CAMOUFLAGING YOUR LOUD-SPEAKER SEE PAGE 584

Wireless Magazine

№ 66. JULY, 1930

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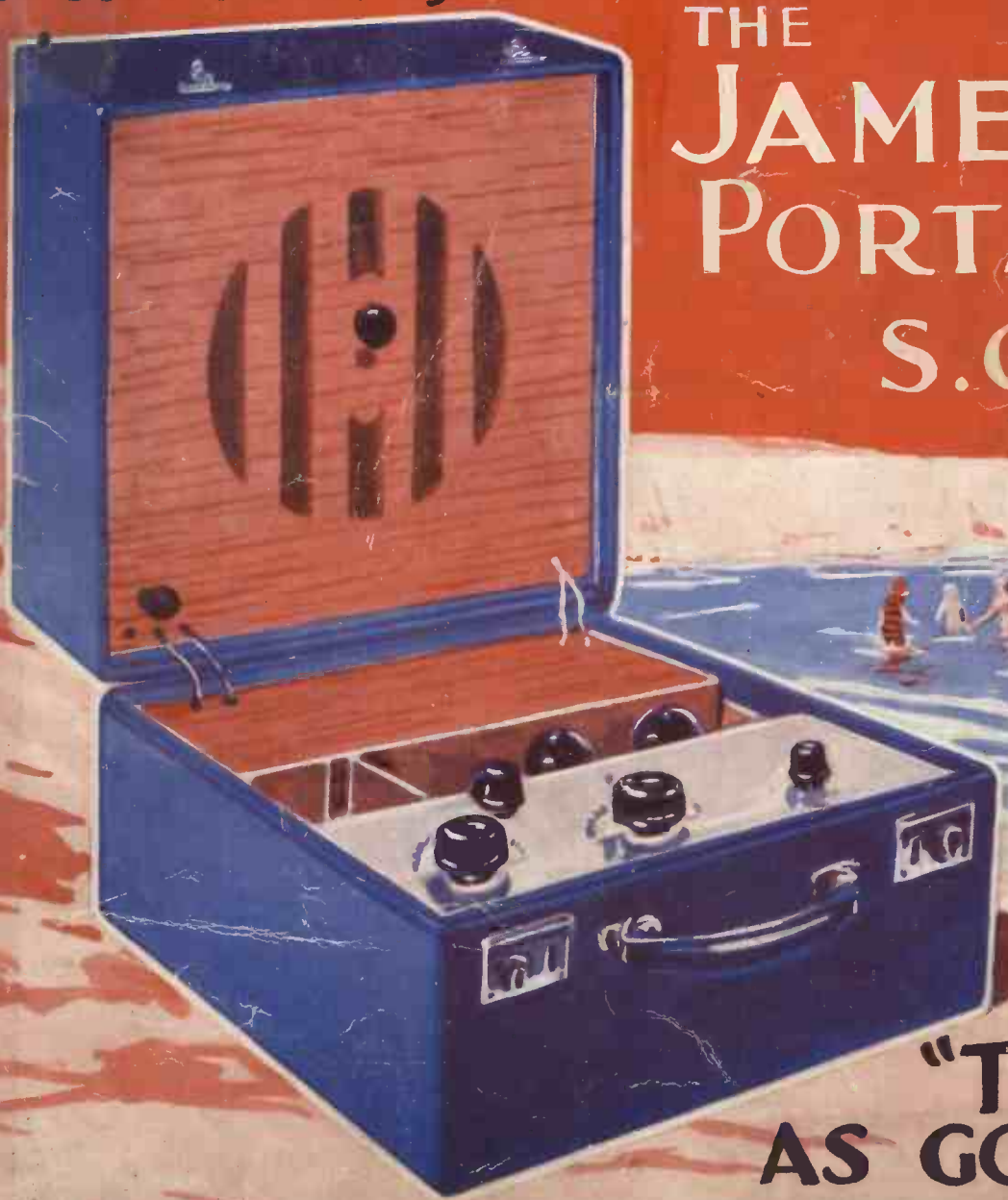

THE JAMES PORTABLE S.G.3

A "THREE" AS GOOD AS MOST "FOURS"

Editor :
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Wireless Magazine

The Best Shillingsworth in Radio

Vol. XI :: JULY, 1930 :: No. 66

Research Consultant :
W. JAMES
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A Portable Success

WHEN W. James started to inquire into the possibilities of a new portable set he had in mind, he experimented with two stages of screened-grid high-frequency amplification, a detector and a power valve, but, telling the story in his own words, "it was not long before the arrangement was dropped. The set was too lively."

So you will find only one screened-grid stage in his portable described in this issue, and even then he guarantees that his "three" is as good as most "fours." You will be interested to read his points in designing and arranging a portable and I trust you will have great success—or rather, I know you will—with his new set.

The valve in practicable form and some of the best valve circuits were evolved during the European War, but it now appears that even as long ago as 1899, a transmitter-receiver with a coherer detector was used during the Boer War and an article on other pages of this issue gives a picture and circuits of the apparatus. By the way, the coherer and some other detectors that have passed into history form the subject matter of a discussion between Professor Megohm and Young Amp

Capt. Round, we are glad to say, has resumed his monthly article. He is a busy man and it is only with extreme difficulty sometimes that I can prevail upon him to write from his great storehouse of knowledge for the benefit of my readers. He is talking this month on the subject of special gramophone records and talkies, with which, as a matter of fact, he has had unique experience.

J. H. Reyner is continuing his tests of high-frequency chokes. Considerable interest has been taken in Mr. Reyner's new method of testing these components and in the valuable test data which he has been able to publish in our pages.

Why should people hide their loud-speaker any more than they should hide any other piece of musical furniture? Great skill has been brought to bear on the design of loud-speaker cabinets, and a large number of them will take their proper place in any room, however beautifully furnished. But I find that a small proportion of people have a liking for the mysterious effect obtained from a speaker that is completely hidden from view and it is to these that Kenneth Ullyett's article "Where to Hide Your Loud-speaker" will appeal.

The seeker after volume will read with great keenness the description in this month's pages of the Staminator, a high-tension unit for A.C. mains, intended for listeners who want to use larger valves for increased output.

For a different type of reader—actually the beginner who prefers to dispense with soldered joints, but who knows the need of selectivity—we offer this month the Gleaner Two, an ideal set for the man who wishes to get the most out of two valves. The Invitation Four is a "request" set intended for all wavelengths between 20 and 10,000 metres.

Do Not Overlook the Half-price Blueprint Coupon on the Inside Back Cover.

Bernard E. Jones

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Next Month: A Lodestone Three with Constant Neutralising on All Wavelengths

Registered at the General Post Office for Transmission by Canadian Magazine Post

Valves to Use in Your Set

TWO-VOLT VALVES

Three-electrode

Make	Type	Impedance	Amp. Factor	Fil. Cur.	Mutual Conduct.
Dario ...	Resist.	60,000	30	.1	.5
Mazda ...	H210	59,000	47	.1	.8
Lissen ...	H210	58,000	35	.1	.6
Six-Sixty	210RC	55,500	39	.1	.7
Mullard ...	PM1A	51,000	36	.1	.7
Cossor ...	210RC	50,000	36	.1	.72
Marconi ...	H210		35	.1	.7
Osram ...	H210		35	.1	.7
Six-Sixty	210HF	25,000	19	.1	.75
Marconi ...	HL210	23,000	20	.1	.87
Osram ...	HL210		20	.1	.87
Mullard ...	PM1HF	22,500	18	.1	.8
Dario ...	Super HF	21,000	25	.15	1.2
Lissen ...	HL210		18	.1	.85
Mazda ...	HL210		26	.1	1.25
Cossor ...	210HF	20,000	20	.1	1.0
Six-Sixty	210LF	12,500	10.6	.1	.85
Cossor ...	210LF	12,000	10	.1	.83
Marconi ...	L210		11	.1	.9
Mullard ...	PM1LF		11	.1	.9
Osram ...	L210		11	.1	.92
Six-Sixty	217D	10,700	13.5	.17	1.25
Mullard ...	PM2DX		13.5	.2	1.25
Dario ...	Univ.	10,000	9	.1	.9
Lissen ...	L210		10	.1	1.6
Mazda ...	L210		15.5	.1	1.55
Marconi ...	P215	5,000	7	.15	1.4
Osram ...	P215		7	.15	1.4
Six-Sixty	220P	4,800	7.2	.2	1.5
Lissen ...	P220	4,700	7	.2	1.5
Dario ...	SP	4,500	9	.15	2.0
Mullard ...	PM2	4,400	7.5	.2	1.7
Cossor ...	220P	4,000	8	.2	2.0
Mazda ...	P220	3,700	12.5	.2	3.4
Six-Sixty	230SP	2,750	5.5	.3	2.0
Dario ...	Hyper	2,700	5	.3	1.8
Mullard ...	PM252	2,600	5.4	.3	2.1
Marconi ...	P240	2,500	4	.4	1.6
Osram ...	P240		4	.4	1.6
Marconi ...	P2	2,300	6.5	.2	2.8
Osram ...	P2		6.5	.2	2.8
Cossor ...	230XP	2,000	4	.3	2.0
Lissen ...	PX240	2,000	4	.4	2.0
Mazda ...	P240	1,900	7	.4	3.7

Screened-grid—Four-electrode

Mazda ...	215SG	400,000	450	.15	1.1
Dario ...	SG	250,000	250	.15	1.0
Mullard ...	PM12	230,000	200	.15	.87
Six-Sixty	215SG	220,000	190	.15	.87
Cossor ...	220SG	200,000	200	.2	1.0
Lissen ...	SG215		180	.15	.9
Marconi ...	S215		170	.15	.85
Osram ...	S215		170	.15	.85

Pentodes—Five-electrode

Lissen ...	PT225	64,000	90	.25	1.4
Six-Sixty	230PP		80	.3	1.25
Mullard ...	PM22	62,500	82	.3	1.3
Dario ...	Pent.	55,000	100	.3	1.8
Marconi ...	PT240		90	.4	1.65
Osram ...	PT240		90	.4	1.65
Lissen ...	PT240	22,500	50	.4	2.0
Cossor ...	230PT	20,000	40	.3	2.0
Mazda ...	230Pen.	—	—	.3	1.5

FOUR-VOLT VALVES

Three-electrode

Make	Type	Impedance	Amp. Factor	Fil. Cur.	Mutual Conduct.
Cossor ...	410RC	60,000	40	.1	.66
Dario ...	Resist.		30	.075	.5
Marconi ...	H410		40	.1	.67
Osram ...	H410		40	.1	.67
Six-Sixty	4075RC	58,000	37	.075	.64
Mullard ...	PM3A	55,000	38	.075	.66
Dario ...	Super HF	21,000	25	.075	1.2
Cossor ...	410HF	20,000	20	.1	1.0
Mullard ...	PM3	13,000	14	.075	1.05
Six-Sixty	4075HF	12,500	13.5	.075	1.1
Dario ...	Univ.	10,000	10	.075	1.0
Cossor ...	410LF	8,500	15	.1	1.76
Marconi ...	L410		15	.1	1.76
Osram ...	L410		15	.1	1.77
Mullard ...	PM4DX	7,500	15	.1	2.0
Six-Sixty	410D	7,250	14.5	.1	2.0
Marconi ...	P410	5,000	7.5	.1	1.5
Osram ...	P410		7.5	.1	1.5
Dario ...	SP	4,500	9	.1	2.0
Mullard ...	PM4	4,450	8	.1	1.8
Six-Sixty	410P	4,200	7.7	.1	1.85
Cossor ...	410P	4,000	8	.1	2.0
Dario ...	Hyper P	2,700	5	.15	1.8
Marconi ...	P425	2,300	4.5	.25	1.95
Osram ...	P425		4.5	.25	1.95
Cossor ...	415XP	2,000	4	.15	2.0
Mullard ...	PM254		4.2	.18	2.1
Six-Sixty	420SP		4	.2	2.0
Mazda ...	P425	1,950	3.5	.25	1.8
Marconi ...	PX4	1,050	3.5	.6	3.3

Screened-grid—Four-electrode

Dario ...	SG	250,000	250	.075	1.0
Mullard ...	PM14	230,000	200	.075	.87
Six-Sixty	4075SG	220,000	190	.075	.87
Cossor ...	410SG	200,000	200	.1	1.0
Marconi ...	S410		180	.1	.9
Osram ...	S410		180	.1	.9

Pentodes—Five-electrode

Dario ...	Pent.	55,000	100	.15	1.8
Six-Sixty	SS4Pent	53,000	83	.275	1.55
Marconi ...	PT425	50,000	100	.25	2.0
Osram ...	PT425		100	.25	2.0
Mullard ...	PM24	28,000	62	.15	2.3
Six-Sixty	415PP	27,000	60	.15	2.2
Mullard ...	PM24A	25,000	50	.275	2.0
Cossor ...	415PT	20,000	40	.15	2.0
Mazda ...	425Pen	—	—	.25	2.0

SIX-VOLT VALVES

Three-electrode

Mazda ...	H607	90,000	40	.07	.45
Cossor ...	610RC	60,000	50	.1	.8
Marconi ...	H610		40	.1	.67
Osram ...	H610		40	.1	.67
Six-Sixty	6075RC	58,000	42	.075	.7
Mullard ...	PM5B	53,000	40	.075	.75

(Continued on next page)

SIX-VOLT VALVES—Three-electrode (Continued)

Make	Type	Impedance	Amp. Factor	Fil. Cur.	Mutual Conduct.
Marconi ...	HL610	30,000	30	.1	1.0
Marconi ...	DE5B		20	.25	.67
Osram ...	HL610		30	.1	1.0
Marconi ...	LS5B	25,000	20	.8	.8
Cossor ...	610HF	20,000	20	.1	1.0
Cossor ...	680HF		27	.8	1.35
Mazda ...	HL607		20	.07	1.0
Mullard ...	PM5D		26	.075	1.3
Six-Sixty	6075HF	15,200	17	.075	1.1
Mullard ...	PM5X	14,700	17.5	.075	1.2
Six-Sixty	D610	9,250	18.5	.1	2.0
Mullard ...	PM6D	9,000	18	.1	2.0
Cossor ...	610LF	7,500	15	.1	2.0
Marconi ...	L610		15	.1	2.0
Osram ...	L610		15	.1	2.0
Marconi ...	DE5	7,000	7	.25	1.0
Cossor ...	680P	6,000	5.5	.8	.92
Marconi ...	LS5		5	.8	.87
Osram ...	LS5		5	.8	.83
Six-Sixty	610P		7.2	.1	1.22
Marconi ...	DE5A	4,000	3.5	.25	.87
Mullard ...	PM6	3,550	8	.1	2.25
Cossor ...	610P	3,500	8	.1	2.28
Marconi ...	P610		8	.1	2.28
Osram ...	P610		8	.1	2.3
Cossor ...	680XP	2,750	3	.8	1.1
Marconi ...	LS5A		2.5	.8	.91
Osram ...	LS5A		2.5	.8	.91
Cossor ...	625P	2,500	7	.25	2.8
Mazda ...	P625B		7	.25	2.8
Marconi ...	P625	2,400	6	.25	2.5
Osram ...	P625		6	.25	2.5
Cossor ...	610XP	2,000	5	.1	2.5
Mullard ...	PM256	1,850	6	.25	3.25
Six-Sixty	625SP	1,780	5.8	.25	3.25
Marconi ...	P625A	1,600	3.7	.25	2.3
Mazda ...	P625A		4	.25	2.5
Osram ...	P625A		3.7	.26	2.3
Cossor ...	620T	1,400	3.2	1.6	2.3
Mazda ...	P650	1,300	3.5	.5	2.7
Marconi ...	LS6A		3	1.6	2.3
Osram ...	LS6A		3	1.6	2.3
Cossor ...	660T	800	2.25	4.0	2.25

Screened-grid—Four-electrode

Six-Sixty	SS6075SG	210,000	190	.075	.9
Cossor ...	610SG	200,000	200	.1	1.0
Mullard ...	PM16		200	.075	1.0
Marconi ...	S610		210	.1	1.05
Osram ...	S610		210	.1	1.05
Marconi ...	S625	175,000	110	.25	.63

SIX-VOLT VALVES—Pentodes

Make	Type	Impedance	Amp. Factor	Fil. Cur.	Mutual Conduct.
Marconi ...	PT625	43,000	80	.25	1.85
Osram ...	PT625		80	.25	1.85
Six-Sixty	SS617PP	28,500	54	.17	1.9
Mullard ...	PM26	25,000	50	.17	2.0

A.C. MAINS VALVES

.8 Volt 1-1.5 Amperes

Dario ...	Super HF	20,000	25	1	1.25
Dario ...	GP	10,000	10	1	1.0
Dario ...	HP	2,500	5	1.5	2.0

.8 Volt .8 Ampere

Marconi ...	S.8	200,000	160	.8	.8
Osram ...	S.8		160	.8	.8
Marconi ...	H.8	55,000	40	.8	.73
Osram ...	H.8		40	.8	.73
Marconi ...	D.8	21,000	14	1.6	.67
Osram ...	D.8		14	1.6	.67
Marconi ...	HL.8	17,000	17	.8	1.0
Osram ...	HL.8		17	.8	1.0
Marconi ...	P.8	6,000	6	.8	1.0
Osram ...	P.8		6	.8	1.0

4 Volt 1 Ampere

Six-Sixty	SS4SG	1,330,000	1,000	1	.75
Mullard ...	S4V	909,000	1,000	1	1.1
Mazda ...	AC/SG	800,000	1,200	1	2.0
Marconi ...	MS4	500,000	550	1	1.1
Osram ...	MS4		550	1	1.1
Cossor ...	MSG41	200,000	400	1	2.0
Marconi ...	MH4	23,000	35	1	1.5
Osram ...	MH4		35	1	1.5
Cossor ...	M41RC	20,000	35	1	1.75
Six-Sixty	SS4GP	14,500	35	1	2.4
Cossor ...	M41HF	14,000	25	1	1.8
Mullard ...	354V		35	1	2.5
Mazda ...	AC/HL	13,500	35	1	2.6
Marconi ...	MHL4	8,000	16	1	2.0
Osram ...	MHL4		16	1	2.0
Cossor ...	M41LF	7,900	15	1	1.9
Six-Sixty	SS4Det	7,000	16	1	2.3
Mullard ...	164V	6,650	16	1	2.4
Cossor ...	M41P	5,000	10	1	2.0
Marconi ...	ML4	3,000	6	1	2.0
Osram ...	ML4		6	1	2.0
Six-Sixty	SS4P		10	1	3.3
Mullard ...	104V	2,850	10	1	3.5
Mazda ...	AC/P	2,650	10	1	3.75
Cossor ...	M41XP	2,000	4	1	2.0
Mazda ...	AC/P1		5	1	2.5

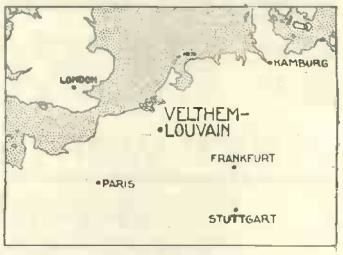
Broadcast Identification Sheets

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.



338.2m.
(887 *kc.*)

Power: 3 kw.

VELTHEM-LOUVAIN
(*Belgium*)

218 *miles from London*

Standard Time: Greenwich Mean Time.*
Announcer: Man and woman.
Call: *Hier Velthem de Katholieke Vlaamsche Radio Omroep* (*op drie honderd negen en dertig meter*).

Transmissions are also given by an Antwerp Socialist Association, in which case the call is *Hier Radio S.A.R.O.V.* No regular interval signal, but on some evenings a gong is struck between items.
Main Programmes: B.S.T. 20.00, concert (Tuesday, Thursday, and Sunday); occasionally 15.00 (Saturday). 22.30 or 23.00, special transmission of gramophone records for British listeners (announcements in French and English). Tests are also made with this transmitter at 11.30 a.m. (Sunday).

It should be borne in mind that the transmitter is still temporarily situated at Forest, near Brussels, and will be re-erected later at Velthem. Closes down with opening bars of La Brabançonne (Belgian National Anthem) and good night in Flemish (*Goede Nacht*) and French.

* Belgium adopts B.S.T.

291.1m.
(1,030 *kc.*)

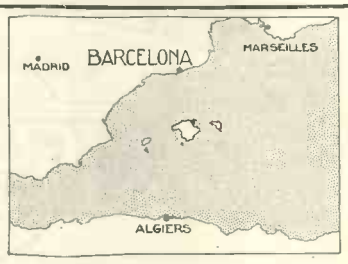
Power: 7 kw.

TURIN
(*Italy*)

578 *miles from London*

Standard Time: Central European.*
Announcer: Woman.
Call (phonetic): *Aye-yah Rah-dee-owe Tor-ee-no.*
Interval Signal: The song of the nightingale (gramophone record). As the station frequently relays Milan, the latter's signal—a morse T—is also heard; in this case the call is: *Radio Milano e Torino.*
Main Daily Programmes: B.S.T. 19.15, light music; 20.30, concert; relay from local theatre or from Milan; 22.30 or 23.00, dance music (outside broadcast or gramophone records). Closes down as Rome: *Fine della trasmissione; Buona notte a tutti*, followed by Fascisti hymn (Giovinezza) and Italian National Anthem.

* Coincides with B.S.T.



349m.
(860 *kc.*)

Power: 8 kw.

BARCELONA
EAJ1
(*Spain*)

718 *miles from London*

Standard Time: Greenwich Mean Time.*
Announcer: Man.
Call (phonetic): *Akky Esta-see-own Ay-ah-chola oono oo-nee-own-ay Rah-dee-oh Bar-thel-own-ah* (Here is station EAJ1, Union Radio Barcelona).

Between items an apparent dialogue is heard, but this is mimicked by the announcer, Jose Torrés, an expert ventriloquist, with doll.

No regular interval signal is used, but at fixed hours chimes are relayed from the cathedral.
Main Daily Programme: B.S.T., 18.30, concert from the International Exhibition; 22.00, main evening transmission. Frequent relays from Madrid (EAJ7). Closes down with Spanish National Anthem, followed by *Buenas Noches, Senoras y Caballeros* (Good night, ladies and gentlemen), *hasta manana si Dios quiere* (until to-morrow, if God so wills it).

* Spain has not adopted B.S.T.

550m.
(545 *kc.*)

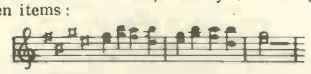
Power: 20 kw.

BUDA-PEST
(*Hungary*)

902 *miles from London*

Standard Time: Central European.*
Announcer: Man.
Call: *Hallo, itt Budapest* (phonetic: *Boodapescht*).

Details of programmes are frequently given in French and German, as well as the Magyar language.
Interval Signal: A musical box, melody as under, repeated as required between items:



Main Daily Programmes: B.S.T., 19.30, concert or operatic relay; 23.00, gipsy orchestra from hotel or restaurant (except Wednesday).

Usually closes down with a "Good Night" in Magyar, French, German, and occasionally in English.

* Coincides with B.S.T.

1,071m.
(280 *kc.*)

Power: 6.5 kw.

HILVER-SUM
(*Holland*)

234 *miles from London*

Standard Time: Amsterdam Summer Time (B.S.T. plus twenty minutes).
Announcer: Man.
Call: *Hier Hilversum*, followed by initials of society responsible for broadcasts, namely, A.V.R.O. or V.A.R.A.
Interval Signal (V.A.R.A.): Chimes: G. D E B D B, in C major.

Announcements in Dutch; when transmissions of gramophone records are made, or special concerts broadcast for British listeners, English translations are given.
Main Daily Programmes: B.S.T., 11.40, lunch-hour music; 14.10, concert; 17.40, gramophone (except Sunday); 19.40, evening entertainment; 10.40, gramophone records.

Closes down with Dutch National Anthem and the conventional good night: *Ik wensch u goeden avond, Dames en Heeren; wel to rusten* (sleep well).

* Hilversum also broadcasts on 298.8 m. (1,004 kc.) daily, from 11.40 a.m. until 17.40, B.S.T., except on Sundays, when the long wavelength is used throughout the day.

WAVELENGTHS OF THE WORLD'S BROADCASTERS

Wavelength	Name of Station	Country	Dial Readings
16.6	Bandoeng (PLF)	Java	
16.8	Huizen (PHI)	Holland	
19.4	Schenectady (W2XAD)	United States	
19.8	Pittsburgh East (W8XK)	United States	
25.4	Vienna	Austria	
25	Rome	Italy	
25.2	Pittsburgh East (W8XK)	United States	
25.53	Chelmsford (G5SW)	Great Britain	
29.7	Radio Experimental (Paris)	France	
31.3	Sydney (2FC)	Australia	
31.28	Eindhoven	Holland	
31.38	Zeesen	Germany	
31.5	Schenectady (W2XAF)	United States	
31.6	Lyngby	Denmark	
32.6	Paris, Eiffel Tower (FL)	France	
32.58	Sydney (2BL)	Australia	
40	Doberitz (AFK)	Germany	
41	Radio Vitus	France	
49	Motala	Sweden	
49.6	Cincinnati (W8XAL)	United States	
49.7	New York (W2XAL)	United States	
50	Moscow (RFN)	Russia	
58	Prague	Czecho-Slovakia	
67.6	Doberitz (AFK)	Germany	
80.2	Rome	Italy	
175	St. Quentin	France	
200	Leeds (2LS)	Great Britain	
206	Antwerp	Belgium	
210	Budapest	Hungary	
219	Beziers	France	
221	Helsinki	Finland	
223	Fécamp	France	
224	Binche	Belgium	
225	Cork (1FS)	Irish Free State	
227	Cologne	Germany	
231	Malmo	Sweden	
232	Kiel	Germany	
236	Chatelineau	Belgium	
236	Nimes	France	
238	Bordeaux (Sud-Ouest)	France	
239	Nurnberg	Germany	
242	Belfast (2BE)	Ireland	
244.7	Ghent	Belgium	
244	Cassel	Germany	
246	Linz	Austria	
	Schaenbeek	Belgium	
249	Juan-les-Pins	France	
250	Almeria	Spain	
253	Gleiwitz	Germany	
256	Toulouse (PTT)	France	
257	Hoerby	Sweden	
259	Leipzig	Germany	
261	London National	Great Britain	
263	Moravska-Ostrava	Czecho-Slovakia	
265	Lille (PTT)	France	
266	Barcelona (EAJ13)	Spain	
268	Strasbourg	France	
270	Kaiserslautern	Germany	
272	Rennes	France	
276	Koenigsberg	Germany	
279	Bratislava	Czecho-Slovakia	
281	Copenhagen	Denmark	
283	Innsbruck	Austria	
	Magdeburg	Germany	
	Stettin	Germany	
	Berlin	Germany	
287	Radio Lyons	France	
	Montpellier	France	
288.5	Swansea (5SX)	Great Britain	
	Stoke-on-Trent (6ST)	" "	
	Sheffield (6LF)	" "	
	Plymouth (5PY)	" "	
	Liverpool (6LV)	" "	
	Hull (6KH)	" "	
	Edinburgh (2EH)	" "	
	Dundee (2DE)	" "	
	Bournemouth (6BM)	" "	
	Bradford (2LS)	" "	
	Newcastle (5NO)	" "	
291	Turin	Italy	
293	Kosice	Czecho-Slovakia	
295	Limoges	France	
296	Reval	Esthonia	
298	Hilversum (between 12.40 and 6.40 p.m. B.S.T.	Holland	
301	Aberdeen (2BD)	Great Britain	
306	Bordeaux (PTT)	France	
306	Zagreb (Agram)	Jugoslavia	
310	Cardiff (5WA)	Great Britain	
313	Radio Vitus, Paris	France	
	Cracow	Poland	
315	Bremen	Germany	
315	Marseilles (PTT)	France	

Wavelength	Name of Station	Country	Dial Readings
320	Dresden	Germany	
322	Goeteborg	Sweden	
325	Breslau	Germany	
329	Grenoble	France	
330	Petit-Parisien	France	
332	Naples	Italy	
335	Posnan	Poland	
338	Forest	Belgium	
342	Brunn	Czecho-Slovakia	
349	Barcelona (EAJ1)	Spain	
352	Graz	Austria	
356	London Regional	Great Britain	
360	Stuttgart	Germany	
364	Algiers	North Africa	
	Bergen	Norway	
368	Frederiksstad	Norway	
	Seville (EAJ5)	Spain	
370	Radio LL (Paris)	France	
372	Hamburg	Germany	
377	Manchester (2ZY)	Great Britain	
381	Radio Toulouse	France	
385	Wilno	Poland	
386	Genoa (1GE)	Italy	
385	Lvov	Poland	
390	Frankfurt	Germany	
394	Bucharest	Roumania	
399	Glasgow (5SC)	Great Britain	
403	Berne	Switzerland	
408	Kattowitz	Poland	
413	Dublin (2RN)	Irish Free State	
416	Radio Maroc	North Africa	
418	Berlin	Germany	
424	Madrid (EAJ7)	Spain	
432	Belgrade	Jugoslavia	
436	Stockholm	Sweden	
441	Rome	Italy	
445	Rjukan	Norway	
447	Paris (Ecole Sup. PTT)	France	
	Bolzano (1BZ)	Italy	
	Klagenfurt	Austria	
453	Danzig	Germany	
	Aalesund	Norway	
	Tromso	Norway	
	Porsgrund	Norway	
459	Zurich	Switzerland	
462	San Sebastian	Spain	
466	Lyons (PTT)	France	
473	Langenberg	Germany	
479	Midland Regional	Great Britain	
487	Prague	Czecho-Slovakia	
493	Oslo	Norway	
501	Milan	Italy	
509	Brussels (No. 1)	Belgium	
517	Vienna	Austria	
525	Riga	Latvia	
533	Munich	Germany	
542	Sundsvall	Sweden	
550	Budapest	Hungary	
560	Augsberg	Germany	
566	Hanover	Germany	
570	Freiburg	Germany	
680	Lausanne	Switzerland	
720	Moscow	Russia	
760	Geneva	Switzerland	
770	Ostersund	Sweden	
840	Nijni	Russia	
938	Moscow	Russia	
1,000	Leningrad	Russia	
1,010	Basle	Switzerland	
1,060	Tiflis	Russia	
1,071	Scheveningen-Haven	Holland	
	Hilversum	Holland	
1,103	Moscow Popoff	Russia	
1,153	Kalundborg	Denmark	
1,200	Boden	Sweden	
	Istanbul	Turkey	
	Reykjavik	Iceland	
1,250	Tunis Kaobah	North Africa	
1,304	Kharkov	Russia	
1,348	Motala	Sweden	
1,380	Bakou	Russia	
1,411	Warsaw	Poland	
1,446	Eiffel Tower, Paris	France	
1,481	Moscow	Russia	
1,554	Midland National	Great Britain	
1,635	Zeesen	Germany	
1,649	Norddeich	Germany	
1,725	Radio Paris	France	
1,796	Lahti	Finland	
1,875	Huizen	Holland	
1,935	Kaunas	Lithuania	
1,961	Ankava	Turkey	

IN TUNE WITH THE TRADE

FETTER LANE'S Review of Catalogues and Pamphlets

A Ferranti Reminder

THERE is one thing about Ferranti's, and that is that they don't keep anybody guessing. For instance, every so often (about once a month, I should think) they send me the latest batch of literature, giving details of new products and so on, and what I am particularly interested in are the constructional supply sheets for the amateur.

This is a new Ferranti idea, showing in a very thorough and pleasingly technical manner the simplest way of using Ferranti components in various wireless units. To take just one example, here is a chart for building a simple A.C. mains unit, using a valve rectifier. This chart is well illustrated with photographs; there is a wiring plan and a drilling diagram and a number of graphs showing the output of the unit under varying conditions.

The whole job of description is done in a very thorough manner and is well worthy of Ferranti. There are several of these constructional sheets available, and if you are interested you should get in touch with Ferranti, Ltd., of Hollinwood, Lancashire. **118**

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Lissen's New Process

I CONFESS I don't quite know, technically, what Lissen's mean by 'The Valve with the Extended Grid," but I do seem to hear from every reliable source that these Lissen New Process valves are really good.

If you are valveless at the moment and want to get good value for your money, then see first the folder dealing with Lissen valves, which can be obtained from Lissenium Works, Worple Road, Isleworth, Middlesex.

This folder gives curves and particulars of each valve in the range and, what is more important, it is stated in what type of circuit each valve can be used and suitable values are given for the coupling resistances and transformers. A good idea. **119**

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Miscellaneous

SOME interesting sheets have been sent to me by the Wholesale Wireless Co., of 103 Farringdon Road, E.C.1. These deal with so many units that it is impossible to refer to them all, but H.T. and L.T. mains units figure largely, and full constructional details are given showing how to make these up at the lowest possible cost.

There is also an efficient-looking all A.C. three-valver, which can be obtained from the Wholesale Wireless Co. as a complete kit of parts. This company is catering largely for folk who like to make up sets and units from kits of parts, and their thoroughness in this direction is commendable, for they appear in every instance to have kept the question of price well to the fore, without apparently allowing efficiency to suffer.

The kits of parts, both for mains units and receivers, contain everything that is necessary, and when made up should rival in performance many commercial jobs. And there are many amateurs who, at the expense of the small amounts of constructional work involved, are glad to obtain units such as these at the lowest possible price; and at the same time they enjoy the fun of home construction. **120**

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Helping the Tuner

THE Polar people have made me a present of the Polar tuning graph, which should be in the possession of every amateur. It consists of a neatly-lined graph on a sheet of stout card, with a cord at the top for hanging. Along the bottom of the graph are plotted the condenser degrees and the vertical ordinates are the wavelengths.

I am sorry if this sounds tricky. As a matter of fact, full instructions are given with each graph, and in about half an hour's listening any amateur should be able to make a tuning graph of his own set, which will then be a constant help in tuning-in stations at a moment's notice and in locating the distant fellows.

Wingrove & Rogers, Ltd., of 188-89 Strand, W.C.2, are asking the modest sum of 2½d. to cover postage for this and, as I say, I think every listener ought to have this graph. **121**

SEND TO US FOR THESE CATALOGUES!

As a keen wireless enthusiast you naturally want to keep abreast of all the latest developments and this special feature will enable you to do so with the minimum of trouble and the cost of only ½d. for postage.

Here we review the newest booklets and folders issued by seven well-known firms. If you want copies of any or all of them just cut out this coupon and send it to us. We will see that you get all the literature you desire.

Just indicate the numbers (seen at the end of each paragraph) of the catalogues you want below. (Send also 2½d. if you want No. 121.)

