being sufficient for the purpose.

As I had no centre-tapped coils, I employed two ordinary coils connected in series, the aerial being connected at this point.

I got very good results with it. It was somewhat difficult to get the set selective, but I improved its selectivity by plugging in a coil with many turns from grid to aerial, and now it is quite good in this respect.

The following stations can be logged at good loud-speaker strength:—Hilversum, Radio Paris, Königswusterhausen (when Radio Paris or Daventry 5XX aren't working), Daventry 5XX, Eiffel Tower, Motala, and Kalundborg on the long waves.

On the medium waveband:—Midland Regional, Rome, Stuttgart, London

Regional, Strasbourg, Toulouse, Lille (very loud), London National (when Lille is not working), and some others which were not identified.

In view of these results, one can say that it is a good set for no great expense. It can be built with confidence.

OVERSEAS FIVE

FORTY to fifty stations on a moving-coil loud-speaker is the record of a South-east London reader with the Overseas Five (WIRELESS MAGAZINE, April, 1930).

Enclosed please find photograph of the Overseas Five. I am writing to tell you



A HANDSOME OUTFIT

Congratulations to the reader who made this fine job of the Overseas Five

that it is a very good set—forty or fifty stations at good loud-speaker strength using a moving-coil reproducer.

It is all that can be desired. My friends say that it is the best set they have heard. Wishing the WIRELESS MAGAZINE every success.

THE FOURSOME

A READER living in Maida Vale is getting good results with the Foursome (WIRELESS MAGAZINE, August, 1930), built up in transportable form:—

I had some correspondence a few weeks ago with your Information Bureau about the Foursome contained in last August's number of your paper. As a consequence I have built it as a transportable and thought you would be interested to hear that it is giving every satisfaction.

Of course, I had to adapt it. To be sure of getting adequate screening I made an aluminium box in which, the



A "FOUR" THAT HAS BECOME A "THREE"

A French reader calls this the Five-point Four, but as he has omitted one valve it is really a "three"

DOING WITH "W.M." SETS

Five-point Two and Four :: Overseas Five

screened-grid valve fits horizontally, protruding through a hole.

I also placed a screen separating the whole of the high-frequency components from the rest of the set and have fitted a switch cutting out the first stage of amplification and going straight to the last stage. This gives quite loud enough results on the loud-speaker here when the room is quiet.

Having a differential reaction condenser by me I have used this and as I could not get 600-ohm anode-feed resistances of the well-known make I generally get I have put 1,000 ohms in their place.

London Regional, Hamburg, Toulouse, Glasgow (local), Stockholm, Rome, Langenberg, and Daventry 5GB. These can be relied on any night when atmospherics are not troublesome. Rome and Stockholm are not easily separated. There are also a fair number of stations I cannot identify.

My letter is longer than I intended but I can't cut any out, you have produced a remarkably fine set. Good luck to the WIRELESS MAGAZINE and W. James.

A CAMELFORD (North Cornwall) reader has made a good job of the Brookman's Four and gets particularly good results on the long waves:—

I enclose photos of my Brookman's Four in a cabinet made locally.

In this district we have to rely mainly on the long waves and I can enjoy Huizen for breakfast if I wish. Of course, 5XX is our main station and this is first-class on an indoor aerial. I can get Kalundborg also on the indoor aerial. One attraction of "W.M." sets is their ease of construction.

FROM Coatbridge (Scotland) comes this report on W. James' Brookman's Four:—

How I used to envy some of your readers sending in reports of having logged about twenty stations. I was beginning to give up hope when I received a magazine with W. James'



HUIZEN FOR BREAKFAST!

A Camelford reader gets good long-wave reception on his Brookman's Four

Brookman's Four. I decided, there and then, to give it a trial.

Now, I am pleased to state, I have surmounted all my difficulties. I have an inside aerial and a linen-diaphragm loud-speaker (behind silk in photograph).

I have logged the following stations at loud-speaker strength:—

MEDIUM WAVES

Nürnberg, Berlin, Gleiwitz, Dublin, Bratislava, Berne, Turin, Rome, Barcelona, Langenberg, Hamburg, Prague, London Regional, Oslo, Toulouse, Milan, Frankfurt, Brussels II, Bucharest, Munich and Budapest.

LONG WAVES

Hilversum, Kalundborg, Moscow, Motala, Warsaw, Eiffel Tower, Midland Regional, Radio Paris and Huizen.

Also a good few others.

I would advise any of your readers who are badly placed to build the Brookman's Four, as it is a sure station finder.

My set was all built at home, including the cabinet. The cabinet is made of mahogany and has a glass panel.

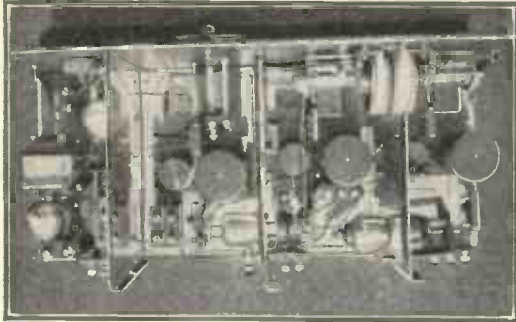
FIVE-POINT TWO

IN spite of being in what he says is a bad spot for reception, a Plymouth reader has received eight stations at good loud-speaker strength on the Five-point Two (WIRELESS MAGAZINE, December, 1930):

A friend of mine was desirous of obtaining a two-valve set for the local station only, and while looking through the December WIRELESS MAGAZINE I came across the Five-point Two. This reads like a fairy tale, thought I. However, I built the set, omitting the wave-change switch, pre-set condenser and one coil.

I am pleased to inform you the results far exceeded my expectations, for I am able to get at least eight stations at good loud-speaker strength, and this for Plymouth—which is a bad spot for reception—is, I think, excellent.

Please accept my sincere thanks for the circuit and congratulations on getting out such a successful one. I propose building another Five-point Two for myself forthwith.



"A REMARKABLY FINE SET"

This is what a Glasgow reader says of the Brookman's Four. Read the report below

BROOKMAN'S FOUR

AN enthusiastic report on the Brookman's Four (WIRELESS MAGAZINE, January, 1930), comes from a Glasgow reader:—

I am one of the multitude who never write to the papers, but this is a special occasion—I have built the Brookman's Four.

The set has certainly exceeded all my expectations. This is my second "W.M." set—the Inceptor Three was my first and it gave excellent results for a three-valver. To quote W. James: "The extra H.F. stage is no passenger," but I think the new Binowave coils play a large part in the excellent performance.

I enclose two snaps of my version of the set. A choke-filter output has been added to the original scheme. Anything up to about 220 volts high tension is obtained from an A.C. mains unit and the valves in use are Osram S215, Mazda 215 SG., Osram DEL210 and Mullard PM252.

I won't trouble you with a great list of stations, but as an indication of what can be done I may say that when starting out on the long waveband, Daventry and Motala were first identified, a rough tuning graph was drawn, and within about forty-five minutes we had picked up ten out of the eighteen or so long-wave stations shown in your table.

Selectivity is good on this band and Kalundborg was received at very good strength (on a new Blue Spot 66R and chassis).

Of the twenty-one stations identified on the medium waveband the best are London National, Aberdeen-Göteborg,



A SURE STATION FINDER

This Brookman's Four, made by a Coatbridge reader, has a glass panel

LISTENERS' FORUM

A Selection of Readers' Letters to the Editor

WANTED—A 6,000-MILE SET!

SIR,—It would be interesting to know why so many sets described and advertised in your magazine are battery operated. Moreover, your correspondents who receive a few European stations think they have done something wonderful if they get stations as far off (?) as Budapest!

What is needed in South Africa is a set that will cover at least 6,000 miles and that is what I've not yet seen claimed for a British set. The Americans and Germans cater for that sort of thing and they are getting the business.

Advertisements in South African papers are full of what the Pilot Super Wasp, Telefunken, Crossley, and Philips will do, but the only British set so far mentioned suitable for South African reception is the Gecophone.

If British manufacturers would only market sets suitable for overseas conditions at a competitive price and advertise them well, I'm sure there would be a good demand.

We have electricity in nearly every town. Even places with a population from 2,000 to 3,000 have electric light. The foreigners have got in first as usual and, of course, they advertise well and put out an article suitable to conditions here. The result is that people think British sets are not as good.

F. W. EDWARDS.

Natal, South Africa.

NEED FOR ESPERANTO

SIR,—If all programmes of more than national interest were announced in the national tongue and in Esperanto (as has already been done on a small scale by Brussels, Ljubljana, etc.) any radio fan with a very small expenditure of energy could soon qualify himself to understand everything that was said, for the language was created by a linguist primarily for non-linguists.

Its creator aimed at the utmost internationality and simplicity, and the result is a language which can be interpreted just as easily by a European, an Asiatic, or an African. The five clearly-defined vowels are especially suitable for radio work; in fact, it is used by the P.O. Engineering Department in testing the frequency of long-distance telephone cables.

The B.B.C. have ample evidence of the utility of Esperanto (they used it some weeks ago to wish the rest of the world "A Happy New Year"), but seem unwilling to follow the lead of the Continental radio stations, about fifty of which give regular Esperanto courses and talks.

Now, Mr. Editor, it is your claim—a claim well justified by results—that your magazine is right up to date and in the van of any matter dealing with the advancement of knowledge amongst radio workers. You are in a position to show the B.B.C. what should be its

If you have anything to say that is of general interest to listeners, you are invited to write to WIRELESS MAGAZINE about it. We are always glad to hear from readers about any matters of radio interest, so let us have your views.

future line of action in this matter; if the B.B.C. see that the technical Press favour the language, they will not hesitate to act, in spite of their traditional conservatism.

A. VENTURE.

Mitcham, Surrey.

P.S.—The British Esperanto Association (142 High Holborn, W.C.) is the headquarters for the British Empire, and is always ready to furnish desired information.

AS GOOD AS MONEY CAN BUY

SIR,—Searching through some old WIRELESS MAGAZINES and books three days ago I came across Vol. I, No. 1, February, 1925, WIRELESS MAGAZINE. On looking through the contents I discovered, page 20, "As Good A Set As Money Can Buy," a straight four-valver.

Discarding my short-wave set I constructed your "four" with some slight changes, namely, I have only two fixed condensers, the grid condenser and a .002-microfarad across the phones-loud-speaker terminals. All the coils are inside the set and I use Reinartz reaction. The only other change is a .0003-microfarad condenser to tune the anode coil (you specify .00025 microfarad).

I am about 1 or 1¼ miles from the 2RN aerial and I have not the slightest difficulty in cutting out Dublin on the medium waves and, of course, Daventry is also clear of Dublin on the long waves. All stations are at loud-speaker strength.

I had only untapped Igranic coils and I tapped them myself.

I wonder how many of the very efficient (?) modern sets could do this at such close range to the local? So five and a half years after it is still "as good a set as money can buy."

You may publish this letter if you wish under the name of a

DUBLIN READER.

Dublin, N.W.3.

GLASGOW'S PROGRAMMES

SIR,—As a regular reader of your periodicals, I venture to write you and make the following suggestion. We are not all millionaires up here, as you will understand, and like to get good value for any money spent.

Speaking for myself I cannot afford to scrap a good set and go in for a better one every now and then as Mr. James

and Mr. Reyner think fit to bring one out.

What I would suggest is that Mr. James should experiment on his Binowave coils and find out if he cannot improve them. I have a Brookman's Four and find it very good, but not just as selective as I would like it.

If I reduce my aerial (66 ft.) I lose volume on the upper band of the lower wavelengths and the same applies to a fixed condenser in the aerial circuit. Ask him to see what he can do for us in this direction.

We get very, very dud stuff from our local station (Glasgow), so that one requires a decent set to get something worth listening to.

The first night you see the "Radio-optimists" broadcasting from here ask one of your staff to listen in and report; you will hear what they term a first-class turn from Edinburgh or Glasgow.

The peculiar thing is, although a lot of this dud stuff is sent out to us, Edinburgh (where it is sent from originally) does not have to put up with it—they take the London programme, if you please!

ALEXANDER GEDDES.

Renfrew, N.B.

MORE LIGHT MUSIC

SIR,—With reference to an article in a recent issue, regarding alternative programmes, the following is a copy of a letter sent to the Director of Programmes, B.B.C.:

"I am writing to ask why we cannot have more light music, especially selections of musical comedies. I am very keen on this kind of music, and so must be thousands of other people.

"Look at the run of *Bitler Sweet*, now having passed 600 performances. On looking down the list of London theatres I find that seventeen are giving musical shows of one type or another. Compare this with the programmes; I find 80 per cent. of the programmes contain 'high-brow' music that the average listener does not care about.

"Some weeks ago a musical comedy was broadcast from Birmingham entitled *Little Miss Make Believe*. This included that very pretty song, 'Love in a Mist,' from *Dear Love*. Can this be repeated, please?

"I am quite sure that the average listeners do not want such items as 'Symphony No. 2 in D.' Further proof of what I have already said is confirmed by the result of the recent *Daily Mail* Ballot."

I wish you would bring your influence to bear on the B.B.C. so that we might have the type of music suggested in my letter. In conclusion, I would like to say I still have my 1927 Five in daily use, from which I get excellent results.

WILFRED MOODY.

Ilford, Essex.

FINISH WITH BATTERIES FOR EVER

Big cut in prices of two most popular "EKCO" H.T. UNITS

**NOW
ONLY**

~~£2'10'0~~

£1'17'6

**D.C. MODEL
I.V. 20**

**A.C. MODEL
I.V. 20**

**NOW
ONLY**

~~£4'12'6~~

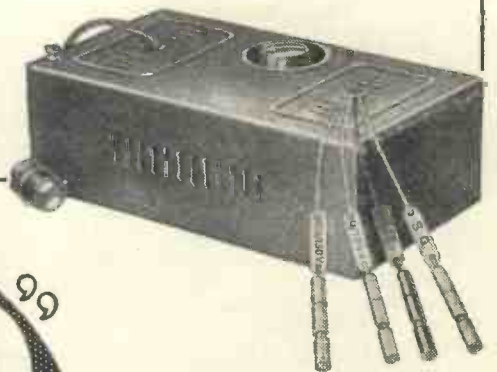
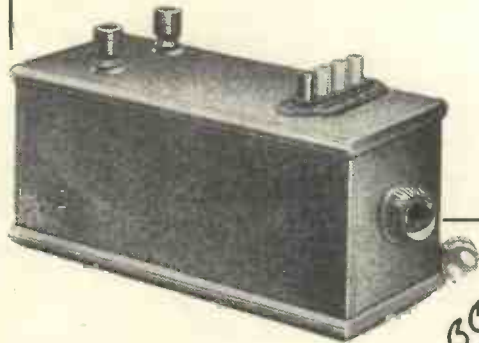
£3'19'6

The huge demand for these two models and extended manufacturing facilities have made these big price reductions possible. At £3-19-6 for the A.C. model and £1-17-6 for the D.C. model there is no finer value obtainable.

In three minutes you can put an end to H.T. battery worries for ever and enjoy permanently perfect radio. Just connect the "Ekco" H.T. Unit in place of your H.T. Battery, plug the Adaptor on the Unit into the nearest electric light or power socket, and switch on, that's all. You get ample current and high voltage constantly and permanently at a cost of less than 3/- a year.