My name and address are :—

Send this coupon in an unsealed envelope, bearing ½d. stamp, to "Catalogue Service," WIRELESS MAGAZINE, 58/61 Fetter Lane, E.C.4. *Valid till July 31*

One Valve and Another

IF I may be excused the metaphor, there is a saying that there is no bad beer, but just beer; and the same is being said by many listeners nowadays, who maintain that there are no really bad valves and that one type of one make is as good as the same type of another make.

Well, I hope this is true, so far as the better-class valves are concerned.

I have just at hand the new Six-Sixty booklet, which gives details of the new range.

What I like about this book is that useful curves and consumption and performance data are given and there need be no guesswork in choosing a Six-Sixty valve. At the end of this little book are brief references to other Six-Sixty products, the cone-speaker assembly, and the portable-set turntables. If you are interested in such things, then write to Six-Sixty House, 17-18 Rathbone Place, Oxford Street, W.1. **122**

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Accumulators from Pertrix

PERTRIX are pushful people, and now that they have made a thorough name for themselves in the dry high-tension battery line, they are following up the success with some jolly good accumulators, both for H.T. and L.T.

They have been good enough to send me a very well-got-up and conveniently-arranged book dealing with the whole range, and I have no hesitation in advising those in search of a new accumulator to write to Pertrix at Britannia House, 233 Shaftesbury Avenue, W.C.2.

One thing that is very pleasing is that the replacement parts can be obtained for all Pertrix accumulators, so if you accidentally drop a cell and buckle the plates or break the box, you can fit "news" and thus obviate the need of scrapping the cell. **123**

◆ ◆ ◆

The Bulgin Multitude

WHENEVER I am in need of a gadget (and what enthusiastic home constructor is not sometimes at a loose end for some or other little component?) I turn to the comprehensive catalogues of Mr. Bulgin, who seems to market every radio fitting that one is ever likely to need. So I am keeping on hand the latest list of Competa parts, which I have just received from A. F. Bulgin and Co., of 9-11 Cursitor Street, E.C.4.

I see that the front part of this catalogue is taken up by meters of one sort and another.

Intend to look carefully through the front part of this catalogue and see if there are not one or two pocket meters that could usefully be added to my range. **124**

WESTINGHOUSE RECTIFIERS
FOR HIGH-TENSION UNITS

200 volts
100 m.a.

Type H.T.1
75/-

150 volts. 50 m.a.

Type H.T.4 **37/6**

120 volts
20 m.a.

Type H.T.3 **21/-**

Also Type H.T. 2 350 volts.
100 m.a.
and
various low-tension types
for all purposes

WESTINGHOUSE
METAL RECTIFIERS
are unquestionably the most convenient and efficient rectifiers at present available for A.C. Mains working. That is why they are used in such large numbers by the leading set manufacturers

Full details of these Units and how to use them are given in our 32-page book "The All-Metal Way, 1930" which tells you all you want to know about A.C. Mains Units. Send 2d. stamp to:—
THE WESTINGHOUSE BRAKE & SAXBY SIGNAL CO., LTD. :: 82 York Road, King's Cross, London, N.1

Enormous Range

SCREENODION 15/6
Bivolt .15 amps
Forvolt .075 amps
SUPERBLY SELECTIVE
The best Screen-Grid in the world

SUPER H.F. 5/6
Bivolt .15 amps
Forvolt .075 amps

Super DETECTOR 6/6
Bivolt .15 amps
Forvolt .075 amps
A super-sensitive detector for anode-bend or leaky-grid rectification

HYPER-POWER 9/6
Bivolt .3 amps
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Write for Free Folder to —
IMPEX ELECTRICAL, LTD.
Dept. K, 538 High Road, Leytonstone, London, E.11

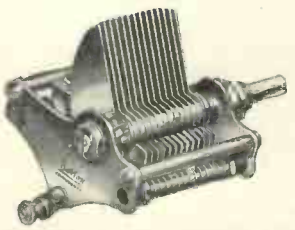
UNIVERSAL RESISTRON 5/6
SUPER POWER and the Super Power PENTODION 7/6 18/6

DARIO VALVES
Best way to all Stations

DARIO L.F. TRANSFORMER
A little marvel. Guaranteed for two years. Completely shrouded. Perfectly designed and perfectly made.
5.1 or 3.1 **5/-**

170

BURTON AGAIN!



BurTon's well-known Variable Condensers and Valve Holders have been specially selected for the "Pedlar" Portable 2 and the "Pedlar" Portable 3. The BurTon Binocular H.F. Choke is specified for the "Invitation 4" described in this issue. Place your confidence in BurTon Components!

"PEDLAR" PORTABLE
BURTON SUPER METAL END PLATE CONDENSER
Designed to occupy a minimum of space. Without dial, .0005 **7/-**

"INVITATION 4"
BURTON BINOCULAR H.F. CHOKE
Designed to avoid peaks and external magnetic field. Covers a waveband of 50-3,000 metres. Price **5/9** *each.*

BURTON COMPONENTS
C. F. & H. BURTON, Progress Works, Walsall

BUYERS' GUIDE TO SETS

In this table we give details of all the new season's sets that have so far passed through the WIRELESS MAGAZINE *Laboratory tests. All can be thoroughly recommended in their several classes.*

For the convenience of set buyers the table has been arranged with receivers in order of price, so that it is only a moment's work to find what sets within the prescribed price range have proved themselves satisfactory.

From month to month this list will be extended, so that readers may keep themselves informed of the sets that are satisfactory in performance under modern conditions.

Maker	Model	Type	Price	Power Supply	Valve Combination.	Test Report
Pye Radio, Ltd.	Model 232	Table Cabinet	£4 17s.	Bat	D, P	February, 1930
Rothermel Corporation, Ltd.	Short-wave Converter	—	£5 17s. 6d.	Bat	D	November, 1929
London Electric Wire Co. and Smiths, Ltd.	Lewcos Chassis	Kit Set	£7	Bat	SG, D, P	December, 1929
Lissen, Ltd.	S.G.3	Kit Set	£7 7s.	Bat	SG, D, P	November, 1929
A. C. Cossor, Ltd.	1930 Melody Maker	Kit Set	£8 15s.	S.C. Bat	SG, D, P	January, 1930
Edison Swan Electric Co., Ltd.	Standard Bat. 3	Table Cabinet	£9 12s. 6d.	Bat	SG, D, P	January, 1930
Pye Radio, Ltd.	—	Portable	£19 19s.	S.C. Bat	2HF, D, LF, P	May, 1930
Kolster-Brandes, Ltd.	K.B.163	★Table Cabinet	£10 15s.	Bat	SG, D, Pen	May, 1930
Burndept Wireless (1928), Ltd.	Screened Ethophone	Table Cabinet	£11 8s.	Bat	SG, D, Pen	January, 1930
Ferranti, Ltd.	S.G.3	Kit Set	£12	Bat	SG, D, P	December, 1930
S. G. Brown, Ltd.	Type A	Kit Set	£12	Bat	SG, D, P	December, 1929
Philips Lamps, Ltd.	2502	Table Cabinet	£12 10s.	Bat	SG, D, Pen	February, 1930
E. K. Cole, Ltd.	Ekco P.2	★Table Cabinet	£12 17s. 6d.	A.C., D.C.	D, Pen	June, 1930
Igranic Electric Co., Ltd.	A.C.2	Table Cabinet	£13	A.C.	D, Pen	May, 1930
Marconiphone Co., Ltd.	Model 39	★Table Cabinet	£13	Bat	SG, D, P	January, 1930
Garnett Whiteley & Co., Ltd.	S.G.P. Set	★Table Cabinet	£13 15s.	S.C. Bat	SG, D, Pen	February, 1930
Edison Bell, Ltd.	Maison Three	★Transportable	£14	S.C. Bat	SG, D, Pen	April, 1930
General Electric Co., Ltd.	Gecophone S.W.3	Short-waver	£15	Bat	SG, D, P	December, 1929
Kolster-Brandes, Ltd.	K.B.169	★Table Cabinet	£17 10s.	A.C.	SG, D, Pen	January, 1930
Varley (Oliver Pell Control, Ltd.)	A.P.1 and A.P.2	★Table Cabinet	£16 16s.	A.C., D.C.	D, P	January, 1930
Columbia Graphophone Co., Ltd.	Model C	Portable	£17 17s.	S.C. Bat	2HF, D, 2LF	July, 1930
Kolster-Brandes, Ltd.	K.B.103	Portable	£18 18s.	S.C. Bat	SG, D, LF, P	November, 1929
Marconiphone Co., Ltd.	Model 55	Portable	£18 18s.	S.C. Bat	2HF, D, LF, P	April, 1930
Dorian Wireless Co.	Super S.G.4	Portable	£19 19s.	S.C. Bat	SG, D, LF, P	June, 1930
E. K. Cole, Ltd.	Ekco-Lectric S.G.P.3	Table Cabinet	£21	D.C.	SG, D, Pen	December, 1929
Edison Swan Electric Co., Ltd.	D.C.3	★Table Cabinet	£21	D.C.	SG, D, P	June, 1930
Gambrell Radio, Ltd.	S.P.3D.C.	★Table Cabinet	£22	D.C.	SG, D, Pen	November, 1929
Marconiphone Co., Ltd.	Model 44	Table Cabinet	£22 10s.	A.C., D.C., Bat	2SG, D, P	November, 1929
Philips Lamps, Ltd.	2514	★Table Cabinet	£23	A.C.	SG, D, Pen	February, 1930
Ferranti, Ltd.	A.C.3	★Table Cabinet	£25	A.C.	SG, D, P	May, 1930
General Electric Co.	BC3030	Table Cabinet	£25	A.C.	SG, D, P	November, 1929
Graham Amplion, Ltd.	253	★Table Cabinet	£25	Bat	SG, D, 2LF	July, 1930
Varley (Oliver Pell Control, Ltd.)	A.P.3 and A.P.4	★Table Cabinet	£26 5s.	A.C., D.C.	SG, D, P	April, 1930
L. McMichael, Ltd.	Super-range Four	Transportable	£27 6s.	S.C. Bat	SG, D, LF, P	March, 1930
Igranic Electric Co., Ltd.	Neutrosonic Short-waver	Table Cabinet	£28 7s. 6d.	Bat	SG, Super-het	March, 1930
Lissen, Ltd.	Radio Gramophone	★Console Cabinet	£30 to £49	A.C., D.C., Bat.	SG, D, P	October, 1929
Radio Instruments, Ltd.	—	Transportable	£30	A.C.	SG, D, P	March, 1930
Edison Swan Electric Co., Ltd.	—	★Transportable	£31 10s.	A.C.	SG, D, LF, P	April, 1930
Columbia Graphophone Co., Ltd.	304	Table Cabinet	£33	A.C., D.C., Bat	3SG, D, P	March, 1930
Selectors, Ltd.	—	★Portable	£33 12s.	S.C. Bat	SG, D, LF, P	February, 1930
Marconiphone Co., Ltd.	Model 56	★Table Cabinet	£35	A.C.	3SG, D, P	June, 1930
Philips Lamps, Ltd.	Model 2511	★Table Cabinet	£37 10s.	A.C.	2SG, D, Pen	November, 1929
Gramophone Co., Ltd.	520	★Console	£75	A.C., D.C.,	SG, D, 2LF	July, 1930

EXPLANATIONS OF ABBREVIATIONS

A.C.=Alternating-current Mains; Bat.=Batteries; D=Detector; D.C.=Direct-current Mains; L.F.=Low-frequency Valve; P=Power Valve; Pen=Pentode; SC=Self-contained; SG=Screened-grid Valve; and ★=set is provided with device for electrical reproduction of gramophone records.

MUSIC BROUGHT UP SHARP!

Voices in sharp relief; song clear and true; music full of life; that is what the LISSEN Secret Process does for your radio.

Because the current that flows from the large cells of this battery is produced by a new chemical combination and process which makes it pure, silent and sustained. There is never a sign of ripple in the current, never a trace of hum. It flows smoothly from beginning to end of the longest programme, and throughout months and months of use.

You want pure power for your radio; any good wireless dealer will supply you with the Lissen Battery that will give it to you.

PRICES

60 volt (reads 66) ...	7/11
100 volt (reads 108) ...	12/11
120 volt	15/11
36 volt	4/6
60 volt (For Portable Receivers)	7/11
99 volt (For Portable Receivers)	12/6
60 volt (Super Power)	13/6
100 volt ,, ,, ...	22/-
4½ volt Grid Bias ,, ...	10d.
9 volt ,, ,, ...	1/6
16 volt ,, ,, ...	2/9
4½ volt Pocket Battery 5d. each (4/6 doz.)	
Single Cell Torch Battery 4½d.	

MADE IN ENGLAND

7/11

LISSEN LIMITED, WORPLE ROAD, ISLEWORTH, Middlesex. Factories also at Richmond (Surrey) and Edmonton
(Managing Director: T. N. COLE)

The JAMES PORTABLE S.G.3

AS GOOD AS MOST FOUR-VALVERS!

Specially Designed for the WIRELESS MAGAZINE by W. James, who Produced the Famous Range of "Brookman's" Receivers.

WHEN I first considered the subject of a portable set for WIRELESS MAGAZINE, it seemed that the desired sensitivity and quality of reproduction could best be obtained by using two stages of screened-grid amplification, a detector, and a power stage.

Accordingly a set was prepared along these lines, the parts being selected to work with picked valves.

Four Valves Too Lively

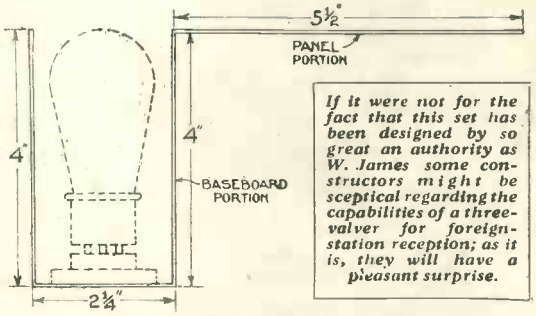
It was not long before the arrangement was dropped. The set was too lively. For sensitivity it was remarkable. Stations rarely heard seemed to come in with regularity. But the design was such that it would have been rather difficult to follow. The high-frequency circuits had to be carefully balanced.

Complete screening was necessary, and because of the elaborate nature of the precautions which had to be taken to obtain stable working, the set was put on one side and an attempt was made to get the maximum of results with three valves—one screened-grid, detector, and power.

By using essential screening and parts of the best values, a good set was produced. The usual four or five long-wave stations are heard at good strength during the lunch hour, as well as the short-wave stations.

What I particularly like about the set in its final form is the ease with which the stations are brought in. Extreme reaction is not needed, and the set is less delicate than many I have tried.

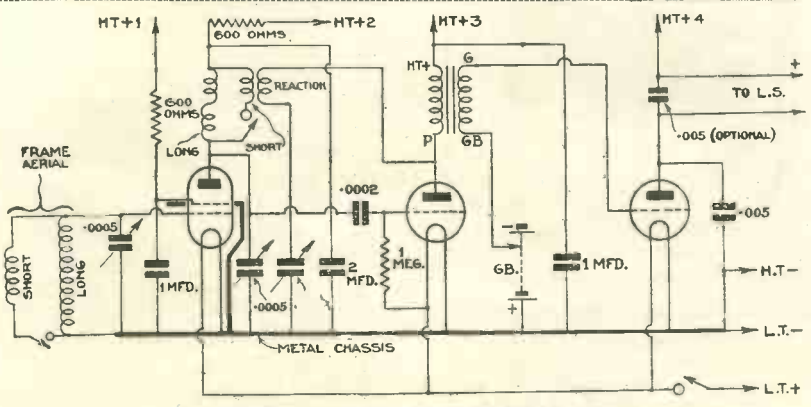
As an example, Midland Regional in London overloads the power valve with no reaction and with the set pointing well away from the direction of maximum strength. I am, therefore, confident that the set will be of value to the numerous readers who want a self-contained set providing a quality of reproduction which is good within the limits of the power valve and loud-speaker.



If it were not for the fact that this set has been designed by so great an authority as W. James some constructors might be sceptical regarding the capabilities of a three-valver for foreign-station reception; as it is, they will have a pleasant surprise.

ARRANGEMENT OF METAL CHASSIS

How a single sheet of aluminium is bent to form the chassis will be clear from this diagram



CIRCUIT OF THE JAMES PORTABLE S.G.3

This set uses a screened-grid valve, detector, and power valve; its performance is equivalent to that of many four-valvers

Stray H.F. Currents

In a powerful portable type set it is necessary to take care of many things which are relatively not important in ordinary sets. High-frequency currents must be kept out of the loud-speaker, for example, or they will pass to the aerial and so cause instability or loss in amplification.

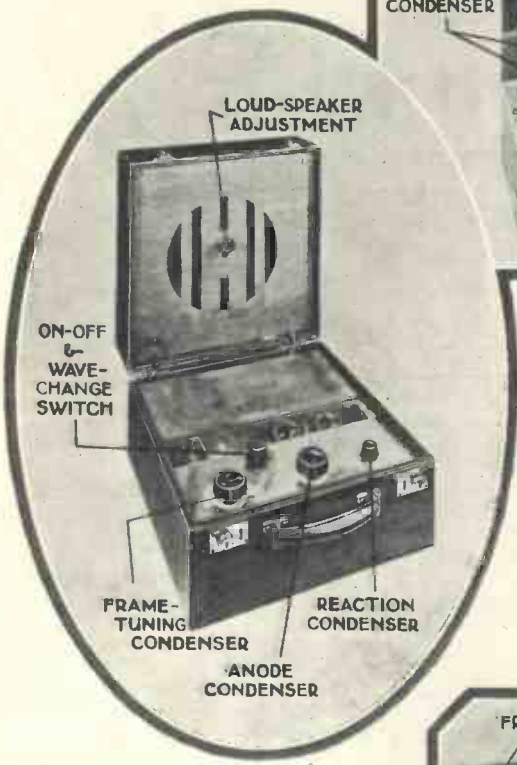
Similarly, as the high-tension battery is near the frame aerial, high-frequency currents should be diverted from it. Failure to minimise stray

The James Portable S.G.3—*Continued*

couplings of all descriptions will lead to trouble when high magnifications are being attempted.

With these points in mind, it was decided to employ a metal assembly and to filter thoroughly all circuits.

The theoretical diagram shows



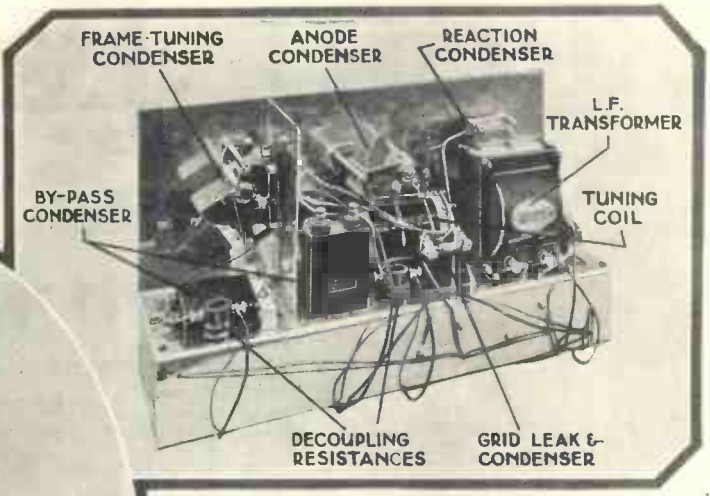
the chief points. There is a two-part frame aerial; the long-wave part is connected to the tuning condenser and is, therefore, always in circuit. To tune over the medium waves the low-wave frame aerial is connected in parallel with the long-wave winding. A simple shorting switch is fitted in the lid of the container, in the bottom left-hand corner.

Aerial Framework

It is connected in the "earth" side of the frames, that is, to the sides which are joined to L.T.— and case. The framework for the aerials is fastened to the thin wood front, which also carries the loud-speaker.

Different sizes of wire are used for the two windings. For the medium-wave frame the wire is No. 26, and No. 36 or 38 can be used for the long waves.

In the screen circuit of the shielded valve a by-pass condenser of 1 microfarad and a 600-ohm filter resistance

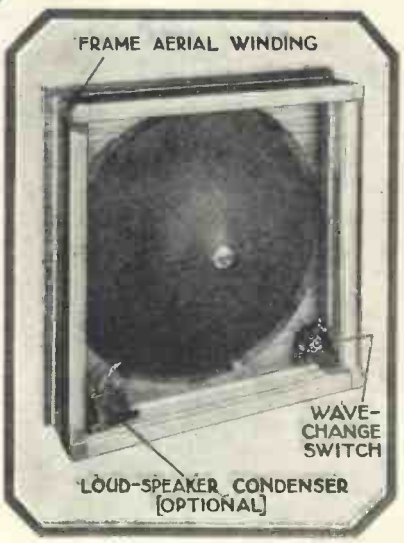


AN EASY JOB FOR THE CONSTRUCTOR

These photographs show how simple is the actual assembly —in spite of the complicated appearance of the layout on the opposite page!

are used. They act to minimise the flow of high-frequency currents in the battery circuit and are essential.

The connections of the tuned circuit to the anode are interesting. In the first place the tuning coils are



FRAME AERIAL AND LOUD-SPEAKER

The two windings of the frame aerial, for long and short waves, are clear from this photograph, which also shows how the loud-speaker cone is mounted. In the left-hand corner is an optional by-pass condenser connected in parallel with the loud-speaker

joined between the anode and positive high tension. Two coils are used, the medium-wave one being fitted inside the long-wave coil. One end of each coil is connected and taken to the 2-microfarad by-pass condenser and through the 600-ohm resistance to positive high tension. The other end of the outer long-wave coil goes to the anode of the screened-grid valve, to the tuning condenser, and to the grid condenser of the detector.

It also goes to one of the contacts of the switch. On the second contact is the end of the medium-wave coil. Thus, when receiving the long-wave stations, only the long-wave coil is in circuit, but the short-wave coil is in parallel with it when the switch contacts are closed for medium-wave reception.

Single Reaction Coil

One reaction coil is used for the two wave ranges. The wave-range switch also has the low-tension positive wire joined to it, and the set is "off" when the switch is in its neutral position. A point to note is that one side of both tuning condensers is in contact with the metal panel and they do not, as a result, need wiring on this side.

The 2-microfarad condenser is part of the high-frequency tuning circuit, as it completes the circuit made up of the tuning coils and condenser. One side of it is taken to the metal base. Normal values of grid condenser and leak are used, .0002 microfarad and 1 megohm, the return end of the leak being taken to L.T.+.

High-ratio Transformer

In the anode circuit of the detector is the usual reaction condenser, of .00034 microfarad, and a good transformer. As there was room for a large transformer, I used one, and it has a ratio of 7 to 1. A fair amount of low-frequency magnification is,

As Good As Most Screened-grid Four-valvers

therefore, provided. This stage has a 1-microfarad by-pass, which is quite essential.

H.F. Stopper

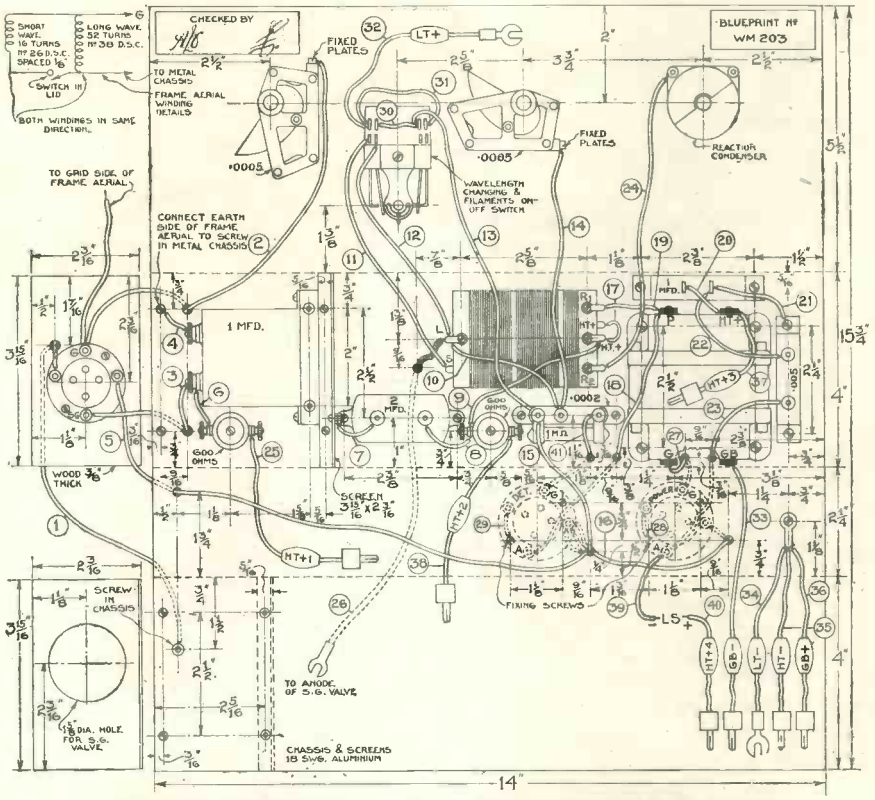
In the final anode circuit a .005-microfarad condenser is joined between the anode and metal base. This helps to prevent high-frequency currents from passing through the loud-speaker wires.

The magnification depends largely upon the arrangement of the high-frequency circuits. With poor coils little amplification would be obtained, even with full reaction. It cannot be too highly stressed that the right condition on both wavebands is one in which the aerial circuit is about to oscillate as the anode circuit is caused just to oscillate.

We want to obtain, first, the maximum amount of amplification in the anode circuit and then to be certain that the strongest possible signal is picked up by the frame.

Use a Good Valve

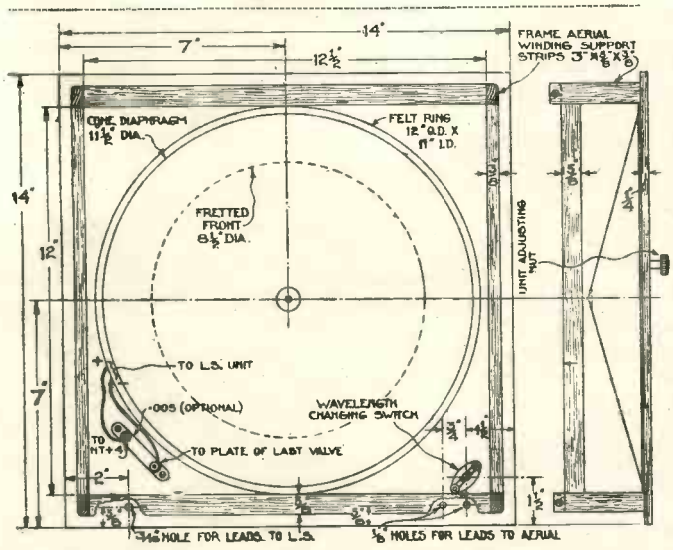
For high amplification it is necessary to use a good valve, suitable coils, and adequate shielding. I have chosen the Mazda 215SG. Taking .15 ampere at 2 volts, its amplification factor is 450, and its impedance is 400,000 ohms under normal conditions. The screening is exceptionally good, from which it follows that with a suitable circuit a high amplification will be obtained.



LAYOUT AND WIRING GUIDE OF THE JAMES PORTABLE S.G.3

This layout and wiring diagram can be obtained as a full-size blueprint for half-price, (that is, 6d., post free), if the coupon on the inside back cover is used by July 31. Ask for No. WM 203. The chassis can be obtained already drilled if desired.

TELL YOUR FRIENDS ABOUT THIS FINE PORTABLE !



CHASSIS FOR FRAME AERIAL AND LOUD-SPEAKER

The arrangement of the former for the frame aerial and the cone loud-speaker is clear from this diagram

Controlling the Magnification Factor

Actually, the valve is mounted horizontally, a screen being fitted further to assist stable working. No grid bias is used, as the input signals are relatively small. Adjustment of H.T. and screen-grid voltage naturally varies the characteristics of the valve and it is, therefore, possible to arrange for average valves of the type to be used under the best possible conditions. Thus, by adjusting the voltage of the screen, the magnification factor may be increased or decreased as desired.

The aerial was, of course, found by trial to have the best characteristics, and any great departure from the specification is not to be recommended.

Constructional Work Not Difficult

It might seem at first glance that the constructional work is difficult. This is not really so. I used a one-piece chassis of aluminium, bending it from a sheet. It was marked out, and then bent in a pair of clamps.

On the top portion, representing the panel, are mounted the two tuning condensers, reaction condenser, and switch. One side of the three condensers

The James Portable S.G.3—*Continued*

A REVOLUTIONARY DESIGN
Unconventional in design, this new portable gives particularly good results, and every constructor will be satisfied with its performance

is, therefore, joined to the metal panel. Next the valve holders may be fitted. The detector and power-valve holders are put in the bottom of the valve compartment, but the base for the screened-grid valve is screwed to a piece of wood, which is fitted at the left-hand end, so that this valve lies horizontally.

Shield for S.G. Valve

A screen, having a hole cut in it, is also provided, and is placed where it lies over the bottom part of the shield in the valve.

Below the frame-tuning condenser, that on the left, is fitted the 1-microfarad by-pass and 600-ohm resistance. A metal screen is fitted between the switch and frame-tuning condenser, so as to isolate, as far as possible, the aerial and anode circuits.

Between the switch and anode-tuning condenser, but on the back of the valve compartment, are arranged the rest of the parts, including the coil, fixed condensers, and transformer. The drawing shows the positions of these parts, which are, of course, fitted with screws and nuts.

Care with Leads

Note should be made of the fact that no connections should be allowed to touch the chassis. Therefore, the two valve holders ought to have their contacts screwed up tightly.

The condenser, of 1 microfarad, fitted below the reaction condenser, was in my case a metal-covered one and the tags are bent down. There is no real need to use so large an L.F. transformer, but if any make is used a by-pass condenser of .0003 microfarad may have to be joined across its primary terminals.

The wiring can soon be carried out if gone about the right way. Some parts must have wires fitted to them before they are finally fitted. Thus the anode terminal of the screened-grid valve holder ought to have a wire put on it before the holder is fitted, and this also applies to the wires on the primary of the low-frequency transformer.

The coil is wired with the tuning condenser removed and the 1-microfarad by-pass with the reaction condenser out of the way.

Good stout Systoflex must be used and I recommend thin tinned-copper wire, such as No. 24. Do not pull connecting wires tight, as they may be stretched when the set is put into the case, cutting through the Systoflex where it passes through holes.

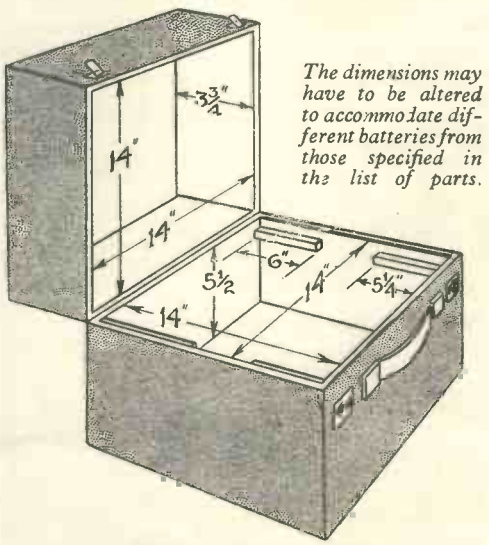
All battery wires should be of good-quality rubber-covered cable and be fitted with plugs of good make.

Winding the Coil

Those who usually wind their own tuning coils will find the one used in this set quite easy to make. Take two tubes of Paxolin, 3 in. long, one being 2 in. diameter and the other 1½ in. diameter. One is fitted inside the other, using long bolts and nuts at each end, with small washers for spacing. Then fit two tags to the 1½-in. tube as shown, one at each end, and fit four tags to the 2-in. tube.

One is by itself at one end, so that there are three at the other end.

Start the outer (long-wave) winding first. Begin near the single tag, joining the No. 40 enamelled wire to it. Put on 155 turns in, say, a clockwise direction. Then stop, fit a small screw by the edge of the winding, and carry on with a further 155



The dimensions may have to be altered to accommodate different batteries from those specified in the list of parts.

QUITE A HANDY SIZE
Although no loud-speaker portables are light enough to take on a route march, the James Portable S.G.3 has a handy size of cabinet for carrying

An Outstanding Design by W. James

turns of wire, but in the opposite direction—anti-clockwise. This coil is of the astatic type and the gap in the centre is quite small, not over .1 in. End this coil by taking the wire to the centre of the three tags and mark it H.T.+.

Reaction Winding

Now you must put on 40 turns of the No. 40 enamelled wire for reaction. Start a short distance, less than .1 in., from the end of the long-wave coil and take this end to a tag marked R2. When the 40 turns have been put on in the same direction as the last half of the long-wave coil, that is, anti-clockwise, finish this coil by taking the end to tag R1. This completes the outer coil.

The short-wave coil has 80 turns of No. 30 d.s.c. in a straight winding, wound anti-clockwise, but started below the left-hand end of the long-wave coil. This short-wave coil is in the same direction as the right-hand part of the long-wave coil and also the reaction.

Finishing Off the Job

Fit the coils together and connect the two ends, one long wave and one short wave, marked H.T.+, together. The coil is now ready.

For the frame a length of No. 26 covered wire and a length of No. 36 or 38 d.s.c. is needed. First prepare the frame by rounding off the corners and wrapping over them a layer of oiled silk or similar material. Fit the short-circuiting switch, if this has not already been done. Then, starting at the outside, put on, with spaced winding, the 16 turns of No. 26 for the short-wave frame. Start and finish by passing the ends through holes in the framework.

Then put on the 52 turns of No. 36 or 38 covered wire in the same direction and start from the front end. These turns may be wound touching. Join the ends of the frame to the switch and to the rubber-covered connecting wires as shown in the diagrams.

When putting the set together, note that the L.T. end of the frame goes to the case, whilst the other end passes to the grid terminal of the screened-grid valve. Also see that the aluminium braided anode wire is connected, and the L.T.−, H.T.−, and G.B.+ wires, which go to a screw in the chassis. Connect the 2-volt cell, and the grid battery, a suitable bias being about 6 volts, or perhaps more, according to the valve used.

Apply at H.T.+1 60 volts for the screen; at H.T.+2 about 120 volts for the anode of the screened-grid valve. For the detector, H.T.+3, apply about 90 volts and, of course, 120 volts at H.T.+4 for the power valve.

Switch Positions

Note that with the switch on the panel in its central position, the valves are off; with it to the left, and with the frame switch "out," the set will receive on the medium waves, whilst with the panel switch to the right and the frame switch "in" the set receives long waves.

The valves used were a Mazda 215SG, an HL, and a 220P. A little adjustment of the detector voltage, HT.+3, may be needed for the best results and it may be necessary to adjust the voltage for H.T.+1, the screen tapping.

A fuse might be fitted in the high-tension negative lead.

COMPONENTS REQUIRED FOR THE JAMES PORTABLE S.G.3

CONDENSERS, FIXED
1—T.C.C. .0002-microfarad, type SP, 2s. 4d.
1—T.C.C. .005-microfarad, 1s. 8d. (or Igranic, Ormond).
1—T.C.C. .005-microfarad, 1s. 8d. (or Edison Bell, Magnum). N.B.—This is optional.
2—T.C.C. 1-microfarad, 5s. 8d. (or Dubilier, Hydra).
1—Dubilier 2-microfarad, type BT, 3s. 6d. (or Lissen, Hydra).

CONDENSERS, VARIABLE
2—J.B. Tiny with dials, .0005-microfarad, £1 (or Formo).
1—Lotus .00034-microfarad reaction, type RC/34, 5s. 6d.

HOLDERS, VALVE
3—W.B. rigid type, 3s. (or Lotus Benjamin).

PLUGS
7—Belling-Lee wander plugs, marked: H.T.—H.T.+1, H.T.+2, H.T.+3, H.T.+4, G.B.—, G.B.+, 2s. 4d. (or Clix, Igranic).
2—Belling-Lee spades, marked:— L.T.+, L.T.—, 8d. (or Clix, Eelex).

RESISTANCES, FIXED
2—Berclif 600-ohm, 3s. (or Wearite, Ready Radio).
1—Dubilier 1 megohm, 2s. 6d. (or Lissen, Watmel).

SUNDRIES
Systoflex insulated sleeving and tinned-copper wire for connecting.
Length of Lewcos rubber-covered flex.
2 oz. No. 30 d.s.c. wire (Lewcos).
2 oz. No. 40 enamelled wire (Lewcos).
1—Paxolin former, 2 in. diameter and 3 in. long, 9½d.
1—Paxolin former, 1½ in. diameter and 3 in. long, 8½d.
3—Sheets of aluminium, 14 in. by 16½ in. 6 in. by 4 in., 2½ in. by 4 in., ready drilled. 10s. 6d. (Parex).
No. 26 and No. 36 wire for frame aerial.
1—Benjamin turntable, 7s. 6d. (or Ormond, Six-Sixty).

SWITCHES
1—Lotus on-off, 1s. 6d. (or Bulgin, Watmel).
1—Wearite, 3-pole 3-way, 7s.

TRANSFORMER, LOW-FREQUENCY
1—Ferranti, ratio 7 to 1, £1 10s. (or Igranic 6 to 1, Lewcos 5 to 1).

ACCESSORIES

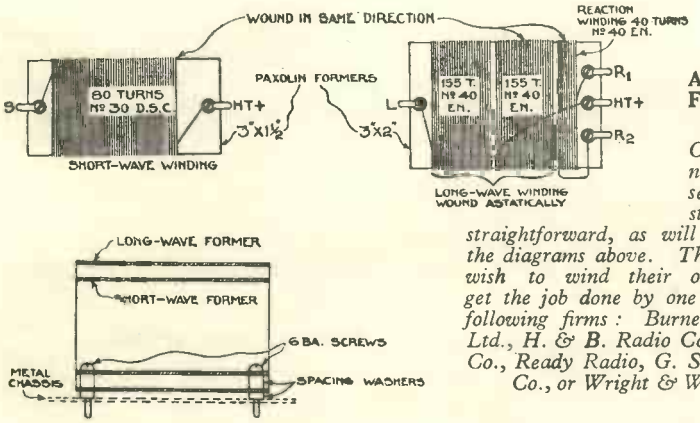
BATTERIES
1—Siemens, 126-volt, type 1075, £1 5s.
1—Siemens 9-volt, type G2, 2s. (or Lissen, Ever Ready).

CABINET
1—Neophone cabinet, £1 10s.

LOUD-SPEAKER UNIT
1—Ormond, 12s. 6d. (or Blue Spot, Watmel).

VALVES
1—Mazda 215SG, £1 2s. 6d.
1—Mazda HL210, 10s. 6d.
1—Mazda P220, 12s. 6d.

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



ANODE COIL FOR THE PORTABLE

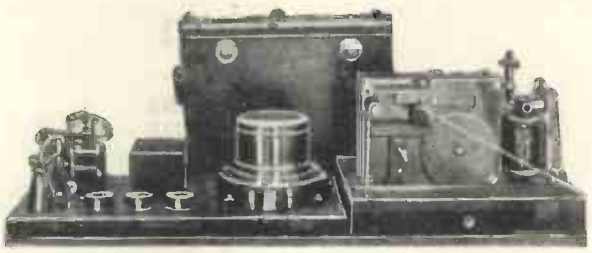
Only one coil is needed for the set, and its construction is quite straightforward, as will be clear from the diagrams above. Those who do not wish to wind their own coils may get the job done by one or other of the following firms: Burne Jones & Co., Ltd., H. & B. Radio Co., P. B. Radio Co., Ready Radio, G. Scott Sessions & Co., or Wright & Weaire, Ltd.

The First War-time Radio

WAS USED AS LONG AGO AS THIRTY YEARS!

IN a shabby storeroom behind the Central Telephone Exchange of Africa's great gold-mining city, Johannesburg, I found the very first radio set ever used in warfare.

This was not, as commonly imagined, the Russo-Japanese contest of 1904, but very much earlier, during the Victorian era. That famous fight between England and the Boer Republics of Africa, which began in 1899 and is still remembered by older people, caused the antique appliance to be utilised in the field.



FIRST RADIO SET USED IN WARFARE

This interesting piece of apparatus was "unearthed" at Johannesburg. It was made by Siemens and Halske, and was used during the Boer War

Built Thirty Years Ago

Mr F. G. Parsons, chief engineer, who looks after 20,000 instruments connected with the exchange, is in his spare time a scientific experimenter of distinction and it was the research instinct which made him buy the quaint, perfectly genuine, portable wireless set built thirty years ago.

During 1903, after the conclusion of peace, this gentleman purchased from a military auctioneer the piece of "Surplus Army Equipment." In a massive packing case the beautifully-made apparatus has rested for a quarter of a century until the writer recently saw it.

The well-known German electrical manufacturers, Siemens and Halske, designed and made the "Apparatus for Telegraphy without Wires," as the official instructions (still preserved) term the outfit. Its history is interesting

When relations between Boer and Briton turned dangerous the Dutchmen ordered from Europe what was then the latest device in communication. But by the time the steamer anchored outside Cape Town in English territory war already existed and Queen Victoria's soldiers confiscated the little plant.

Marconi sent out a couple of London experts and on the lonely veld, behind the lion infested front, they tapped radio signals in laborious morse.

Breakdowns were innumerable and the "portable" set very cumbrous, but, still, it was genuine radio and useful messages reached the troops. Eventually, however, English conservatism and the difficulties of Africa's hot climate brought the experiments to an end and the soldiery fell back on the stereotyped heliograph apparatus.

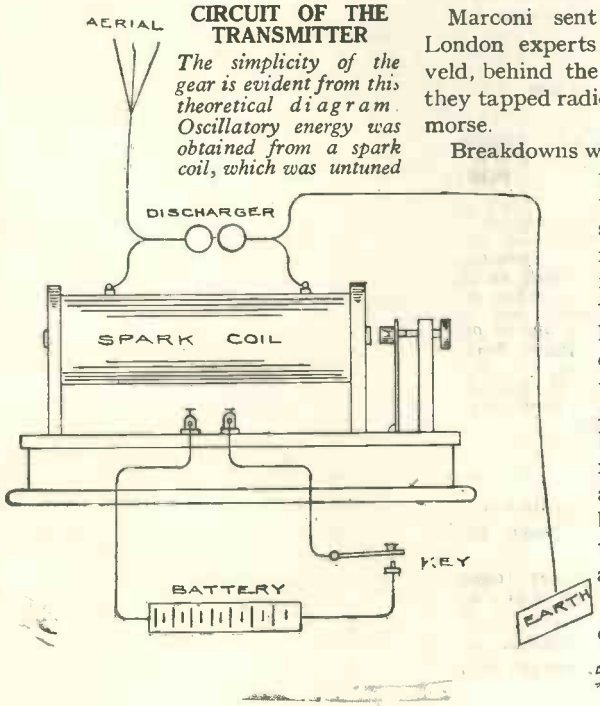
As a specimen of scientific craftsmanship the antique set is immeasurably ahead of the average 1930 equipment. After three decades the wheels and pinions of the printer work so silently that hardly a sound is noticeable when it operates.

The wiring, which Mr. Parsons has very kindly reproduced on an accompanying diagram, shows some queerly familiar peculiarities. Let me describe it.

"An open-circuit transmitter of the non-syntonic type," thus runs the engineer's summary of the sending installation. The receiver, the part still in existence, was made up of a "coherer," that primitive tube of metal filings which stuck together during transmission, also a relay and a morse printer (a very modern notion).

CIRCUIT OF THE TRANSMITTER

The simplicity of the gear is evident from this theoretical diagram. Oscillatory energy was obtained from a spark coil, which was untuned



Untuned Transmissions

Oscillations of a very violent type (no standardised wavelength) were set up by the transmitter, which was worked from a group of cumbersome batteries, and at the other end the waves were caught in an aerial that had to be dug into the ground.

The current passed to the coherer and in this little glass tube (about 1½ in. long) the metal filings cohered to form a conductor. By tapping, a special "decoherer" undid the connection again. A local battery then passed electricity sufficiently strong to operate the relay which in turn brought a more powerful cell into play and set off the morse printer

Amusing Instructions

Perhaps a literal translation of the original German instructions may prove amusing to WIRELESS MAGAZINE readers :—

INSTRUCTION FOR THE WORKING OF AN APPARATUS FOR TELEGRAPHY WITHOUT WIRES

The Sender

The accumulator battery is joined to the inductor by inserting the morse key and the Deprez circuit breaker, adjusted in such a way that its operation commences immediately

the circuit is closed. Although the chemical contact breaker is particularly suitable for this purpose every rapid-operation circuit breaker can be used.

Do not bend the "springs' too tightly. If the inductor of 30 cm. spark length gives long sparks of 25 cm. between plate and point it is quite sufficient. The secondary clamps must be connected with the sliding clamps A and B of the "radiator"

Controlling Strength

To adjust the distance of the middle balls slide the cylinders. To give the requisite strength aerial wires must be erected both at the sender and the receiver. At the sender's end aerial wires, adjusted from A and B, must be brought vertically upwards.

Along their entire length these must be at least ½ metre distant from all conductors. Sufficient insulation must also be provided at the place of erection. The length of these aerial wires varies but over the first kilometre (sic) 5 or 10 metres suffice.

For greater distances conditions are much more favourable. Instead of aerial wires wire-netting can also be used (!). The other ball on the outside is earthed to water pipes. In telegraphing speed should be so timed that one dot shows as one tap of the key at the receiver while a dash ought to last 3 or 4 taps.

The Receiver

In the first place the tube must be jammed in the holder and both connecting wires screwed tight. Furthermore the morse set must be joined to the receiver. Then push the plug in the box of elements into the corresponding contact.

To adjust the relay turn the regulating screw far enough for the key to work and then slowly backwards till it is in position again. If properly adjusted the buzzer (key) ought to work immediately, and cease when the short-circuit is broken. As in the case of the transmitter an aerial wire is also screwed into the coherer's clamp, while another one is earthed. Length of wires as above.

For Short Distances

For short distances, up to 50 metres (sic), the enclosed brass wires suffice instead of the aerial wires. Both are inserted on either side, that is horizontally, in the two clamps. At the sender short wires may likewise be screwed on to the left and right but for short distances this is not necessary.

In installations which can both send and receive messages the coherer must be at a sufficient distance from the sender. It is best, however, to take it out and place it in a metal case if the transmitter is working at the same station. Always store the coherers in metal tins or metal boxes. The annexed diagram shows the circuit contacts.

BERLIN, 1899.

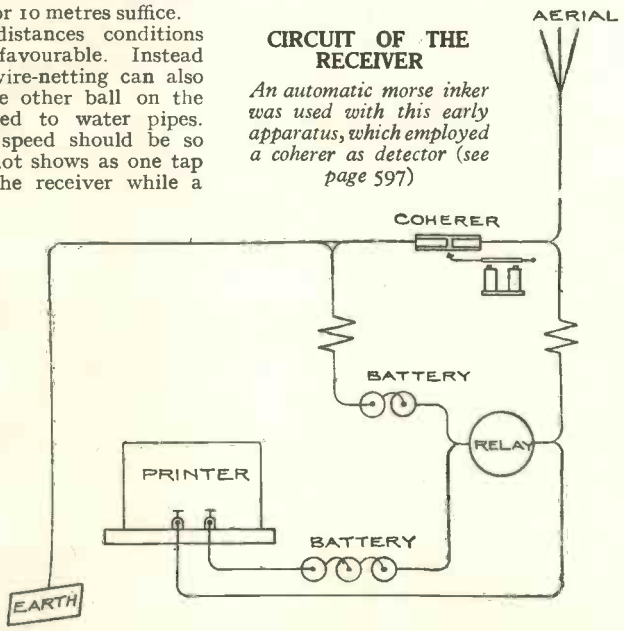
After the Boer War Mr. Parsons gave some demonstrations with the set at an exhibition over a distance of several hundred feet, to the great astonishment of an old-time crowd. Since then the packing case has hidden it, but I genuinely hope it will some day go into a museum.

As ye shall search, so shall ye tune in

Time flies and we with time,
From all corners of the earth come in signals
To while the witching hour

CIRCUIT OF THE RECEIVER

An automatic morse inker was used with this early apparatus, which employed a coherer as detector *(see page 597)*



As a valve blows, so shall ye weep.

For sets must howl, and women must weep.

'Tis better to have heard and lost than never to have heard at all.

Music, music everywhere, and not a valve to blink.

Show me your log, and I'll know the friends you hear.

The hand that rocks the dial brings in the world.

Hell hath no fury like an overloaded valve.

It's a long programme that has no call-sign.

Never put off till to-morrow the call you can bring in to-day

J W. B.

SLOGANS FOR BROADCASTERS

WHEN radio broadcasting first became popular about eight years ago in the United States, stations began a mad scramble for permission to select certain calls with letters representing initials of a slogan, the owner, a product, or a novelty. The scramble is still on.

The present system of call letters, as fixed by the government and the Federal Radio Commission, is arranged geographically. Every radio station must have either of two letters, K or W, as the prefix of the call. K, with the exception of KDKA and KYW, denotes stations west of the Mississippi river; W denotes those east.

Suiting Themselves

On application, and with the approval of the commission, stations can arrange the remaining three letters to suit themselves. If arranged by the commission, however, they are arranged alphabetically. This is done by adding other letters of the alphabet to the geographical designation, as WAAB, WABC, and so on.

These station calls stand for no descriptive or ownership phrase, but those arranged by the broadcasters are novel and are intended to impart a subtle bit of advertising.

Many of these call letters bring to mind the slogan they stand for. When a listener hears WPG, Atlantic City, for instance, he says: "Well, there's the World's Playground." WIOD, Miami Beach, Florida, stands for the beautiful phrase, "Wonderful Isle of Dreams." Then KGFJ, Los Angeles, "Keeps Good Folks Joyful"; KTHS says "Kum to HOT Springs"; WJR, Detroit, is "Where Joy Reigns"; WCOA, Pensacola, Florida, is the "Wonderful City of Advantages"; and WOS, Jefferson City, Mo., says "Watch our State."

Names of Churches

Other calls are made up of the first letters in the names of churches. For example, KPPC, Pasadena Presbyterian Church, Pasadena, California.

Novelty call letters are common. WOW, Omaha; WHAM, Rochester; KICK, Red Oak, Ia., and KTNT, Muscatine, Ia., give the impression of a lot of pep, noise and activity. KOIL, Council Bluffs, Ia., sells oil; and WASH, Grand Rapids, Mich., sounds like a laundry station. F. P.

Blotting Out the Twins

FOR sheer brazen impudence commend me to Huggins, a somewhat *too* near neighbour of mine, who dabbles in wireless. You see, Huggins is the type of man who fancies he has nothing more to learn

Jack Harris—Conductor of the Grosvenor House Dance Band

about radio because he can put together a wireless receiver wi h the blueprint stuck to the baseboard, thus giving him the exact position of every lead and individual component.

Besides which, he is a bore, and, what is worse, he took ten shillings off me as a result of an unfairly won wager.

The fact is that on that afternoon I was up to my ears in work—this selectivity problem, you know—devising new wavetraps in an endeavour to separate the noisy Twins within a two-mile radius of their lair. And it was just at the moment when a brain-wave had struck me that the idea was driven out of my head by a violent ringing of my front door bell.

No, I was not pleased to see him, and when he slapped down on my desk the latest of his home-built monstrosities, thereby scattering the papers with which I was busy, I admit I was positively rude to him.

"How would you like a set like this?" he asked, his face radiating a 500-watt smile.

"I wouldn't," I replied gruffly. Mind you, it is impossible to offend Huggins; I have tried to do so many times.

"No, no," he retorted, "what I mean is, if you had a set like this, what do you think you could do with it?"

Just as rudely, I answered: "Burn it, or get the dustman to make a special call. However, we need not argue, but for heaven's sake take it away."

As I made these unpleasant remarks I pushed his latest abortion to one side and collected my papers.

"My dear chap, do be serious. It's well worth your trouble. I've worked on this circuit all night and, do you know, it's wonderful."

There was no squashing him and, failing brute force, I could not see how he was to be put out of the house.

"Ah, well," I muttered with a sigh, "spill it; what's the trouble?"

His face took on a surprised look. "Trouble?" he inquired "Trouble? There's no trouble. Why, it works beautifully. I tried it this morning. I got London Nat. and London Reg. and Midland Reg."

"And any others of the confounded family?" I asked. "Personally, I've been trying to cut. ."

"Yes," Huggings interrupted, "I also got Glasgow and Aberdeen."

"Good for you, but my problem is. "

He caught hold of his receiver with one hand and my arm with the other, then dragged me into my wireless room. The trouble is that the brute knows his way about too well; his house is built on the same plan. Before I could stop him he had disconnected the leads to my pet receiver, and had fastened them on to his own.

"Just listen to this," he said, as he switched on. A slight adjustment of the condensers and a broadcast from Brookman's Park blared through the loud-speaker.

"Well?" I queried, "what of it?"

"Eh?—oh, yes—and this." He gave the condenser a twirl and the alternative transmission was heard, but through the background, with full clarity, one of the Twins was percolating.

I smiled. It was a derisive smile and I enjoyed it to the utmost. Why, this was just the problem I was trying to puzzle out, and Huggins coolly imagined he had solved it.

"All right,' I said, "now cut. "

"Do you think," my neighbour asked, "I can't separate or cut them out? Good heavens, I'll do it with one turn."

"I do," I replied emphatically, "I most certainly do."

"Bet you ten bob I can cut them out."

Ten bob! Huggins was always vulgar. However, I took him up.

"Done," I said, and in a very silly way, I placed a bank note on top of the receiver.

Huggins looked at me, grinned, then with a slight movement of his wrist he turned a rheostat. The set went dumb instantly—he had switched it off.

Now, would you believe me, before I had time to speak, he had grabbed at both money and the set and was making for the door. I tried to stop him.

"I've won the bet," he shouted with glee. "I've cut them out with one turn."

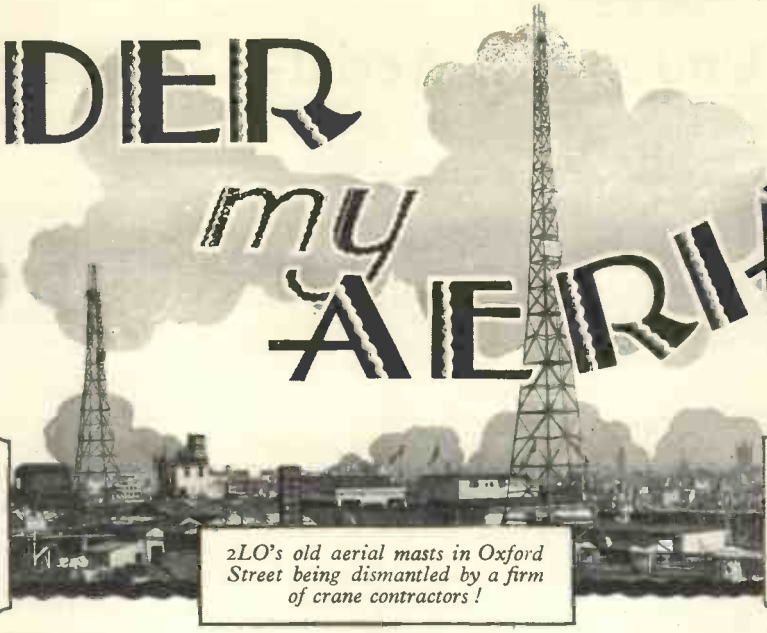
No, I've never suffered from homicidal tendencies, but I can

Sir Thomas Beecham, whose broadcasts are so popular

assure you that our next meeting on a dark night will be an eventful one. I can hardly trust myself to say what I think, but in the near future you may hear of a messy murder in our street. JAY COOTE.

UNDER my AERIAL

HALYARD'S CHAT ON THE MONTH'S TOPICS



2LO's old aerial masts in Oxford Street being dismantled by a firm of crane contractors!

SKETCHES SPECIALLY DRAWN BY GLOSSOP

Holiday Wireless

"LET us go somewhere different this year." Have you ever heard such a remark when the summer holidays are being discussed and planned? Well, when the question of wireless crops up in connection with your holiday this year, why not say: "Let us go somewhere this year where wireless is different."

I am sure that, if you make up your mind to go somewhere wirelessly different this year, you will enjoy your holiday a great deal more than you otherwise would.

The question of going somewhere different from the point of view of wireless reception is not so difficult as it might seem at first sight. Suppose you live in London or in the south-east of England, and you have never heard Dublin or Belfast, then, if you spent your holiday on the north-west coast of England, or in the Isle of Man, you would be able to make a close acquaintance with these two excellent Irish broadcasting stations.

If you have never heard the Scandinavian broadcasting stations, you might consider a holiday on the north-east coast of England or on the east coast of Scotland. You would enjoy your holiday if you captured several Continental wireless stations which were entirely new to you.

Excellent Irish broadcasts

A really good suggestion for a wireless holiday quite different from the usual run of things would be to spend that holiday in Wales chasing the elusive Cardiff station with a portable set. Now that would be an excellent wireless motoring holiday, wouldn't it?

Nobody seems to know why Cardiff is inaudible in some of those deep Welsh valleys. You might do a fine piece of wireless work on such a holiday and by it add considerably to our knowledge of wireless reception.

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Under Cover

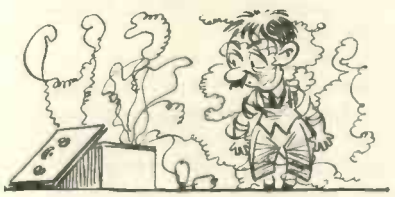
Do you happen to have a macintosh cover for your portable set? If you have not, then I should strongly advise you to have one made so that you will not have to go through the same kind of unfortunate experience I had to go through last night.

Yesterday afternoon was so temptingly fine that I set out for a wireless picnic with a wireless friend of mine. We had a glorious afternoon and we had a jolly wireless tea in the pleasant warmth of the sun. After tea, however, a thunderstorm came upon us suddenly and we had to hurry for shelter.

We were a couple of miles out in the country and there were no buildings, so we had to take the very poor shelter offered by a hedge.

I pushed my portable set under the hedge and I placed over it the paper from our tea basket, but that was very poor protection from the heavy rain. I had neither coat nor macintosh for myself, but that did not worry me much. Getting wet myself, at the worst, might mean a cold. I felt very anxious though at the effect of the rain on my portable set.

It should not be a difficult matter



A wireless picnic

to make a rainproof cover for a portable set. Take it from my experience of last night, such a cover is essential in this uncertain climate of ours.

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New Words

Don't you think that American wireless folk are decidedly more ingenious than our own wireless folk in the rather important matter of inventing new words for wireless apparatus and component parts? I certainly think so, and I rather admire the way in which the American wireless manufacturer launches a new product under a new name.

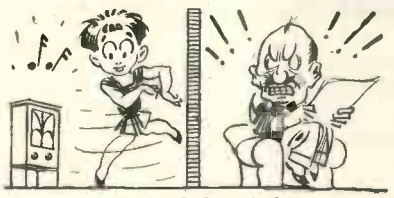
Take one of the most recent of these American words, qualpensator, for example. Can't you see immediately the origin of this new word? Qual-pensator, qual—quality, pensator—compensator, quality compensator; now you've got it. Not only do you get the origin of the word easily, but you get its obvious meaning also.

Of course, all the newly-invented

Under My Aerial—*Continued*

words of the American wireless manufacturer are not so easily deciphered. How do you like this American word-concoction, claroceptor? Can you get at the meaning? Clar—clear, ceptor—receptor, clear receptor; we have it, a piece of wireless apparatus for clearing up reception, blocking out interference and hum.

I find these new words in the advertisement pages of the American wireless periodicals. You know I never fail to look through those advertisement pages, and I am always amply repaid. How do you like these recent gems of expression?



New words for wireless

"Look at its curve or listen to its wallop."

"Short-wave thrill box."

George admires the ingenuity of the American advertiser as much as I do, but he says there is one thing the American wireless advertiser cannot do and that is invent a name for a hydrometer made specially for jelly-acid accumulators.

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Capital and Counties

If you were to ask a schoolboy which was the capital of England, he would very quickly tell you, but do you think that same boy would be able to tell you the *wireless* capital of England? He might guess, of course, and, unless he suspected a trap, he would guess London, which, as we all know, would be correct.

Yes, London, with its half-million wireless licences, must be looked upon as being the wireless capital of England. No other town can come anywhere near to it in this matter of number of wireless licences. Besides, the headquarters of our broadcasting organisation are in London, and isn't London the headquarters of wireless journalism?

Amongst the counties of England, Lancashire, with over 300,000 wireless licences, takes the first position, and I am sure our Lancashire friends are mighty proud of this, especially as they lead Yorkshire by a matter of 50,000 licences.

Headquarters of wireless journalism

Have you any idea where your county comes in the wireless licence honours list? Is it a six-figure county? Surrey is a six-figure county, having well over 100,000 wireless licences.

As everybody would expect, Rutland is the county with the smallest number of wireless licences. There are, however, over 1,000 wireless licences in Rutlandshire.

On the basis of population, this works out at one licence for every eighteen of the population, a figure which compares very favourably with the corresponding figure for Lancashire, namely, one licence for every seventeen.

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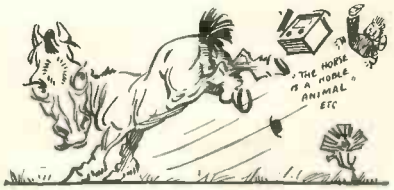
Gee—up!

There seems to be a slight change regarding my outdoor work with a portable set this summer. Last year most of my animal adventures were with cows. This year my adventures so far have been concerned with horses.

Has a horse ever evinced interest in your portable set? Rather intelligent creatures, horses are, aren't they, much more intelligent than cows?

The other afternoon I was out in the country with a fellow wireless enthusiast. We were sitting on the grass in the corner of a field listening to 5XX. Suddenly I had a feeling that there was something moving behind us. I turned round quickly and there was a horse just on the point, so I thought, of putting an affectionate lick on the top of my wireless friend's bare and rather bald head.

We both jumped to our feet and, to my great surprise, my friend waved



Rather intelligent creatures

his arms about and made strange noises. The horse seemed to understand for he turned round, galloped across the field in great style, turned again, and galloped back to us looking exactly as if he were saying, "How's that, now?"

On subsequent inquiry, I found that my wireless friend of that afternoon had been in the artillery during the war, and he both understood and was very fond of horses.

What animal adventures have you had this year when you have been out in the open with your portable wireless set?

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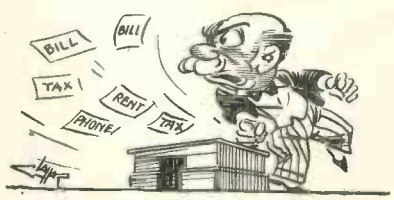
Wireless Fever

It has been a common thing amongst us for years to joke about imaginary wireless diseases and epidemics such as knob-twiddlers' thumb, distance itch, and flattened ears. Now there comes news, from America, of course, of a perfectly new and very real wireless fever.

Research engineers of one of the biggest electrical companies in America have discovered some hitherto unknown very short waves. These ultra-short waves, which are broadcast by means of wireless transmitting valves, have the peculiar property of raising the blood temperature of anybody who happens to come under their influence.



Raising the blood temperature

Used in moderation, these very short waves, it is claimed, have remarkable curative powers. When used in excess, these same waves can be made to cause a high fever, which would bring about the death of the unfortunate being upon whom the waves were concentrated.

What do you think of all this? We have heard so often of these "death rays" that we are bound to be a bit sceptical, aren't we? Anyhow, in case you are at all alarmed, judging from other American short waves, these new wireless-fever short waves are not likely to do us much harm when they reach us over here.

Halyard's Chat on the Month's Topics

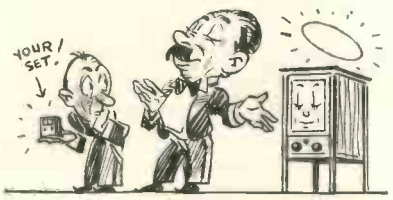
Similarity

"Accumulators," said George, as he sat down heavily in a deck-chair in my garden, "are like human beings."

"How do you make that out, George," I asked.

"Well, for one thing they are continually needing re-charging."

"Um! I suppose that is so, but——"



A tendency to gas

"For another thing, they do not last for ever"

"Er—yes, George."

"For another thing, they are at their best in middle age."

"Let me see, George, how old are you now?"

"And for another thing, they are extremely troublesome when they are young."

"I think your last point needs explanation, George."

"Let me give you a case in point. Last Monday I purchased a new 2-volt accumulator and I had it charged ready for use. I brought it home on Wednesday and, after using it for three nights only, it requires re-charging. Six hours in use and, according to the reckoning, it ought to have given me twenty hours."

"Isn't that the usual thing with a first charge?"

"Usual thing or not, it is most annoying. When you buy a new accumulator, you naturally expect you will have to make less journeys to the charging station than with your old accumulator."

"There is another point of similarity between accumulators and human beings, George—at least some human beings."

"Oh, what is that?"

"A tendency to gas at times.

My word, you should have seen George look at me.

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Mains v. Batteries

Have you ever in the course of your holidays or travels come across a village where there is an electric-light supply but no gas? I have recently spent a few pleasant days in such a village in one of the most picturesque parts of England.

Naturally, I took particular interest in wireless in this village, and I was fortunate enough to make friends with a wireless enthusiast who had an excellent mains set.

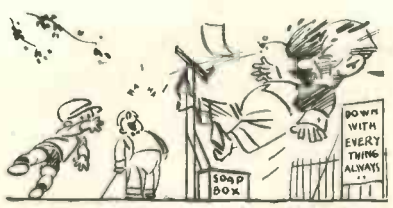
One evening, this new friend of mine and I were discussing the relative merits of mains-driven sets and battery-driven sets. We had an interesting discussion, and I found myself taking up cudgels on behalf of the battery-driven set. To prove several of his points, my new friend turned on his excellent mains-driven set.

After ten minutes of really good reception, the set suddenly became silent. A quick investigation revealed that the power had failed.

Now the electric power supply to this village comes by overhead cable a very long way over hill and dale. My friend telephoned to the transformer station, ten miles away, and he was informed that a severe thunderstorm had put the overhead cable out of action. It was two hours before the fault was located and the power came on again.

Look Out for the August "Wireless Magazine" on Thursday, July 24

You can imagine the point I gleefully made. Battery-driven sets don't let you down quite as suddenly as do mains-driven sets when the power fails, now do they? Still, I suppose a breakdown in the supply of power from electric mains is about as rare an occurrence as a breakdown at a broadcasting station!



Breakdown at a broadcasting station

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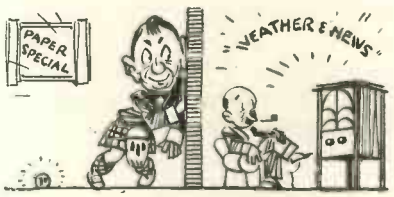
Service

One of the greatest problems of wireless at the present time is the provision of adequate service for our wireless sets. Those of us who make our own sets and are able to keep them going are in a fortunate position.



When wireless is popular

There are, however, many thousands of listeners who do not understand their sets sufficiently well to carry out the small renewals and repairs which become necessary from time to time. How are such listeners to obtain adequate wireless service?

It is a problem, isn't it? The manufacturer of wireless sets does all he can to make his sets foolproof, but valves burn out, batteries become used up, and sometimes soldered joints come unsoldered.

Of course, there ought to be a properly trained and properly qualified wireless mechanic in every wireless centre, but it is the exception, and not the rule, to find such a wireless mechanic these days in places where wireless is popular.

I do not know what will be the ultimate solution of this service problem. The other day, though, I saw what I thought was a partial solution. A friend of mine has had an excellent four-valve receiver for nearly five years. Quite suddenly the set ceased to function. Rather than bother with it, my friend sold the set to his wireless dealer in part exchange for a new up-to-date all-from-the-mains set.

That seemed to me to be a possible solution of the wireless-service problem. Suppose a wireless set gives you five years' good service and, at the end of that time, you return it to your dealer as part of the price of a new set which will give you another five years' service. You would not be doing so badly, would you?

Wireless Magazine. July. 1930

Problems of Recording Sound

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

Las month Capt. Round gave a brief review of some of the questions involved in gramophone recording, particularly in the making of normal records, and he explained some of the technical defects of standard records.

This month he discusses talking picture records.

GRAMOPHONE AND FILM WORK

IN those talkies which use discs, some difficulty was experienced in getting sufficient on a record to last a reasonable time in accompaniment with the film, and this problem was solved by making the records not only very much larger, but also by running them slower

This act of running slower, to my mind, was a very retrograde step and it would probably have been better to have kept the speed up and still further increased the diameter.