"Ekco" H.T. Unit No. 1V20 gives a current output of 20 milliamperes. It has three voltage tappings: (1) for grid of S.G. valve, (2) 0-120 variable, (3) 120/150. On the A.C. Model the 120/150 tapping can be reduced to 100 volts in cases where the output valve does not require more. It is suitable for practically all 1 to 5 valve sets at present fed from troublesome and expensive and unreliable H.T. Batteries. It fits snugly into all portable sets. It brings an old set up-to-date, and gives you *permanently* all the improvements in reception and quality of reproduction which you know are obtainable when you have a constant and ample H.T. supply.

See your radio dealer to-day or send coupon now for new "Ekco" Folder.



RADIO POWER

SUPPLY UNITS

To: E. K. COLE, LTD.
(Dept. K.2.)
"Ekco" Works,
Southend - on - Sea

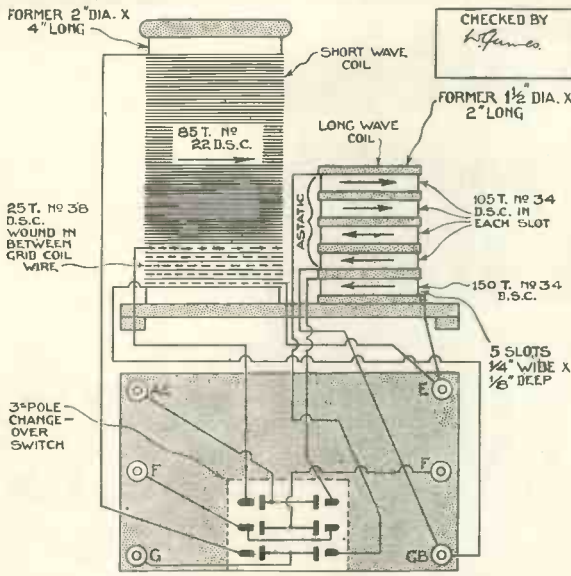
PLEASE SEND ME:—
(a) New Folder describing how I can finish
with batteries for ever; (b) full details of
the famous "Ekco" All-Electric Sets.
(Cross out item not required)

NAME.....

ADDRESS.....

When replying to advertisements, please mention "Wireless Magazine"

MAKING THE BINOWAVE COILS Specially designed for "W.M." by W. JAMES



Constructional details of the type A Binowave coil for use in aerial circuits. The wave-change switch breaks the filament circuit in its mid-way position

BINOWAVE coils were specially designed for WIRELESS MAGAZINE by W. James and details of the latest types were published in August, 1930. In response to many requests received from readers we are reprinting the details here.

Selectivity and magnification are the two chief characteristics involved in coil design and there is no doubt that the Binowave coils are among the best dual-range examples yet produced for the home constructor.

There are three types for general use, the first (type A) being an aerial-grid coupling coil with two sets of windings—one for the long waves and the other for the medium waves. They are mounted together on a common base with a Wearite type I23 three-pole switch and have the usual terminals.

The medium-wave coils, that is, primary and secondary, are wound on a 2-in. ebonite tube, while the long-wave coils are arranged in a slotted former, the secondary being astatic. The dimensions of the formers will be clear from the diagram on this page.

For coupling a screened-grid valve to a detector or further amplifier a different coil is used, known as type C. In this the medium-wave coil is wound astatically, while the long-wave coil is plain. The arrangement is

thus the opposite of that employed in the aerial unit.

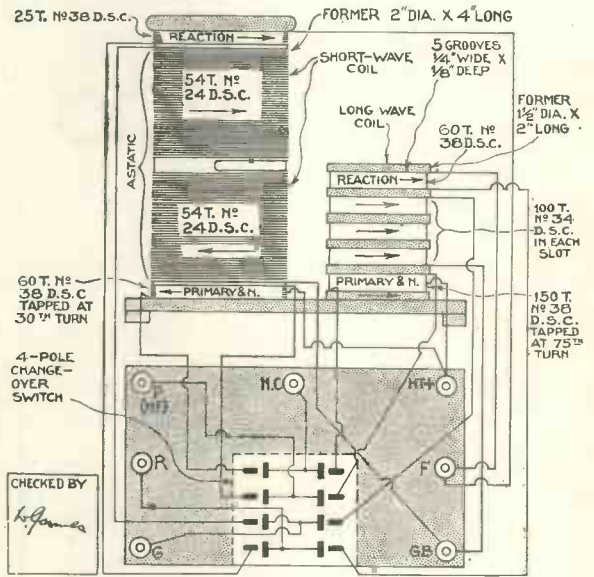
Details of the type C coil will be found on this page. It should be noted that if the primary winding is arranged in a clockwise direction the first half of the grid coil must also be in a clockwise direction, while the second half is anti-clockwise. The reaction winding is also anti-clockwise. The switch used is a Wearite type I23 (three-pole).

It should be noted that the primaries are arranged to suit average screened-grid valves, with an impedance of approximately 200,000 ohms. Two sockets are arranged on the base so that the primary can be tapped. Both positions should be tried in order to determine which tapping gives the best results with any particular valve.

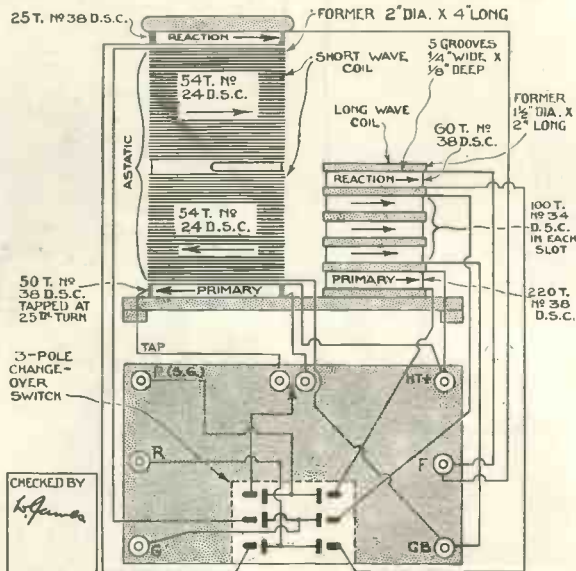
The type C coils should be used with a .0003-microfarad reaction condenser, but with different valves it may be

desirable to increase or decrease this value.

For sets employing a neutralised three-electrode valve for high-frequency amplification the type D coil should be used. This includes a special neutralising winding. It should be noted that, owing to the special design of the coil, one setting of the neutralising condenser is correct for both long and medium waves. This is an important point and one that will be much appreciated.



This type D Binowave coil is for neutralised three-electrode high-frequency valves and gives constant balancing on all wavelengths



Details of the type C Binowave coil for screened-grid valve sets. The medium-wave primary is tapped for the best results with different impedance valves

The switch for the type D coil is a four-pole change-over (Wearite, type I24).

Although the units are arranged with one winding in each astatic, it is necessary to use a simple form of metal screen to avoid capacity effects.

Owing to the sizes of the wires used and to the transformation ratios, high magnification with exceptional selectivity is obtained.

A large number of sets using these Binowave coils have been described from time to time in WIRELESS MAGAZINE and all have met with the greatest success. Among these sets are the Brookman's Two, Brookman's Three, New Brookman's Three, Brookman's Push-pull Three, Brookman's Three-plus-one, Lodestone Four, Brookman's Four, New Lodestone Three, Regional Band-pass Four, and the Regional A.C. Four.

Clear tone, free from "background"

Reception with the Exide High Tension Battery is always crystal clear. No other source of power is so completely free from causing a background of buzzes and crackles. It is an essential part of the

principle of this battery that it gives current without the slightest fluctuation or fall right to the end of its charge. This means also that it causes **no howl, harshness or "motor boating."** Distant stations come in clear. It helps selectivity, too.

And economy. The Exide High Tension Battery

can be recharged. With a trickle charger it gives all the freedom from attention of a mains unit yet retains all its inherent advantages of clearer tone. That is why this battery is **used in the big speech amplifiers,** talking film apparatus and everywhere where clarity of tone is of the utmost importance.



Prices: WJ, 60 volts, 2,500 milliamp hrs., £1 17s. 6d. WH, 60 volts, 5,000 milliamp hrs., £2 6s. 6d. WT, 30 volts, 10,000 milliamp hrs., £2 4s. 0d. Exide L.T. Batteries and Drydex H.T. and Grid Bias Batteries are recommended for the "W.M." Super 60 Receiver. From Exide Service Stations or any reputable dealer. Exide Service Stations give service on every make of battery

Exide Batteries, Clifton Junction, near Manchester. Branches at London, Manchester, Birmingham, Bristol and Glasgow.

M12

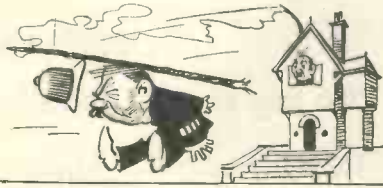
UNDER MY AERIAL

**HALYARD'S CHAT ON
THE MONTH'S TOPICS**

**SPECIALLY ILLUSTRATED
BY GLOSSOP**

March Gales

HAVE the March gales done any wireless damage in your locality this year? Sometimes they do catch unfortunate listeners unawares, you know, and the damage may be serious.



His aerial mast was blown down

The worst case I have heard of this year is that of a new acquaintance of mine who, rather foolishly, brought the lead-in from his aerial straight through a hole in a window frame to the aerial terminal of the set. On one of our worst nights, a night of heavy rain and strong gales, his aerial mast was blown down. The resultant pull on the unanchored lead-in caused the set to fall from the table on which it stood to the floor.

As you would expect, the damage was pretty serious. There were three valves in the set. One was broken, the other two survived, and it is a most interesting point that the surviving valves were in spring holders, whereas the broken valve was in a solid holder.

The 2-volt accumulator which was connected to the set was also pulled to the floor. There was a bad crack in the glass case but, by a lucky chance, very little acid escaped.

There may be more gales yet, so it would be just as well if you had a look round your aerial installation to make sure all is secure. And don't have an unanchored lead-in from aerial to set; it isn't wise!

Via Mathematics

You remember my mathematical friend, don't you? I have mentioned him to you on rare occasions in these notes. The reason I do not mention him more frequently is that I do not often find use for his mathematics. However, I dug him out the other day to discuss with him America's

very latest television sensation.

"Have you seen the latest television news from America?" I said to my mathematical friend.

"You mean the news regarding the Farnsworth tube, don't you?" asked my mathematical friend, as he took off his mathematical glasses and polished them on the mathematical frictionless polisher he carries in his waistcoat pocket.

"Yes. It appears that this young mathematical wizard, P. T. Farnsworth, of California, claims to have invented the television valve. I have always maintained that television demanded its own valve, and that television would never be possible until the television valve was evolved. Do you think this man Farnsworth has really done it? If he has it is terribly exciting."

"Why do you ask me?"

"For the simple reason that the reports say that Farnsworth first worked the whole thing out mathematically. He then set up the apparatus and it worked immediately. Do you think such a thing possible?"

"Certainly I do. I should say it was most suggestive of success. Let me remind you that Clerk Maxwell conceived the whole theory of wireless waves mathematically long before Hertz made his first experiments. Let me also remind you that Leverrier and Adams calculated the orbit of Neptune long before Galle first saw the planet. To my mind it is the most promising thing about the Farnsworth television tube that the inventor first worked the idea out mathematically."

What do you think of all this? I am afraid my mathematical friend took me a little out of my depth. Perhaps we shall have further news soon.



America's latest television sensation

The Boat Race

The nearness of Boat Race day serves as a pleasant reminder that the season of outside broadcasts of big sporting events is once more upon us. I suppose the Oxford and Cambridge Boat Race is easily the most popular of our outside broadcasts, and that, in all probability, very many more people listen to it than to any other similar commentary.

How many times have you actually seen the Boat Race? I have seen it on two occasions, but I doubt if I shall ever go to see it again, for I think it is a much better proposition to stay at home and listen to the broadcast commentary.

If you journey to the Putney-Mortlake course, you do not see very much of the race, even with the best of luck, but if you listen at home you can follow the race from begin-



The most popular of our outside broadcasts ning to end, and you can get far more excited than if you were on the river bank waiting to catch a fleeting glance of the crews as they swing by.

After the Boat Race, which, in your opinion, is the next most popular outside broadcast? The Derby, the Grand National, the King's Prize at Bisley, Wimbledon tennis, the Schneider Cup, and the Association Football Cup final make a pretty formidable list from which to choose.

The B.B.C. has always expressed itself as being ready and anxious to receive suggestions and new ideas from listeners regarding outside broadcasts. Have you an idea you could send along this year?

Wireless and Influenza

Did the influenza epidemic last month reach your district and were you one of the victims? I thought I

(Continued on page 310)

for 100% results

Telsen Valve Holders. Pro. Pat. No. 20286/30. An entirely new design in Valve Holders, embodying patent metal spring contacts, which are designed to provide the most efficient contact with the valve legs, whether Split or Non-split. Low capacity, self locating. Supplied with patent soldering tags and hexagon terminal nuts.



Telsen Four-pin Valve Holders.
Price 1/- each

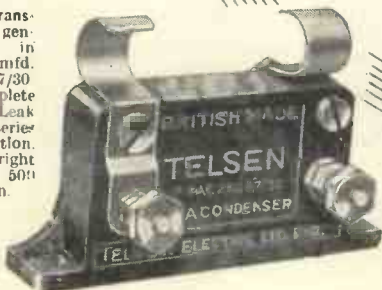


Telsen Five-pin Valve Holders.
Price 1/3 each

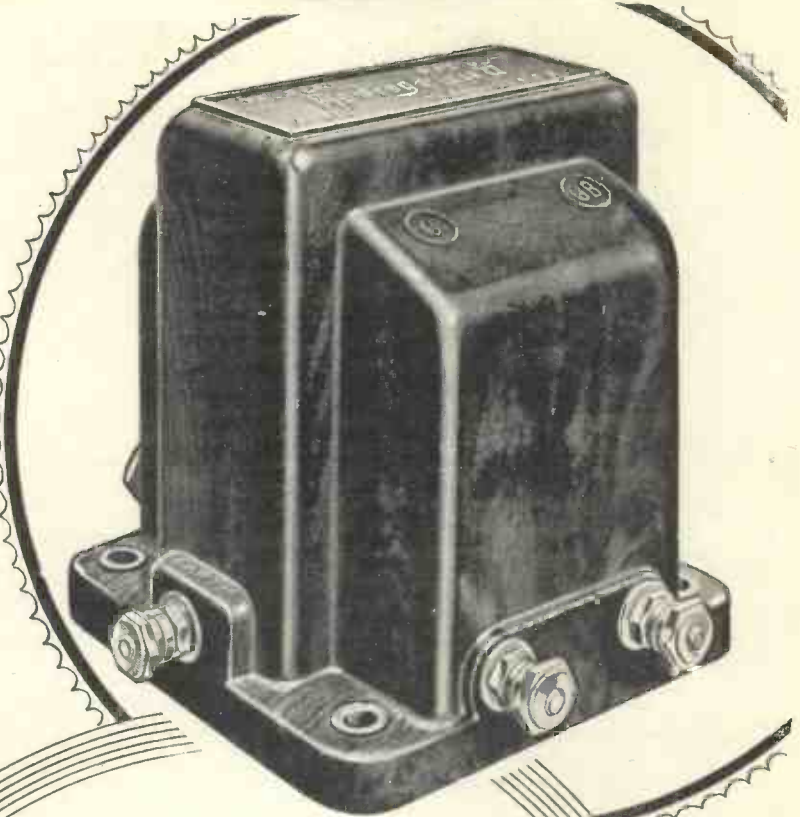


Telsen Grid Leaks. Absolutely silent and non-interfering, practically unbreakable, cannot be burnt out, and are unaffected by atmospheric changes. Not being wire wound, there are no capacity effects. Made in capacities 1, 1.2, 3, 4 and 5 megohms.
Price 1/- each

Telsen Fixed (Mica) Transformers. Shrouded in genuine bakelite. Made in capacities up to .002 mfd. Pro. Pat. No. 20287/30 (1930) supplied complete with Patent Grid Leak Clip to facilitate series or parallel connection. Can be mounted upright or flat. Tested on 500 volts. Price 1/- each.