One curious thing about these big Vitaphone discs is the fact that they are recorded from inside outwards, and this actually is, for one or two reasons, a very good point. It would be preferable if ordinary gramophone records were cut in this way because it is well known that towards the centre of the record there is a tendency for poorer reproduction, this being due to a combination of two factors which work at once

Quicker Needle Wear

Not only are the higher frequencies less well reproduced towards the centre because of the lower surface speed of the record, but the needle is also worn down quicker

If the records were made to play outwards, the result would be that one would have a brand new needle where the record required it most, and when the needle was worn this would be partly balanced by the higher surface speed; thus the general effect would be a much better average.

Probably some other manufacturing feature was the cause of these talkie records being designed to play outwards, for one factor that is definitely limited is the minimum diameter of the centre of the recording.

If one records below a certain minimum surface speed the record becomes very bad, so that if talking-picture records were made from the outside to the inside, and the length of time overran the danger line in the centre, then the whole thing would have to be done over again, whereas by starting in the centre and providing a recording wax of generous dimensions, a little over-spilling on the outside only means that the final disc is a bigger one than usual, which fact can easily be handled.

Another Type of Gramophone Recording

I want to write about another method of recording to which I have personally paid some attention but which, so far, I have not been able to bring into practice for purely financial reasons. I want particularly to speak about it because the law of recording that is used is very similar to that which is used on a sound film.

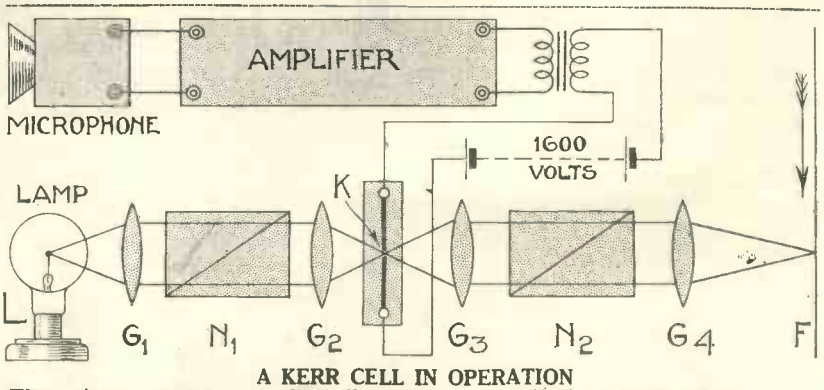
In my last article I showed how a normal record was made so as to play properly on a mechanical gramophone and that this necessitates that the "velocity"—which term I explained carefully—is proportional to the sound energy at all frequencies except for certain practical limitations.

If one removes the limitations that the record must give the correct tone on a mechanical gramophone some very interesting possibilities arise and these were, I think, first suggested generally by Mr. Sykes, the inventor of the well-known Magnetophone

Working on this basis, I considered the possibility of producing a record in which the "amplitude" was proportional to the sound energy and it looked as though very considerable advantages would be obtained. The reason I choose the basis of constant amplitude was mainly because the method of playing off correctly required only a very simple change in an electrical gramophone to give correct quality

Advantages of Constant Amplitude

But now consider the advantages of such a recording :—



A KERR CELL IN OPERATION

The various parts are arranged as follows :—L is a gas-filled lamp; G_1 a lens to make parallel light; N_1 is the first nicol prism polarising the light; G_2 a lens condensing the filament image on to a Kerr cell; K is the slot of 6 mils in nitro-benzine called the Kerr cell; G_3 converts the light from the Kerr gap into parallel light; N_2 is the second nicol prism; G_4 condenses the image of the slot on to the film F; and F runs in direction of arrow at speed of 1.5 feet a second.

(1) Surface noise can be decreased because the higher frequencies where the noise occurs most can be made much stronger than on a normal record.

(2) Both lower and higher frequencies can be recorded better.

(3) As all amplitudes are small, the grooves can be much closer together.

(4) Grooves being much closer together need not be cut so deeply, and this tends to better higher-frequency reproduction, so that

(5) Slower surface speeds are possible.

Extensive experiment proved all these points and I have actually obtained records of high quality lasting up to one hour on one side of a 12-in. disc, and I am pretty sure much longer ones still can be made.

Playing Off the "Distorted" Record

An interesting point is how this record is played off, because if one applies the ordinary pick-up the sound comes off—and this holds good for electrical or mechanical reproduction—as very squeaky high-pitched quality, but there was a very easy cure for this. The pick-up was carried to a valve, resistance-coupled to the next valve, and across from plate to filament of this first valve a condenser of about .1-microfarad was placed.

The result with this condenser is to exactly invert the distortion on the record and the final result (at the slight expense of one more valve and this condenser correction) is a long-playing record of generally better quality than can be obtained from other methods because the bass, down to the lowest frequencies, is fully represented, and the upper frequencies are actually better represented than usual. Probably this latter point is chiefly due to the fineness of the grooves.

It is preferable to use a very light pick-up for these records, but not at all essential.

I should have much liked to issue records in this way, but at present financial reasons prevent them being made and marketed. The cost of making a record is always very great, because of the fees of the musicians, and the very limited sale of these long records which there would be at first, owing to the special apparatus needed for playing-off, makes it almost hopeless from a business point of view, and for the moment experiments are put aside until a demand comes for something of greater length than the present discs. No other known method can record so much speech in such a small space.

Recording on a Film

I really described this process of constant-amplitude recording because of its similarity to the way we put stuff on to a film. There are two methods at present, as is well known, for recording speech and music on photographic film for cinema work.

One is called the variable-density method and the other is called the variable-area method. Both have their own exponents and, as far as results under ideal conditions are concerned, there is very little to choose between the two methods. There is possibly, however, a greater tendency for the variable-area method to be used, because the photographic problem is not quite so troublesome in this case as it is with the variable-density method.

A TALKIE IN THE MAKING

Lilian Harvey in a new talkie production, "Love Waltzes." Note the microphone in the top right corner

Variable-density Recording

In variable-density film, the film is exposed when no sound is being produced to a light which gives half-way in density between plain film and jet black, and when the sound modulation is produced the loudest sounds at their peaks just carry this half-density to either transparency or complete blackness.

All sounds of equal strength carry the film density between the same limits so that if this film density is considered as a sort of amplitude, the recording is what one might call a constant-amplitude method, differing however, from my constant-amplitude disc recording in that no anti-distortion is required in playing off.

Various methods have been invented to make this variable-density film Neon or mercury-vacuum tubes are quite commonly used and one of the most successful methods is what is called the Kerr cell, which was turned by Carolus into a recording apparatus.

The Kerr cell contains two prisms, called nicol prisms, made of Iceland spar. If light is passed through the first of these prisms, it removes all the light except that which is vibrating in one plane. Then if this remaining light, called plane-polarised light, is passed through the next nicol prism, on the position of this prism depends whether this polarised light can get through or not.

If this second nicol prism is turned so that it will only pass light polarised in the other plane, then, of course, there will be complete darkness. It is a very interesting experiment to get two of these perfectly transparent crystals and hold one behind the other, slowly rotating one, and then to find at a certain position of the rotation the combination will not allow light through at all.

Kerr discovered many years ago that if the light, after passing through the first nicol prism, was passed between two electrodes immersed in nitro-benzine, and then stopped by the second nicol prism, when a potential difference was applied to the electrodes in the nitro-benzine more or less light went through the second prism depending upon the potential applied. The explanation given is that the plane of polarisation of the light is rotated by the electrical field between the electrodes.

This, it can be seen at once, gives a method of modulating light so as to

Problems of Recording Sound—*Continued*

imprint speech or music on a film.

The diagram shows a Kerr cell in operation. The two electrodes are separated by a distance of 6 mils and in operation 1,600 volts are impressed on the electrodes after the nicol prisms have been set to zero light. The 1,600-volt supply is arranged so as to give the half density on the film and on the top of this 1,600 volts is super-imposed a voltage representing the speech or music, with the result that the film is produced with a modulated density representing the speech or music.

I have described this process more intimately than the vacuum-tube method because I have actually worked it and by means of it have produced very fine speech and music records. The Kerr cell has practically no inertia and whatever one passes on to it in the way of wave form gets represented on the film. Also the intensity of light that can be obtained is quite great and I have calculated out that it is quite feasible to get records on film running at speeds of 30 to 40 ft. a second, which would enable one to graph out frequencies of the order of one million a second.

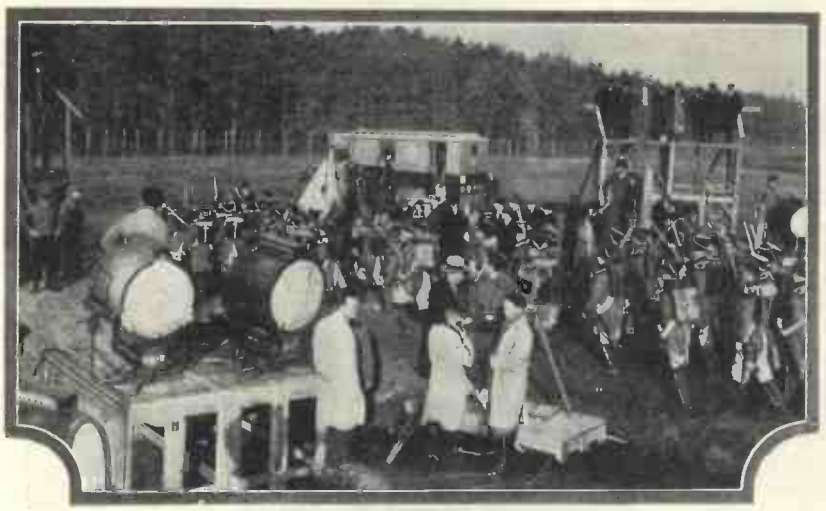
Of course, in actual practice the original negative that has been made has to be printed and it is very essential that the medium density in the negative should be maintained as a medium density in the positive. This fact very seriously handicaps the picture photographers who have their picture on the same film, in that they can no longer play tricks with developing.

The amount of developing must remain very constant so that the sound track will be developed to the right extent; both under or over developing—particularly under—may cause serious distortion.

Playing off this film record is comparatively simple. A similar thin slot of light impinges on the film, is passed through the film and on to a photo-electric or selenium cell, and the varying currents produced are amplified.

Just as the constant-amplitude gramophone presents no trouble in recording down to the lowest bass, so the variable-density film presents no trouble either, but a small trouble is met with on the higher frequencies, only to a lesser extent than is met with in gramophone practice.

Just as the needle in the gramophone wears itself to a size which is too long for the wave forms it wants to pick out, so the light slot can be too wide to pick off properly the higher frequencies although, fortunately, the light does not wear, so that one of the gramophone difficulties is non-existent.



FILMING A TALKIE IN THE OPEN

Taking an outdoor talkie scene for a Ufa production. The recording van is in the background. Note the special stands that have to be erected for lights and cameras

Microscope Examination

One very interesting point about film recording is the way in which one can examine very carefully under a microscope, and measure if necessary, the different frequencies, and it is very interesting to see what the S and TH and similar sounds are like in practice, and one very quickly recognises most of the vowels.

It is unfortunately very difficult to print illustrations of some of these higher sounds like the S or TH because no printing that is done is sufficiently fine to illustrate them.

Radio Proverbs

Like the hare, oscillation starts when a man least expects it.

Two valves are better than one.

Who listens alone must put up his aerial alone.

A station is not known by a monthly tuning-in to it.

A set is better worn out than rusted out.

A well-used set seldom lets a fan down.

Varnishing hides a crack, but not a broken contact.

Never trust one station for all your entertainment.

Wireless friends are lost by calling often.

Waiting takes a long time to tune-in.

Dear bought and far fetched are pretty sets for ladies.

An ounce of wireless wisdom is worth a pound of wireless wit.

An expert may look ridiculous in the company of radio fools.

Many talk like philosophers who cannot turn a knob.

When one is radio wise a family is happy.

Wishes can never get distant stations.

Don't disturb a concert to test a knob.

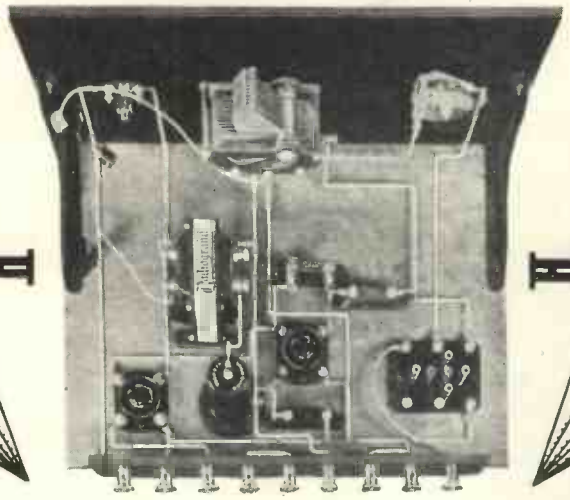
When the set's finished you may judge the maker.

He who knows not how to tune-in curses wireless.

Many stations are good, though they never be listened to.

The GLEANER TWO

An ideal set for the beginner is this two-valver, which is exceptionally selective and sensitive. A number of Continental stations should be available on the loud-speaker wherever the set is used



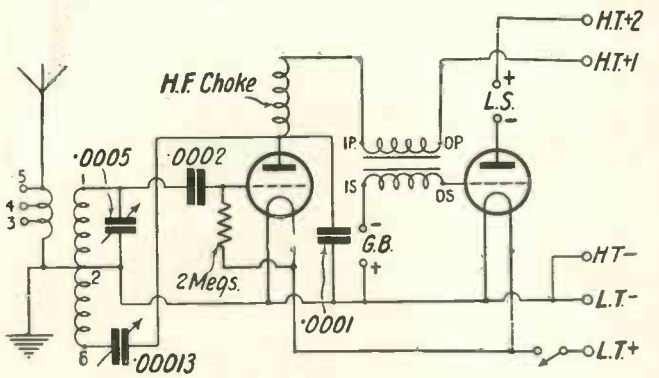
There is no need for soldering in the construction of this receiver, which can be built for about £5 (including valves, but excluding batteries and cabinet). Read about it now—and then build!

TESTED in south-east London on an outdoor aerial 60 ft. long and 35 ft. high, excellent reproduction was given by the Gleaner Two from the two Brookman's Park stations and the Midland Regional transmitter, all three being received at sufficient strength to "fill" a medium-sized room.

In addition, during the course of a single evening, the following foreign stations were heard at good loud-speaker strength and definitely identified: Turin, Radio Toulouse, Rome, Langenberg, and Oslo. Several other stations were heard at weaker strength, but were not identified.

Results such as these, which were obtained by a listener not highly skilled in the operation of receivers, prove three important points: First, that the set is selective; second, that it is particularly sensitive; and, third, that it is simple to handle.

The photograph in the heading shows beyond all doubt the extreme simplicity of the layout, and it will be evident that the construction is well within the capabilities of even the novice who has never yet built a radio set.



CIRCUIT OF THE GLEANER TWO

The valve combination is a leaky-grid detector, followed by a transformer-coupled stage of low-frequency amplification

What to Expect

Good as are the results noted above, they are by no means exceptional, and anybody building the set can expect to log more transmissions after a few days' experience.

Not only is the mechanical construction particularly straightforward, but the circuit is also very simple electrically, which is probably one reason for its success.

The only departure from standard practice is in the tuning coil. This is actually a special and very efficient type of high-frequency transformer for intervalve coupling which is provided with an interchangeable primary.

As can be seen from the photographs, the main body of the coil is similar to the standard two-contact type, but it is provided with six contacts, and on the front is a small plug-in primary winding provided with three contacts.

The main coil (or secondary) is connected to contacts 1 and 2, across which is placed a standard .0005-microfarad variable condenser for tuning. (See circuit diagram on this page.)

Capacity Reaction

Coupled to the secondary is the usual reaction windings (between contacts 2 and 6), the amount of feed-back being controlled by a .00013-microfarad variable condenser.

The two ends of the primary winding (the extra plug-in attachment on the main coil) are connected to sockets 3 and 5, contact 4 being a centre tap.

It is important to note that the coil used is a transformer and not an aerial coil. The manufacturers do produce an aerial coil proper, but in that case the interchangeable attachment takes the form of a reaction coil.

Our object in using an intervalve high-frequency transformer as an aerial tuner was to take advantage of the tapped and interchangeable primaries for varying the selectivity to suit local conditions.

There are two types of the main transformer: one for wavelengths from 235 to 550 metres and the other from 1,000 to 2,000 metres. Actually, there are ten interchangeable primaries; the number of turns in each

The Gleaner Two—*Continued*

is indicated in the list below:—

Primary Reference P4, 15 turns; P6, 20 turns; P8 25 turns; P10, 30 turns; P12, 35 turns; P14, 40 turns; P16, 50 turns; P18 70 turns; P20, 80 turns; and P22, 90 turns

Use of Common Primary

Our tests show that, although the two secondaries are needed to cover each waveband, a common primary can be used with both We have tried the set on a number of aerials and find the P22 primary with 90 turns to be satisfactory for reception on both wavebands

For the long waves the aerial is connected to contact 5, putting the whole primary in circuit For the medium waveband the aerial is tapped on to contact 4; this is the centre tap and puts only 45 turns in circuit.

In cases where bad interference is experienced it will be necessary to reduce the size of the primary coil to gain selectivity, but it should be remembered that a reduction in size will mean loss of strength It is always necessary to compromise between selectivity and sensitivity

Valve Combination

Looking into the circuit in greater detail, it will be seen that the combination of valves employed, as might be expected, is a detector and transformer-coupled low-frequency amplifier.

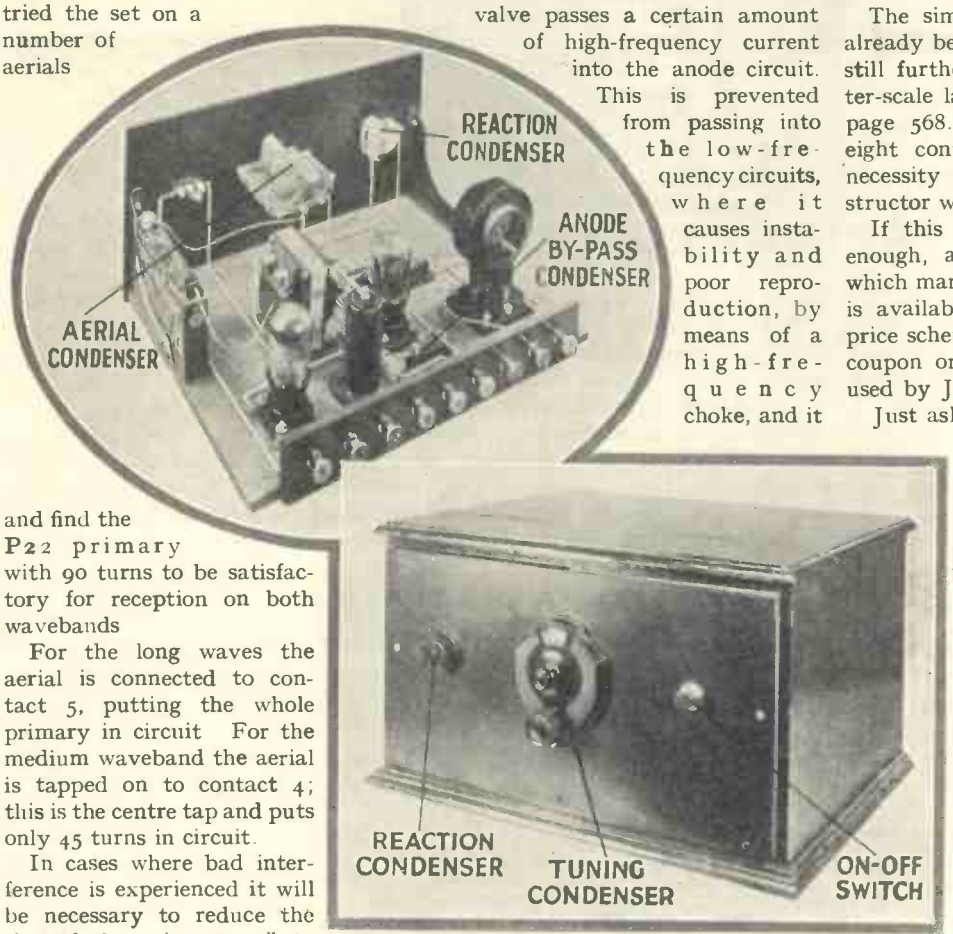
The detector is arranged on the leaky-grid principle, which has two advantages in a set of this type. With the values of leak and condenser used the best compromise between sensitivity and selectivity is obtained, and there is considerable latitude in the type of valve that can be successfully utilised in this position.

For maximum efficiency the detector valve is provided with a by-pass condenser of .0001 microfarad between anode and filament negative. It is well known that a detector valve passes a certain amount of high-frequency current into the anode circuit. This is prevented from passing into the low-frequency circuits, where it causes instability and poor reproduction, by means of a high-frequency choke, and it is therefore obvious that some other path must be provided for it, if it is not going to be passed back to the grid circuit to give a reaction effect.

Such by-passing is the function of the .0001-microfarad condenser.

The connections of the low-frequency transformer are standard, and grid bias is applied to the power valve in the ordinary way. With only one stage of low-frequency amplification it is obviously an advantage to use a high step-up ratio, although this is not essential.

One further point to note about the circuit is that a separate high-tension lead is provided for each anode circuit. With some valves this is a great advantage and materially improves reception by allowing of the best voltages being applied to suit particular valves.



ONLY THREE CONTROLS ON PANEL

Not only is the construction simple, but the operation of the set can be mastered in a few minutes even by the novice. The three controls are plainly marked

Soldering Not Essential

The simplicity of the design has already been pointed out. It will be still further evident from the quarter-scale layout and wiring guide on page 568. There are only twenty-eight connections and there is no necessity for soldering if the constructor wishes to avoid it.

If this reproduction is not large enough, a full-size blueprint—from which many readers prefer to work—is available under our special half-price scheme for 6d., post free, if the coupon on the inside back cover is used by July 31.

Just ask for No. WM201 and send your remittance to Blueprint Dept., WIRELESS MAGAZINE, 58-61 Fetter Lane, London, E.C.4. A copy will be sent by return.

For the benefit of absolute beginners, for whom this set is ideal, the construction will be described in detail.

Drilling

First take the panel and lay its polished side flat on a bench in such a way that it is not scratched. Now take the blueprint and lay the top part of it, which represents a back view of the panel, squarely over the ebonite.

Take a sharp-pointed tool and mark through the drilling points for holes for the on-off switch, tuning condenser, and reaction condenser Also mark positions for holes for fixing the panel brackets, not forgetting to allow for the thickness of the baseboard.

When the marks have been made, remove the blueprint and drill holes of the correct diameters for the particular components. Then mount

A Real Loud-speaker Set for the Novice

the components in position and fix the panel to the baseboard.

Again refer to the blueprint and place on the baseboard all the appropriate components in the positions indicated by the blueprint. A variation of ¼ in. or ½ in. in the position of any component will not matter greatly

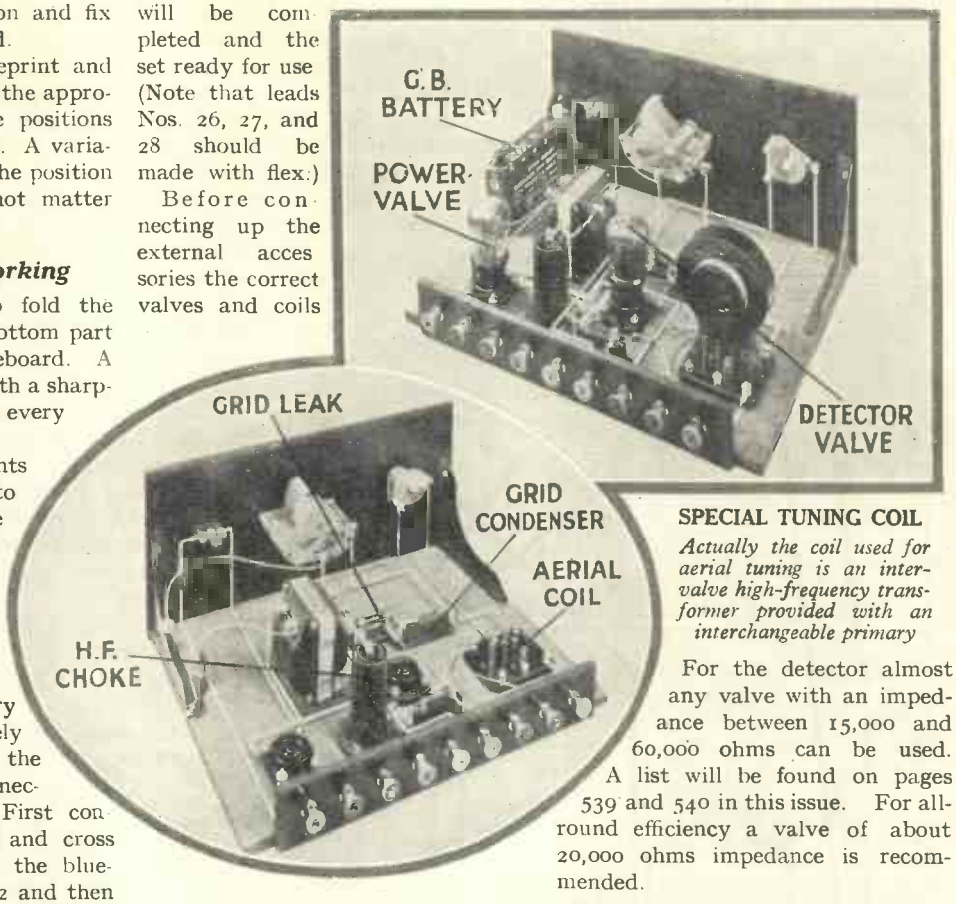
Another Method of Working

Another method is to fold the blueprint and place the bottom part squarely over the baseboard. A mark can then be made with a sharp-pointed instrument where every fixing lug is shown.

When all the components have been firmly fixed into position the set can be wired up. Here the special wiring system developed by the WIRELESS MAGAZINE will save a great deal of time and prevent errors.

It will be seen that every wire is numbered separately These numbers indicate the best order in which connections should be made. First connect the lead marked 1 and cross that number through on the blueprint. Proceed with No. 2 and then cross that through. Carry on in sequence to No. 28, when the wiring will be completed and the set ready for use (Note that leads Nos. 26, 27, and 28 should be made with flex.)

Before connecting up the external accessories the correct valves and coils must be inserted in the set. The choice of valves is not difficult



SPECIAL TUNING COIL

Actually the coil used for aerial tuning is an inter-valve high-frequency transformer provided with an interchangeable primary

For the detector almost any valve with an impedance between 15,000 and 60,000 ohms can be used. A list will be found on pages 539 and 540 in this issue. For all-round efficiency a valve of about 20,000 ohms impedance is recommended.

Choice of Power Valve

The power valve should preferably have an impedance in the neighbourhood of 2,500 ohms, but this is not essential, and an impedance as high as 6,000 ohms will generally be satisfactory.

In this connection it should be remembered that the higher the impedance of the power valve, generally speaking, the lower will be its anode-current consumption, and consequently the set will be more economical to maintain.

We strongly recommend the constructor to use a double-capacity type high-tension battery. Although the first cost may be high, it will be more economical than the standard-capacity type in the long run.

Lowering Consumption

Actually, we have specified a 108-volt battery in order to keep the total consumption as low as possible. Those who do not mind a little extra current consumption can use a 120-volt battery.

In either case the full voltage should be applied to H.T.+2, which

COMPONENTS REQUIRED FOR THE GLEANER TWO

CHOKE, HIGH-FREQUENCY
1—Bulgin, type SG, 6s. 6d. (or Lissen, Igranic).

COILS
2—Lewcos Super six-pin, types CSP5 and CSP20, 16s. 6d.
1—Lewcos primary coil, type P22, 4s.

CONDENSERS, FIXED
1—Trix .0001-microfarad, 1s. (or Magnum, Edison Bell).
1—Trix .0002-microfarad, 1s. (or Magnum, Edison Bell).

CONDENSERS, VARIABLE
1—Lotus .0005-microfarad, type LC/5, 5s. 9d. (or Edison Bell, Burton).
1—Lotus reaction, .00013-microfarad, type RC13, 5s. (or Polar, Cyldon).

DIAL, SLOW-MOTION
1—Brownie, 2s. 6d. (or Harlie, Lotus).

EBONITE
1—Lissen 14 in. by 7 in., 5s. 6d. (or Becol, Potter).
1—Terminal strip, 12 in. by 2 in.

HOLDER, COIL
1—Lewcos six-pin base, type SPB, 2s. 3d. (or Magnum, Cason).

HOLDERS, VALVE
2—Benjamin Vibrolders, 3s. (or Igranic, Edison Bell).

PLUGS
2—Belling-Lee, marked: G.B.+, G.B.—, 7d. (or Clix, Igranic).

RESISTANCES, FIXED
1—Watmel 2-megohm, 1s. (or Lissen, Ediswan).
1—Bulgin holder for above, 9d. (or Watmel, Lissen).

SUNDRIES
Glazite insulated wire for connecting.
1—Pair Ready Radio panel brackets, 2s. 6d.

SWITCH
1—Bulgin push-pull, type S22, 1s. 6d. (or Lotus, Junit).

TERMINALS
9—Eelex, marked: Aerial, Earth, L.S.+, L.S.—, L.T.+, L.T —, H.T.+1, H.T.+2, H.T.—, 3s. 4½d. (or Burton, Igranic).

TRANSFORMER, LOW-FREQUENCY
1—Telsen Radiogrand, ratio 5-1, 12s. 6d. (or Burton, Brownie)

ACCESSORIES

BATTERIES
1—Marconiphone 108-volt, type B1570, £1 1s. (or Hellesen type POSOL, Siemens type 1206).
1—Marconiphone 9-volt, type B500, 1s 9d. (or Hellesen, Siemens).
1—C.A.V 2-volt accumulator, type 2AG5, 9s. (or Exide, Oldham).

CABINET
1—Carrington table model, £1 1s. (or Pickett, Ready Radio)

LOUD-SPEAKER
1—Brown Duckling, £1 15s. (or Whiteley Boneham, Philips).

VALVES
1—Lissen HL210, 10s. 6d. (or Dario SuperHF, Mazda HL210).
1—Lissen P220, 12s. 6d. (or Dario SP, Mazda P220).

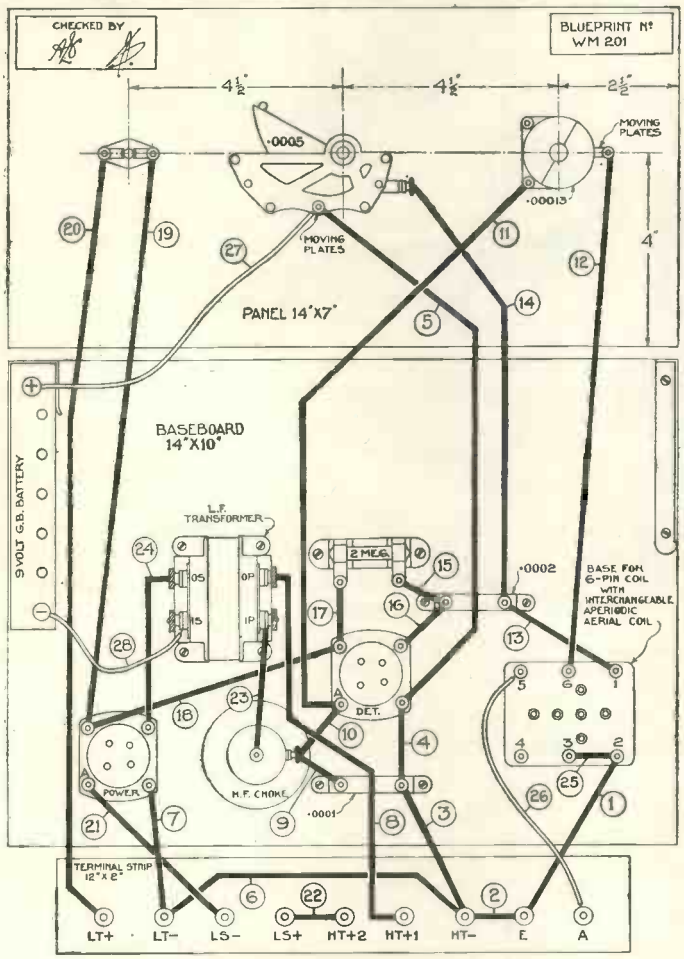
The Gleaner Two—*Continued*

supplies the power valve, and 60 to 90 volts should be fed to H.T.+1, for the detector.

Applying Adequate Bias to the Power Valve

The grid bias applied to the power valve should be in accordance with the maker's recommendation for the particular high-tension voltage used. It is better to over-bias than to under-bias. The grid-bias battery is clipped into a holder incorporated in one of the panel brackets.

Before finally switching on see that the appropriate coil is in position—CSP5 for the medium waves and CSP 20 for the long waves. The primary coil should also be plugged into the main coil.



LAYOUT AND WIRING DIAGRAM OF THE GLEANER TWO

This quarter-scale diagram can be obtained as a full-size blueprint for half-price (that is, 6d., post free) if the coupon on the inside back cover is used by July 31. Ask for No. WM201

How to Adjust the Set for Sensitivity

Now pull out the on-off switch to put the set into operation (see photograph on page 566), and adjust the reaction condenser until the set is on the verge of oscillation and in its most sensitive condition for reception.

This is indicated by a certain "live" sound from the loud-speaker that can best be described as a rustling or hissing noise. It is quite unmistakable when it starts.

The knob of the main tuning condenser should then be slowly turned until a station is picked up, when the reaction control should be readjusted for the best results.

It will be found that towards the top of the scale on the main tuning dial the reaction knob has to be moved further to the right to keep the set on the verge of oscillation.

To the beginner all this will sound very complicated, but it is simple enough in practice, and a few hours' experience with the set will give the operator complete mastery of the controls.

Avoiding Violent Oscillation!

Care must be taken with the reaction control. If the set is allowed to oscillate violently interference will be caused to the neighbours—and more letters of complaint will be written to the B.B.C. !

If you decide to build the Gleaner Two because of the results of the test recorded at the beginning of this article, remember that other listeners will be glad to know what the set will do in your locality.

We therefore invite all constructors of the set to send us reports. These will be published without the disclosure of the sender's name. Moreover, a prize of half a guinea is offered for every photograph published of a WIRELESS MAGAZINE set made by a reader.

See the offer made on page 578 and then order the parts for your Gleaner Two !

Regional Broadcasting for Switzerland

THE Swiss Telegraph Directorate has applied to the Royal Council for authorisation to erect three high-power stations in the German, French and Italian speaking sections of the country respectively, and smaller relay stations where required in the principal towns. The scheme is to have a "regional" broadcasting system, somewhat similar to that which is being instituted by the B.B.C.

The most powerful of the new stations, a Marconi type PB 60-kilowatt broadcasting transmitter, is to be erected at Münster, about 12 miles to the north-west of Lucerne, and will constitute the main "regional" station for German-speaking Switzerland. It will be allotted the wavelength of 459 metres.

For Crystal Listeners

To provide for crystal listeners in the towns, Marconi broadcasting stations of ½-kilowatt aerial power are to be erected at Berne and Basle. The new station at Berne will replace the present Marconi 1-kilowatt station.

At Basle the new station will be this town's first full-time broadcasting station, the broadcasting service having previously been carried out by the Marconi transmitter at Basle aerodrome, which is primarily employed for wireless telephony with aircraft. The reorganisation of the Swiss broadcasting service on the "regional" basis is expected to be completed in 1931.

Current Comments on Radio

Trans-oceanic Radio

THE wireless-telephony service recently established between Rugby and Australia is now by far the longest radio link in constant operation, covering a distance of 11,000 miles, as compared with the 6,400 miles stretch between Madrid and Buenos Aires.

The latter service, though ranking only second in mileage, presented some particularly tough problems to the engineers in charge of operations.

For instance, in connecting up the radio link to the more important cities in South America, it was found necessary to run a cable under the Rio de la Plata, one of the widest rivers in that Continent, and also to carry the service lines over one of the highest mountain ranges in the world.

A peculiar difficulty was encountered in Argentina, where enormous cobwebs, blown loose by high winds, fouled the wires and short-circuited the signalling currents.

Three different wave-lengths are in use: 15 metres during the daytime, 30 metres at night, and 20 metres during the sunset and sunrise periods. This ensures a reliable service over the whole twenty-four hours.

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A Loud-speaker Problem

The radiation of sound waves from the diaphragm of a loud-speaker remains practically constant for tone frequencies between 80 and 600 cycles. Above 700 cycles the efficiency of radiation increases in a marked fashion up to a frequency of about 3,000 cycles, after which it tends to fall off.

For this reason it is difficult to reproduce the lower frequencies at the same intensity level as the higher notes without introducing a certain degree of distortion, particularly, for instance, in "talking picture" work where a high standard of fidelity is essential.

Captain H. J. Round has recently devised a method of using two separate loud-speakers so connected in circuit that, at the lower frequencies, where the response is comparatively poor, the two outputs are added together.

For the higher tones a shunt condenser comes into operation, and progressively reduces the output from one speaker until it is reduced to zero at a frequency of about 3,000 cycles, thus automatically producing the required compensating effect.

◆ ◆ ◆

Jean Baptiste Fourier

In view of current controversy as to the "real" nature of sidebands, it is interesting to record the centenary of the death of the originator of the famous system of analysis on which the sideband theory is based.

Fourier's theorem shows that any form of periodic wave-motion may be analysed into a fundamental wave and its harmonics. In other words, any complex curve can be built up from a series of pure sine curves.

Thus a carrier wave modulated by a periodic low-frequency note is regarded by mathematicians as equivalent to (*a*) the original carrier frequency, (*b*) a sideband or "summation" frequency, and (*c*) a lower sideband or "difference" frequency.

The physical reality of these sidebands can, in fact, be demonstrated by comparing the resonance curve of a highly selective receiver working first with an unmodulated and then with a modulated valve oscillator.

Fourier, the son of a poor tailor, was born at Auxerre, in France, on March 21, 1768. In addition to cultivating a natural genius for mathematics, he found time to make his mark as a politician and orator in the most difficult and stirring epoch in French history.

He was a close friend of Napoleon, and after the latter's fall from power, was appointed perpetual secretary to the Paris Academy of Sciences by Louis XVIII, in 1822. He died on May 16, 1830.

Dick Francis, the comedian *Frank Johnson—saxophone solos*

◆ ◆ ◆

Broadcast Set for the Motorist

The biggest problem in operating a receiver when actually on the road is that of shutting out interference from the car ignition system. Efficient screening of the high-tension coil or magneto and distributor, as well as the spark plugs and leads, is absolutely necessary if signals are to be free from "noise."

For the rest, the new high-mu screened-grid valves which have made the ordinary portable such a success, may be depended upon to give the necessary volume of sound, even at long range.

The receiving aerial should be of the open or "capacity" type rather than a loop, the pronounced directional properties of the latter being a distinct disadvantage when travelling along a winding road.

An upright aerial, 3 or 4 ft. high, with capacity extensions along the roof in the case of a saloon, will provide sufficient pick-up, with two stages of screened-grid radio-frequency amplifiers, to give adequate loud-speaker strength within a radius of fifty miles from the transmitting station.

MORTON BARR.

Broadcasting the King of Instruments

By WHITAKER-WILSON
the W.M. Music Critic.

LAST month I restricted my observations to some account of how an organ is constructed, an account that had necessarily to be somewhat sketchy. This month I want to interest you in the difficulties of broadcasting the organ or, if you prefer it, of recording it. The difficulties in either case are much the same for the simple reason that the work has to be done by means of a microphone.

Not What Fancy Paints Them

Microphones are not all one's fancy paints them, by any manner of means, and the difficulties are many. Even when most of these are overcome there is the difficulty of obtaining a suitable reproduction in sets or in gramophones.

In making a test of my own church with an acoustician from a well-known gramophone company a few weeks ago, I came to the conclusion that several of the effects I wanted to produce could be got *on* to a record but, as my companion said, "How we shall ever get it *off* the record and into a cheap gramophone is another matter."

The trouble is that one is dealing with sound waves the whole time, and it is not always easy to persuade them to accommodate themselves to such circumstances as one is able to provide for them.

A Loss to Listeners

Organ transmissions are not, I think everyone will agree, the best class of production the B.B.C. has to give us. It seems a great pity because English organs and English organists are the best in the world, or so it has been stated.

Regarding the organs I think the statement is pretty accurate; regarding the organists—well, perhaps there are some very good ones, though it must be admitted that the other kind exist in large numbers.

I am afraid I have been guilty of some uncharitable remarks about

Difficulties in broadcasting and recording the organ are dealt with in this article. Last month the mechanical construction and operation were explained

cinema organs and cinema organists in this journal; there have been some amusing discussions in the office of the WIRELESS MAGAZINE in consequence. As a matter of fact, I freely concede one point that the staff here has raised against me—I may add in the friendliest and most sympathetic manner possible.

The point is that the cinema organ is an instrument apart and has its own peculiar tone and effect; not only must it be restricted to the production of dance music and music of a light type, but it is positively unsuitable for anything else.

The strange point about cinema organs is that the music they produce, though immensely popular with the general public, is detested by all serious organists. The obvious retort, I suppose, is that serious organists, so-called, are very narrow-minded. But that retort will not do; it is not so by any means.

There is something about the tone of a cinema organ that is an anathema to all lovers of good music and certainly to all practising musicians. I do not know one who can tolerate them; indeed, I know more than one cinema organist, constantly in the public eye, who has admitted to me that he has sold his soul and conquered his spiritual nausea.

The B.B.C., having bowed to the public demand and broadcast cinema organs regularly, has also given the great public of these islands an opportunity of hearing the best music written for the instrument. The gramophone record companies have done the same thing.

But there are great difficulties in the way. The first and greatest of them might be overcome if the B.B.C. and the gramophone companies only had the pluck to adopt a certain course.

There is such a thing as commercial necessity and advisability, we all know; both the B.B.C. and the gramophone companies are as awake to that as is any other business concern. The great thing for the B.B.C. is the *announcement in their programmes*; the great thing for the gramophone companies is the *name on the label*.

Too Long An Echo

Consequently we get broadcasts from Southwark Cathedral simply because it is Southwark Cathedral, and for no other reason—certainly not for its acoustic properties. I have not measured the echo in that building, but I know it to be of several seconds' duration.

Commonsense says "avoid Southwark Cathedral"; commercial necessity says "Southwark Cathedral is near to London and it *is a cathedral*." The result is nothing except confusion, but that cannot be helped apparently; the B.B.C. must have an organ in a well-known place for its transmissions—*because of the public*.

I happen to be organist of a church where the echo, even when the church is empty, is only just a fraction over one second in duration. The organ, not particularly large, is built by probably the best-known firm in England and it is a beautiful instrument.

Almost Ideal Conditions

The conditions both for broadcasting and for recording are as ideal as can possibly be in a building never designed for the purpose; but, and this is the point, it is a *parish church* and not *a cathedral*; it is not even a West-end church, or a noted city church; therefore it is no good for the purpose.

Thus the public misses what might prove to be excellent results from the acoustic point of view because of this necessity for a name. My church is not the only one, of course;

there must be others if one only knew where they were. But that is the first difficulty.

It is the same with the gramophone companies; no one blames them of course. They have to think of their bread and butter.

Celebrity Records

The head of one of the largest companies told me the other day that what are called "celebrity records," price 8/6 upwards, do not sell in large quantities. They must be produced for artistic reasons, but they are not the sellers.

I was informed that if I made a record of a classic organ work it would be necessary to balance the loss I created by issuing a cinema-organ record. It is an appalling situation and, until something is done, this acoustic difficulty brought about by broadcasting and recording large organs in large buildings is going to continue.

The next trouble that comes to my mind is one which the organists might cure for themselves. They are far too inclined to give recitals as though they were playing for an audience within the building itself. In fact, I believe I am correct in saying that where Southwark Cathedral is concerned this is actually so, the general public being admitted to the recitals.

That, to my way of thinking, is simply asking for trouble because, naturally, an organist would use his organ as it should be used for purposes of giving recitals; I mean that he uses any or all of his stops. If he has an echoing building, what is to prevent him from sending thunders down its reverberating aisles when he plays a Bach fugue or a Mendelssohn sonata? He would be a fool if he did not!

Hard on Listeners

That is all very well for those who are listening there; but it is a trifle hard on those who are trying to enjoy him *broadcast*. The 32 ft. reeds thrill one to the marrow *in the building* itself, but they "blast" on every wireless set in Europe.

Even if they do not actually cause unpleasant noises in the sets they cause an acoustic confusion which does not make for clarity. Therefore it seems to me that all wireless organ recitals should be made in places where the organist is not expected to play to the general public.

I claim to know what I am talking about because I spent five months in 1925 researching for H.M.V. on organ recording. I believe I was the first person actually to make an organ record. Those I made I loathe with a deadly loathing; I would not give you the name or number of one of them.

The method used then (now much improved upon, of course) was not satisfactory—from my point of view, at all events. The result sounded much as I had it in the original so far as the *manuals* were concerned, but the pedals were hopeless.

The microphone would not take the low notes of my pedal reeds and, although I used every care in trying to avoid bad effects for the microphone's sake, I only succeeded in avoiding some of them.

It was the same when I broadcast my organ at St. John's, Regent's Park, in 1924. I had a letter from a friend (who was stationed in Jerusalem) a few weeks later. He had heard the broadcast and told me that he should have recognised the tone of my magnificent organ, but added "Were you using the pedals? I missed the tone of your larger stops."

Of course that was in the early days; things are a trifle better now. Some, by no means all, of the sets will reproduce a small percentage of the tone of the pedal stops.

We prove that every day in the laboratories of the "W.M." We have put an organ record on the mechanical gramophone—an excellent instrument in its way—and then heard it on the big electric machine. The results are scarcely comparable so far as the bass goes. Moving coils, again, are going to work wonders for the improvement of organ broadcasting.

Playing Too Smoothly

Another point, which organists miss, is the fact that they play too smoothly for broadcasting. We all know the organist who cannot play smoothly to save his life, and we all wish he would take to some other profession, but I am not thinking of him.

I am thinking of the man whose technique is perfect in this respect but who forgets that a little detachment is necessary; I found that out in 1925 when I did those gramophone tests.

What is wanted is a special building in which beams in the roof are closely put together to cut up the sound waves so that they cannot skid along smooth surfaces. The great mistake at Savoy Hill, in my judgment, has always been that the B.B.C. has always sought to stop echo and reverberation by means of *soft* substances.

Echoes are caused by hard substances; they should be prevented by hard substances also. Having built a suitable place a suitable organ should be erected in it. I should like to see the B.B.C. and the chief gramophone companies combine and build a place and a suitable instrument.

More Mistakes

Regarding the instrument, if they are going to allow either an organist who does not understand the difficulties of broadcasting and recording, or an organ builder to specify the instrument, there will be more mistakes.

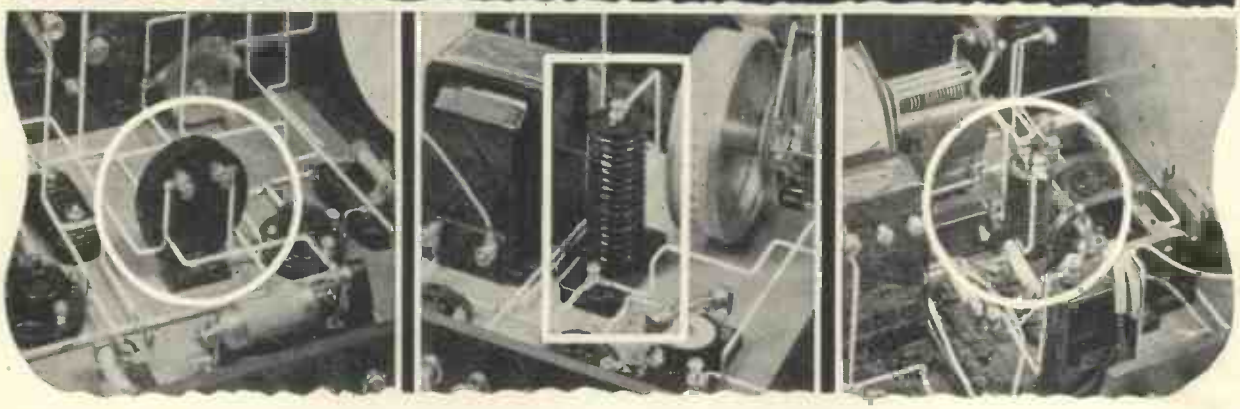
It can be done, but the organ will be an extraordinary mixture of fact and fancy, in other words, of true tone and faked effects to produce true tone.

Then, when it is built, someone has to learn how to play it for broadcasting. *There has been no satisfactory organ transmission yet.*

(H)AIR BY BACH!

An impression of Whitaker-Wilson, who says in this article that there has been no satisfactory organ transmission yet

The Truth About High-frequency Chokes



IN my article last month I gave a large number of tests on representative examples of high-frequency chokes. One or two well-known chokes had not been received at the time of going to press and therefore it was not possible to include them in the test, while in addition, there were a large number of less well-known makes which had to be held over. It is proposed to deal with these in the present article.

Lower General Standard

The curves reproduced for this month do not in general attain quite such a high standard as those of last month. While last month all the chokes shown had a performance factor exceeding 80 per cent. over the greater part of the 200 to 2,000 metres range, there are this month a number which fall considerably below these requirements.

This line of demarcation is, of course, purely arbitrary, and cannot be considered as rigid, but it is based on practical experience, for I have found that chokes which show up well according to this test are satisfactory for general use.

Method of Making Tests

Some information regarding the actual method adopted during the test will probably be of interest. As I pointed out in the last article, it is desirable to avoid introducing across the choke any circuit which is likely to affect its constants.

Even though, in use, the choke sometimes has a small capacity across it provided by the valve in the circuit, this effect is mainly of importance where one is dealing with choke-coupled circuits, and here conditions are so special as to require treatment of their own.

For example, the connection of a valve voltmeter across the choke is not desirable, owing to the capacity of the instrument. The valve voltmeter which I used in these tests has an input capacity of about 25 micro-microfarads under the conditions of the experiment and this would naturally have a very considerable effect upon the tuning properties of the choke.

Last month J. H. Reyner, B.Sc., A.M.I.E.E., our Technical Editor, dealt with some interesting aspects of high-frequency chokes. Here he explains his new method of testing them and gives data on a further selection of commercial types, which will be of great value to the constructor.

The method of testing was arranged on a slightly different plan, and the scheme which finally proved the most satisfactory was that shown in Fig. 1. Voltage is obtained from a local oscillator, and this is applied across the choke under test in series with a resistance.

This resistance is of the vacuum type, consisting of a small rod of glass sprayed with semi-conducting material, the whole being housed inside a glass tube, from which the air is evacuated; it has little self-capacity and has much the same value at high frequencies as at low frequencies.

In any case, the actual value of the resistance does not enter into the test so that any variation is of relatively small importance.

A valve voltmeter (see Fig. 2) is connected across this resistance. Now if we pass current through the choke, this current will also pass through the resistance and in doing so will set up a voltage across the resistance.

Voltmeter Deflection

This voltage, in turn, will produce a deflection on the valve voltmeter, the extent of which indicates the amount of current flowing. For example, if the choke is functioning well very little current will flow, and consequently the deflection on the voltmeter will be small.

On the other hand, if the choke is not acting efficiently, the current will immediately increase and the voltmeter deflection will rise.

Thus we have a very simple qualitative test as to the performance of the choke. This, however, is not sufficient because we wish to convert the results into actual figures.

Comparison with Condenser

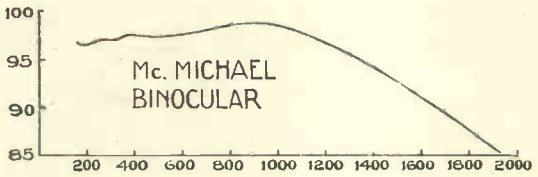
This is done by direct comparison of the choke with a small capacity. As I pointed out in the last article, a high-frequency choke acts, or should act, over the greater part of the range as a small capacity, and therefore we may compare it with an actual capacity with comparative ease.

The leads, therefore, are changed over from the choke on to a small calibrated capacity, the maximum

(*Continued on page* 574)

L. McMICHAEL, LTD.

Binocular Junior—Price 4s.



INDUCTANCE :
85,000 *microhenries.*

SELF-CAPACITY :
2.5 *micromicrofarads.*

D.C. RESISTANCE :
230 *ohms*

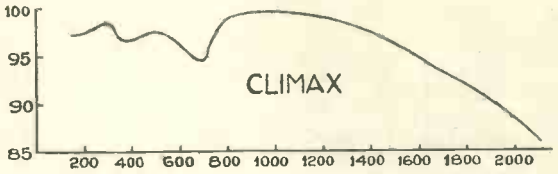
INDUCTANCE :
98,000 *microhenries.*

SELF-CAPACITY :
3 *micromicrofarads.*

D.C. RESISTANCE :
1,100 *ohms.*

CLIMAX RADIO ELECTRIC, LTD.

Price 7s. 6d.



BRITISH GENERAL MANUFACTURING CO., LTD.

Price 5s. 6d.

INDUCTANCE :
128,000 *microhenries.*

SELF-CAPACITY :
4.5 *micromicrofarads.*

D.C. RESISTANCE :
400 *ohms*

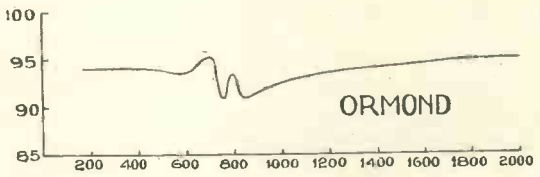
INDUCTANCE :
376,000 *microhenries.*

SELF-CAPACITY :
6 *micromicrofarads.*

D.C. RESISTANCE :
900 *ohms.*

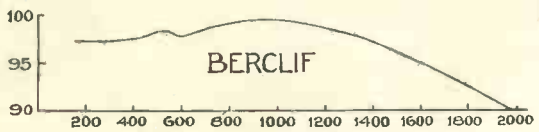
ORMOND ENGINEERING CO., LTD.

Price 7s. 6d.



SIMMONDS BROS.

Berclif—Price 5s.



INDUCTANCE :
80,000 *microhenries.*

SELF-CAPACITY :
2.8 *micromicrofarads.*

D.C. RESISTANCE :
650 *ohms.*

The curves show the performance factor at different wavelengths

The Truth About High-frequency Chokes *Continued*

value of which is only a few micro-microfarads, and this condenser is adjusted until the deflection on the voltmeter is the same as before.

This indicates that the current through the circuit is now the same as previously, and therefore the value of this condenser must be equivalent to the capacity of the choke at the particular frequency under consideration.

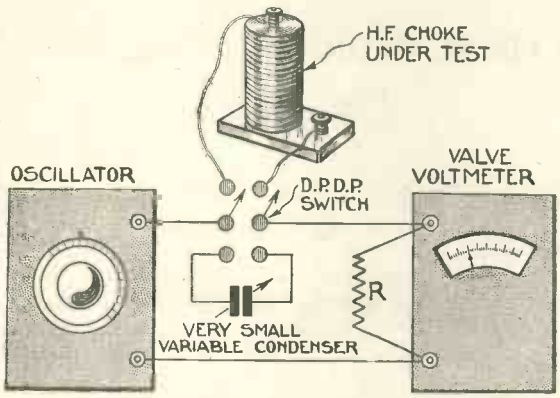


Fig. 1.—Skeleton circuit of apparatus used for testing high-frequency chokes.

Current Through By-pass

In evaluating the performance factor for a particular choke, this capacity is compared with a .0001-microfarad by-pass condenser and a simple calculation serves to show the proportion of the total current which would flow through the by-pass condenser.

The test must, of course, be repeated for a large number of wavelengths from 200 metres up to 2,000 metres. In particular, any peaks or dips must be noted carefully, and an additional reading taken at the particular point where the peak or dip is most pronounced.

Need for Care on Testing

Thus the production of a complete performance curve is a matter requiring some care, and for this reason only those chokes with reasonably good performance have been included in the review.

There are, of course, a number of refinements to the method which need not be dwelt upon in this article. For example, it is necessary to ensure that the voltage applied across the circuit is the same throughout any one test.

At any particular frequency, the voltage applies across the high-frequency choke must be the same as that applied to the circuit when the choke is replaced by the condenser.

A sensitive valve-voltmeter is also required, because if the choke is at all satisfactory the current which does flow through the circuit is very small indeed. The value of the resistance R is limited, it being desirable for reasons of accuracy not to exceed about 10,000 ohms, so the voltage developed becomes very small indeed, and a sensitive meter is required to detect its presence.

There are certain other effects in connection with chokes which this test does not actually measure. For example, where a choke is being used in the anode circuit of a screened-grid valve, the high-frequency currents being by-passed to a tuned grid circuit, the choke is effectively connected across the circuit.

Now although a choke acts as a small capacity, it is a poor condenser. It has a rather high dielectric loss, and therefore prevents the circuit from developing its full efficiency. This defect is so marked that some manufacturers prefer to test their chokes by connecting them across a tuned circuit and noting the drop in voltage caused by so doing.

While the test utilised in the present instance does not give a definite indication of such loss, the fact remains that if the choke is a good one, its capacity effect will be very small and, therefore, the amount of current flowing through the choke will be strictly limited.

In such circumstances the actual loss introduced into the circuit must, of course, be small so that a choke which shows up as good by the method adopted herewith also gives good results when tested by other methods. In any case, variations in the choking effect, which cause uneven amplification, are shown up by both methods.

Special Short-wave Chokes

Throughout the test attention has been confined to standard broadcast wave chokes. Many manufacturers also make a short-wave choke particularly suitable for wavelengths below, say, 100 metres. Such a choke consists of a single layer of relatively fine wire wound on a small former, so that the self-capacity is kept low.

The inductance should be such as to resonate with the self-capacity at a wavelength between 50 and 100 metres. The choke will then behave as a small capacity on wavelengths of 20 to 30 metres, or less, where it is commonly required to be used.

Suitable Resonant Point

Owing to the fact that such chokes are usually wound in a single layer there is usually little difficulty with them. Provided their resonant point is suitably chosen (and in the majority of cases this is so), no trouble will be experienced with their use.

Where one is designing a short-wave set pure and simple, the use of a choke of this type is all that is required, and one can save a certain amount of expense by using such a component in place of the normal broadcast type of choke.

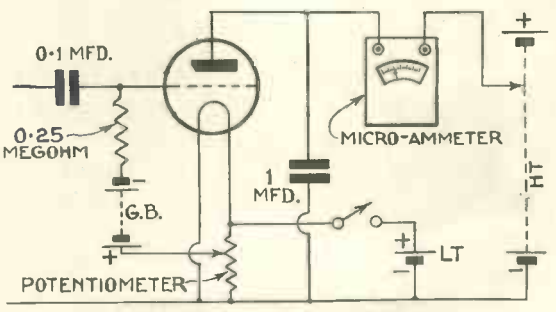


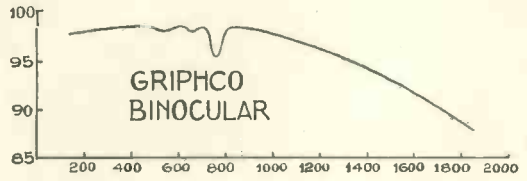
Fig. 2.—Circuit of valve voltmeter. The microammeter shows the changes in anode current of an anode-bend detector.

Where a receiver is normally used

(*Continued on page 576*)

A. W. GRIFFIN & CO., LTD.

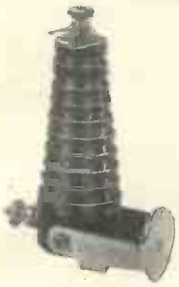
Griphco Binocular—Price 6s. 6d.



INDUCTANCE :
110,000 *microhenries*

SELF-CAPACITY :
1.8 *micromicrofarads.*

D.C. RESISTANCE
1,300 *ohms.*



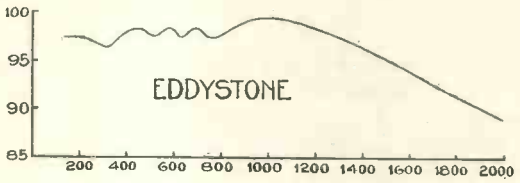
INDUCTANCE :
185,000 *microhenries.*

SELF-CAPACITY :
1.6 *micromicrofarads.*

D.C. RESISTANCE :
1,400 *ohms*

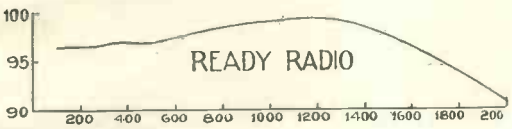
STRATTON & CO., LTD.

Eddystone—Price 6s. 6d.



R. R., LTD.

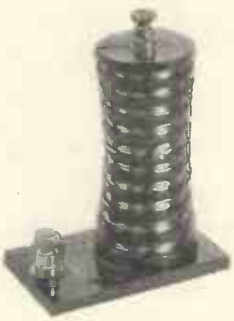
Ready Radio—Price 6s.



INDUCTANCE :
92,000 *microhenries.*

SELF-CAPACITY :
4.2 *micromicrofarads.*

D.C. RESISTANCE :
350 *ohms.*



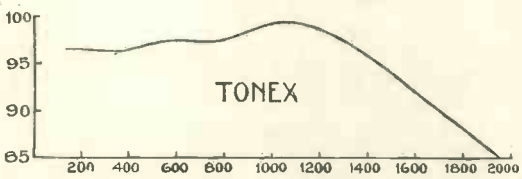
INDUCTANCE :
63,000 *microhenries.*

SELF-CAPACITY :
4.8 *micromicrofarads.*

D.C. RESISTANCE :
230 *ohms.*

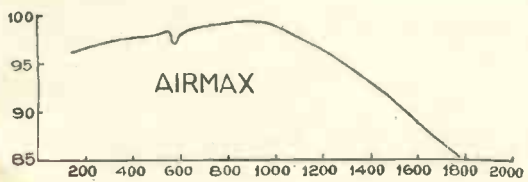
TONEX CO.

Standard Type—Price 4s. 6d.



J. DYSON & CO., LTD.

Airmax—Price 5s.



INDUCTANCE :
76,000 *microhenries.*

SELF-CAPACITY :
3 *micromicrofarads.*

D.C. RESISTANCE :
600 *ohms.*

The curves show the performance factor at different wavelength

The Truth About High-frequency Chokes *Continued*

on broadcast wavelengths, however, and is intended to be tuned to the short waves only occasionally, the use of special short-wave chokes by themselves will not suffice. It is necessary to have a good broadcast choke in circuit, suitable for the normal wavelengths, and if the choke is satisfactory it will operate equally well on the very short waves.

Behaving as Capacity

It still behaves as a very small capacity even on 10 or 20 metres, and its choking effect, in comparison with that of a by-pass condenser, will remain practically the same as at 200 metres.

In some cases the use of a short-wave choke in series with a broadcast choke is recommended. It should be pointed out, however, that this practice is unnecessary if the broadcast choke is a good one.

Suppose for example, the performance factor of a choke at 200 metres is 90 per cent. If we insert, in series, a short-wave choke having the effect of a small capacity also, the effective capacity of the combined arrangement is little smaller than either of the two chokes individually.

Improved Performance

The result of this is to increase the performance factor by perhaps 3 or 4 per cent., which is not of great moment.

This is confirmed by tests which I made some time ago, which showed that if the self-capacity of the short-wave choke was distinctly lower than that of the broadcast choke, then some advantage was gained on the short wavelengths by placing the two in series, but if the two self-capacities are of the same order, or if the capacity of the broadcast choke is below that of the short-wave choke, no improvement whatever results from the use of the two components in series.

Question of Self-capacity

The self-capacity of the average short-wave choke ranges from 2 to 4 micromicrofarads, so that any broadcast choke having a self-capacity of less than about 5 micromicrofarads may be considered as suitable for very short wavelengths as well as the broadcast band. A self-capacity of 5 micromicrofarads, incidentally, corresponds to a performance factor of 95 per cent.

Having regard to these facts, no tests have been made on short-wave chokes, the measurements being confined to standard types. Of these, some thirty-five have been reviewed, and it is thought that all the principal makes have been included.

The reader will be advised, therefore, to select his components from those which have been reported on.

In those cases where a firm makes more than one type, the choke reviewed is that giving the best results under average conditions.

CHOKES TO USE IN YOUR SET

Alphabetical List of Makers and Trade Names

Test data and curves of these chokes appear on the pages indicated. Back numbers of the June issue (for pages 467, 459 and 471) can be obtained for 1s. 3d., post free.

Poets' Radio Quotations

Tuning-in

Some minds improve by travel, others rather
Resemble copper wire or brass,
Which gets the narrower by going farther.
T. Hood : *Ode to Rae Wilson.*

◆ ◆ ◆

Talks

So much they talked, so very little said.
Churchill : *The Rosciad.*

Words learned by rote, a parrot may rehearse,
But talking is not always to converse.
Cowper : *Conversation.*

"The time has come," the Walrus said,
"To talk of many things :
Of shoes—and ships—and sealing-wax—
Of cabbages—and kings."
Lewis Carrol :
Through the Looking-glass.

Though I'm anything but clever,
I could talk like that for ever.
Sir W. S. Gilbert : *H.M.S. Pinafore.*

◆ ◆ ◆

Weather Forecast

The day is cold, and dark, and dreary;
It rains, and the wind is never weary.
Longfellow : *The Rainy Day.*

◆ ◆ ◆

B.B.C. Stations

Our little systems have their day;
They have their day, and cease to be.
Tennyson : *In Memoriam.*

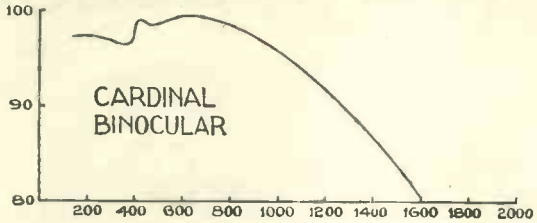
◆ ◆ ◆

B.B.C. Censorship

Oh, no ! we never mention her,
Her name is never heard;
My lips are now forbid to speak
That once familiar word.
T. H. Bayly :
Oh, No ! We Never Mention Her.

J. STEWART

Cardinal Binocular—Price 3s. 6d.



INDUCTANCE :
41,000 *microhenries.*

SELF-CAPACITY :
3 *micromicrofarads.*

D.C. RESISTANCE :
280 *ohms.*

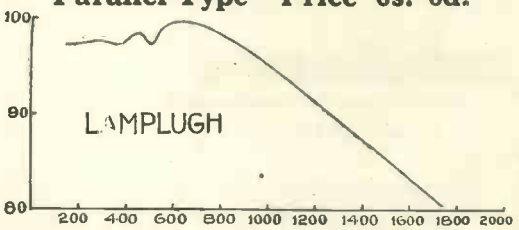
INDUCTANCE :
50,000 *microhenries.*

SELF-CAPACITY :
2.5 *micromicrofarads.*

D.C. RESISTANCE :
280 *ohms.*

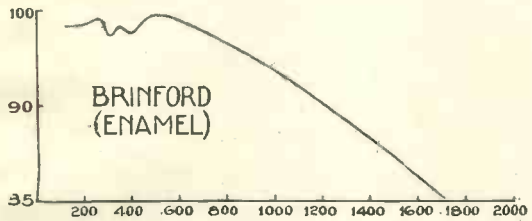
S. A. LAMPLUGH, LTD.

Parallel Type—Price 6s. 6d.



BRINFORD MANUFACTURING CO.

Enamel Type—Price 2s.



INDUCTANCE :
60,000 *microhenries.*

SELF-CAPACITY :
1.8 *micromicrofarads.*

D.C. RESISTANCE :
270 *ohms.*

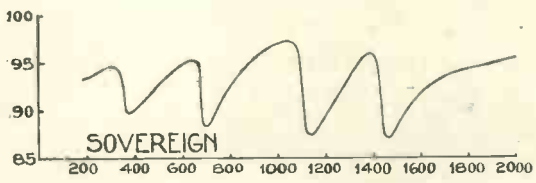
INDUCTANCE :
40,000 *microhenries.*

SELF-CAPACITY :
2 *micromicrofarads.*

D.C. RESISTANCE :
260 *ohms.*

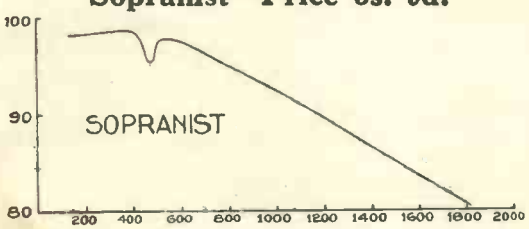
J. R. WIRELESS CO.

Sovereign—Price 5s.



S. KALISKY (Aldgate), Ltd.

Sopranist—Price 3s. 9d.