Adv. of Telsen Electric Co. Ltd., Birmingham



TELSEN L.F. TRANSFORMERS

"ACE" - ratios 3-1 and 5-1 8/6
"RADIOGRAND" - 3-1 and 5-1 12/6
"RADIOGRAND" super ratio 7-1 17/6

A good circuit can be ruined by indifferent components. Why risk disappointment when you know that Telsen Components alone can give the maximum volume with wonderful tonal quality?

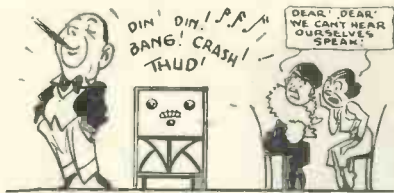
Technical designers and amateur enthusiasts agree that for 100% results you MUST fit



Telsen H.F. Chokes. Designed to cover the whole wave-band range from 18 to 4,000 metres. Extremely low self-capacity, shrouded in genuine bakelite. Inductance, 150,000 microhenries. Resistance, 400 ohms.
Price 2/6 each.

TELSEN COMPONENTS

UNDER MY AERIAL—Continued



Wireless is a boon indeed

was going to escape, but it got me in the end.

Influenza is not a pleasant subject I know, but I wonder if you have realised how very useful wireless is when you are down with that or some other illness. Of course, if you are really ill you do not want to be bothered with anything at all, but when you begin to improve towards convalescence, wireless is a boon indeed.

The first I heard of my wireless after my attack of influenza was a Sunday evening service. I was in bed, and someone turned on my three-valve set in the room underneath, and I did enjoy that Sunday service, especially the singing.

After the worst of my attack was over, although I had to stay in bed, I managed to do quite a lot of wireless in the way of reading, and I brought my reading up to date, especially as regards the American periodicals I take regularly, and which George borrows equally regularly.

I think where wireless helps the most, though, with regard to illness is during the period when you are up and about but are not allowed to go out. If you can get at the old set, and if you can do a bit of constructional work now and then, time is unlikely to hang heavily on your hands. In fact, it is far more likely to go too quickly.

Loud-speaker Names

"George, old man, before you really do go, there is a little point I should like to get clear on," I said to my technical adviser just before midnight.

"Well," said George, "late as it is, it would be a pity to let you go to bed with that worried look on your face. Your point is—?"

"Loud-speaker nomenclature."

"Proceed."

"How many kinds of loud-speakers are there, George?"

"First, there's the bad old type

with the straight spout."

"I am not troubled about the shape of loud-speakers, George. How many classes of loud-speaker are there according to the sound-reproducing movement? For instance, is a moving-coil loud-speaker a dynamic loud-speaker, and is a dynamic loud-speaker always a moving-coil loud-speaker, and what is a static loud-speaker? I'm thoroughly foodled."

"And so you will continue to be if you fire questions at that rate. Listen carefully. First of all there is the electromagnetic type of loud-speaker, which may have but two poles, like the earth, or sixty, like the Wigan barbers. In a horn type of loud-speaker there is a diaphragm. In the cone type the cone is the diaphragm."

"I think I know all that, George. What about the dynamic loud-speaker?"

"A vulgar contraction for electrodynamic, the whole word signifying electrical movement, the moving coil. In the electrodynamic or moving-coil loud-speaker, the moving coil, wound on a cylindrical extension of the cone, moves in the strong magnetic field of the surrounding energised winding."

"The static type, George?"

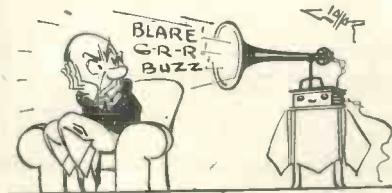
"Electrostatic, if you please. Merely the condenser or capacity type—rather a promising type just now."

"Has that type a winding of any kind, George?"

"No, but why all these questions about loud-speakers at this time of the night?"

"I'll tell you, George. I happened to get hold of a list of talking-film apparatus for cinemas, and in that list it said that all moving-coil loud-speakers were woolly and that it was only by using the dynamic type that perfect speech could be obtained. What have you to say to that, George?"

"Bedtime, my boy; bedtime."



Bad old type with the straight spout

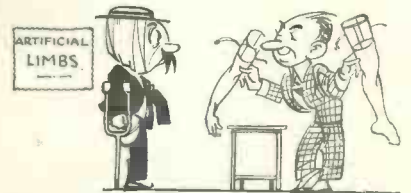
Mains Errors

This last month I have spent a great deal of my time over that most important side of wireless, all-from-the-mains receivers. Although the progress I have made in this work has been very pleasing, I am left with the feeling that all will not be well until our electric supplies are standardised throughout the country.

At present it is so very easy to make mistakes in apparatus and so be held up for days waiting for the right article.

Let me tell you of a recent experience of mine regarding a mains receiver I started to make. It was quite a straightforward affair and I ordered the necessary new parts by post. When they arrived I found that the rectifying valve supplied was a half-wave rectifier, and I had ordered a mains transformer for a full-wave rectifier.

I sent the half-wave rectifying



Ordered the necessary new parts

valve back. Meanwhile, the mains transformer duly arrived. On looking at it I was thoroughly disappointed, for it was suitable only for a supply of 200 volts, whereas I needed a transformer for 250 volts. Back the transformer had to go.

It was a whole week before I received the correct type of transformer, and I disliked having my work held up for so long.

Mistakes of this kind will happen while we have so many different kinds of mains supply, and I do wish the authorities would hurry up and standardise electric supplies throughout the whole country.

Too Tempting

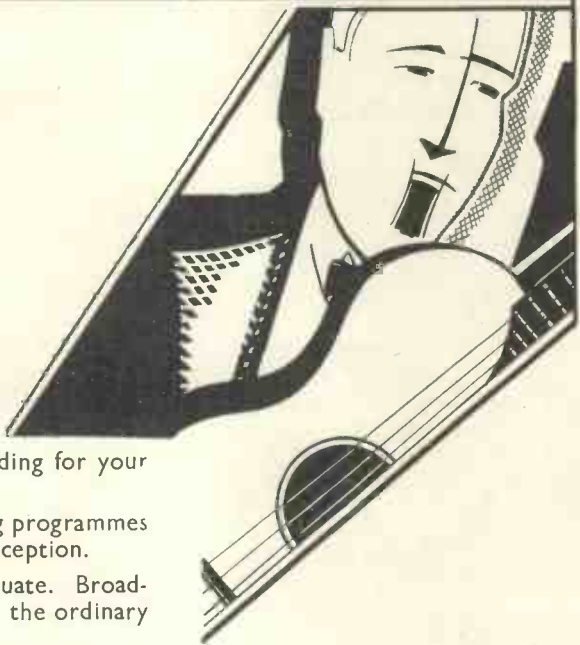
It isn't often that I refer to my wireless correspondence, but I really must give you this extract from a letter I have just received from an undergraduate of one of our universities, who is a near relation of mine.

Although he does not take an interest in the constructional side of wireless, he is a good listener, and he

(Continued on page 312)

IT HAD TO COME...

A BATTERY TO COPE WITH MODERN BROADCASTING CONDITIONS.... A PERTRIX BATTERY



More powerful stations are bidding for your attention.

More beautiful, more interesting programmes worthy of clearer and better reception.

The old-time battery is inadequate. Broadcasting activities have outgrown the ordinary dry battery.

So Pertrix came—the NON-SAL-AMMONIAC Dry Battery—to meet the demand of radio listeners, a demand for a battery that improved reception . . . that did not deteriorate when not in use . . . that lasted at least 60 per cent. longer.

Ask your dealer—he will tell you all about Pertrix and the type most suited to your set.

Did you know that you can get Pertrix Dry Batteries for your flash-lamp, too? They are 6d. each, with an unlimited guarantee.

PRICES:

60-v. Standard	8/-
90-v. "	11/9
100-v. "	13/-
120-v. "	15/6
60-v. Super	13/-
100-v. "	21/-
120-v. "	25/6
150-v. "	31/-



PERTRIX

TRADE MARK

NON-SAL-AMMONIAC DRY BATTERIES

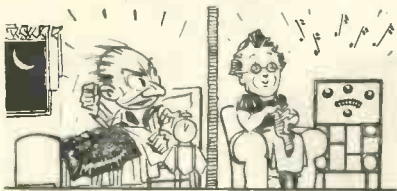
"The Samson of Radio"

Advt. of PERTRIX LIMITED, Britannia House, 233, Shaftesbury Avenue, London, W.C.2
 Telephone: Temple Bar 7971 (4 lines) Works: Redditch Telegrams: Britanicus, Westcent, London.

P107

Please mention "Wireless Magazine" when corresponding with advertisers

UNDER MY AERIAL—Continued



My landlady has a powerful set

is specially interested in football broadcasts. Here is the extract from his letter:

"My landlady has a powerful set. It doesn't worry me much except when there is some queer vaudeville on, and then I can just hear all the cackling and the shinygazee without being able to distinguish the words, which is maddening.

"Last Saturday afternoon I heard the bulk of the International Rugger match broadcast *via* my landlady's set and the wall. I was trying to write an essay, but I found my attention wandering to the football broadcast, so I finally gave up the struggle, opened the door of my room, and so heard all."

Can't you sympathise with the boy trying to write an essay, on a Saturday afternoon of all times, and having

ultimately to give up the struggle against the football broadcast?

By the way, don't write and ask me what shinygazee means. I haven't the faintest idea.

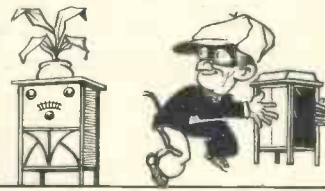
Wireless Plus

What do you think of the latest American effort in home entertainment, namely, a wireless set, a gramophone, a silent-film projector, and home talking-film apparatus all included in the one big instrument?

To me it seems a little puzzling why all these extra things should be attached to wireless, for I can never look upon wireless as being anything other than a thing apart—a complete pastime and entertainment in itself.

I suppose this adding to wireless began with our radio-gramophone sets. A great deal may be said in favour of the electrical reproduction of gramophone records and it is certainly convenient to some people to be able to use the low-frequency amplifying side of their receivers for gramophone work.

To an old stager like myself it seems as if there is as much, if not more, to be said in favour of keeping



Keeping the gramophone and wireless apart

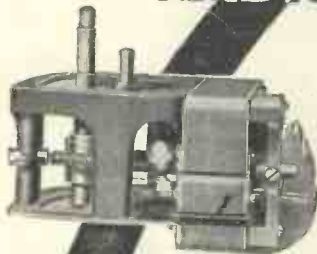
the gramophone and wireless apart. Certainly I have always preferred to play my gramophone records with a separate amplifier built for the purpose.

However, the gramophone has become definitely allied with the wireless receiver, and that's that. Now the Americans have added silent films and talking films to the radio gramophone. Why?

Well, there is absolutely no reason for the addition of silent-film apparatus to the radio gramophone except that of a desire to put all the home-entertainment eggs in one basket.

There is just a slender reason, though, for the addition of the talking-film apparatus to the radio gramophone, and that is that the gramophone can be used.

CONVERT your RECEIVER into a RADIOGRAM



The new Paillard Junior 2-pole asynchronous Induction Motor is made on an entirely new principle (patent applications pending). It gives a perfectly smooth drive without a hint of interference, and has an ample margin of power to play the heaviest recordings. Current consumption about 13 watts. 4 4 1/2" - 2 1/2". No. 1501 for 100-130v, No. 1503 for 200-250v. Price complete with 12" Turntable and combined brake and switch, Automatic f rake 2/6 extra.

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POWER RHEOSTATS - - -
POTENTIOMETERS



Whether you require a volume control, power rheostat, or heavy-duty potentiometer, there is a Centralab to take care of your needs.

These famous controls are used as standard equipment by the world's most prominent manufacturers of radio receivers and they are available for you in numerous resistance ranges.

IF YOU HAVE NOT RECEIVED A COPY OF THE NEW CENTRALAB FOLDER, WRITE FOR ONE TO-DAY.

TO MANUFACTURERS

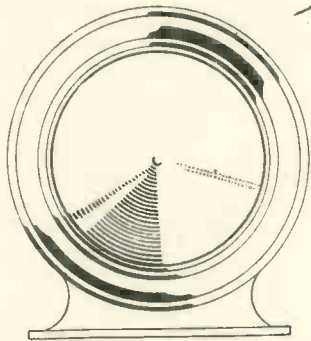
Centralab Volume Controls are available in various styles and forms, both single and dual for manufacturing purposes. It will pay you to write for a copy of "Data on Volume Controls."

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With the Eta Valve, purity of tone is only one of many good qualities. Above all, it is dependable. It is a quality valve—but a quality valve at the right price. Meticulous care in manufacture, both in choice of materials, design and workmanship ensures a superlative performance in operation, low current consumption, and long life.

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Advertisers like to know whence the business comes—please mention "W.M."

Activities at Savoy Hill

WHEN Mr. Baldwin, as Conservative Prime Minister, announced in March, 1928, that the ban on controversial broadcasting was to be removed, he emphasised that it was a discretionary power which was being placed in the hands of the B.B.C., and ever since then the Corporation has made a point of conforming to the unwritten law that the chief political parties should be consulted before anything of a controversial nature affecting them is put out from a studio.

This works fairly well in the case of the ordinary talks, where advance manuscripts are called for, as in the case of a recent series on the problem of unemployment; although even there the arrangement was not altogether satisfactory.

An Advantage

While two of the parties agreed to let the representatives of opposing parties see their manuscripts beforehand, the representative of the third party refused to disclose the line that he intended to take, thus giving himself some advantage over his competitors for the public favour. That, however, is another story.

Greater restriction is necessary in the case of debates. It is not the custom for debaters to submit a verbatim copy of their manuscripts; for it is felt that a debate can only develop logically as it proceeds. Hence the participants are only required to submit the general outline of their arguments.

Consultation Necessary

This is what happened in the case of a proposed debate on "Does Tradition Hinder Progress?" But the outline submitted was sufficient to show the desirability of putting the machinery of consultation into operation. And so the debate was postponed until this could be done.

The B.B.C. is not by any means obstructionist; but it has sufficient independence to determine that the treatment of political matters must be subject to absolute impartiality and that the best way of maintaining fairness in this respect is to submit all proposals for political broadcasting to the party organisations.