INDUCTANCE :
48,000 *microhenries.*

SELF-CAPACITY :
1.5 *micromicrofarads.*

D.C. RESISTANCE :
320 *ohms.*

The curves show the performance factor at different wavelengths

Pleasures of Home Construction

CATARACT FIVE

BUILT in a glass case after a period of eighteen months, a North Finchley reader feels well rewarded with the results from the Cataract Five (WIRELESS MAGAZINE, *June*, 1928) :

I am enclosing photographs of my set, the Cataract Five, constructed according to the circuit in the June, 1928, issue of WIRELESS MAGAZINE. This circuit gives, as claimed in that same issue, perfect output. When driving a large cone speaker, music sounds most realistic.

As will be seen in the photographs the set is constructed in a glass case, while the gramophone, pick-up, etc., are built into the side of the loud-speaker cabinet. This design is an advantage where one wishes to display the components and wiring of the receiver.

In all, the complete set has taken eighteen months to build, but I feel by the results obtained I have been well rewarded.

◆ ◆ ◆

OUTPOST FOUR

THE following letter from a Tobago reader about the Outpost Four (WIRELESS MAGAZINE, *November*, 1929) *shows how a design that is fundamentally good can be adapted for the use of different parts :*

May I offer you my thanks for the circuit of the Outpost Four—it is by far the best short-wave receiver I have ever handled. But this is not all. The circuit lends itself to a very different layout from that published, and therein I think lies its chief value.

I was much struck by its possibilities as soon as I saw the theoretical circuit, so determined to make it up with the components I had here—none of them those specified except the Clarostat !

As I had no Dimic coils, I was forced to change the layout to include Eddystone plug-in coils on a baseboard 18 in. by 8 in. I had not even got the right values of fixed condensers in all cases.

I hope this may enable other readers of the WIRELESS MAGAZINE who may be, like myself, 4,000 miles from wireless dealers who can supply the specified components to make up the set with whatever they have, at any rate as a temporary arrangement.

I had only one 1-microfarad condenser, so used it in the resistance-capacity feed to the first L.F. transformer. Instead of 1 microfarad between screening grid and filament of the H.F. valve, I am using a .006-microfarad, being the largest mica condenser I had.

Instead of the .001-microfarad condenser between top of anode coil to filament I am using the nearest I had, a .002 microfarad. The grid condenser and grid leak of detector are .0001 microfarad and 5 megohms, as specified.

A FINE HOME-CONSTRUCTION JOB

This attractive outfit was made by a "W.M." reader at North Finchley. The set is the Cataract Five ; it is built in a glass case. The top view shows how the turntable and pick-up are mounted behind the loud-speaker

High-frequency Chokes

Instead of 50,000 ohms in detector anode feed, I have 60,000 ohms. The H.F. choke is an Eddystone and the S.W. choke a Wearite; transformers are both Lissen 8s. 6d. type.

I was able to introduce one refinement—the grid leak goes to the moving arm of a 400-ohm potentiometer. L.F. choke is a Lissen; valves PM12, PM1HF, Cossor 210 detector and L.F., and Cossor Stentor 2. The S.G. valve has been in continual use for one year already and the other three valves for two years. What the results would be with new up-to-date valves I cannot imagine.

The Blue Spot—White Spot loud-speaker is fully loaded by the set.

Reaction Condenser

Tuning condenser is .0002-microfarad Cyldon, and reaction .0003-microfarad Cyldon. Owing to the coupling between my plug-in coils not being so tight as in Dimic's, the .0003-microfarad reaction condenser is just right when the reaction coil is a size larger than the anode coil.

I get loud-speaker reception at the same strength as I expect on a good four-valver with the old 2LO (at about sixty miles), from 2XAF, 2XAD, 8XK, PCJ and, between 4 p.m. and 5.30 p.m., from 5SW. The hours at which 5SW is at good strength here varies with the time of year. Local time is exactly four hours' slow on Greenwich.

Other good stations at fair loud-speaker strength are BRY (Demerara, 43.86 metres), PH1, W6XN, W8XS, Zeesen, WM1, W2XE, W8XAL. Therefore, once more, many thanks.

◆ ◆ ◆

CONTINENTAL THREE

MOST old sets are too unselective to separate the Brookman's Park stations in London, but not so the Continental Three (WIRELESS MAGAZINE, *April*, 1927), *which is being used by a South Woodford constructor :*

It may interest you to know that with the Continental Three, long omitted from your list of sets, and built over three years ago, using the alternative aerial through fixed condenser, with ordinary plug-in coils, I find no difficulty whatever in receiving the 261.3 or 356.3 metre programmes and Midland Regional, whenever and which ever I like, entirely without interference.

I write because none of my friends can do this with their sets.

MAKE USE OF THESE REPORTS !

The letters from readers reproduced here are something more than just praise for the WIRELESS MAGAZINE—they are a definite help to the listener who intends to build a new set, showing as they do the merits of various types of receivers in different localities.

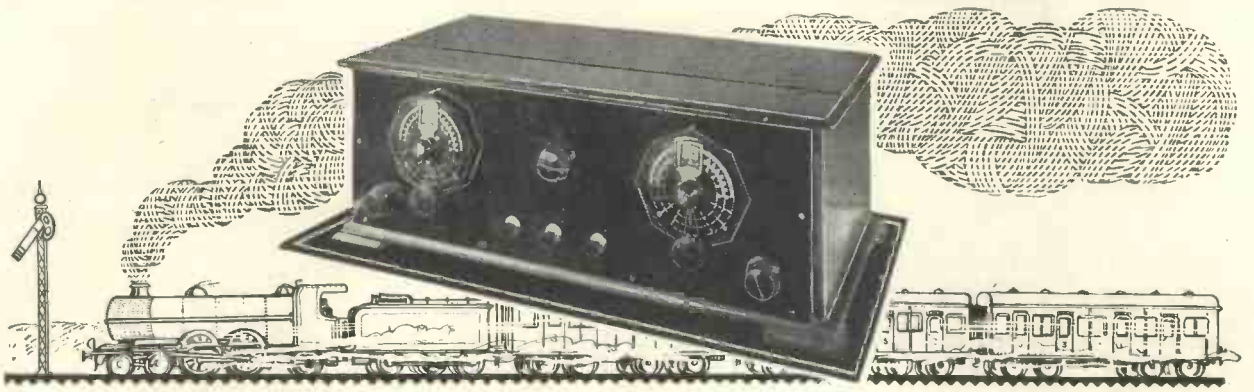
Remember that full-size blueprints and back copies describing most of these sets are still available.

◆ ◆ ◆

Readers are invited to send us photographs of WIRELESS MAGAZINE receivers they have built; for each one printed we shall pay half a guinea. The prints must be sharp and clear for reproduction ; they should be as large as is conveniently possible.

The INVITATION FOUR

FOR ALL WAVELENGTHS FROM 10 TO 10,000 METRES!



SOME weeks ago a most interesting letter was received in the WIRELESS MAGAZINE offices; it has not previously been acknowledged because, although it was signed, no address was given.

In brief, the letter was written on behalf of twenty-four railway men who wanted a new edition of the Outpost Four to cover all wavelengths and not only the ultra-short waves.

Railway men are, apparently, short-wave enthusiasts in their spare time, but when they are on late turns their wives need sets for ordinary broadcast reception!

The writer of the letter mentions what he considers were the two outstanding successes of 1929—the Arrow Four and the Outpost Four—both of which he and his friends have built. He concludes: "Well, I suppose if I were to say how many stations have been heard on these two sets someone would say, 'He is a ——,' but personally I don't think any stations have been missed."

All-wave Reception

Various points and suggestions mentioned in the letter were considered and tried out. The resulting set we have called the Invitation Four—for the reception of all wavelengths from 20 to 10,000 metres.

Whilst efficiency and general utility have been the main considerations in the design of the set, cost has also been borne in mind. It will be found that the price of the parts needed for assembly is particularly reasonable for a receiver of the type.

The actual valve combination is a screened-grid high-frequency stage, leaky-grid detector, resistance-capacity coupled low-frequency amplifier, and a transformer-coupled power valve. Refinements incorporated in the circuit are a motor-boat stopper on the detector; an output transformer to the loud-speaker; and provision for the use of a pick-up.

Use is made of the well-known Dimic interchangeable coils, which cover every wavelength range needed for normal purposes. As can be seen from the photographs, these coils are wound in two equal sections, each section being provided with its own connections; there are thus four connections to each coil.

COMPONENTS REQUIRED for the INVITATION FOUR

CHOKES, HIGH-FREQUENCY
1—Burton Binocular, 5s. 9d. (or British General, Bulgin).
1—Watmel, type DX3, 6s. (or Magnum, Graham-Farish).

COILS
4—McMichael Dimic, two each Nos. 1a and 3a, for broadcast reception, £1.
2—Sets McMichael Dimic short-wave coils, £2.

CONDENSERS, FIXED
1—Graham-Farish .01-microfarad, 2s. 6d. (or T.C.C., Dubilier).
2—Graham-Farish .0005-microfarad, 2s. (or T.C.C., Dubilier).
1—Graham Farish .0003-microfarad, 1s. (or T.C.C., Dubilier).
1—Graham-Farish .0002-microfarad, 1s. (or T.C.C., Dubilier).
1—Graham-Farish .0001-microfarad, 1s. (or T.C.C., Dubilier).
1—Hydra 1-microfarad, 2s. 2d. (or Lissen, T.C.C.).
1—Hydra .2-microfarad, 3s. (or Ferranti, Lissen).

CONDENSERS, VARIABLE
2—Ready Radio .0005-microfarad, 9s. (or Lissen, Trix).
1—Dubilier Midget .0002-microfarad, 5s. 6d. (or Cyldon, Formo).
1—Lewcodenser, .0002-microfarad maximum, 2s. 6d. (or Formodenser, Igranic).

EBONITE
1—Trolitax, 21 in. by 7 in. panel, 7s. (or Lissen, Becol).
1—Terminal strip, 21 in. by 2 in.

HOLDERS, COIL
2—McMichael Dimic, 4s.

HOLDERS, VALVE
3—Lotus, type VH/25, 5s. 3d. (or Igranic, Wearite).
1—Parex S.G., low type, 2s.

PLUGS
3—Belling-Lee, marked: G.B.+, G.B.−1, G.B.−2, 10½d. (or Eelex, Clix).

RESISTANCES, FIXED
1—Graham-Farish 30,000-ohm with holder, 2s. 9d. (or Ediswan, Igranic).
1—Graham-Farish 100,000-ohm with holder, 2s. 9d. (or Ediswan, Igranic).
1—Graham-Farish 3-megohm with holder, 2s. 6d. (or Ediswan, Lissen).
1—Polar semi-fixed potentiometer, 2s. (or Lewcos).

RESISTANCES, VARIABLE
1—Wearite 15-ohm rheostat, 1s. 6d. (or Lissen, Lamplugh).
1—Rotorohm 1-megohm potentiometer, type M, 6s. 6d. (or Igranic).

SCREEN
1—Parex, 10 in. by 6 in., with baseboard foil same size, 2s. 9d. (or Wearite, Ready Radio)

SUNDRIES
Glazite insulated wire for connecting.
1—Pair Ready Radio panel brackets, 2s. 6d.

SWITCHES
1—Bulgin three-spring short wave, type S36, 2s.
1—Bulgin single-pole change-over, type S23, 2s. 3d. (or Lotus).
1—Bulgin push-pull on-off, type S22, 1s. 6d. (or Lissen, Lotus).

TERMINALS
12—Eelex, marked: Aerial, Earth, Pick-up +, Pick-up −, L.T.+, L.T.−, L.S.+, L.S.−, H.T.−, H.T.+1, H.T.+2, H.T.+3, 4s. 6d. (or Belling-Lee, Burton).

TRANSFORMERS, LOW-FREQUENCY
1—Igranic, type J, ratio 3 to 1, 17s. 6d.
1—Lissen output, type LN633, 12s. 6d. (or Ferranti, Varley).

ACCESSORIES

BATTERIES
2—Ever Ready 60-volt, type High-power 60, £1 11s. (or Dubilier type 363, Columbia type 478).
1—Ever Ready 16-volt, type GB2, 3s. 6d. (or Obeta type 167E, Lissen).
1—Lissen 2-volt, type LN509, 13s. 6d. (or Exide, C.A.V.).

CABINET
1—Pickett table model, £1 5s. 6d. (or H. & B. Radio, P.B. Radio).

LOUD-SPEAKER
1—Celestion cone, type C12, £5 12s. 6d. (or Brown, Whiteley Boneham).

VALVES
1—Marconi S215, £1 2s. 6d. (or Lissen SG215, Six Sixty 215SG).
2—Marconi HL210, £1 1s. (or Lissen HL210, Six Sixty 210HF).
1—Marconi P2, 15s. (or Osram P2).

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

The Invitation Four—*Continued*

These double-section coils can be used in a number of special ways, but in this case we have utilised them as two separate, yet coupled, coils on a common former. Two complete coils—the price is very reasonable indeed—are needed for each wavelength range; one coil for the aerial circuit and the other for the anode circuit of the screened-grid valve.

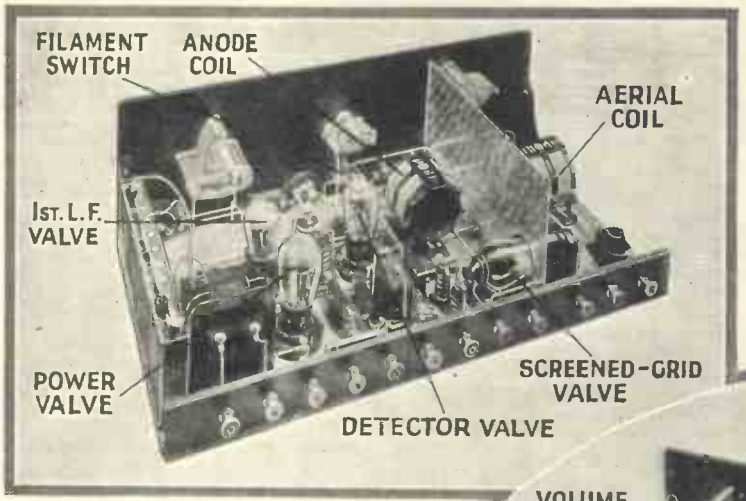
The aerial is connected to one half of the aerial coil, which is used as an aperiodic or untuned primary. The second half acts as a secondary and is tuned by means of a .0005-microfarad variable condenser.

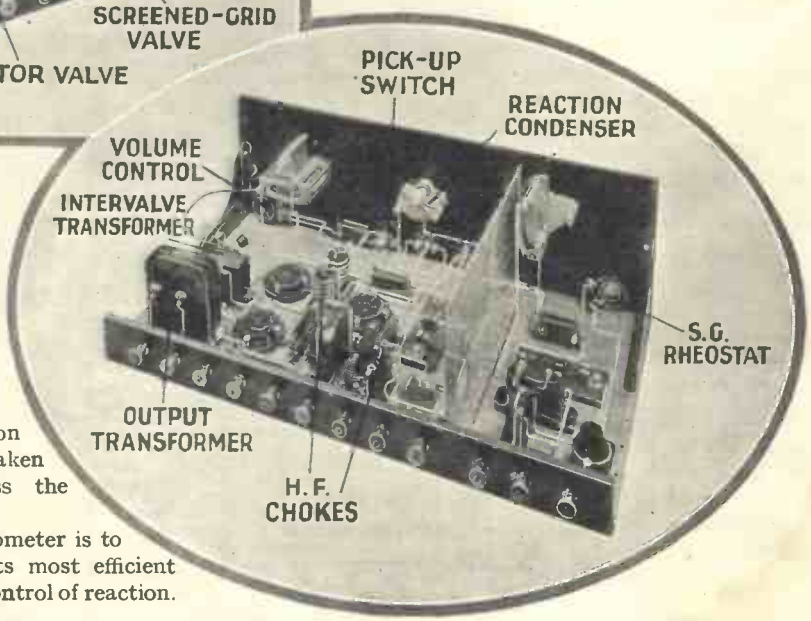
Connections to the screened-grid valve follow standard practice, a 1-microfarad by-pass condenser being inserted between the screening grid and low-tension negative. This valve is provided with a filament resistance, which acts as a pre-detector volume control.

Increasing Selectivity of the Set

When this rheostat is operated so that the filament current is decreased, the impedance of the valve is increased and the selectivity of the set is improved. This point should be remembered.

Parallel feed by means of a high-frequency choke is utilised in the anode circuit of the screened-grid valve. Signal currents are blocked by the choke and pass through a .0003-microfarad coupling condenser to one half of the second (anode) coil, which is tuned by another .0005-microfarad variable condenser.





A REAL LOUD-SPEAKER SET

Really loud results from a large number of stations are assured by the use of this set

We now come to a consideration of the detector valve, on the efficiency of which so much depends. For the best compromise between sensitivity and selectivity, a .0002-microfarad grid condenser is used in conjunction with a 3-megohm leak, which is taken to a potentiometer connected across the low-tension supply

The reason for inserting this potentiometer is to allow the valve to be adjusted for its most efficient working and especially for the smooth control of reaction. The actual effect is to alter the grid bias applied to the detector valve.

Three values of positive grid bias are obtainable—one-half, one-third or one-quarter of the normal filament voltage Thus, in the case of 6-volt valves, the bias available is 3, 2 or 1½ volts; for 4-volt valves 2, 1$^1/_3$, or 1 volt; and for 2-volt valves, 1, $^2/_3$ or ½ volt

How Alternative Connections Are Made

These variations are obtained by altering the connections to the small circular potentiometer fitted in the set. The connections for one-half and one-quarter are already marked. For a one-third tapping the "¼" terminal and L.T.— are connected together, the grid leak being connected to the "½" terminal.

As the resistance of the winding is 3,000 to 4,000 ohms the current consumption is negligible.

Detector efficiency is still further helped by the use of a .0001-microfarad by-pass condenser for high-frequency currents connected between anode and the negative side of the filament.

In the anode circuit of the detector is a second high-frequency choke. On the efficiency of this depends the smooth control of reaction, which is obtained by means of the second half of the anode coil and a .0002-microfarad variable condenser.

The coupling resistance between the detector and the first low-frequency valve is of 100,000 ohms resistance. In series with it is a 30,000-ohm de-coupling or anti-motor-boating resistance, a 2-microfarad by-pass condenser being connected at the point where the two resistances are joined.

Switch for Gramophone Pick-up

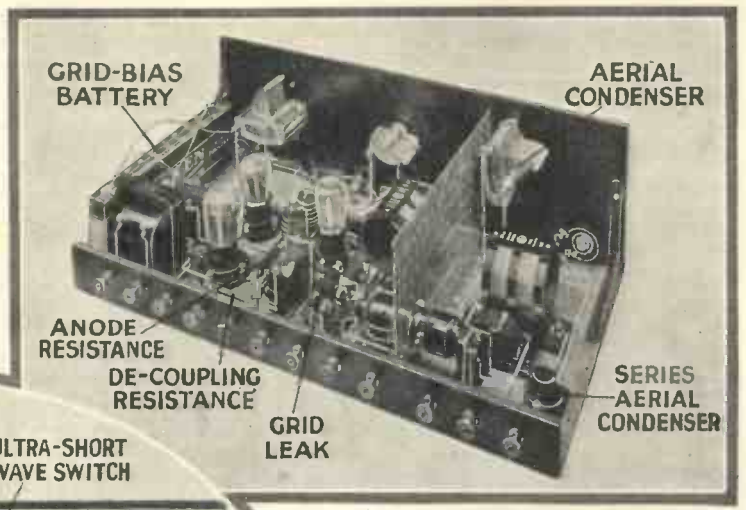
Between the anode circuit and the grid coupling condenser of .01-microfarad capacity is a switch for the insertion of a gramophone pick-up when it is desired to play records electrically.

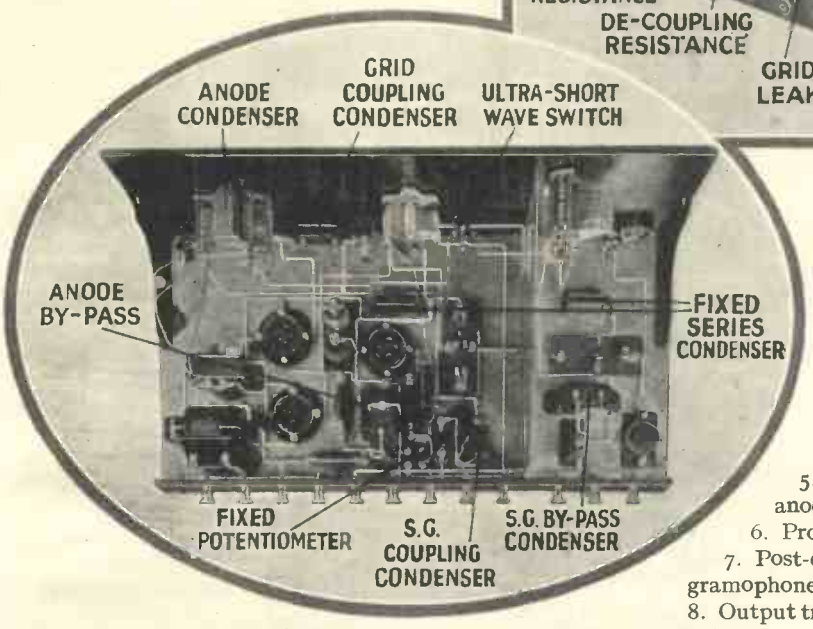
For Ultra-short Wave and Broadcast Reception

The grid leak of the first low-frequency amplifier takes the form of a 1-megohm potentiometer, the grid of the valve being connected to the variable contact. This acts as a post-detector volume control and has the advantage of not affecting the relative strengths of the high and low notes, whatever the setting may be.

For maximum volume, the sliding arm is kept towards the grid condenser

The low-frequency transformer in the anode circuit of the first low-frequency valve is connected in the ordinary way





NO NEED FOR SOLDERING

Only four of the sixty-odd connections in the set need to be soldered, consequently the wiring is not difficult

In the anode circuit of the last valve is an output transformer. The use of this is to isolate the loud-speaker windings from the high-tension supply.

It helps to improve the quality of reproduction and protects the loud-speaker from damage by the anode current which would otherwise be flowing through its windings whenever the set is switched on.

There is one important feature of the tuning circuits that has not yet been mentioned. For ordinary broadcast reception a .0005-microfarad condenser is quite suitable, but for ultra-short wave work this value is too large, because a given dial variation causes too great a change in the wavelength and stations are likely to be missed.

We have, therefore, incorporated a simple expedient that has been found satisfactory in other WIRELESS MAGAZINE receivers. In series with each .0005-microfarad variable condenser is placed a fixed condenser of the same value.

Fine Tuning for Ultra-short Waves

The resultant capacity in each case is 00025-microfarad and consequently tuning is very much finer When these extra fixed series condensers are not required they are put out of circuit by means of a single switch.

Briefly summarised, then, the chief points about the Invitation Four will be seen to be :—

1. Use of easily interchangeable coils for reception on wavelengths from 20 to 10,000 metres.
2. Pre-detector volume control that adjusts and influences selectivity.
3. Parallel feed from screened-grid valve to detector valve.
4. Grid-bias potentiometer and anode by-pass on detector.
5. Anti-motor-boating device in detector anode circuit.
6. Provision for use of pick-up.
7. Post-detector volume control for radio or gramophone reproduction.
8. Output transformer for protection of loud-speaker windings.

Little need be said about the actual construction of the Invitation Four. None of its sixty-odd connections need be soldered unless desired except for the four to the screened-grid valve holder, which is provided with tags and not terminals.

Full-size Blueprint Available for 9d.

All the constructional details will be clear from the diagram on page 582, if this is not enough, a full-size blueprint can be obtained for half-price (that is, 9d., post free), if the coupon on the inside back cover is used by July 31.

Ask for blueprint No. WM200 and address your inquiry to Blueprint Department, WIRELESS MAGAZINE, 58-61 Fetter Lane, E.C 4.

Apart from showing the location and sizes of all the holes to be drilled, and the exact positions of all the parts, the blueprint is a quick and sure wiring guide, because each connection is numbered separately in the best order of assembly.

The sizes of coils needed for the set are indicated in the list of components. For any given wavelength range the aerial and anode coils are of the same size. Thus, two No. 1A coils are needed for the medium waves and two No. 3A's for the high waves.

There is no need for us to give here the wave ranges

The Invitation Four—*Continued*

of the coils in detail as the makers supply a most informative leaflet on this point. The short-wave coils needed are two each of Nos. SW4, SW3, SW2 and SW1, for approximately 20 to 200 metres.

20 to 10,000 Metres

With the appropriate sizes of these coils, it is possible to cover the range from 20 to 10,000 metres without a break.

An important question for the operator is always the best types of valve to use with a set.

Standard Types

In this case the choice is not particularly difficult and ordinary standard types will be quite suitable. For the first position any standard screened-grid valve will be satisfactory as a general rule.

The detector valve should have an impedance from one-half to one-third of the value of the anode resistance, which is, in this case, of 100,000 ohms. A valve between 25,000 and 50,000 ohms impedance will therefore be suitable.

A slightly lower impedance will be suitable for the first low-frequency stage—something of the order of 15,000 to 30,000 ohms.

The choice of power valves in the end must always depend on the source of high tension. It is desirable to use a valve of the order of 2,000 ohms impedance for the best quality of reproduction, but many of these take an anode current that is far too great a drain on a battery.

However, a number of valve manufacturers have recently tackled this problem and produced a new type of power valve taking comparatively little anode current for its impedance and magnification.

With the valves and high-tension batteries recommended in the list of components, we are confident that economical working can be assured for the Invitation Four.

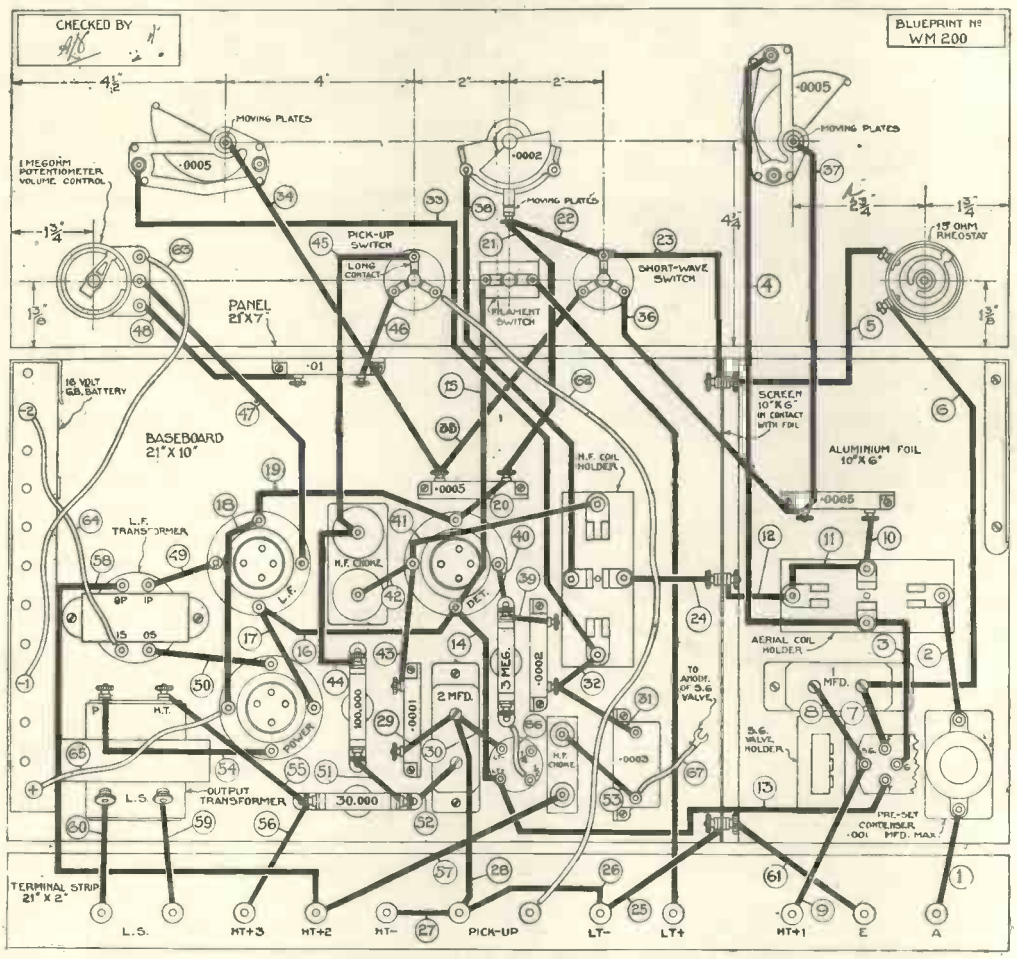
It is disastrous to use ordinary standard-capacity batteries with a set of this type; those recommended are for a maximum discharge of 25 milliamperes.

Apart from the actual voltage of the batteries, it is important to apply the right values to the three high-tension terminals.

These are arranged as follows: H.T.+1 feeds the screening grid of the shielded valve; H.T.+2 feeds the anodes of the screened-grid and first low-frequency valves; and H.T.+3 supplies the anodes of the detector and power valves.

The detector valve is fed with the same high voltage as the power valve because of the voltage drop caused by the coupling and decoupling resistances in its anode circuit.

Suitable voltages to apply are: H.T.+1, 50 to 60 volts; H.T.+2, 100 volts; and H.T.+3, 120 to 150 volts. The grid bias applied to G.B.−1 and G.B.−2 should be in accordance with the maker's recommendations for the particular valves in use.



LAYOUT AND NUMBERED WIRING DIAGRAM OF THE INVITATION FOUR

This can be obtained as a full-size blueprint for half-price (that is, 9d., post free), if the coupon on the inside back cover is used by July 31. Ask for No. WM200

Method of Operating

In spite of the large array of controls on the front panel, the set is not difficult to operate. Only two or three of the knobs are ever used at the same time.

Let us first discuss the use of the set

A Set That Will Do All You Ask of It!

for radio—ordinary broadcast reception. First turn the screened-grid rheostat full on (to the right) and also the right-hand volume control (also to the right).

Of the three switches, that on the left should be out, so that the fixed condensers in series with the main tuning condensers are short-circuited. The right-hand switch should be "in." Then the knob of the centre switch should be pulled out to switch the set on.

Searching for Stations

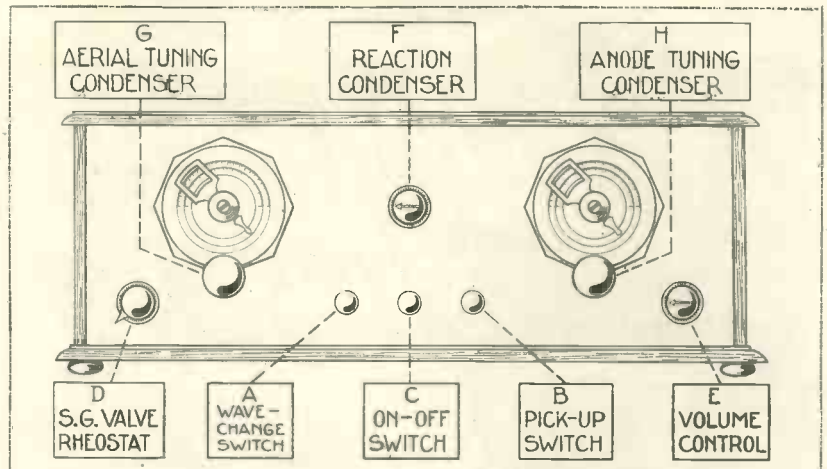
To search for stations set the two main dials at approximately the same readings and adjust the reaction condenser until the set is on the verge of oscillation—indicated by a rustling or hissing from the loud-speaker. Then turn the main dials more or less in unison.

To change the wave-range of the set it is, of course, necessary to change the coils. Remember that both aerial and anode coils are the same size and it is immaterial which way round they are placed in their holders.

Reducing the Volume

Should the volume be too great, there are three methods of reducing it. They should be used in this order: (1) Set the reaction condenser at zero; (2) turn the rheostat knob to the left; and (3) turn the volume control to the left.

If the rheostat is turned right round to the left, the screened-grid valve will be switched off altogether.



HOW TO OPERATE THE SET

FOR BROADCAST RECEPTION

1.—*Pull out A*
2.—*Push in B*
3.—*Pull out C to switch on*
4.—*Turn D to right for maximum volume*
5.—*Turn E to right for maximum volume*
6.—*Set F for sensitivity*
7.—*Turn G and H simultaneously*

FOR ULTRA-SHORT WAVES

Adjust as above, but push in A

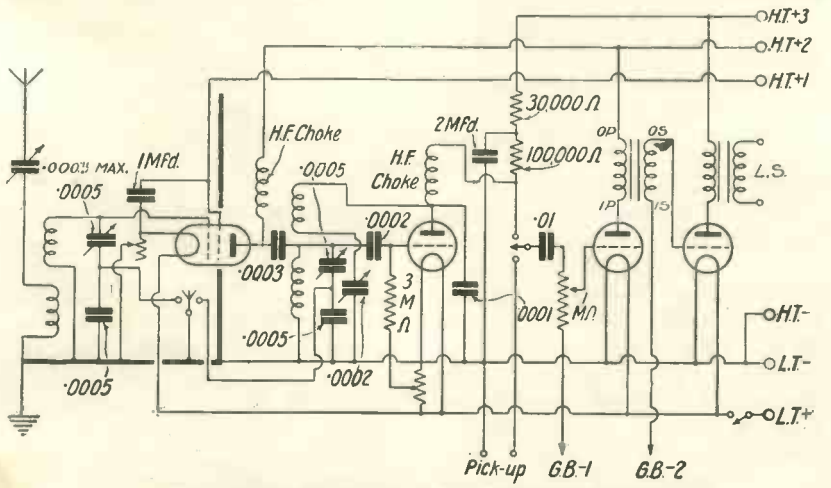
FOR GRAMOPHONE REPRODUCTION

1.—*Turn D to left*
2.—*Pull out B*
3.—*Pull out C*

For ultra-short wave reception, carry out exactly the same procedure except for pushing in the knob of the left-hand switch.

For the use of a pick-up, turn the screened-grid valve right off by turning the rheostat to the left and pull out the knob of the right-hand switch. The position of the left-hand switch is immaterial.

In this case only the right-hand volume control is effective in controlling the loudness of reproduction.



CIRCUIT DIAGRAM OF THE INVITATION FOUR

The set consists of a screened-grid high-frequency valve, leaky-grid detector, resistance-capacity amplifier, and transformer-coupled power stage

Things Heard

From Riga

Light music.
Chamber music.
Sextet music.
Dance music.
Operatic music.
Vaudeville.
A talk on music.
An excellent soprano vocalist.

From Leningrad

A talk on the "Duties of the Citizen."
A talk on "The State is Supreme."
A talk on "The Ideal State."
A talk eulogising the state of affairs in Russia and condemning it elsewhere.
Mournful music.
Minor music.
Much political economy.

From Marseilles (P.T.T.)

Sailor songs.
Port information.
Weather forecast.
Descriptions of other lands.
Local items.
Local sport.
Local talks.

E. B. R.

Where to Hide Your Loud-speaker

An article of practical value to every listener by KENNETH ULLYETT

THE reproduction of many sets is too often judged partly by the appearance of the loud-speaker. If the speaker is easy to look upon and pleases the taste of the listener, then it goes a long way towards making reproduction sound better, and may even make programmes sound brighter !

Like A Good Start

That this is not just a fad may easily be proved if you hide an unsightly loud-speaker. While low-frequency tests and comparisons easily show that one instrument is better than another, it is a fact that in an average listener's home, where accurate comparison is impossible and one can judge reception only by trying to remember the quality of a standard instrument, good appearance is like a good start in a race.

The trouble is that it is as difficult to design a speaker to please the eyes (and the furnishing arrangements) of the majority of listeners as it is to arrive at a natural tone which is universally satisfactory.

Some listeners like plenty of bass, while others are keen about the brilliance of reproduction; and in just the same way some people prefer horn speakers to plaques, and others cabinet cones to pedestal portables.

A universal solution is to hide the loud-speaker and this is a scheme which has many advantages, particularly if the speaker is rather large, a linen-diaphragm job for example, and difficult to house in the ordinary way.

Not only can a poor looking loud-speaker be given a chance by hiding it, but by choosing a good position in the room the naturalness of reproduction can be improved. Make a few tests and you can easily prove this for yourself.

Probably the average set has the loud-speaker stood on top of it in a corner of the room, by the fireside or in the window. The window position is generally convenient for the set, for the aerial and earth leads can come straight in to it; but neither the window nor the fireside positions are always the best for the loud-speaker.

I think it is true that in the average home, in the evening, at least, two people listen-in at a time. This means that with the fireside or window positions one of the listeners generally has his back to the loud-speaker, and this is hardly a natural way of listening.

The first thing in finding a place for the loud-speaker is to discover which is the most natural part of the room for a speaker to be in. Some listeners put their loud-speakers in most impossible corners. I always think it sounds strange to hear Jack Payne performing behind the potted aspidestras !

Directional Effects

As far as possible one should endeavour to make the loud-speaker face towards that part of the room where one generally sits to listen. All loud-speakers are directional to a degree : a good deal of uncomfortable listening is often the result of straining to direct attention to a loud-speaker in an unnatural position.

The great point, having settled where to hide the loud-speaker, is how to hide it. A difficulty is raised by the fact that most modern speakers, those capable of dealing with bass notes without rattle, need a baffle in order to prevent low-note loss.

The other day I heard a concealed loud-speaker which was arranged in a very novel way. A baffle-board about 18 in. wide and 6 ft. long, which had been cellulosed to match the colour scheme of the room, had been fixed transversely across one corner of the room so that a **V**-section channel was formed by the meeting of the two walls.

Soundproof Joints

The baffle was fixed tightly to the wall and to the floor, and a soundproof joint was made all round by means of thin strips of rubber draught-excluder. The top of the **V**-channel was open, of course, and the whole thing was somewhat like a long organ tube closed at the bottom.

About a foot from the floor the mounting hole for the cone loud-speaker was cut, and the cone was mounted facing inwards against the walls, so that the sound waves had to travel up the 6-ft. length of the

channel and out at the top.

Some trouble had been taken to get a cone of just the right size, and the natural tone of the whole thing was very pleasing. A certain non-directional effect resulted from reflection from the walls and ceiling of the corner of the room.

An old idea, but I think a good one, is to conceal a loud-speaker under a table. This is a handy scheme with linen speakers which can be conveniently mounted under a large table, and which forms its own baffle. Care must be taken, however, that an unnatural effect is not produced.

Non-directional Effect

If the speaker is carefully placed, it is very difficult to tell whence the sound is coming, and this should be one of the aims of concealing a speaker.

A friend of mine has utilised the back of a small sideboard as a baffle, and the cone loud-speaker is fitted inside one of the cupboards facing the wall. The sideboard is stood up about 6 in. and the sound is not muffled.

Level matters a great deal, and unless one uses some arrangement, such as the corner baffle I have described, whereby the sound is heard at the top of the room, it is unwise to have the loud-speaker near the floor.

After all, if one had the B.B.C. artistes actually performing in one's lounge, they would not grovel about on the floor! It is equally unnatural to have the loud-speaker at a height of less than 5 ft. from the ground. When a loud-speaker is placed on a low table this unreality of reproduction is very noticeable.

Direct Attention to It!

If one does not want to hide a loud-speaker, or if this cannot conveniently be done (if it is housed in an unwieldy cabinet), then the next best thing, paradoxical as it may seem, is to direct attention to it. A well-known gramophone manufacturer does this in an effective manner in connection with moving-coil speakers used with electric gramophones.

A small pilot light, which indicates when the field current is switched on, is placed inside the loud-speaker fret, facing towards the cone. Thus when the speaker is "on," a faint reddish light is visible behind the fret, and the psychological effect of this on the listener is to attract his eyes, as well as his ears; and two senses are better than one, even for "listening"!

Controlling Your Volume

I WONDER how the many London listeners who normally receive the regional station at too great strength reduce the volume? By detuning, in the majority of instances, I imagine.

This is a good practical method and may suffice for the time being. But what happens when both of London's Regional transmitters are working? With two powerful stations, detuning may mean interference. And if we have contrasted programmes, the result is bound to be the reverse of pleasant.

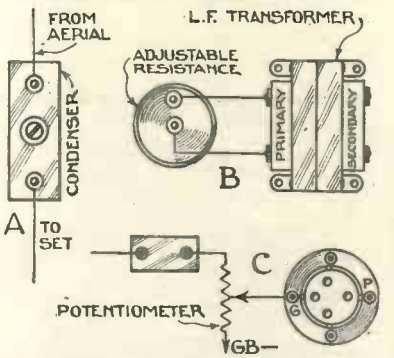
Clearly, then, a proper volume control will have to be fitted.

The first that I would suggest is not, strictly speaking, a volume control as it only reduces the strength incidentally But as a little further selectivity will, in all probability, do no harm the tip may be worth noting. It consists in connecting in the aerial wire to the set a semi-fixed condenser, a typical example being the Formodenser.

The sketch will make the matter clear. The type used should have a low minimum capacity, such as .00003 microfarad, and it should be adjusted to a suitable value whilst listening. It will be found not only to sharpen the tuning, but also to cut down the volume as the capacity is reduced. This method is applicable to any set, but I have in mind sets of the detector and low-frequency variety.

A better and more certain volume control, pure and simple, comprises an adjustable resistance, having the maximum value of about 50,000 ohms, connected across the primary winding of the transformer.

When this type of coupling is not used, but instead, a resistance or choke coupling, a potentiometer will have to be fitted. This may have a resistance of about the same value as the grid leak which it replaces. When the grid leak is enclosed in a unit the potentiometer had better have a high resistance, such as 1 megohm.



Three methods of controlling volume

The drawings indicate the connections. They are quite simple; a mistake can hardly be made. Suitable parts may be found from other pages. The adjustable resistance or potentiometer, should, when possible, be fitted to the panel, but when this is hardly practical, a vacant place will, no doubt, be found somewhere inside the set.

W. JAMES.

How They Anticipated Radio

At 2 a.m.

Oh, Sleep! it is a gentle thing,
Beloved from pole to pole.

Coleridge: *Ancient Mariner.*

◆ ◆ ◆

The Broadcast Concert

Here will we sit, and let the sounds of music
Creep in our ears; soft stillness, and the night,
Become the touches of sweet harmony.

SHAKESPEARE: Merchant of Venice.

◆ ◆ ◆

Some Talkers

For I have neither wit, nor words nor worth,
Action, nor utterance, nor power of speech,
To stir men's blood; I only speak right on:
I tell you that which you yourselves do know.

SHAKESPEARE: Julius Caesar.

◆ ◆ ◆

Broadcast Stories

A tale should be judicious, clear, succinct,
The language plain, and incidents well linked;
Tell not as new what everybody knows,
And, new or old, still hasten to a close.

Cowper: *Conversation.*

◆ ◆ ◆

Man wants but little here below, but wants reception loud.

We Test Before You Buy

[*In this feature the Set Selection Bureau reviews every month some of the outstanding receivers at present on the market*]

AMPLION 253 BATTERY FOUR

Maker : Graham Amplion, Ltd.
Price : £25.
Power Supply : Batteries.
Power Consumption : High tension—200 volts 30 milliamperes; low tension—6 volts .5 ampere.
Valve Combination : Screened-grid high-frequency amplifying valve, detector, and two low-frequency amplifying valves.

MODERN THUMB-CONTROL TUNING

On the Amplion four-valve battery set the tuning dials are graduated directly in wavelenths to make searching an easy matter

WHEN, last autumn, Graham Amplion, Ltd., entered the set market, they had to live up to a big reputation, well earned in the production of loud-speakers. So far, our experience of Amplion sets is limited to a test of the Amplion 253 four-valver for battery operation.

As the test turned out so satisfactorily, we hope in the near future to extend our knowledge of this firm's range.

Maximum Quality

The makers have obviously not attempted to compete with the cheaper lines. The model tested is priced at £25, complete with valves, or £33 5s. 6d., complete with a really adequate battery supply. The set is intended for those who, lacking an electric-light supply, desire the maximum quality of reproduction possible with battery operation.

The makers take a strong line in their insistence upon an adequate size of high-tension battery. Not many set makers are so frank about the expense involved in buying suitable batteries. Graham Amplion visualise three different conditions governing the choice of a suitable high-tension supply.

(A) **Normal Condition.** Here the makers advise a high-tension battery giving 200 volts, derived either from high-tension accumulators or super-capacity high-tension dry batteries. This power supply is capable of doing justice to the super-power output valve recommended.

(B) **Super-power Condition.** If desired, the owner can use an LS5a output valve, with 300 volts maximum high tension. A very large volume of sound could then be produced from nearby stations; but accumulator high-tension batteries would be essential, owing to the high total anode-current consumption, namely 40 to 45 milliamperes.

(C) **Economy Condition.** Where only a moderate high-tension supply can be contemplated, the makers specify a smaller power valve run from a 120-volt double- or treble-capacity battery

Those who are prepared to spend £25 on a set will probably be equally ready to do justice to the set by complying with condition (A). But very good results can be obtained under condition (C), as our tests have proved. We are inclined to think that the makers have under-rated the capabilities of the set when run from a small power valve and a moderate high-tension supply.

Before leaving the battery question, we ought to mention that the makers use a 6-volt accumulator to heat the filaments of the three 4-volt valves and the 6-volt output valve. The voltage of the first three valves is, presumably, dropped down and use made of the voltage drop for grid bias. There is only one negative grid-bias terminal on the set, this being for the output valve.

Battery connection has been greatly simplified. One high-tension positive terminal at 120 volts is provided for the first three valves and another for the higher voltage to be applied to the last valve The shield voltage of the high-frequency valve is, presumably, derived through a voltage-dropping resistance in the 120-volt lead.

In operating the set, the listener has the advantage of calibrated tuning dials. Long and medium waves are clearly marked on each of the two drum dials. Subsidiary controls are well planned. Selectivity can be varied within wide limits by the rotation of a smoothly working knob on the left. This knob actuates a swinging coil giving a variation in the aerial-coil coupling. Reaction is controlled by a knob on the right.

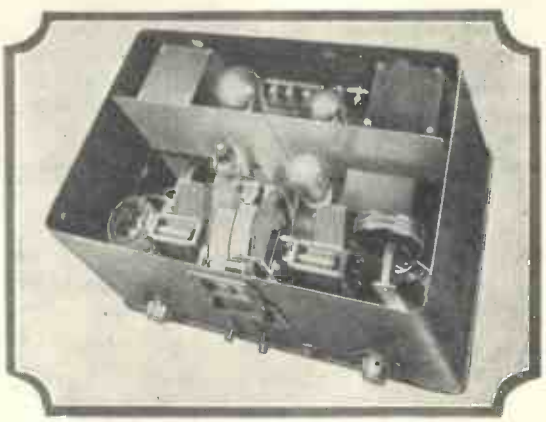
Exceptional Appearance

No attempt has been made to economise space in the crystalline-finished metal box containing the set. As a rule, metal boxes are not particularly pleasing in appearance. But the Graham Amplion container is exceptional. It would grace the average home.

As the makers recommend an aerial considerably short of 100 ft., we tested the Amplion set on a short 50-ft. single-wire aerial in South London. Results were exceptionally good, fully justifying the circuit employed. The high-frequency amplification from the screened-grid valve is considerable. So also is the low-frequency amplification derived from the two stages following the detector valve.

Wavelength Calibration

Both Brookman's Park stations, and the Midland Regional, were first tuned in to test the accuracy of the calibrations. The National came in exactly at the 261-metre mark on the right-hand dial. The left-hand dial, operating the condenser in the aerial circuit, is naturally prone to vary according to the aerial



NOTHING IS CRAMPED IN THIS DESIGN

All the parts in the Amplion set are well laid out, as can be seen from this photograph. A screened-grid valve is used

in use The 261-metre National came in at the 268 mark on the left-hand dial.

The following log refers only to the right-hand dial calibration : the London Regional came in at 370, while Midland Regional was a little out at 490. We consider the calibrations near enough to narrow down the operator's search for distant stations.

Fine Quality of Reception

Langenberg was good just below the Midland Regional and clear of its interference. Turin at 291 was accurately logged. We noted the very fine quality of this station's operatic broadcast. Incidentally, we were working the set under the "normal" condition specified.

Bratislava, at 280, was near enough to its actual wavelength of 279 metres. The strength was very good, as was Rennes, at 272, clear of the National at 261.

Toulouse, at 255, was excellent. Between 240 and 250, Juan Les Pins was extraordinarily good. Bordeaux, on 304 metres, came in well between the 300 and 310 marks. The 381-metre Toulouse station came in very well between 380 and 390, quite clear of the Regional.

In London, it is difficult to tune in a station between Toulouse and the Regional; we were, therefore, impressed when Hamburg was brought in at 370, practically clear of interference. Frankfurt, between 390 and 400, was fair. Rome, on 441 metres, was very strong at 450. Lyons La Doua was another fine signal at 475, its actual wave being 466 metres.

On the long waves, most of our old friends came in at good loud-speaker strength. Both the Eiffel Tower and Radio Paris were received quite free from all trace of Daventry.

Subsequently we were able to extend the log of stations received considerably. The stations mentioned are an indication of what can be done under average conditions during the course of an hour's operation of the Amplion battery set. We congratulate the makers on a fine product.

H.M.V. RADIO GRAMOPHONE

Maker : The Gramophone Co., Ltd.
Price : Oak, £75; mahogany, £78; walnut, £80.
Power Supply : A.C. mains.
Power Consumption : 160 watts.
Valve Combination : Screened-grid high-frequency amplifier, detector, and two stages of low-frequency amplification.

DURING a recent visit to the London showrooms of the Gramophone Company, a representative of the WIRELESS MAGAZINE Set Selection Bureau was able to hear and operate the H.M.V. radio-gramophone. As a result of this demonstration, we are now able to add the instrument to our approved list.

Like all H.M V. products, the H.M.V. radio-gramophone is a handsome piece of furniture. It is entirely devoid of that fiercesome scientific aspect so abhorrent to the lay-minded listener.

The lid at the top protects the usual gramophone turntable and pick-up arm. To the end of this arm is fitted the new H.M.V. gramophone pick-up, which is claimed to have a straight-line response over a wide band of frequencies. Opening the doors at the front, the operator is confronted with the very accessible controls of the radio set.

There is nothing about the controls likely to scare anyone capable of handling a gramophone. For tuning, there is a large thumb-operated drum dial in the centre; on the left is a volume-control knob, and on the right a switch panel.

The volume control is cleverly designed; it controls the intensity of sound for both radio and gramophone records. Its function is changed from radio to gramophone volume by controlling the gramo-radio switch. We cannot recall any other instrument with such an ingenious volume control.

Use of External Aerial

With the H.M.V. radio-gramophone, an external aerial is needed. We do not think a very ambitious erection is necessary because, at Oxford Street, where conditions are certainly below the average, our representative had no difficulty in bringing in Radio Paris, Hilversum, Daventry 5XX, and both Brookman's Park stations.

TYPICAL OF MODERN PRACTICE

A particularly pleasing feature of the H.M.V. Radio Gramophone is the sloping panel for the radio-set controls

Selectivity was up to standard. Sensitivity was above the average. Quality of reproduction was really exceptional.

The radio set tunes from 220 to 550 metres on the medium band and 700 to 2,000 metres on the long-wave band.

Every set of which a report appears in this regular feature has reached a certain standard of efficiency in our testing laboratory.

No reports are given on receivers that do not reach this standard; indeed, every month we have to return to the manufacturers receivers that do not come up to scratch.

It will be understood, therefore, why the reports that do appear in these pages never condemn a set.

With its screened-grid high-frequency amplifying valve, the four-valve set has a good range, provided that the external aerial is not exceptionally poor.

The good quality of reproduction can be attributed to the well-designed low-frequency couplings and to the provision of a very high potential for the output power valve. High-tension current is provided by means of a U9 rectifying valve, which converts the A.C. supply into a direct current of high voltage. The pot magnet of the moving-coil loud-speaker derives its current from another U9 rectifier valve.

Model 520, as this H.M.V. instrument is called, is primarily designed for A.C. mains supplies. It is interesting to note that the Gramophone Company supply a converter, price £18 10s. extra, to work the H.M.V. radio-gramophone from D.C. supplies.

Smooth Motor Running

Other features of the instrument that appealed to our representative were the panel illumination when the radio set is switched on, the smooth running of the electrically-driven gramophone motor, and the facility with which needles could be changed in the gramophone pick-up.

Several H.M.V. gramophone records were played for the test of quality. The instrument delivered majestic volume with plenty of natural bass, which was not unpleasingly augmented by a certain amount of box resonance. A military-band record was reproduced with almost uncanny realism.

We have been dipping into the service manual supplied to dealers stocking the H.M.V. radio-gramophone. Packed with relevant information relating to the installation, maintenance, and repair of the instrument, this manual should considerably assist all dealers.

Comprehensive Test Charts

The test charts are unusually searching and comprehensive. If, after following the manual, the dealer is still unable to locate a fault, the radio-gramophone is so arranged that the amplifier unit can be readily removed and returned to the factory.

The H.M.V. dealer service organisation should reassure those contemplating the purchase of an H.M.V. radio-gramophone. The H.M.V. system is an object lesson to the radio trade, into which the Gramophone Company has made an honourable entry.

COLUMBIA PORTABLE

Maker: Columbia Graphophone Co., Ltd.
Price: 17 guineas, complete.
Power Supply: Batteries.
Power Consumption: High tension—108 volts 8.5 milliamperes, low tension—2 volts .55 ampere.
Valve Combination: Two high-frequency amplifiers, detector, and two low-frequency amplifiers.

TO the listener with a simple crystal or valve set, the modern self-contained portable must seem admirable. Housed in a small cabinet or suitcase are all the essentials for reasonable broadcast reception—the set itself, by which we mean the valves and associated components; the loud-speaker; the aerial; and all the battery equipment.

Compactness

What a contrast of compactness a modern portable offers to the old-fashioned installation, requiring a large external aerial, dozens of battery connections, and quite an appreciable corner of the living-room for housing! The Ordinary Listener, who is more interested in the broadcast programmes than in the means whereby they are propagated, seldom fails to find portables attractive.

We take the view that, if the listener must use batteries, through the absence of electric light, the least complicated way of doing so is through the medium of a good portable.

It is not true that portables are excessively expensive to run. It is much more true that *all* battery-operated sets worth considering require more current than can be economically delivered by small-capacity batteries.

We have no patience with the theory that a portable is expensive to run just because it *is* a portable. Many non-portable sets tested in the laboratory have required a greater anode current than the average portable; yet such sets are sold with portable-set batteries.

Current Consumption

A five-valve portable of high merit is the Columbia, recently tested and approved. Before we talk of its capabilities, let us take the measurements of its current consumption. We found the 108-volt high-tension battery had to deliver 8.5 milliamperes. When we remember that this is the total for five valves, including a small power valve, we have little to grumble about.

Here is economy of working in a degree seldom attained in non-portable battery sets. The low maximum high tension of 108 volts, and the use of a still lower high-tension voltage for the high-frequency and detector valves, is a perfectly sensible way of keeping down the current consumption.

The high-tension battery employed gives its most useful life when discharged at not more than 6 to 7 milliamperes. As this rate of discharge is exceeded a little, the life of the battery is inevitably shortened. But with average use it should last several months.

The filaments of the valves are economically heated. The total low-tension current consumption is .55 ampere. The first four valves (the two high-frequency amplifiers, the detector, and first low-frequency amplifier) take .1 ampere each. The power valve filament takes .15 ampere.

Providing the low-tension current is a non-spillable C.A.V. 2-volt cell it is the 30-ampere-hour size, but, owing to the jelly electrolyte, the actual capacity is rated at 20 ampere hours.

EVERYTHING IS INSIDE THE CASE
This Columbia portable has all the necessary batteries, aerial and loud-speaker self-contained

This means that the accumulator will require re-charging for every thirty-five hours' use in the portable. With an average of five hours' listening per day, a weekly charge would be necessary. A spare cell, which is quite inexpensive, would obviate a tiresome dis-continuance of reception.

The Columbia portable is built on lines that appeal to us. We like the upright type of cabinet. It is a logical and dignified form for a portable. The control panel is arranged just above the loud-speaker grille. A strap handle on the top of the case is easy to grip when it is desired to move the portable.

No one would want to carry the Columbia on a route march; but in such an unlikely contingency we would prefer the Columbia to some others tested. Until feather-weight batteries are invented, portables must continue to be inappropriately named. But the lady of the house, be she ever so frail, would not hesitate to take a grip of the Columbia if broadcast music were desired in, say, the boudoir instead of in, say, the smoking-room of his lordship.

Hinged Back

The whole of the back of the Columbia is hinged. On swinging it open, the owner can readily get at the batteries, which are a loose fit in a compartment below the platform carrying the bulk of the set. Suitable provision is made to prevent the batteries fouling the cone diaphragm of the loud-speaker.

Straightforward leads, with good, tight-fitting plugs, are taken to the various battery points. The accumulator is easy to remove for charging. In so doing, some care is necessary to avoid the low-tension leads touching the high-tension battery sockets.

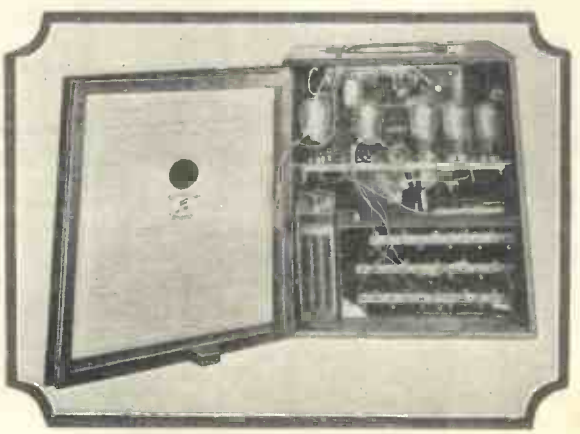
The five valves are arranged in line on the platform above the batteries. General construction is on modern lines. Mass-production signs are evident. All the valve holders are moulded in a single block of bakelite. Other perfectly legitimate means of cheapening the cost of production were noted.

The high- and low-tension battery connections are taken to a four-pin adaptor, which links up the power supply to the set by plugging into an attachment on the valve platform. By this means an external mains-power unit can be substituted. The Columbia A.C. and D.C. power units, recently reviewed in our Batteries and Mains Supplement, are specially designed for this portable.

Almost "All-electric"

With these units, the Columbia portable can be made practically "all-electric," for home use, while retaining its mobile advantage with spare batteries. The A.C. unit delivers 120 volts and 2 volts for high- and low-tension current respectively.

The selectivity of the single-tuned circuit is enhanced in several ways: (1) Reaction helps to sharpen tuning, though an excessive application impairs quality. (2) The whole aerial circuit has a lower resistance than the normal coil and condenser circuit connected to an



COMPACT—YET ACCESSIBLE
Although the design is compact, the valves and batteries in the Columbia portable are easily accessible

aerial and earth. (3) The frame aerial (and therefore the lid in which it is enclosed) is directional; it has a maximum pick-up effect when in line with the incoming signals, which are reduced to inaudibility when the frame is rotated at right angles.

For combined simplicity of control and selectivity, the circuit of the Columbia portable is probably unbeatable; but the makers have realised that regional centres of broadcasting considerably counteract the advantage of the frame aerial. When we have two strong signals coming from the same direction, selectivity depends on conditions (1) and (2).

Three Models Available

Under adverse conditions, as when the location of the set is close to a regional centre, the selectivity of the Columbia model tested would be inadequate for complete separation of the twin transmissions. For this reason, the Columbia Company market models A, B, and C. The model tested was C, having single-dial tuning. Models A and B, in oak or morocco, have an auxiliary control, giving increased selectivity.

Tested first on the long waves, the Columbia portable gave a good account of itself. Hilversum, at 31 degrees, was a good loud-speaker signal of quite fair quality, clear of all interference. Kalundborg, at 37 degrees, was equally good. The absence of interference was solely due to the directional property of the frame aerial.

Eiffel Tower, at 55 degrees, was very strong; so strong that Daventry did not greatly interfere. The trouble here is that London (where the set was tested), Paris, and Daventry are in almost a straight line; hence the selectivity due to the frame aerial is nullified. The same remarks apply to Radio Paris, which, at 71 degrees, was a very strong loud-speaker signal suffering somewhat from Daventry, which was at its maximum at 62 degrees.

Huizen—and Cross-talk!

Huizen, at 78 degrees, was a good loud-speaker signal and free of interference. Round about 20 degrees much cross-talk between air liners and air ports in England and France was picked up.

The medium waves were not so lucrative. Midland Regional, at 69 degrees, was a good loud-speaker signal. London Regional, at 42 degrees, was too strong. National, on 12 degrees, was clear of the Regional. Turin, at 26 degrees, was a good loud-speaker signal. So was Toulouse, at 49 degrees, but as this was only 6 degrees above the Regional, some interference was inevitable.

Frankfurt, at 50.5 degrees, was a good loud-speaker signal clear of interference, due, of course, to its easterly direction when compared with Daventry and Bookman's Park. Rome was good at 61 degrees, clear of interference. At 73 degrees, Milan came in very well. Brussels, at 74.5 degrees, was good, but Vienna, at 75.5 degrees, was only fair.

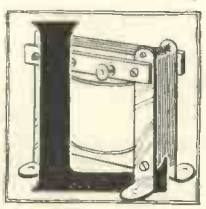
General sensitivity is good. Selectivity is up to the standard to be expected from the circuit employed. Quality of reproduction is distinctly good. Control is almost fool-proof.

A WIRELESS ALPHABET

By Leslie M. Oyler

for the Jigger. With dismay
He views the dances of to-day,
For these he does not care a fig,
Because a Jigger loves a jig!
He dances with high frequency,
And—as their steps so well agree—
A Circuit always partners him,
And up and down they jig with vim!
They make a handsome couple too.
(N.B.—I will not vouch this true!)

for the Kilohertz. 'Tis thought
That time to him is less than naught,
His life must be a ceaseless race,
He speeds along at such a pace.
He'll never be an "also ran,"
For if he were a flying fan,
Or motor maniac, no doubt,
He'd be in prison more than out.
To pay large fines he would be forced,
His licence, too, would be endorsed.



for the Laminated Core
Who is respected more and more
By all Transformers, also Chokes,
Their admiration he evokes.
He has a stern, resisting will,
An iron constitution, still
His heart is kind, these form a shell—
Acting as screens to hide him well.
To put it briefly he's the grand,
"Strong, silent man" of wireless land!

Wireless Magazine, July, 1930

Band-pass Filters Are Coming

In this article W. JAMES discusses the value of band-pass filters as an aid to selectivity. It is likely that the introduction of these devices will be the next step forward in receiver design; listeners should therefore become acquainted with them now.

WHEN we want to increase the sharpness of tuning of a plain aerial circuit, we usually either fit a primary winding or tap the coil, as indicated in Figs. 1a and b.

In both instances, the fewer the turns of wire included between the aerial and earth the sharper is the tuning. The actual voltage set up across the condenser also depends upon the size of the primary coil with respect to the secondary or upon the position of the aerial tap.

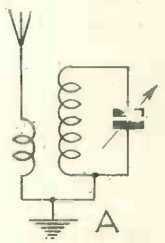


Fig. 1a.—Use of primary winding

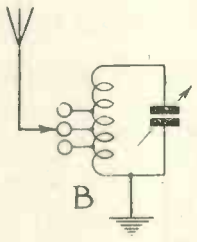


Fig. 1b.—Tappings on aerial coil

In general, a size of primary or a tapping point will be found for a given wavelength where the signal strength is the maximum. At both higher and lower wavelengths the strength will be different. As a rule, it is less, but this depends upon the characteristics of the coil and the circuit.

It is very easy to check this by testing first on the London Regional and then on the National station, or on another pair of stations. Thus it is found that if the best arrangement of aerial circuit is determined for, say, the London Regional, the National station is received relatively not so well.

Tuning Too Sharp

The selectivity is not so good, neither is the strength. But this can be altered by using a smaller number of turns in the aerial circuit. If this is, in fact, settled on, then the tuning will be too sharp and the strength will be less than the optimum for stations working on longer wavelengths. This would be particularly noticeable at the upper end of the wavelength range, say, from Midland Regional upwards.

Of course, the aerial circuit could be tapped as in Fig. 1b, but usually it is necessary to consider the wave range as a whole, and to arrive at values which provide reasonable selectivity and strength over it.

The selectivity is greatly to be improved by the addition of a further tuned circuit, as in Fig. 2a. But owing to the magnification of the high-frequency stage the results may be not sufficiently good. This is especially likely to be true when the stage is magnifying very well.

When a volume control is fitted, and it acts to vary the magnification, quite a good control of selectivity is available, for as the impedance of the valve is increased a loose coupling effect is produced.

However, the selectivity of the tuned interval ve circuit may be permanently improved by joining the anode to a point on the coil, as in Fig. 2b. In certain circumstances the magnification will be increased, but the tap can be fixed at a point where the selectivity and magnification are the most suitable.

With a further stage of tuned high-frequency, the selectivity would be sharper still, and with more stages the high-frequency magnification and tuning ought to be such that distant stations would be brought in with little interference.

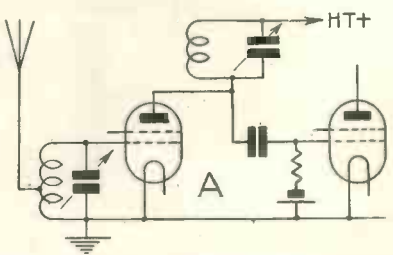


Fig. 2a.—Addition of tuned-anode circuit

Now the danger of using so many high-frequency circuits is that the tuning will be too sharp, with the result that the high-frequency signal is distorted. This can be avoided by increasing the resistance of the coils as they are increased in number. With three stages of high-frequency, for example, coils of 1 in. diameter having windings of fine wire would be suitable, whilst 2-in. coils or larger ones are generally fitted when there is only one high-frequency stage.

Possible Improvement

The tuning of the three-stage high-frequency amplifier with its higher resistance coils is much better than that of the one high-frequency stage, but even this is not so good as can be arranged by other means, as for instance, a coupled circuit followed by a moderately selective amplifier.

A simple coupled circuit is indicated in Fig. 3, where coils L1 and L2 are coupled. No other couplings, such as capacitative, ought to exist, and for the finest results the magnetic coupling ought to be adjustable. With identical coils L1 and L2 and tuning condensers C1 and C2, a single knob control is practicable provided precautions are taken.

In practice, the coupling is fixed. Whether it is adjusted to the critical value at the centre of the wavelength range or at the top end is a matter for the individual to decide.

What Actually Happens

Briefly, what happens is this: The coupling is so adjusted that a band of frequencies of, say, 10,000 cycles wide, is passed at a particular part of the range. That is, one coil is placed in a position with respect to the other where this tuning characteristic is obtained.

A more practical method may be to arrange a small coupling coil, as in Fig. 4, and to shield the two parts of the circuit, or two small coils may be used as in Fig. 5. In this arrangement, the separate coils L1 and L2 and the condensers C1 and C2 would be screened, so that the only coupling is that provided by the two small coils A and B.

The actual coupling that is needed is dependent upon various factors, such as the characteristics of the

tuned circuits, and the width of the band of frequencies it is desired to pass at the point in the tuning range taken as the mean.

This matter is not made easier by the fact that in practice a little feed-back through the first valve is bound to occur. The amount varies with the wavelength and sometimes with the setting of the volume control. However, in practice, the circuit can be adjusted at this one wavelength.

Now what happens at lower and higher wavelengths when once the coupling has been fixed? As a rule, the sharpness of the tuning increases for higher wavelengths. Therefore, the high-frequency signal is being distorted more than at the point where the coupling was fixed to pass a definite band.

Amount of Distortion

The amount of the distortion is dependent upon the resistance of the coils and the behaviour of the amplifier; it may be serious, or not, according to the values of the circuit, which in themselves are affected by reaction effects in the amplifier.

Tuning will broaden as the wavelength is reduced. A pronounced double lump will, no doubt, appear, and this may introduce a more or less serious distortion. Coil resistance, reaction effects and the aerial all play a part, with the result that the actual tuning curve cannot normally be predicted with accuracy.

The tendency is for the tuning to become much more broad as the wavelength is reduced. This is also the characteristic of an ordinary tuned circuit.

Broader Tuning

An amplifier having a magnetically coupled aerial-grid circuit and the usual tuned-anode or transformer intervalve couplings, therefore tunes more broadly at the lower wavelengths than at the longer wavelength part of the range. The amount of the distortion produced by too sharp tuning is entirely a matter of the circuit values under working conditions and is, fortunately, not quite so bad in some cases as one might expect.

A further important point is that of magnification. How does it vary with the wavelength? Normally, the magnification falls off as the wavelength is increased, but taking the amplifier by itself, it is possible so to arrange it that no material variation occurs.

In practice there often is a wide difference in the magnification at low and high wavelengths, but with care this can, at all events, be minimised. Further, the aerial circuit can be adjusted to improve matters.