In this article Our Special Commissioner, who has exclusive knowledge of what goes on behind the scenes at the B.B.C. headquarters, discusses

Controversial Talks and Debates, Musical Education, Better Vaudeville, and "North Regional" Tests

Broadcasting must be a public and not a party service, an opinion which has been expressed in the House of Commons itself. The B.B.C. feels that it is far better that the conduct of controversial broadcasting should be clearly comprehended in that quarter than that any illusion should foment in the listener's mind as to the turpitude of Savoy Hill.

◆ ◆ ◆
"Whatever criticisms may be levelled against the B.B.C. on account of its musical activities, no one can blame it for lack of enterprise." So runs a grudging reference to the B.B.C.'s major activity in a popular journal.

What is the situation now, as seen by Savoy Hill, compared with the situation of eight years ago? It is this: The faculties of appreciation and discrimination in the public have improved as the result of broadcasting.

The B.B.C.'s contact with the listener through correspondence shows clearly that his musical education is on the up-grade and he is becoming his own judge; a point which has a subtle repercussion on the work of the music critic; for he is being relieved of his task of "guiding" the layman—at best a thankless job in days gone by—and is finding it necessary instead to "discuss" with his readers the music that matters.

The work of the programme builder has also changed considerably in the few years of broadcasting. He now regards the whole body of listeners as one group. He maps out the terrain so as to embrace some examples of all the fruits of the earth. He says: "You listeners must study the map and choose for yourselves the route which you will pursue and

the fruits which you prefer to gather."

This makes the listener his own programme builder and his is the responsibility of avoiding the discomfort of listening to those things which, although they may appeal to his neighbour, are distasteful to himself.

Now, it is, perhaps, an immense boon to give the listener the opportunity of hearing the best works of the master minds of music of all schools, but the B.B.C. feels that something more must be done to inculcate a knowledge of the unfamiliar.

Special Music Talks

One step in this direction has been taken in arranging musical talks about the newer school by Dr. Boulton, Percy Scholes, Constant Lambert, and Dr. Malcolm Sargent. This attempt to explain what the new musicians are aiming at comprehends composers like Arnold Bax, Debussy, Holst, Sibelius, Strauss, Vaughan Williams, Bela Bartok, Stravinsky, Hindemith, and Schonberg, whose works, it may be asserted, would be practically unknown to the average Briton but for the publicity afforded by broadcasting.

◆ ◆ ◆
As in the rest of the programme make-up, changes are continually being tried in vaudeville presentation with the object of improving technique and maintaining interest. One respect in which this influence has been expressed is in the different methods employed of introducing vaudeville turns.

Six Different Methods

Recently the vaudeville producer, Mr. Bertram Fryer, has tried six different means of doing this. He has had a singing compère, double pianos, a comedy compère, silent presentation (that is, the striking of a gong as the equivalent to the fall of the curtain in a variety theatre), an instrumental trio, and a feature vaudeville programme. These methods generally constitute in themselves vaudeville items of considerable merit.

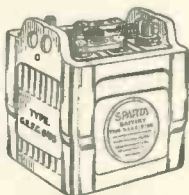
The singing compère, for instance,
(Continued on page 316)

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FULLER ACCUMULATOR CO. (1926) LTD., CHADWELL HEATH, ESSEX

ACTIVITIES AT SAVOY HILL—Continued

will possess a fine baritone or tenor voice and sing specially-written couplets to introduce an artiste, thus providing a musical chain throughout the programme. The two-piano method implies the engagement of such accomplished pianists as Fairchild and Lindholm. The comedy compère may be Tommy Handley or Fred Duprez.

The musical combination may consist of Albert Sandler's or De Groot's trio, who will provide a musical treat for listeners in addition to fulfilling their definite objective of linking the items of the programme.

Musical Treat

A later form was the introduction of four artistes under the name of "The Foursome," who provided musical-comedy interludes between items. They undoubtedly lifted the routine of "announcing" the items of the programmes out of the dull monotony which is inevitably associated with the uninspiring formula, "And now Stainless Stephen is going to entertain us."

Some of the ideas adopted by the

B.B.C. have already found their way into the halls, where comedians are employed as compères for revue.

The policy of the vaudeville producer now is to divide his presentations into two sections, the first embodying the spirit of vaudeville in its most popular form, the other appealing to the listener who has been attracted to the older type of vaudeville, but desires a better kind of programme, including vocalists, sketches, harp and oboe solos, quartets, and comedians of a class that is appreciated by admirers of the broader type of vaudeville as well as of the more subtle type.

The search for talent for the lighter side of broadcast entertainment is never-ceasing, and the B.B.C.'s aim is to provide the supply which is undoubtedly the demand of a very large proportion of listeners.

When these lines were written, the North Regional transmitter had merely made an unmodulated test, and in preparation for the full programme tests a booklet was being compiled by the engineers at Savoy

Hill for the benefit of Northern listeners who will, by the time they read these remarks in print, know more about the reproduction quality.

The wavelength of the North Regional programme transmitter is 479.2 metres, which is the best wavelength allotted to the B.B.C., with the exception of the 1,554.4-metre wavelength employed by Daventry National. The second transmitter of the Northern region, which is radiating the National programme, is using a wavelength of 301.5 metres.

Service Ranges

Some listeners in the region will fall within the service range of the Regional programme—because transmissions on long waves travel better than those on medium waves—but outside the service range of the National programme transmitter on 301.5 metres. The object of the B.B.C. is to give the Regional programme the maximum range, as the National programme is obtainable by listeners who cannot tune down to 301.5 metres from the 1,554.4-metre transmitter at Daventry.

For the Wireless Magazine "SUPER-SIXTY" REGENTONE MODEL W.5

The designer has tested the Regentone A.C. Combined Unit Model W.5 (H.T. with L.T. Charger), and found it in every way suitable for the WIRELESS MAGAZINE "SUPER-SIXTY."



Electrify your set with the Regentone Combined Unit Model W.5. Specified for the "Super-Sixty" it is suitable for all portables (it fits inside) or any popular 2-, 3- or 4-valve receiver. Your radio electrified by Regentone will be more economical, more convenient and more reliable.

Regentone Combined Unit Model W.5 (H.T. with L.T. Charger) for A.C. Mains. Output 120-v. at 20 m/a. Three tappings. Size 9 x 5 x 3 1/2". Price £5.17.6.

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A NEW MULLARD 2-VOLT VALVE FOR MODERN RECEIVERS

Type P.M. 1HL has been particularly designed for use in aperiodic choke-coupled high frequency stages such as are incorporated in many modern portable receivers, but it is equally efficient as a high frequency amplifier in stages employing tuned coupling circuits, or as a detector when followed either by a high impedance low frequency transformer or by a resistance-capacity coupling incorporating an anode resistance of approximately 100,000 ohms.

CHARACTERISTICS.

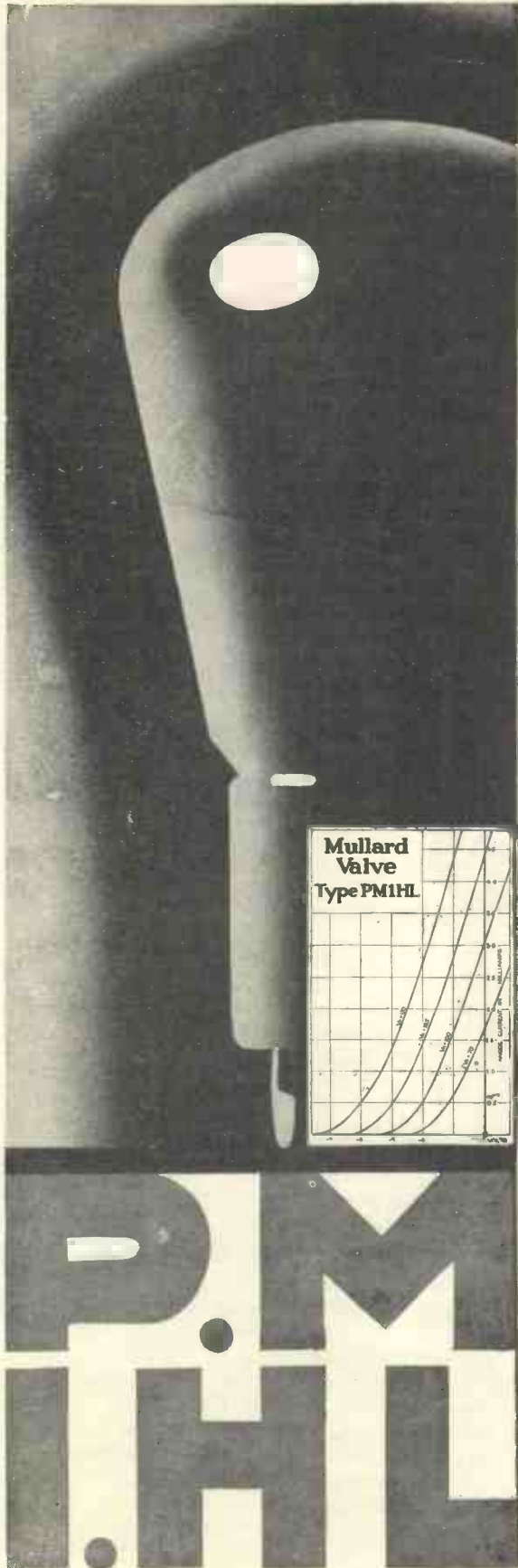
Maximum Filament Voltage	- - -	2.0 volts
Filament Current	- - -	0.1 amp
Maximum Anode Voltage	- - -	150 volts
*Anode Impedance	- - -	18,500 ohms
*Amplification Factor	- - -	28
*Mutual Conductance	- - -	1.5 mA/volt

*At anode volts 100: grid volts zero.

PRICE 8/6

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Better service results from mentioning "Wireless Magazine" when writing to advertisers

Arks

Compiled by JAY COOTE

A LISTENER'S LOG

IT was only to be expected that as soon as the various broadcasting associations started operating high-power transmitters their thoughts would turn to the construction of better and larger studios.

In many Continental countries this has already come to pass and concerts are now broadcast from halls in every respect equal in size and acoustic properties to the houses of entertainment from which operatic and other musical relays are carried out.

Palatial Headquarters

Moreover, growing in importance, many programme organisers have built for themselves palatial head-

quarters. In some instances, existing premises have been adapted for the purpose but such countries as Great Britain, Germany, Czechoslovakia and Austria have designed special headquarters to house the innumerable studios required.

From a technical point of view it is stated that the building is eminently favourably constructed inasmuch as its four towering minarets will be utilised for the aerial and the nave will lend itself admirably to the installation of a super-studio.

At the present moment we hear so much about the proposed construction of super-power "giants" in Europe that the mere suggestion to erect a modest 15-kilowatt or so passes unnoticed. Yet, notwithstanding the invasion of these broadcasting Titans we may find ere long an array of smaller transmitters of which the signals are not to be ignored.

shall find Radio Paris, Poste Parisien, Radio Toulouse, Lille, Bordeaux-Lafayette and Strasbourg, all transmitters which may provide entertainments easily captured in the British Isles.

For the past three years the Belgians have daily clamoured for the possession of more powerful broadcasting stations and their appeal led to the constitution of a Government organisation, L'Institut National Belge de Radiodiffusion.

Angry Fans

Since February 1 last, when the new Velthem-Louvain twin transmitters were brought into operation, the Brussels newspapers have seen their columns filled with hundreds of letters received from angry radio fans.

Well, if you have heard either Radio Bruxelles or Radio Velthem you will sympathise with them, as the generator hum from both these stations has been such that on most occasions when I have tried to listen to their concerts I have rapidly left them for more musical entertainments elsewhere.

Moreover, to satisfy all parties the Belgian Government has granted permission to the innumerable political bodies to air their views on different days of the week, with the result that the programmes are swamped with speeches.

Each party also appears to run its own patriotic song *ad nauseam* and on alternative evenings from these studios you will hear in turn, *La Brabançonne*, the *International*, and the *Flemish anthem (Vlaamsche Leeuw—Flemish Lion)*, commemorating the Lion of Flanders.

State of Chaos

Apparently there is no censorship and the suffering mike is used for propaganda, publicity and even for libellous attacks on prominent public notabilities. For the present, at least, Belgian broadcasting spells chaos and somewhat recalls the old fable of the Frogs who desired a King and chose a nasty, big Bull as an Emperor.

There are some countries in which no established organisation can thrive
(Continued on page 320)



PORTABLE TIME IS COMING !

And here is a cheap set that gives excellent results. It is a Kone-Dope five-valver and costs only 9 guineas. The anode-current consumption is only 8½ milliampères and among the foreign stations received during a test were Lyons, Rome, Katowice, Madrid, Paris PTT, Milan, Budapest, Eiffel Tower, Radio Paris, Huizen and Kalundborg. Altogether, very good value for the money

quarters. In some instances, existing premises have been adapted for the purpose but such countries as Great Britain, Germany, Czechoslovakia and Austria have designed special headquarters to house the innumerable studios required.

Church As A Studio

From Turkey now comes the report that the historical Mosque of Aghia Sofia, previously the orthodox church of St. Sophia, at Istanbul, is to be turned into a broadcasting station, and is to be mainly used for the purposes of Mohammedan propaganda.

Such will be the case of Radio Beziens, which until now has only attracted the attention of local listeners. Funds have been collected in and around the French wine-growing districts for the establishment of a 15-kilowatt plant in order that due publicity—mingled with musical programmes, as usual—may be given to the products of the local industry. Providing they secure a lady announcer, *Wine, Woman and Song* should be their slogan!

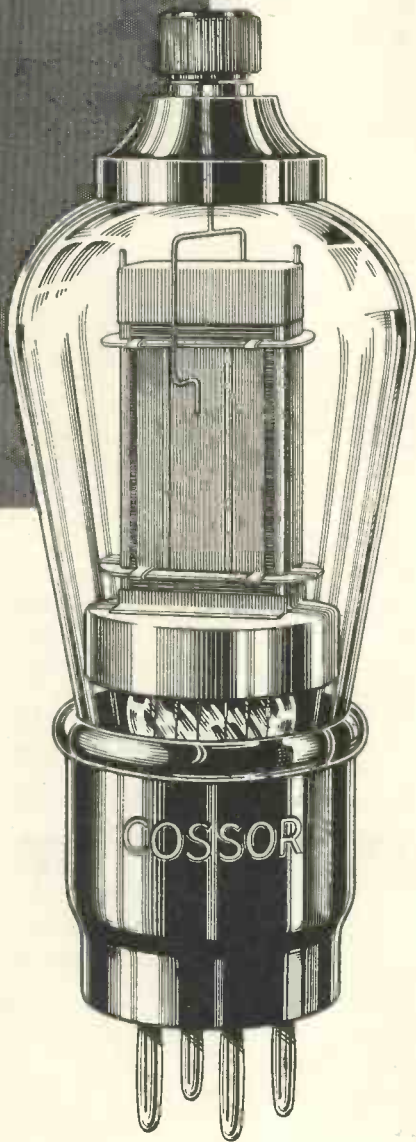
Within the next few months France will not be so badly off as has hitherto been the case in regard to high-power stations, as within her frontiers we

Specified for the "Super 60"

*—because of its high
effective amplification*

The Intermediate-frequency Amplifying Valves in a super-heterodyne Receiver are largely responsible for its success. Upon their efficiency depends the performance of the Set. That is why two Cossor 215 Screened Grids have been chosen for the "Super 60."

The effective amplification available with any Screened Grid Valve is largely controlled by its inter-electrode capacity. The lower this self-capacity the greater the effective amplification available. In the new Cossor 215 S.G. residual capacity has been reduced to the low order of .001 micro-microfarad—lower than any other Screened Grid Valve on the market. Due to this—and also to the absence of grid current—the new Cossor 215 S.G. permits a degree of effective amplification which, a year ago, would have been considered utterly impossible. Illustrated folder giving full technical details sent free on request.



Cossor 215 S.G. 2 volts,
·15 amp. Impedance 300,000.
Amplification Factor 330.
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1·1 m.a/v. Normal working
Anode Volts 120. Positive
Voltage on
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THE NEW
COSSOR
215 S.G.

HIGHEST EFFECTIVE AMPLIFICATION

A LISTENER'S LOG—Continued

and, believe me, Belgium is one of them.

As the new high-power stations take the air so I have to re-cast my list of what I term *reliable* daily transmissions. You will understand from this that they are the broadcasts which can be obtained on any evening and especially when you wish to show to your friends what that new set will do. Calculations, however, are often upset on the advent of a newcomer.

Two Examples

As an example, Eiffel Tower frequently marred my reception of Warsaw, but now the Pole has blossomed out in all his strength the Frenchman must take a back seat. Again, Radio Brussels with its 15 kilowatts was inclined to swamp Milan but the latter now threatens to grow into a 60-kilowatter.

What will happen when the new Radio Toulouse is launched with a reinvigorated Lvov in his immediate vicinity I do not know, but I can make a shrewd guess. So it goes on and it is likely that the congestion will be much worse before it can be alleviated.

We may have to wait for the next Madrid Conference, and 1932, comparatively, is still a long way off.

Stations Heard Well

Anyhow, at time of writing these are the stations to be heard easily on almost any evening: Huizea or Hilversum (whichever is working on 1,875 metres), Radio Paris, Lahti, Moscow (Trades' Unions), Berlin, Warsaw, Eiffel Tower, Motala, Kalundborg, Oslo, and Leningrad in the upper band; of the others I choose: Nürnberg, Moravska-Ostrava, Heilsberg, Bratislava, Turin, Breslau, Strasbourg, Radio Barcelona, Mühlacker, Algiers, Lvov, Radio Toulouse, Stockholm, Rome, Brussels, Vienna, Budapest, and Ljubljana.

I have purposely avoided mention of stations which persistently fade.

With such a list at my elbow I have no difficulty in securing a wide choice of programmes and should consider myself very unlucky if among them I could not find an entertainment permitting me to while away an hour or so when the home stations broadcast items unlikely to interest me. And,

on Sundays, I make a point of getting away from England altogether.

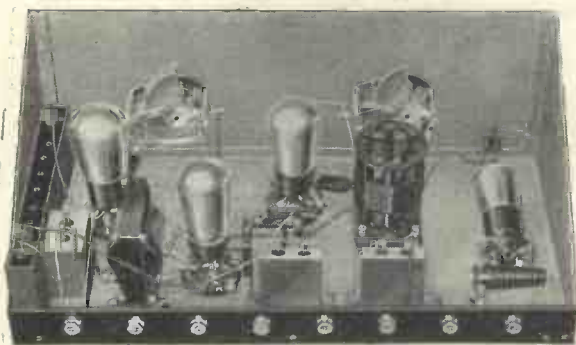
Apparently the Soviet authorities are not satisfied with the range of the Moscow (Trades' Unions) station and are contemplating something on a much bigger scale.

In accordance with the Five Years' Plan, to which lengthy references are made in every broadcast, the Russians are erecting at Noghinsk, a suburb of the capital, a 500-kilowatt station which will fulfil, they hope, what they require of it. But this is not the end of the constructional programme, for the reorganisation of the broadcasting system calls for eleven new 100-kilowatt stations and a further twenty-eight transmitters capable of radiating some ten kilowatts.

In 1933

If all goes "according to plan," these will all be working by the end of 1933. In the meantime, at Kolpino, the new 75-kilowatt destined to take the Leningrad programmes is nearly ready and should be testing at any moment.

HOW YOU ENVY HIM!



EDDYSTONE "HOMELAND FOUR"

Short-wave Receiver Kit of Parts

Designed for Home construction and capable of reception of S.W. programmes at loud-speaker strength over vast distances and under adverse conditions. Simple to operate—only one tuning dial. Smooth reaction control and no unpleasant capacity effects. Wavelength range from 12.5 to 85 metres and from 250 to 550 metres. Coils for any between wavelengths up to 2,000 metres can be obtained. Built on a metal chassis ready drilled for assembly, and includes all components, wires, screws, etc., needed to make up the complete receiver.

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Booklet with full constructional details, diagrams and descriptions. Post free 6d.

SEND NOW FOR FREE LIST No. 50

That fellow with the wonderful Short Wave Set . . . built it himself, you hear . . . what enormous *Range* and *Power*! Stations thousands of miles away come in easily at loud-speaker strength—Schenectady, Sydney!

YOU, TOO, CAN EASILY BUILD SUCH A SET. But build it with **SPECIALLY DESIGNED COMPONENTS**—not job lines—build it properly with parts made by specialists and designed to the last intricate detail for its *important, individual* share of the work. Build it *now, easily, yourself!*

The **SUPREME**

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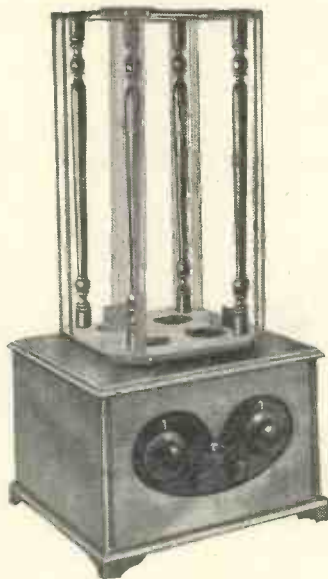
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With every KIT "A" we give gratis 1 Konekit containing 5 yards glazed tinned copper connecting wire, ebonite terminal block 2" x 5", set of Cortabs de luxe, one pair Bulgin grid bias clips, fixing screws worth 4/-.

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Or Easy Way—12 monthly payments of **11/-**

Less Valves, Cabinet and Frame

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One 50,000 Rotorohm volume control ... **6:0**

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SET 6 VALVES. 6 Mullard Valves (1 PMrLF, 2 PMrHF, 2 PMr2 and 1 PM2) **£3:16:0**
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5 T.C.C. 1-mfd. Fixed Condensers, type 50	14	2	
2 Ormond .0005-mfd. Variable Condensers, type R.426, with S.M. dials	12	0	
1 Bulgin Grid-leak Holder	6		
9 Telsen 4-pin Valve Holders	9	0	
7 Belling-Lee Wander Plugs and 2 Belling-Lee Spade Terminals	2	6	
2 Keystone Spaghetti-type Resistances, 15,000 and 20,000 ohms	3	0	
1 1-meg. Grid Leak	1	0	
1 Rotorohm 50,000-ohm Potentiometer	6	0	
1 Ferranti A.F.8 L.F. Transformer	11	6	
1 W. B. Three-point Switch	1	6	
Konekit, containing 5 yards glazed connecting wire, ebonite terminal strips 2½" x 4" with connecting terminals, set of Cortabs de luxe			GRATIS
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To Messrs. Peto-Scott Co. Ltd., 77 City Road, London, E.C.1

Please send me **C.O.D./CASH/or H.P. TERMS**—(Cross out items that do not apply)

- KIT "A" Super 60 Set.
- Duo-Range Frame Aerial Kit or completely assembled Frame.
- Set 4 Wearite Super-het Coils. for which I enclose Cash/H.P. Deposit £ s. d. Or I will pay the postman
- Set of 6 valves for Super 60.
- W5 Regentone Eliminator.
- Specified Cabinet for Super 60. (State whether Oak Cabinet is required)

Name..... Address..... WM4/1931

Advertisers take more interest when you mention "Wireless Magazine"

TEST REPORTS ON THE SUPER 60

AN APPROVED KIT

From the Peto-Scott Co. Ltd., of 77 City Road, E.C.1, we have received a Super 60 constructed from a Pilot kit. The price of this with cabinet, frame aerial and a set of Mullard valves is £11 16s. 6d.

This set has been tested by the designer, W. James, and found to be satisfactory in every way.

If desired this Pilot kit for the Super 60 can be obtained on an easy payment - by - instalments scheme.

Details of this and other kits will be found among the advertisements in this issue.

IF you have any doubts about the Super 60, read the following report from a Palmers Green reader of WIRELESS MAGAZINE:

Many thanks to all concerned for the Super 60. I have had my model working now for nine days and have learned to fully enjoy its power and selectivity.

The easy way in which one can tune in Mühlacker without the slightest interference from London Regional is almost uncanny, especially when one considers that my home is a bare five miles from the latter station.

Then the Fun Started . . .

I easily managed to assemble and wire the set on Saturday evening, February 21, and then the fun started. In came Rome. It nearly made the loud-speaker jump off the table and my wife suggested that I should make less noise. A slight movement of the potentiometer and the giant's roar became decent music.

In just under the hour I had bagged something like fifty stations, all on the medium band and all much too loud to be comfortable with the volume control about half-way round.

Since then I have logged sixty-five stations on the medium and eight on the high band that can be relied upon any time for good loud-speaker strength, and many more that are not so reliable.

Absolutely Stable

The set is absolutely stable; not once have I heard it oscillate unduly whilst tuning in the most distant stations and, furthermore, it is absolutely free from hand-capacity effects.

Tuning is simplicity itself, and the quality of reception remarkably good, more especially so when one remembers the squeaky noises to which we used to listen, more with pride than mere enjoyment, from the super-hets of the old days.

I had to depart to some extent from your original layout because I wanted to use my old cabinet, but I don't think that I have lost any efficiency.

I am sending herewith several snaps of the set. I am afraid that they are not very good, but I will make another

The Super 60 is the greatest constructional success yet and although details were published only in the previous issue we have already received a number of reports from users. Read the following letters from readers at Palmers Green, Bushey, Glasgow, Lowestoft, Alexandria (Dumbartonshire), and Prestatyn. Send in your report as soon as you have completed construction—and remember that we pay half a guinea for each photograph of a "W.M." set published in these pages

exposure or two in a day or so's time and if the results are better I will send you more prints.

Again, sir, many thanks for the best set yet.

A LONG and interesting report on the Super 60 has been received from a Bushey reader. He points out that he is "well within the swamp area":

I made up the Super 60 on the skeleton of an old neutrodyne receiver fitted with two S.L.F. .0005-microfarad condensers. I kept to the circuit exactly, except that I gave the screened-grid anodes a separate high-tension supply, making five taps in all.

As soon as the receiver was connected it started bringing stations in and for reception of stations it is all you claim for it. Last night, between 6.15 and 8.30 p.m., I actually tuned in fifty-eight stations on the loud-speaker.

The powerful ones were very good and quite suitable for entertainment, but on the weaker ones it rather seemed that everyone for miles round was having a lesson in tuning. All the stations from about Belfast down were very mushy and suffered from interference, morse, etc.

I was using a rather big hexagonal frame aerial (about 3 ft. across) which I had by me and which is, of course, a very good collector.

I tried for the longer waves by adding a loading coil to this aerial, but I got no response at all. I don't quite see why not, if the switch in the oscillator unit is O.K. Incidentally, for a reason which I cannot find, I have never been successful with the long waves where I live; they can never be got except by excessive reaction.

There are times when a heterodyne whistle is rather hard to get rid of, but I think this is probably due to the two

dials not being dead in tune with each other.

On the whole it is the most wonderful set I have made and I have hooked up quite a few. I am so pleased with it that I am going to rebuild it as a biggish portable, with enclosed frame and loud-speaker.

I should like to congratulate Mr. James on this production; his articles, etc., have always given me much interest.

P.S.—With the Super 60 the National station goes out in one degree.

A CENTRE-TAPPED FRAME

Constructors of the Super 60 will be glad to know that the Lewcos dual-range frame aerial is now provided with a centre tap on the long-wave winding.

This tapping is taken to a terminal on the base, marked No. 3 to correspond with the published connections of the Super 60.

It is understood that this modification has been made because of the great demand experienced for the Lewcos aerial for use in conjunction with the Super 60. A photograph of the aerial appears on page 256.

FROM a doctor in Glasgow comes the following report on W. James' Super 60:

I have been a super-het enthusiast since 1924 and have built at least fifty hook-ups of this very fascinating circuit.

I have just acquired a set of Super 60 coils and in one evening have built them into a set using a pair of very old Mullard PM12 screen-grid valves and a scratch lot for the other positions.

The results on the medium band are very much better than I have ever had before.

Astonishing Quality

The set is highly selective, very powerful, and gives excellent quality—astonishing quality in view of the small power valve used—and with a minimum of hiss and valve noise.

Mr. James and the makers of the coils are to be heartily congratulated on the production of this set, which, in view of the increasing power of foreign stations—not to mention our own regional prospects—ought to fill a real want.

I have not had time to wind a long-wave frame yet, so cannot report on long-wave reception, but see no reason to doubt that the results will be equally satisfactory.

(Continued on page 324)

TWO DATES TO REMEMBER

In response to a great number of requests W. James is working on two modifications of the Super 60—as a portable and for complete A.C. mains operation.

The portable edition of the Super 60 will be fully described in the May issue, published on Friday, April 24.

In the June issue, published on Friday, May 22, will be described an all-A.C. model of the Super 60.

Make a note of these dates; there will be a great demand for both these issues.

The greater excellence in volume and tone which an 8 pole unit alone can give

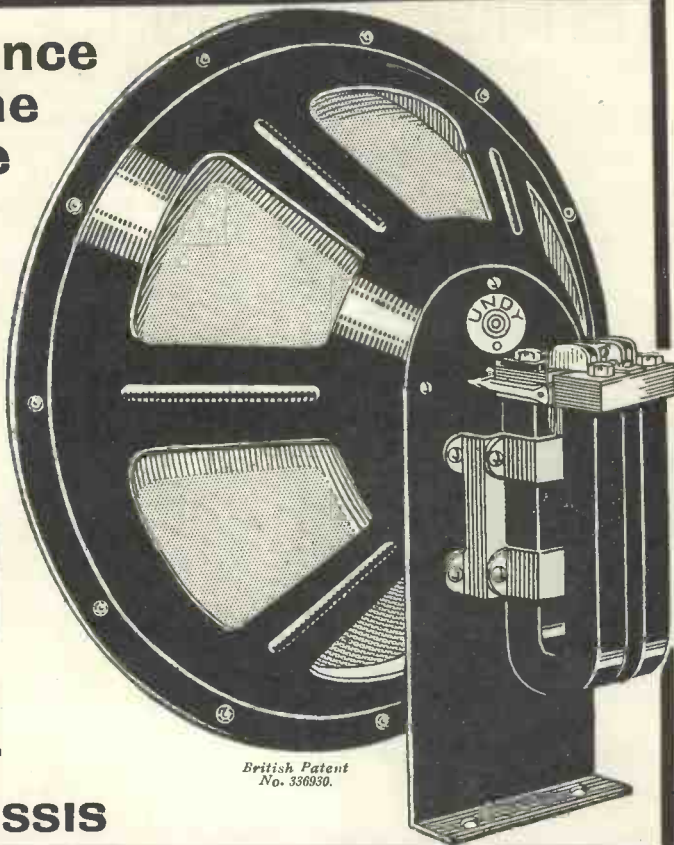
The "Undy" 8 pole Dynamic Unit and Chassis is so marvellously sensitive that it gives the maximum result from every receiver large or small. At the same time the "Undy" works on a minimum of power, rendering unnecessary expensive high power final stage valves. Hear the "Undy" and KNOW that none other can give such perfect result.

UNDY

8 POLE Dynamic UNIT

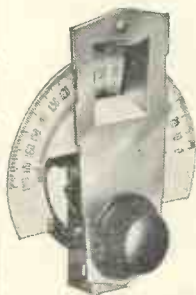
AND CHASSIS

50/-



British Patent No. 336330.

TWO PERFECT CONTROLS



POLAR DISC DRIVE
A knob control slow-motion drive, with scale behind panel. Smooth action; easily read scale, 0-180 in recessed aperture. Metal escutcheon. Bronze finish.

Price 5/-



POLAR DRUM DRIVE. An improved slow-motion drum drive. Smooth, precise action. Clear scale, 0-180. For single or ganged condensers mounted parallel to panel.

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24-page Catalogue Free on Request.

WINGROVE & ROGERS, LTD.
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NEW!

THE



WAVERLEY SENIOR

Radio-Gram Cabinet for panels

21" x 7"



Complete with 15" Base-board; actual panel opening 19 1/2" x 8 1/2"; and loudspeaker compartment measure 21" x 18" x 16". Height 40". Depth 16". As beautifully made as the famous "Waverley Junior", £7 5s. Oak, £8; Mahogany, £7 5s. If you have a 21" x 7" panel, choose the Cameo "Senior" Cabinet and have a Waverley Radio Gramophone.

See the "Waverley" Senior Cabinet at our Showrooms or send coupon for Catalogue to

CARRINGTON MFG. CO. LTD., 24 Hatton Garden, London, E.C.1. Phone: Holb. 8202. (Works: S. Croydon)

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Address _____

WM

IT MAY NOT HAPPEN TO YOU, BUT ???

7 DAYS' TRIAL

"RADIO MAST SMASHED."

The wooden wireless mast on the roof of the Air Ministry, London, was struck by lightning and split in two."

5/- C.O.D.

THE SPA SAFETY FUSE

F. E. HARMER & CO. Ltd.,
KNOWSLEY HOUSE, BOLTON.

It helps us if you mention "Wireless Magazine"

TEST REPORTS ON THE SUPER 60—Continued

GREAT enthusiasm for the Super 60 is expressed by a reader at Alexandria (Dumbartonshire). Read his report:—

On Saturday last I completed the Super 60 and am delighted with the results, which even surpass those you describe in your test report.

I copied your layout exactly, with the exception of the rear 2 in. of the baseboard, which I shortened. I have adapted the set to a transportable one, containing Regentone mains H.T. unit W5, and accumulator; and the frame aerial is wound on a 16-in. by 16-in. five-ply frame placed in the lid.

On first test, ten minutes after completion of the set, I logged thirty stations at good loud-speaker strength in broad daylight, on the medium waves.

Over three evenings listening I have logged an average of over sixty stations; most have real entertainment value.

On the local station, 5SC, I find that unless a suitable valve is used, the detector is inclined to be overloaded by the tremendous strength of signals—this at a distance of eighteen miles.

In the meantime, the search for the perfect set is at an end, thanks to the excellent Super 60.

FROM a dealer in Prestatyn we have received a copy of a report he sent to his factor about the Super 60:—

I am enclosing a copy of a letter which I sent to my factor, who kindly let me

have the first sample set of coils he received from the makers.

I made it up forthwith. I am usually very busy with repairs, but was interested in your description of the new set; hence my making up this set for my own use. I have no regrets and wish to congratulate you for your efforts:—

"I hope you will not be disappointed if I do not send you a full report of the Super 60, but I only finished wiring up less than an hour ago. I rigged up an old frame of 18's d.c.c. round a box, 12 in. by 15 in., 17 turns centre-tapped. With this I tried out the set.

"In half an hour I tuned in FORTY stations and then turned back to London Regional, which came in clear without interference. On tuning to the right the big German came in equally clear, and so did Graz on the other side of London Regional. I am looking forward now for the proper frame aerial and cabinet.

"I am using a Pertrix standard 120-volt battery; the total output is 11½ milliampères, using a Mullard L.F. as oscillator, H.F. as first detector, two Cossor 215 S.G.'s, Mazda H210 as second detector, and a PM2 as power. Very good, I am satisfied; you can recommend it.

"On the baseboard the components are mounted as specified, but I have used a 16 in. by 8 in. panel, as I have had to spread the variable condensers out, as I

have used two Polar Ideal condensers with the large dials."

THOSE interested in short-wave reception will be glad to read the following report on the Super 60 which comes from Lowestoft:

I obtained the parts for the Super 60 on Friday afternoon and got it working on Saturday evening, having done the construction in a few hours, and the results were all you claim for it.

On Sunday morning I rigged up a short-wave gadget and immediately got on to the usual Sunday morning amateur performance, getting Edinburgh and South Devon amateurs besides others, and between 22.00 and 22.30 hours got Radio Maroc (32.26 metres), Schenectady (31.48 metres), and Rome (25.4 metres).

For the last three stations I used a Dimic coil, No. SW2, and for the other band a Dimic No. SW3, loosely coupled to my ordinary broadcast aerial by a Unimic Coil No. 5, the Dimics being, of course, connected exactly in the same manner as the frame aerial.

The striking feature of this short-wave work was that I was able to use the .0005-microfarad condensers.

Condenser readings follow:

Station.	Oscillator.	Frame.
Maroc...	70	68
Schenectady...	62	66
Rome	32	42
Amateurs	112, etc.	28, etc

The NEW "W.M." LINEN-DIAPHRAGM LOUD-SPEAKER

Described in this issue

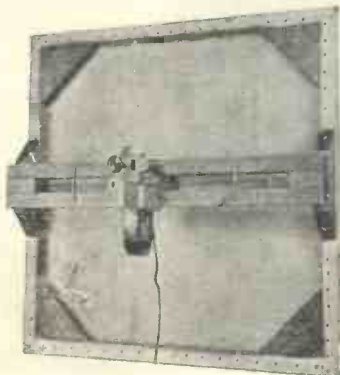
IN the Loud-speaker Supplement of this issue are found full particulars of a new-principle linen-diaphragm loud-speaker. The reproduction and tone of this speaker are far in advance of any yet designed and are equal to, if not better than, the majority of moving coils. It is capable of handling large volume without any trace of resonance or distortion. The secret is the diaphragm, which is made of specially doped Kone-Dope linen. We are supplying this linen at 5/- per sq. yd. post free. But for those readers requiring complete speakers, duplicates of the "W.M." model can be obtained, size 20 in. by 20 in., 29/6, post free. These are complete and ready for mounting unit and are

guaranteed to be exactly as the original made by the WIRELESS MAGAZINE Constructional Department.

Special Dope 1/- per bottle, post free, Double Chuck Extension Rod 1/-, post free.

THE K.D. PORTABLE FIVE This is a real portable, size 12 in. by 12 in. by 8 in.; weight 19 lbs.; imitation crocodile finish, assorted colours. Beautiful tone; brings in Continentals at fine loud-speaker strength. Complete with valves, batteries and accumulators ready to switch on, 9 gns., carriage paid. Write for free illustrated folder showing complete range of K.D. products.

THE KONE DOPE COMPY. 1 FLASHET ROAD, UPTON MANOR LONDON, E.13



BECOL

EBONITE PANEL

18 in. x 7 in.

SPECIFIED FOR THE

Brookman's Three-plus-one

DESCRIBED IN THIS ISSUE

LOOK FOR THE TRADE MARK. BRITISH MADE

SOLE MAKERS:—

THE BRITISH EBONITE CO., LTD. HANWELL, LONDON, W.7

Amateur Wireless HANDBOOKS

each 2/6 net.

Loud-speaker Crystal Sets.

The Wireless Man's Workshop.

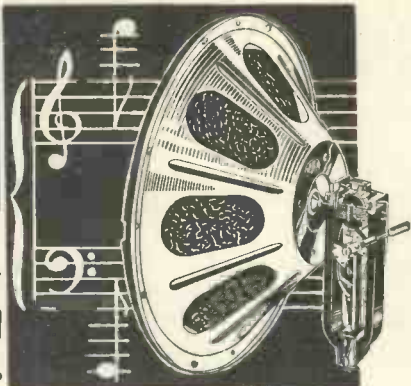
Wireless-Controlled Mechanism for Amateurs.

The Practical Wireless Data Book.

THE BOOK OF THE NEUTRODYNE, by J. H. Reyner, B.Sc. (Hons.), A.M.I.E.E. Price 1/6 net, or post free for 1/9

Of all Newsgents and Booksellers or by p.st. 3d. extra, from Cassell & Co., La Belle Sauvage, E.C.3.

HIGH
and
LOW
notes well
handled...



"Even response, both very high and all low notes being well handled."
"The best unit I have tried."
"Reproduction of the very finest quality."
"Wufa is the 'Ace.'"
"It has surpassed anything I have tried."

Above are only a few extracts from numerous reports all praising the "Wufa." Ask your dealer to demonstrate. You will be astounded at the marvellous reproduction and volume.

COMPLETE WITH
CHASSIS

40/-
UNIT
ONLY **27/6**

WUFA

60 POLE SUPER POWER UNIT

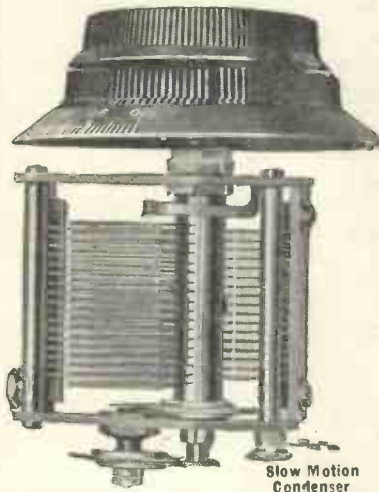
If your dealer has not yet received supplies, send order direct to us giving dealer's name and address
WRITE DEPT. A.

M. LICHTENBERG, 4 Great Queen Street, London, W.C.2

The Sign **ASTRA** of Quality

CONDENSERS

Praised and used by the Technical Press.



SLOW MOTION CONDENSER

Mid Log Line Type. Accurate in design and construction, with faultless fast and slow motion dial control. Action is silent and control is smooth but firm. Scale 0-100, 3 in. dial.

.0005 or .0003 7/6

With Mica Dielectric .0005 or .0003, 6s.

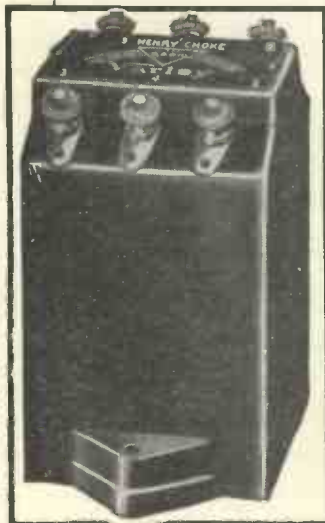
DIFFERENTIAL CONDENSER

High insulation, smooth movement and silent action. Terminals and Tags for connections. .00015, each side, 3/6.

"ASTRA" GEARED MOVEMENT DIALS
Type No. 2, 4 in. diameter 5/-
Type No. 1, 3 in. " 3/6
"Astra" Popular, 3 in. " 3/-

"ASTRA" Products are obtainable from all Dealers

Get True Balance of Bass and Treble



Add a tone control unit to your set and improve reception quality. It will enable you to correct loud-speaker deficiencies and to adjust the reproduction to your own requirements by varying the proportions of bass and treble.

Built in a few minutes—all you need is a Varley 3-Henries Tapped Choke, a Varley Power Potentiometer and a semi-fixed condenser of the compression type.

Suggestions for tone control circuits and diagrams are contained in the Varley Instructional Book D—free on request.

L.F. Tapped Choke (3 henries), 5 tap-pings. Total D.C. Resistance, 47 ohms. Full particulars and uses are given in Varley Instructional Book D.
Power Potentiometer. Totally wire-wound. One-hole fixing. Dissipates up to 20 watts. Full particulars and uses are given in Varley Instructional Book B and C.

L.F. Tapped Choke (3 Henries) ... price 8/6



Power Potentiometer
Full range, 10/50,000 ohms, from 9/- to 11/-

Varley

E.W.G.

Advertisement of Oliver Pell Control, Ltd., Kingsway House, 103 Kingsway, London, W.C.2. Telephone: Holborn 5303

Advertisers like to know whence the business comes—please mention "W.M."

TESTS OF NEW APPARATUS

Manufacturers are invited to submit new apparatus for test and comment in these pages. Only apparatus that reaches the required standard of efficiency will be reported on; any instrument that does not reach that standard will be ignored.

Readers who would like to see reports on any particular piece of new apparatus are also invited to write to us, when we shall do our best to give them the required information.

BRITISH GENERAL OUTPUT TRANSFORMER

THE use of an output transformer is becoming steadily more popular. Such a component has several advantages, many of which are not generally appreciated.



AN OUTPUT TRANSFORMER

This new British General output transformer gives five ratios for loud-speaker matching

In addition to isolating the loud-speaker from the set, thus avoiding the presence of the large steady current through the winding, the voltage drop with an output transformer is distinctly less across the loud-speaker itself, so that it is quite possible to obtain 10 per cent. more voltage actually on the anode of the valve, and this means 20 per cent. more power output.

Improving Tonal Quality

The tendency to self-oscillation and motor-boating is also minimised if an output transformer is employed, while finally the quality and tonal value can be materially improved by correct matching.

Indeed, it is largely the question of cost which prevents the universal use of the system, for if good results can be obtained by inserting the loud-speaker directly in the anode circuit, why go to

the extra cost of adding another component?

This argument has largely been removed by the introduction of the British General output transformer. This component, which sells at 9s. 6d., provides five ratios on the secondary, namely, 1, 1.4, 1.7, 2.5, and 3.5—1. By this means a wide range of matching can be carried out, and the quality of one's reproduction, as well as the power output, may be adjusted to suit the valve in the output stage.

The laboratory tests on this component gave excellent results. The inductance was between 10 and 20 henries at the normal currents obtaining in practice, and from our tests we estimate that it should handle currents of 15 to 18 milliamperes quite satisfactorily.

DIEHL GRAMOPHONE MOTOR

THERE are many gramophone users who still refuse to have any dealings with electric motors. They say that despite the extra trouble of winding which is involved with a clockwork motor, it is impossible to obtain the same steadiness and smoothness of running with an electric motor.

Few Good Motors

Undoubtedly there is a great deal of justification for this complaint. The number of really good electric motors can be counted on the fingers of one hand and, this being so, it is with pleasure that we welcome the Diehl Aristocrat.

This motor, which is of the induction type, is therefore only suitable for A.C. supply; it is remarkably steady and silent. There is no audible hum while it is revolving. Tested with a stroboscopic disc the speed was found to remain quite steady without any of the hunting which is often present.

The motor is mounted on a chassis provided with an effective start and stop mechanism, which works reliably, and altogether we received a very favourable impression.

The machine is, of course, electrically silent, since there is no brush-gear. A novelty is the use of a bakelite turntable, which is rust-proof, besides being attractive in appearance and light in weight. The turntable is separate from the motor, being a loose fit on the spindle, so that the



IF YOU WANT AN A.C. GRAMOPHONE MOTOR—

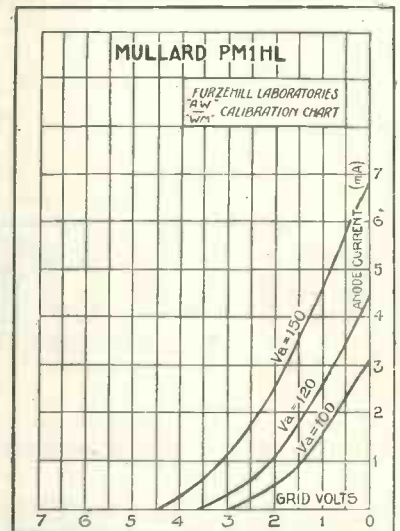
—consider carefully the merits of the Diehl Aristocrat; it is reported on above.

drive is taken up through a cork-faced clutch.

We recommend this motor to the notice of gramophone enthusiasts. It is handled in this country by Claude Lyons, Ltd.

MULLARD HL VALVE

AS soon as one waxes enthusiastic about any particular advance in valve construction, one is almost immediately faced with further developments of the same order. Valve performances have been improving steadily for some years, and we have been prone to treat them as a matter of course.



A USEFUL VALVE

There are many uses for the latest addition to the Mullard range, the PM1HL

Consider, for example, the new Mullard PM1HL valve, which has a filament consumption of only .2 watt. This has a performance which was considered very good only a few years ago in a valve of the DE5B class, having a filament consumption of 1½ watts, so that the filament efficiency has increased by some 700 per cent.

This particular valve is one which fits very nicely into the present scale of valves. It has a rated impedance of 18,500 ohms, and an amplification factor of 28. On test the impedance was 20,000 ohms and amplification factor 29.5, values which are substantially in agreement with the makers' rating.

This is a useful general - purpose valve, for high-frequency, detector or first-stage low-frequency work. In the latter case it will handle 3 volts grid swing.

(Continued on page 328)

H & B

SUPER 60

GUARANTEED KIT

	£	s.	d.
1 Set of Wearite Coils (1 02, 2 T1, and 1 T2) ...	2	10	0
1 Formo Fixed Condenser, .0002 mfd. ...			6
2 T.C.C. .001 Fixed Condensers, upright type ...	3	8	
5 T.C.C. 1-mfd. Fixed Condensers, type 50 ...	14	2	
2 Ormond Variable Condensers, .005 mfd., type R/426, with slow-motion dials ...	12	0	
1 Trelleborg Ebonite Panel, 12 by 8 in. ...	4	3	
1 Lissen Grid-leak Holder ...			6
9 Telsen 4-pin Valve Holders ...	9	0	
7 Belling-Lee Wander Plugs, marked: H.T.+3, H.T.+2, H.T.+1, H.T.—, G.B.+ , G.B.—1, G.B.—2 ...	1	9	
2 Belling-Lee Spade Terminals, marked: L.T.+ and L.T.— ...			8
1 Magnum 15,000-ohm Fixed Resistance, spaghetti type ...	1	6	
1 Magnum 20,000-ohm Fixed Resistance, spaghetti type ...	1	6	
1 Telsen 1-meg. Grid Leak ...	1	0	
1 Rotorohm 50,000-ohm Potentiometer ...	6	0	
Tinned Copper Wire for connecting ...			6
5 Lengths of Sistoflex Sleaving ...	1	3	
1 Set of Cortabs de Luxe (Money Hicks) ...			9
1 W.B. Three-point Switch ...	1	6	
1 Ferranti L.F. Transformer, type A.F.8 ...	11	6	
1 Terminal Strip, 2½ by ½ in. ...			6
3 Small Terminals ...			6

CASH PRICE £6 3 0

Any part sold separately.

All purchasers of above kit at full cash price can, if they wish, have the receiver constructed free of charge.

TRADE SUPPLIED

SUGGESTED ACCESSORIES

H & B Frame Aerial and Cabinet (as illustrated in editorial pages) ...	£2	5	0
Six Marconi or Mullard Valves ...	£3	16	0
Two 60-volt Siemens "Power" Super H.T. Batteries ...	£1	7	0
One Exide 2-v. 100 ...	13	6	

TERMS.—Carriage paid on all cash orders.
C.O.D. charges paid on orders over £1.

Amazing Success!

Every day we receive letters of congratulation, saying what amazing results are secured by those building the "Super 60" from the H & B Guaranteed Kit

PERFECT RESULTS ANYWHERE
ON ONLY SMALL FRAME AERIAL

ONLY TWO TUNING CONTROLS

SMALL H.T. CONSUMPTION

NO OUTDOOR AERIAL OR EARTH
NEEDED

60 STATIONS GUARANTEED
BY THE "WIRELESS MAGAZINE"

Two more H & B Guaranteed Kits

"PLUG-IN COIL THREE"

Cash Price £4 : 5 : 5

3 Mullard or Cossor Valves £1 : 7 : 6 extra

"BROOKMAN'S THREE-PLUS-ONE"

Cash Price £7 : 3 : 9

3 Mullard or Mazda Valves £2 : 7 : 6 extra

H & B SCREENS for the "Brookman's Three-Plus-One" each **1/9**

Detailed price lists on request

H & B RADIO CO.

Gerrard 2834

34, 36, 38 BEAK STREET, REGENT STREET, LONDON, W.1

TESTS OF NEW APPARATUS—Continued



GIVES H.T. AND L.T.
This Heayberd unit gives high-tension and low-tension supplies from A.C. mains

HEAYBERD MAINS UNIT

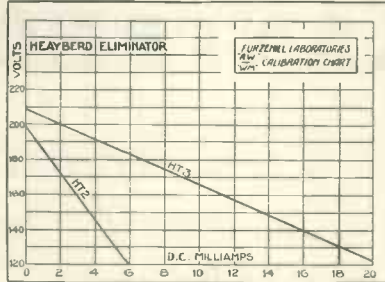
H EAYBERD components are well known to mains users. We have recently tested a complete high-tension and low-tension unit, type C150, supplied by this firm. The high-tension side has three taps, one of which is variable, while the other two are fixed; in addition, there are two terminals delivering 4 volts for heating A.C. valves.

Attractive Finish

The controls are housed on a front panel measuring 7 in. by 6 in. The unit, which is 9 in. from back to front, is shielded in a metal case finished in a

black crystalline enamel. A convenient feature is the provision of a small flash-lamp fuse in the interior.

We checked up the performance and found that the smoothing was adequate. As will be seen from the curve reproduced on this page, the highest tapping will give 14 milliampères at about 150 volts, while the other two tappings will



HOW THE OUTPUT VARIES

This curve shows how the voltage varies with the current taken

give approximately 5 milliampères each when delivering 150 volts.

The low-tension winding gave 4.4 volts on open circuit, the figure falling to 3.95 volts at 3 amperes.

The high-tension output seems to us a little low, but it will suffice for many purposes.

The price is quite reasonable, being £4 4s. for a constructor's kit or £4 14s.

ready built. This unit is obtainable, either in kit form or ready built, without the low-tension winding at 8s. less.

ODD JOTTINGS

On Sunday, March 8, the first modulated tests of the new North Regional station at Moorside Edge were heard by a member of the WIRELESS MAGAZINE Technical Staff. The signals, consisting of music and speech, were received in broad daylight on an ordinary three-valve receiver and were quite as strong as the normal signal from the present Midland Regional station. The new station may quite well give another alternative programme service to southern listeners.

A useful station-identification chart has been issued by Philips Lamps, Ltd., for use with instruments incorporating the Philips four-valve receiver. Two columns are provided for logging long- and medium-wave stations and it is possible to estimate the approximate wavelength for any particular dial reading. Useful operating hints are also provided on the back of the chart.

Which is the world's highest broadcasting station? It is the transmitter at La Paz and is over 10,000 ft. above sea level. And in Europe the highest broadcast transmitter is on the Pic du Midi, something like 3,000 ft. in height.

WATES

NEW MODEL 31 DOUBLE CONE CHASSIS



NEW CONE PRINCIPLE GREATLY IMPROVED RESULTS

Once again Wates have triumphed with the greatest advance in Cone Speakers! The New Model 31 employs two cones of special and different texture, the large one of heavier density than the smaller to permit perfect response of the low and high frequencies respectively. Both cones are scroll cut (an exclusive Wates feature) to avoid a direct line through the sound frequencies, and the suspension of the large cone by a unique method permits absolute freedom without any self-resonance.

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Full particulars and leaflet from THE STANDARD BATTERY CO. (Dept. W.M.)

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All the following Units can be fitted to the Wates Chassis, without alteration, in a few minutes by means of the Wates Universal Bracket, supplied with all Chassis:—Blue Spot 66R, 66F, Ormond, Blue Spot 66K, Watmel, Ediswan, Hegra, G.E.C., Lissen, Tritron, Brown Vee, Ampion B.A.2, Loewe, W. & B., Silver Chimes, Grawor, Grassman, Tefag, Six-Sixty, Kukoo, and the Wates Star.

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- A Master Instrument.
- A.C. All Mains.
- 4-Valves, 3 to Radio.
- 1 S.G., 1 L.F. and Pentode output.
- Ganged Condensers.
- Illuminated Dial.
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A NEW MOVING-COIL SPEAKER

A SUPERB model of the permanent magnet moving-coil type. Two models are available. Cat. No. 452B (Pentode) having a speech coil of high impedance, designed for use with Pentode output valves with suitable components, mounted on baffle, rendering it suitable for direct connection to the output valve.

Cat. No. 452B (Power) has a low impedance winding suitable for power or super-power output valves and has an input transformer fitted.

The large Cobalt steel permanent magnet is of unique construction and will retain its flux density indefinitely and both models are supplied with a 14-inch baffle. Reproduction is of an entirely pleasing character, bass being correctly rendered in proportion to treble, while large volume is easily handled without overloading.

PRICE £5:12:6 now reduced to £5:5:0

A Cabinet model enclosed in an attractive Walnut case is also available, this model being fitted with a smaller magnet and incorporating the above input components. Cat. No. 452. Price £5:15:0 now reduced to £5:10:0

Extraordinary demand entailing mass production has made this reduction possible

Write for full particulars and lists:—

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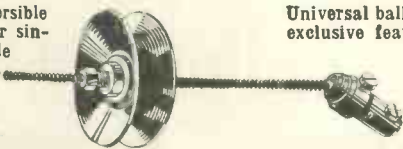
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Large reversible washers for single or double diaphragm.



Universal ball joint: this exclusive feature obtainable only in this rod.

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AROUND AND ABOUT

RECENT news from Paris states that a new high-power transmitter is shortly to be built at Le Havre. At the present time there are few stations in this part of France giving a satisfactory service area. Incidentally, this new station should give good reception to listeners in the south of England.

A new cheap range of fixed condensers has recently been put on the market by the Telegraph Condenser Co., Ltd., of North Acton. The prices are : .0005—.0005 microfarad, 1s.; .004—.001 microfarad, 1s. 4d.; .005 and .006 microfarad 1s. 9d.; and .01 microfarad, 2s. 3d.

In the test report of the Mains Radio Transportable receiver published in the March issue of WIRELESS MAGAZINE it was stated that this instrument could not be obtained for use with D.C. mains. We have now been informed that a D.C. model is obtainable.

Russia is still continuing her programme of building large high-power stations. Another new giant 100-kilowatt transmitter is being erected at Borodouja. This station will relay programmes similar to the Moscow transmissions.

A new model of the Marconiphone pick-up known as the No. 10 is now being supplied in place of the original model.

The moulded base is larger and more robust, and convenient quick-grip spring terminals have replaced the usual screw type. It is finished in a brown bakelite case.

A postal census of listeners is being taken in Germany with the object of finding out what types of receivers are in general use. The information obtained will be used as a basis for determining what power is suitable for various broadcasting stations.

Radio is being put to a new use in North Africa. At intervals the programmes from Radio Algiers are to be interrupted so that medical bulletins giving instructions for the combating of malaria can be transmitted.

Latest returns issued by the United States Board of Trade give the number of listeners in the U.S.A. as 13,476,000. The states of New York, California and Illinois have the largest number of listeners, while Nevada comes last with the smallest number.

An interesting new all-electric receiver, with built-in loud-speaker, has been marketed by the Loewe Radio Co., Ltd., of Fountayne Road, Tottenham, N.15. Designed for A.C. mains only, this receiver incorporates a Loewe triple valve, preceded by two indirectly

heated stages. Full details can be obtained from the makers. The price is 10 guineas.

The Osram power valve, type DA60, has been reduced in price from £7 to £5 10s. This valve is suitable for use in the output stage of public-address and talking-picture amplifiers of moderate size.

A new loud-speaker coupling unit has recently been introduced by the General Electric Co., Ltd. It is contained in a brown crystalline metal box with four terminals for connection to the set and loud-speaker. The unit consists of a low-frequency choke and a 2-microfarad condenser, and costs 19s. 6d.

A D.C. model of the Pye Twin-triple portable has just been marketed at 28 guineas by Pye Radio, Ltd. The standard receiver is designed for voltages between 200 and 250. The current consumption is 100 watts at 200 volts, and 125 watts at 250 volts.

Kolster Brandes, Ltd., have recently reduced the price of their high-tension batteries. The 105-volt battery for the Pup receiver has been reduced from 15s. to 12s. Other batteries reduced in price include the 108-volt portable battery which is now £1, the 108-volt ordinary type, 13s.; and the grid-bias battery, 1s. 6d.

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NOW WE HAVE A
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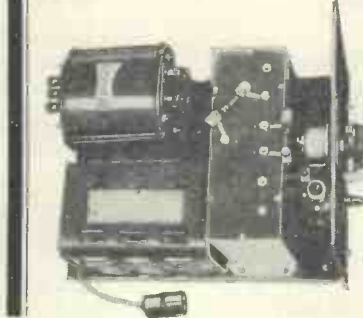
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2-point Model 1/-

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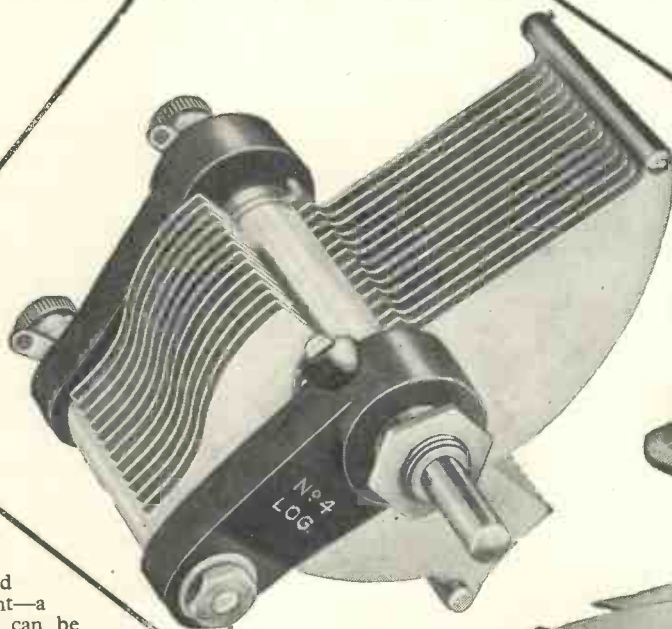
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Designed to follow the Logarithmic Law, it has such value that it will be found very suitable for use under average conditions in the modern receiver. The vanes are of aluminium, firmly secured to slotted spindles. The condenser ends are of best quality bakelite, with the greatest possible reduction in size. This condenser is not supplied with dial.

Capacity: .00025, price 4/-; .00035, price 4/-; .0005, price 4/-

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Direct drive is obtained by means of a beautifully finished 2½-inch diameter bakelite dial engraved 0 to 180 degrees. Slow-motion movement ratio approximately 9 to 1 is incorporated in the condenser and is controlled by means of the upper small knob. Complete with 2½-inch dial and slow-motion control knob. Easy to mount, "One Hole" fixing, terminals and soldering tags for connections.

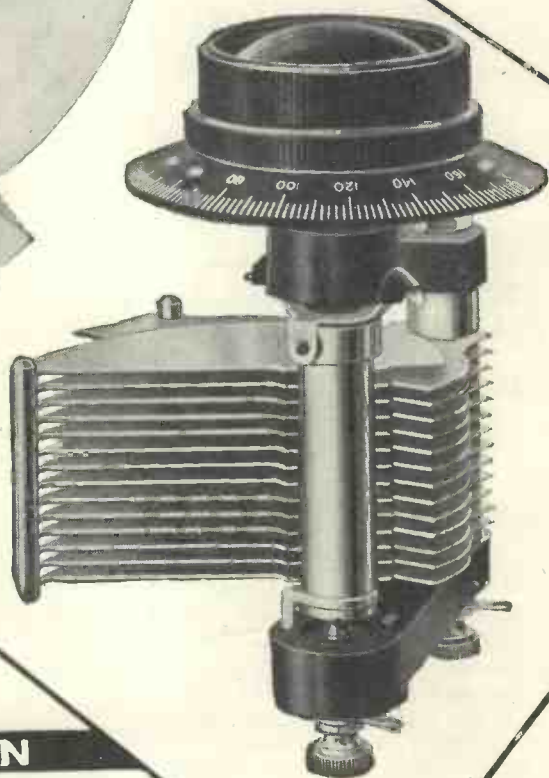
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DANISH RADIO

Every listener will be interested in this bright account of wireless activities in Denmark

WOULD you like to hear a little about radio conditions over here? Perhaps you don't know very much about Denmark, but you must have heard of Hans Andersen, our famous fairy-tale teller, and of course you can tune in the Kalundborg station.

Do you hear it often? It is a rather good station, and you can hear it very well in most parts of England. You don't understand the talks, and only want music? Well, we have plenty of music at Kalundborg. If you tune in at about noon, you can on most weekdays hear a transmission from one of the great restaurants or hotels in Copenhagen for two hours, and at 3 p.m. you can hear the station's orchestra giving you an afternoon concert for another two hours.

Then we have some talks and news, but after eight o'clock in the evening we have concerts, opera or plays, and most evenings we have dance music from a restaurant at about 11 p.m.

Light Music Preferred

We like light music over here, but we have very fine classical concerts in the evenings. You prefer the light music? So do I, and if our evening concerts are too heavy, I go round the dial to pick up some low-brow music from other stations.

What do I hear best? Conditions vary and fading can be rather disturbing in the winter, but I think that I can hear most of the stations you can. Of course, I cannot get English stations as well as you can in England; the English stations are not our best prey now.

Some years ago Daventry 5XX was the touchstone of our wireless sets, and it was absolutely the most favourite station here, but now we cannot get it with the same strength—I don't know the reason. I got it on a crystal set some years ago—very faint, naturally—but now I have to use a good three-valver on an outdoor aerial to pick it up. No, Daventry is not like it was, and we have some interference from Königswusterhausen.

The new London stations are better—stronger I should say—but the

selectivity problem is worse. Bad receivers? No, we have quite good sets; most are factory-made mains sets, both Danish and foreign, and they are well made as a whole. We have electric light all over the country—220 volts A.C., except for a few large towns with D.C., but we are trying to get 220 volts A.C. all over the country.

Mass Production

Fine conditions, then? Yes, I think so. Our factories have only to make one model in mains receivers, then go in for mass production, cheaper and better sets, and so on. Denmark is an ideal country for radio; we have mains in almost every house; we have no screening by mountains; and our situation is very good.

Look at the map. Westward we have England; to the north, Norway; to the east, Sweden, Russia, etc.; and to the south, Germany, Poland, Hungary, Austria, Italy and France. We have only one high-power station, Kalundborg, but it interferes with only a few stations on the long waves.

We must have a selective set to get the new Oslo station without interference, and some older sets cannot get Motala in Sweden, but on the medium waves we have no "local-station problem," except in Copenhagen, where the little 1-kilowatt station is working on 281 metres. As it comes in at the low end of the dial, a good wavetraps can eliminate it and give us many good stations further up.

Position of Amateurs

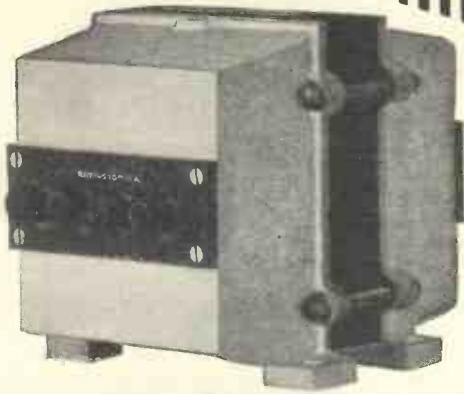
Our sets? I have said that we use many factory-built mains sets, but we have as well amateur-made set; we have technical papers like you have, and many like to build their sets themselves. As a member of the technical staff of the Danish monthly, *Radiomagasinet*, I make many sets every year, and I shouldn't like to have a commercial set. Most of the latter are very fine, but I can play about with my set, try new components and so on. I like experimenting, and one cannot make many experiments with a set in a sealed box!

TAGE BYSKOV.

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VOLUME CONTROL
FOR

The James “Super 60”



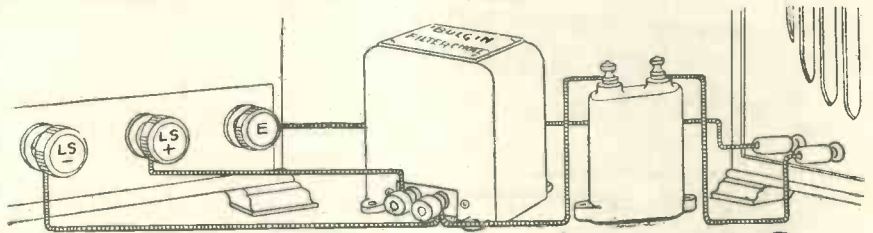
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in all
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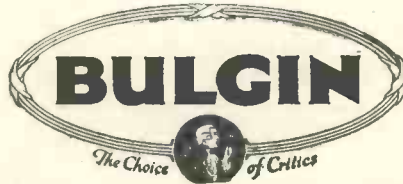
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BENJAMIN

CLIX

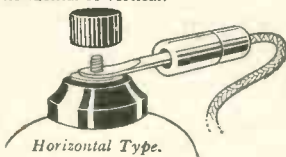
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LOUD-SPEAKER LIMERICKS

LIMERICKS are coming into their own again. They were a very popular feature in the good old days, when women were women, and beer was beer, and wireless was not.

Now, however, someone has rescued these poems of our parents, and lots of people are sending "last lines" and empty wrappers to lots of firms who are giving prizes with one hand and collecting wrappers with the other. In brief, limericks are bobbing up all over the place.

Falling into Line

Wireless, in order to hold its position as the most modern thing there is, must fall into line and offer its devotees limericks also. I have felt it my bounden duty to see that this offer is made. Which accounts for the following charming little verses. I wrote them all myself. (In any case, the Editor disclaims all responsibility.)

Let me tell you the sad story of the Madrid gentleman who rashly hid a birthday present for his child in his wireless cabinet :

There was a young man of Madrid
Who'd hidden a gift for his kid.
When they heard it announced,
The child, of course, pounced,
And ruined a new leaky grid.

I think it was a leaky grid which suffered. I must ask my Madrid correspondent to confirm this.

Equally poignant is this—which may have come from India (and may not) :

An enthusiast in distant Khartoum
Cleaned all L.T. cells with a broom.
He remained calm and placid
When he upset the acid,
But his wife—well, his cell's now a toun.

Very tragic, isn't it? I am sorry for the gentleman concerned. Wives

do not seem to realise that acid on the carpet saves a lot of cleaning—you can't clean what isn't there.

Continuing our tour round the world, I understand that a French fan has a grouse against his wireless. Translated, it is this :

A listener living at Rheims,
Said : "Radio is not all it sheims.
I've built a new set—
Ain't heard nothing yet,
Is *this* the result of my drheims?"

I call that very pathetic. The pathos of the last line brings tears to my eyes. I do *not* agree that the other four lines have a similar effect.

Coming nearer home, read of the things which happen in Rhosllanerchrugog, or thereabouts :

A certain young couple in Wales
Bought a really posh pram in the sales.
They got it, you bet,
For a portable set
Which weighed under a ton on the scales.

And have you heard of this embarrassing episode? (I don't know where it happened) :

A lady, so it is said,
Invariably listened in bed.
A voice (in a play)
Said, "I'm coming your way,"
And she blushed a beautiful red!

About Me!

Last, but by no means least, a limerick about me. You are sure to find this interesting :

When my speaker emits a loud cough,
I shout out in rage, "Turn it ough!"
If my set catches 'flu,
I may get it tu—

Don't laugh! This is serious—why scough?

You are rude. Therefore, I shall not tell you any more limericks, and if people say wireless is behind the times, don't blame me. It's your own fault. W. M. G.

NOTE THE DATE—FRIDAY, APRIL 24!

There has been such a great demand recently for WIRELESS MAGAZINE that readers are advised to order their copies in advance to make sure of getting them.

In the May issue, to be published on the date noted alongside, there will be a special article describing a portable version of the Super 60 and a radio-gramophone supplement on tinted paper. You will not want to miss these special features!

McMichael's Latest Triumph!

In the firmament of fine radio has appeared an outstanding Receiver. Brilliant in performance, compelling in its tonal quality, faultless in the remarkable certainty of its control and operation, and offering an unequalled range of stations,

THE McMICHAEL ALL MAINS THREE

is a receiver fulfilling every demand, not only of the present but of the future.

The set combines an unusual selectivity with an even flow of power. Yet its installation and control are simplicity itself. Just plug into an electric-light socket or plug, and with the simple tuning control, dozens of stations are within your reach. The illuminated scale calibrated in metres makes station finding of remarkable simplicity.

Fitted in handsome Walnut Cabinet. Made in two standard types: 200-250 v. A.C., and 100-115 v. A.C. The All Mains Three is also available for use on 25 cycle supply at 21 Gns.

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 (Deferred Payments can be arranged)

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 Gleaner Two (D, Trans) ... WM201
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 Searcher's Four (SG, D, RC, Trans) ... WM194
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INTERVAL SIGNALS

YOU know that rather melodious musical-box signal you hear between programme items from Budapest? Well, its adoption has induced other stations to seek equally attractive methods to advertise their presence on the air.

Oslo has installed in its studio a similar mechanical gadget; it provides two short melodies for the opening and closing of the station. The former gives you the first five bars of the Norwegian national anthem (*Ja vi elsker*), the other just a short theme from Grieg's opera *Sigurd Jorsalfar*. Listen for it whenever there is a short pause in the programme.

Now the 60-kilowatt has been brought into operation again the Oslo programmes are as easy to capture as those from, say, Radio Paris. By the way, the wavelength has been reduced to 1,060 metres, partly to free it from the Dutch commercial station at Scheveningen-Haven and partly to get away from Rostov (Russia), which for some time had caused considerable interference.

Another new signal on the air is that put out by Radio Strasbourg (PTT); it is a very deep-toned gong automatically "ponging" in periods of five seconds at equal intervals.

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INDEX TO ADVERTISERS

	Page
Apollo Gramophone Co., Ltd.	312
Bakers Selhurst Radio	244
Belling & Lee, Ltd.	244
Benjamin Electric, Ltd.	334
Borst, Charles, & Sons	330
British Ebonite Co., Ltd.	324
British Blue Spot Co.	327
British General Mfg. Co.	329
Brodersen, A.	230
Bulgin, A. F., & Co., Ltd.	333
Burne-Jones, Ltd.	233
Carrington Mfg. Co.	323
Chloride Electrical Storage Co.	246, 307
Chromogram	328
Clarke H., & Co. (Mic.), Ltd.	226
Cole, E. K., Ltd.	305
Cossor, A. C., Ltd.	319
Dubilier Condenser Co., Ltd.	231
Eastick, J. J.	230
Edison Bell, Ltd.	329
Edison Swan Electric Co., Ltd.	Cover iv, 231
Electrical Trading Association	313
Electroset, Ltd.	336
Emkabe Radio Co., Ltd.	325
Fluxite, Ltd.	226
Formo Co.	244
Fuller Accumulator Co., Ltd.	315
Garnett Whiteley & Co., Ltd.	233
Garratt Stores	236
Graham Farish	332
Gripso Co.	230
Harmer	323
H. & B. Radio	327
Heayberd, F. C., & Co.	330
Hegra	245
Jackson Bros.	241
Kone Dope Co.	324
Lectro Linx, Ltd.	334
Loewe Radio Co., Ltd.	240
Lichtenberg, M.	325
Limit Engineering Co., Ltd.	230
Lissen, Ltd.	235
London Electric Wire Co., and Smiths, Ltd.	Cover ii
Lyons, Claude, Ltd.	236, 244
McMichael, L., Ltd.	335
Morogoro	333
Morris, J. R.	244
Mullard Wireless Service Co., Ltd.	317
New London Electron Works, Ltd.	Cover iii
Ormond Eng. Co., Ltd.	331
Paroussi, E.	230
Partridge & Mee, Ltd.	333
Pertrix, Ltd.	311
Peto Scott, Ltd.	321
Pickett Bros.	334
Philips Lamps, Ltd.	229
Ready Radio	239
Regentone	316
Rothermel Corporation Ltd.	241, 312
Rotor Electric, Ltd.	333
Scott Sessions, G., & Co.	230
Stratton & Co., Ltd.	320
Tannoy Products	245
Taylor, A.	230
Tekade Radio & Electric, Ltd.	240
Telegraph Condenser Co., Ltd.	243
Telsen Electric Co., Ltd.	300
Turner & Co.	226
Undy	323
Vandervell, C. A., & Co.	236
Varley	325
Wates Products	328
Watmel Wireless Co., Ltd.	245
Weedon & Co.	329
Westinghouse Brake and Signal Co., Ltd.	243
Whiteley Electrical Radio, Ltd.	245, 330
Wingrove & Rogers, Ltd.	323
Wright & Weaire, Ltd.	237

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