Increasing the size of the primary, as mentioned above, will improve the relative strength of signals working on the longer waves. By this simple means alone it is possible to modify the overall relative strengths of signals at the various wavelengths.

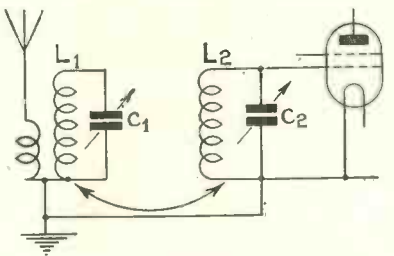


Fig. 3.—Simple coupled circuit

We must remember, however, that an aerial introduces capacity into the circuit L1 C1 (Fig. 4), and that across circuit L2 C2 is the capacity of the valve. Fortunately a balance may be effected by adding a trimming condenser to one of the circuits, which usually put matters right over a fair range.

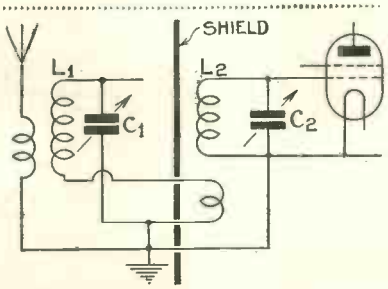


Fig. 4.—Use of small coupling coil

The alternative to a magnetic coupling is a capacitative one, although it must be remembered that a mixed coupling may be present. To couple two circuits capacitatively, a condenser is so connected that it is common to both.

In Fig. 6 the coupling condenser is marked C and it forms part of both circuits. The grid and filament of the valve are joined to C2; therefore a resistance R is included to complete the grid-return circuit. Its value may be of 1 or 2 megohms.

It is not very difficult to form a rough idea of the working of a coupled circuit of this type. The reactance of a condenser increases with the wavelength. Actually it is $\frac{1}{2 \pi fc}$ ohms, f being the frequency and c the capacity in farads.

If, therefore, the value of the condenser is adjusted at the longest wavelength in the range to give with the circuits the desired band width, then the coupling will be less at the lower wavelengths and the tendency will be to tune more sharply.

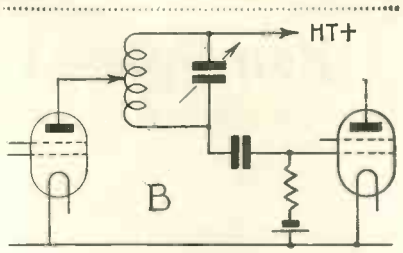


Fig. 2b.—Increasing selectivity of anode circuit

Acceptable Result

The actual variation depends upon the working values of the complete tuned circuit, but the variation in the selectivity is there. It seems, however, that, as the capacitatively coupled filter circuit varies in its sharpness of tuning in one direction, whilst the tuned intervalve coupling circuits vary in the opposite direction that the combined result would be an acceptable one.

Such is indeed the case with a little careful designing, and it is possible so to arrange an amplifier with an aerial-circuit filter that the selectivity at all parts of the wave-range is tolerably uniform. Anyhow, the selectivity is without doubt more nearly made ideal than with a similar number of circuits arranged in any other fashion.

Suitable Values

The value of the condenser C (Fig. 6) is dependent upon the other circuit values, but .01 to .02 microfarad with coils of the usual size (1½ or 2 in. in diameter having windings of from No. 26 to No. 30) is

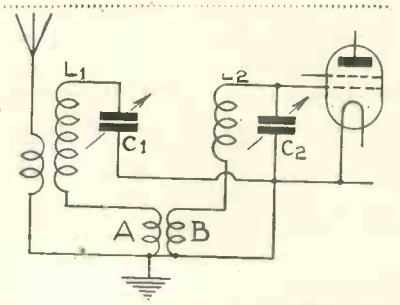


Fig. 5.—Use of two coupling coils A and B

Band-pass Filters Are Coming—*Continued*

usually found desirable. Such a circuit should be set at a wavelength near the maximum of the range and will then tune more sharply as the wavelength is reduced.

Logical Position for Filter

It is not hard to understand that the logical place for a filter circuit is between the aerial and the first valve. When used in this position, it is most effective, as it helps to reduce the strength of interfering signals before they reach the first valve.

Too strong a signal is rectified by the screened-grid valves and, when present with another signal, produces interference not to be tuned out by following stages.

A filter high-frequency coupling may, of course, be used between valves, one circuit being indicated in Fig. 7. The arrangement has a disadvantage, however, which may be sufficient to prevent its use. It has to do with magnification and stability.

Danger of Oscillation

The stability of the amplifier depends upon the actual magnification in the anode circuit, as the amount of the feed back to the grid circuit is dependent upon the high-frequency voltage of the anode with respect to the grid. The magnification in the anode circuit cannot, therefore, be allowed to exceed a certain amount or the circuit will oscillate.

Now the actual high-frequency voltage set up in the grid circuit of

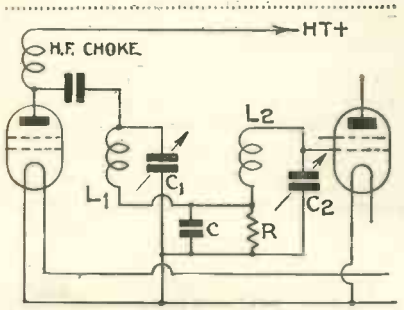


Fig. 7.—Use of band-pass filter between valves

the second valve will, over part of the tuning range, at least, be less than half that in the anode circuit. The magnification with stability is, therefore, materially less with the filter than when the ordinary tuned circuit is used and can hardly be compensated for by using improved coils.

Incidentally, the voltage applied to the first valve through an aerial filter will be half or less of that applied by the first coil only. This is not a serious loss, however, as in practice it is usual with ordinary circuits deliberately to sacrifice a little strength for selectivity.

An ideal receiver would be one

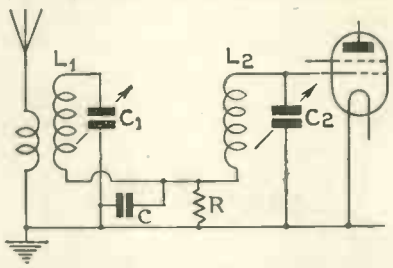


Fig. 6.—Coupling condenser forming part of both circuits

having uniform selectivity and magnification over the whole wavelength range. With sufficient valves and careful design this result could be fairly well obtained. A difficulty is the feed-back. Perfect shielding of all parts is not normally obtained and there is always the anode-grid capacity of the shielded valves. A slight coupling with great magnification will cause trouble. Valves vary amongst themselves and the behaviour of an amplifier will, therefore, depend to an extent upon the valves fitted.

With several stages giving but little magnification each, very good results are to be obtained, however, and no doubt the set of the future will be of this type. A fine set could be made with four screened-grid valves followed by a so-called power detector and a power stage.

No Ganged Condensers

There seem to be no good ganged tuning condensers available—at least, not British ones. This is perhaps not surprising, as sets with ganged condensers are not used here to any extent.

If the condensers were marketed here I would build a set of this description for publication. In my own experiments, foreign condensers have been used. The results to be obtained from a set having adequate tuning and high-frequency magnification are not to be compared with the usual type of three- and four-valve sets, the quality and ease of tuning being of a very different order.

Some Things Heard—

From Belgrade

An English comedian.

The number of fifes in the orchestra.

The tremendous noise that comes through.

Just one talk during one day.

An instrument which gave the effect of breaking glass.

The great preponderance of music in the programmes.

Excellent dramas poorly sent over.

Poor effects in drama.

An unusual number of ladies' voices.

An exceptionally screechy chorus.

Partisan items—religious, political, and social.

From 6ST

A tin whistle or some similar musical instrument.

The ticking of a clock or a watch.

A female voice: "Remember that last bar."

During an item a voice in the studio, not in a whisper: "No smoking, please!"

The longest tuning-in an orchestra ever made.

The laughter of a humorous speaker.

A gramophone that frequently runs down.

From Hilversum

The Dutch character of the programme.

A plea for the guarding of the dykes.

Talk about the origin and manufacture of floorcloth.

Floorcloth markets.

Heavy footsteps approaching the microphone.

A good English speaker.

The talkativeness of the orchestra.

A speaking as well as a conducting orchestra conductor.

The English National Anthem.

A dialogue between two women that lasted so long that I switched off.

Sending Talkies by Radio

HOW IT WAS SUCCESSFULLY ACCOMPLISHED IN 1925

CONSIDERABLE interest has been taken in the possibilities of film "talkies" by radio. A scheme that has been suggested is to supply films for use on the type of projector now becoming quite popular for home use, which would be run in conjunction with a play broadcast in the usual way that the radio drama is "put on the ether."

"First-hand" Sound

The receiver would be operated in the usual manner and at the beginning of the broadcast the projector would be started, the result being a home version of the talkies, with the sound however, being received at first-hand through the loud-speaker and not from reproduced sound records on wax or film as is, of course, the usual principle of operation.

Due precautions would have to be taken to ensure synchronisation between the actors before the microphone and the listener working his home projector, preferably by some sort of automatic control gear.

The idea, however, is by no means new, and a few details of an earlier attempt at a similar scheme to tie up radio with the movies may be of interest.

Back in August, 1925, one of the larger American motion-picture corporations, in co-operation with the broadcast station of one of the Los Angeles newspapers, put over practically an identical stunt.

The two movie stars, who had previously been filmed in the usual way, broadcast the sound accompaniment. Simultaneously, in fifteen picture theatres, crowds sat back in astonishment as they heard through the loud-speakers practically perfectly synchronised words to the lip movements of the two stars they saw on the silver screen before them.

Watching Themselves

The success of the synchronising, on which, of course, the whole scheme depended, was due to the use of a sixteenth projector in the broadcast studio itself, by means of which the actors could observe their own actions as being portrayed at the instant in the fifteen picture theatres, and time their speech accordingly.

This projector (which was enclosed in a glass-sided soundproof cabinet to prevent the noise of the machine itself being broadcast), also threw the cues for the actors on the screen.

Operator's Headphones

This machine was motor driven and set the pace for the other projectors in the various theatres which were hand-operated. Each operator wore headphones through which he received the time-setting cues for the film and for his metronome, by means of which he kept the speed steady and in step with the master machine in the studio.

The results as regards synchronism, taking into consideration the human element in the form of the operators turning the driving handles, were surprisingly good, except in one theatre, where the operator, through nervousness probably or an anxiety to get the job over quickly, wound at an excessive speed with the result that the voices from the broadcasting artistes via the loud-speakers kept on some time after the film had finished, to the delight of the sceptics in the audience.

No attempt was made to stage an elaborate play, the cast consisting of two persons only, who talked, danced to the gramophone, and carried on similar actions. No effort at long-distance reception was involved, the fifteen theatres taking the broadcast all being situated in Southern California.

Practical Example

Nevertheless it afforded a practical example of the probable impression created by the sound and film entertainment we know now by the word "talkies" which had been in the laboratory stage and tentatively tried out with unsatisfactory results for many years before.

It also represented one of the first attempts at co-operation between the radio and the film industry which now is finding its culmination in the huge mergers we hear of every day between the giants of the two great industries dealing in electrical entertainment.

J. H. R. PEERS.

—on My Radio Set

From Eiffel Tower

Nothing.
Music.
Oscillations.
Morse.
A concert.
Music.
Nothing.

From Bucharest

American music.
English music.
Gramophone music—not very good.
High-brow music.
Jazz.
Music, operatic and otherwise.

From 5IT

The most perfect and beautiful broadcasting voice I've ever heard—and a lady's at that!

A parrot.

The dry Irish humour of an announcer.

A really Welsh programme.

A violin bow which needed resin or scrapping.

The heavy breathing (probably asthmatic) of a speaker.

Many sly digs at England and the English.

A speaker who said that England was an island near Ireland.

From Radio-Paris

Gramophone records.
Dance music.
Sport descriptions.
One talk.
Religious service.
A priest's voice.
Cross-talk, not exactly humour.
Skits, not exactly humorous.
Drama.
Good radio drama.
Gramophones.

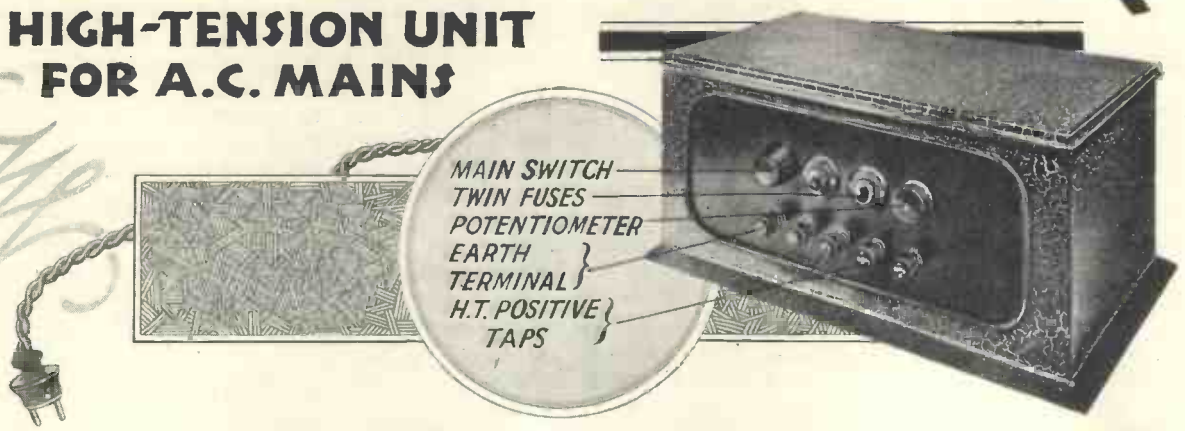
E. B. R.

Understand your set and your neighbours will not quarrel with you.

Wireless Magazine, July, 1930

THE STAMINATOR

HIGH-TENSION UNIT FOR A.C. MAINS



MANY listeners are unable to get the very best reproduction from their receivers because the high-tension supply is not sufficient to allow the use of the types of valves that would be most desirable for super quality.

Too Small Power Valves

For instance, the final power valve is in ninety-nine cases out of a hundred not large enough to give the required output because a larger valve would take too much high-tension current.

With the use of dry batteries for high-tension supply, it is expensive to take an anode current for the whole set in excess of 20 milliamperes, whereas a super-power valve may need as much as 50 milliamperes on its own.

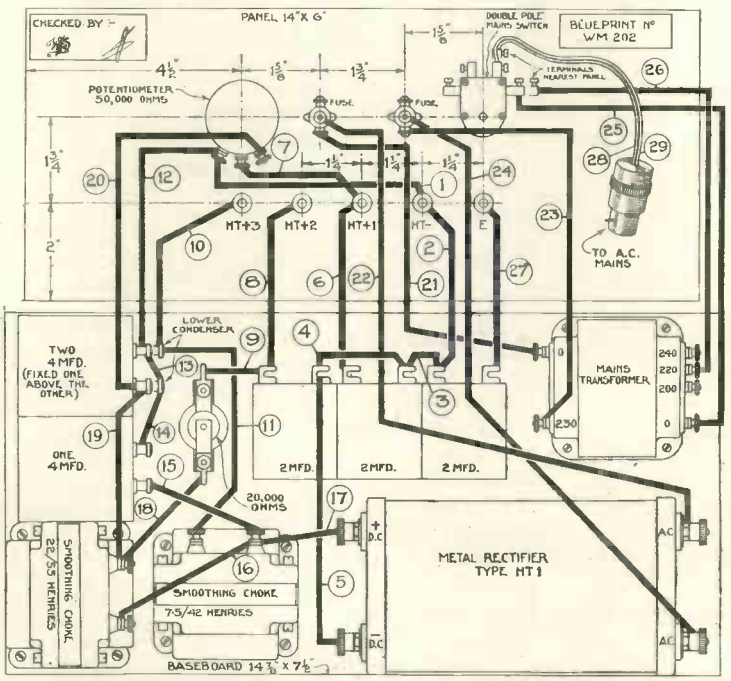
It is primarily for listeners with efficient sets who want to use larger valves for increased output that the WIRELESS MAGAZINE Technical Staff has produced the Staminator High-tension Unit.

At the outset, however, it should be clear that this is suitable for alternating-current (A.C.) mains only, and cannot be used with direct-current mains.

Moreover, it should only be used for receivers taking a total anode current of 30 to 100 milliamperes at about 180 volts, which is the maximum voltage at full load. With a load of only 30 milliamperes the voltage rises to about 220 volts. For outputs of less than 30 milliamperes, reference should be made to the various units that have been described in these pages already. (See the list of blueprints on a later page).

The chief feature of the Staminator is the use of an all-metal (copper-copper oxide) rectifier; these rectifiers have a very long life and are mechanically almost unbreakable.

Every precaution has been taken in the course of design to make the unit safe and reliable. The circuit arrangement follows closely the recommendations of the metal-rectifier manufacturers, who have done a great deal of the research into the conditions under which their apparatus will give the best service.



LAYOUT AND WIRING OF THE STAMINATOR HIGH-TENSION UNIT

This wiring diagram can be obtained as a full-size blueprint for half-price (that is, 6d., post free), if the coupon on the inside back cover is used by July 31. Ask for No. WM202

Provided that elementary care is taken, and that the lid of the metal container is not opened *unless the mains connection is removed entirely from the power socket*, there is no possibility of shocks.

Starting from the outside, we may as well mention one or two special points about the case to begin with. In the first place it should be put at earth potential by being connected directly to the earth terminal on the ebonite panel.

Ventilation

Another point is ventilation. At heavy loads the rectifier itself may get warm (this is a natural condition and should not cause alarm) and may need ventilation.

This is provided by making a series of holes at the back of the box, some at the top and some at the bottom, so that a circulating current of air is set up to dissipate the heat.

The metal box illustrated in the heading to this article has a special leatheroid finish and costs more than the type actually specified in the list of parts; it is made by the same manufacturers, however, who will give quotations for special finishes.

Four Main Circuit Divisions

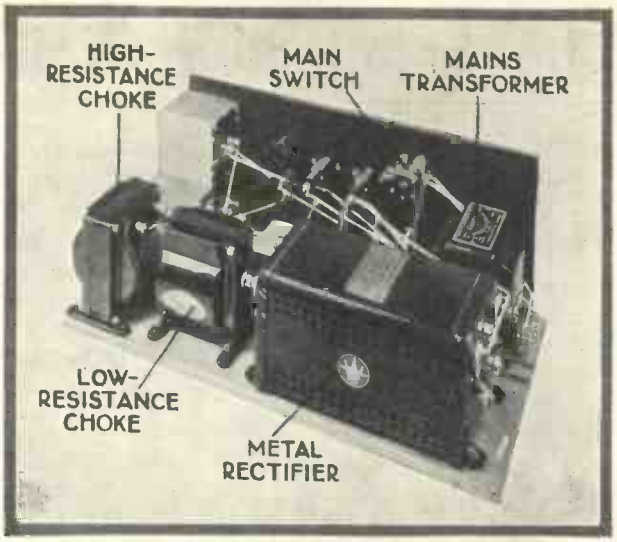
In a mains unit of this type there are actually four separate circuit sections to be considered, namely (1) the mains transformer for giving the correct input to (2) the metal rectifier, the output of which must be passed through (3) a smoothing circuit and lastly to (4) a voltage-regulating device.

The transformer must be of a type specially designed for the particular metal rectifier used, or the latter will be operated under the wrong conditions and may quickly come to grief.

It is essential when ordering a transformer to state clearly the voltage and frequency of the electric-light supply and the type of rectifier with which it is to be used—in this case the Westinghouse H.T 1

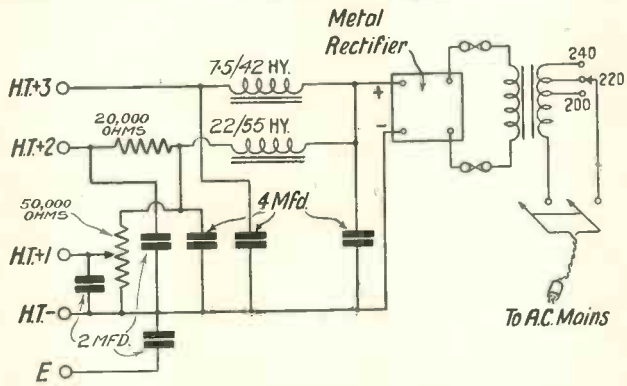
The metal rectifier needs no further discussion. It is a complete unit in a ventilated metal case, and is provided with two input and two output terminals. In appearance it is somewhat similar to a large transformer

Much could be written about smoothing circuits, but here we shall confine ourselves to the actual system employed in the Staminator.



CONSTANT POWER FOR A LARGE SET

It will be seen that the layout of the parts is quite simple and that wiring can easily be put into position



CIRCUIT OF THE STAMINATOR HIGH-TENSION UNIT

This diagram shows the theoretical arrangement of the components in the unit. It is for A.C. mains only

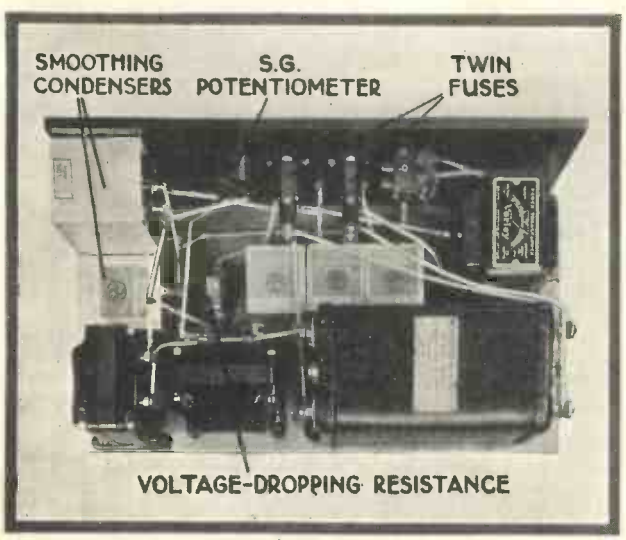
From the rectifier the output is taken to a reservoir condenser of 4 microfarads capacity and then to a series of separate smoothing chokes and condensers for various supplies.

The first circuit is for the supply to the power valve, and is for the maximum output (terminal H.T.+3). Here the choke, of the low-frequency type, of course, has a moderate inductance (of the order of 20 henries is sufficient) at the maximum output, that is 100 milliamperes.

It is most important, though, that this choke should have a low resistance or it will cause a considerable voltage drop at high anode currents.

For instance, if the anode current taken by the power stage were 60 milliamperes, the voltage lost in a choke of 500 ohms resistance would be 30 volts. On the other hand if the resistance of the choke was only 200 ohms, as it should be, the voltage drop would be only 12 volts.

It will be noticed that the smoothing condenser of 4 microfarads capacity is connected between the output end of the choke and high-tension negative.



HOW THE PARTS ARE ARRANGED

This plan view will make quite clear the relative positions of all the components in the unit

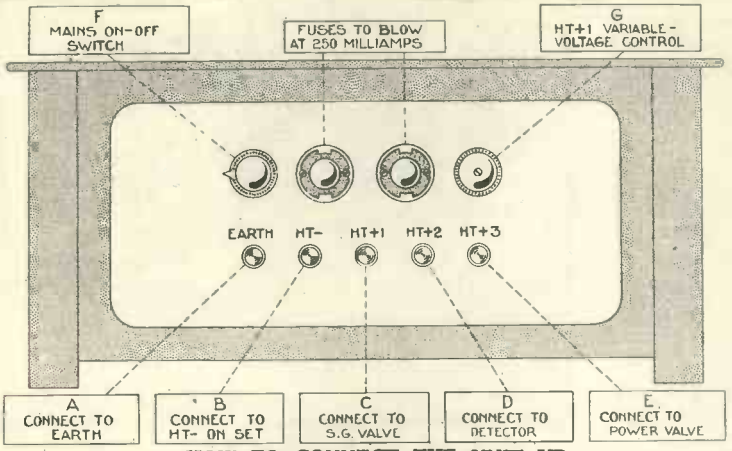
Second Smoothing Circuit

The second smoothing circuit is arranged in conjunction with two other outputs, one for a screened-grid valve or anode-bend detector and the other for ordinary anode supplies of all but the power stages of the receiver.

In this case it is desirable to have a choke of higher inductance, which inevitably means high resistance.

A high resistance here (say, 400 ohms) does not matter very much as the load will be small and consequently the voltage drop across it will be negligible. An inductance of 40 henries is desirable.

The Staminator High-tension Unit—*Continued*



HOW TO CONNECT THE UNIT UP

1.—*Remove earth connection from receiver and screw to A*

2.—*Connect B to high-tension negative on set*

3.—*Connect C to screening grid of shielded valve or anode-bend detector*

4.—*Connect D to anodes of high-frequency, detector and first low-frequency valves*

5.—*Connect E to power valve*

6.—*Switch on by turning mains switch*

7.—*Adjust screened grid valve by turning G*

Again, it will be seen that the smoothing condenser of 4 microfarads capacity is connected between the output end of the choke and high-tension negative. Should the electric supply be very bad, a 4-microfarad condenser may not smooth the output sufficiently to prevent hum. If this should prove to be the case, another 4-microfarad condenser should be connected in parallel, making a total of 8 microfarads

Voltage Regulation

We must finally consider the voltage-regulating devices. No regulation is normally needed for a power valve, so the output is taken direct to H.T.+3.

H.T.+2 is intended for the anode supplies of a screened-grid valve, leaky-grid detector and preliminary low-frequency valves. The voltage actually obtained depends upon the total consumption taken from the unit and the value of the resistance (which is shown as 20,000 ohms).

Practical Example

For instance, if the total load were 60 milliamperes, the voltage available without the resistance in circuit would be approximately 190 volts. We might find from the valve maker's figures that the first three valves need 120 volts at a total consumption of 8 milliamperes.

What resistance must be used to get this result?

In the first place it is clear that we must drop 70 volts and that the resistance must do this by carrying 8 milliamperes. We then apply Ohm's Law $\left(\text{Current}=\frac{\text{Voltage}}{\text{Resistance}}\right)$ and get the equation $R=\frac{E}{C}$. So in this case the resistance will be 70 divided by .008 ampere (8 milliamperes) or 8,750 ohms. In practice it would be necessary to use 10,000 ohms.

Between the output end of the voltage-dropping resistance, which also acts as a de-coupling device, and high-tension negative is a 2-microfarad by-pass condenser.

The output from H.T.+1 should be used only for the screening-grid of a shielded valve or an anode-bend detector (it cannot be used for both at the same time).

In this case the resistance is applied across the smoothing circuit and the voltage is obtained by moving a slider. Assuming the conditions already noted, the question arises as to where the slider should be placed to get 60 volts for a screened-grid valve.

Voltage Distribution

The total 190 volts available will be spread over the whole resistance. If this is tapped at the centre then the voltage will be 95 volts. The position for 60 volts is approximately one-third $(\frac{£0}{1\ 0})$ up from the negative end.

A 2-microfarad by-pass condenser is also inserted between the slider of the potentiometer resistance and high-tension negative.

There are three other points about the Staminator that should be carefully noted. First, a double-pole switch is fitted, so that both main leads are broken when the unit is switched off.

Secondly, a fuse is inserted in each lead from the secondary of the mains transformer and the rectifier. These should blow at about .25 ampere.

Thirdly, between the high-tension negative point and the earth terminal is a 2-microfarad condenser. This is to insulate the remainder of the gear from earth.

Earth Connection

When the Staminator is in use, the direct earth connection *should be removed from the receiver* and the earth lead connected to the unit.

The actual construction will be clear from the photographs and diagram reproduced in these pages. If desired, a full-size blueprint can be obtained for half-price, that is, 6d., post free, up till July 31.

COMPONENTS REQUIRED FOR THE STAMINATOR HIGH-TENSION UNIT

CHOKES, LOW-FREQUENCY
1—Ferranti type B1, £1 1s. (or Regentone GR).
1—Ferranti type B2, £1 1s.

CONDENSERS, FIXED
3—Hydra 4-microfarad, 14s. 3d. (or T.C.C., Dubilier).
3—Hydra 2-microfarad, 8s. 3d. (or T.C.C., Dubilier).

FUSES
2—Bulgin 250-milliampere panel type, 5s. (or Cambrell).

EBONITE
1—Becol 14 in. by 6 in., 5s. 6d. (or Lissen, Trelleborg).

METAL RECTIFIER
1—Westinghouse type H.T.1, £3 15s.

RESISTANCE, FIXED
1—Igranic 20,000-ohm with holder, type 2234/11, 7s. (or Ferranti, Dubilier).

RESISTANCE, VARIABLE
1—Lissen 50,000-ohm potentiometer, type LN538, 4s. 6d. (or Centralab, Rotorohm).

SWITCH
1—Wearite double-pole mains, type QMB, 3s. 6d.

TRANSFORMER, MAINS
1—Varley type EP1, £1 5s. (or Regentone WR1, Ferranti EM1).

TERMINALS
5—Belling-Lee, marked: Earth, H.T.—, H.T.+1, H.T.+2, H.T.+3, type B, 2s. 6d. (or Igranic).

ACCESSORIES

CABINET
1—Wholesale Wireless all-metal type, 12s. 6d.

Detectors of Yesterday & To-day

You will learn a lot from this discussion between Professor Megohm and Young Amp—if you are a beginner. Should you be an "old hand," your memory will be refreshed.

"MY goodness, Professor!" exclaimed Amp "What on earth is that funny-looking thing you've got there?"

"A detector," said Professor Megohm shortly, without looking up from what he was doing.

"What for—crooks?"

"No. Just ordinary radio signals."

Amp became interested If this was a radio detector it was certainly the funniest he had ever seen. There were two drums round which was what appeared to be a piece of wire, and this wire was slowly moving round in an endless band.

Headphone Reception

There was a little bunch of works in the middle through which the wire passed, and attached to this was a pair of telephones which the Professor had on his head at the time "Do tell!" said Amp at length.

For answer the Professor handed him the telephones, and sure enough he heard very faint spark signals—the customary dots and dashes of the morse code.

Amp became excited. "What a funny thing!" he said. "Won't you tell me more about it? I didn't know, as a matter of fact that you could use anything other than a valve or a crystal for detecting."

"Oh, yes, you can," said Megohm, searching his pockets for his pipe, which he filled slowly. "When the crystal first came out, it was considered a great discovery, and resulted in a marked improvement over the reception prior to that date.

First Type of Detector

"The first detector was the old coherer. Marconi used this in his original experiments. He discovered that——" The Professor broke off here, and looked at Amp over the top of his pipe which he was just in the act of lighting.

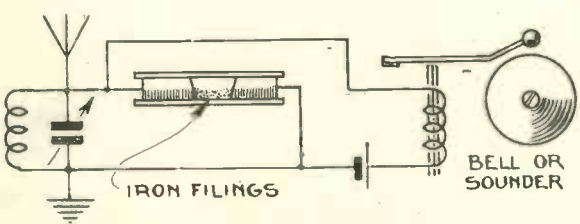
"You know, of course," he barked, "why we have to use a detector."

"Oh, yes," replied the boy. "You told me that a long time ago. It's because the radio currents oscillate backwards and forwards millions of times every second, and we could not possibly hear them unless we used a detector"

"Yes," agreed the other, "that is correct as far as it goes. At any rate it will do for the moment. In the original wireless transmissions the aerial was caused to radiate waves in periods of long or short duration according to the well-known morse code.

"Although the receiving aerial could be tuned to these signals it was not possible to detect them without some additional apparatus, for the reason you have just mentioned—that the oscillations were much too high in frequency

"The original coherer was based upon the fact that if radio-frequency current passed through iron filings it caused them to cohere and become conducting, whereas in the ordinary way iron filings are only a relatively poor conductor.



TYPICAL COHERER CIRCUIT

This diagram illustrates how a coherer detector operates. The iron filings had to be re-set after each signal impulse

"Therefore, Marconi caused the signals received to be passed through a little tube containing loosely packed iron filings. Connected across this tube was also a circuit containing a battery and a sounder or other device which made a noise when current flowed through it.

"Normally no current would pass through this, but on the arrival of a radio signal the filings cohered, the circuit became conducting and current from the battery passed through the sounder causing it to strike the gong."

"By jove!" exclaimed the boy, "that's rather cunning. Then did it go on doing that every time a signal arrived?"

"No," Megohm answered. "Once the radio current had passed through the filings they remained a conductor, and it was necessary to administer a sharp tap in order to break up the filings again—to de-cohere them as it was called

Re-setting the Filings

"A smaller tapper was arranged underneath the coherer—operated by a mechanism like a trembler bell, which shook up the filings periodically, and thus automatically re-setting them for the next signal."

"I suppose that apparatus wouldn't be much good for telephony?"

"None whatever. Don't you think we might sit down," continued Megohm. "If we are going to make a meal of it, we may as well do so in comfort." So saying he walked over to his desk, where they both sat down.

"No," resumed the Professor, puffing determinedly at his pipe, "the coherer simply forms a circuit for the current to the sounder, and the actual current which flows in the local circuit is largely independent of the amount of current received. There is no sort of proportionality about the action so that it would be quite useless for any form of telephony reception."

Amp nodded. "What about that gadget you had on the bench just now, Professor?" he inquired.

Magnetic Detector

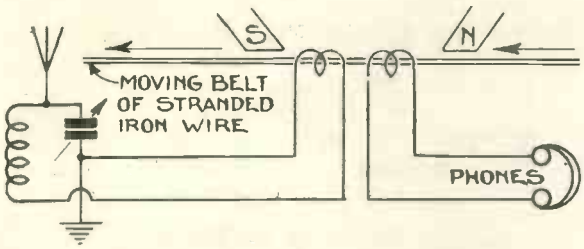
"That was one of the next developments and was known as the magnetic detector. It was an improvement over the coherer in sensitivity and ease of operation, and it works on quite an ingenious principle.

"If we apply a varying magnetic force to the piece of iron, the iron becomes magnetised, but the magnetism does not follow the variations in the magnetic force faithfully. There

Detectors of Yesterday and To-day—*Continued*

is a curious lag in the action which is known as hysteresis.

"This effect is largely destroyed if we cause the current to vary with extreme rapidity In the magnetic detector, therefore, we have a band of stranded iron wire made up rather like a piece of Litz wire, only using iron instead of copper, and this is caused to move past the poles of a magnet. The motion is only quite slow, perhaps three feet a minute or thereabouts.



ACTION OF MAGNETIC DETECTOR

The action of the old-type magnetic detector is explained by this diagram, which shows a typical circuit

"Round the iron wire is placed a small coil through which the high-frequency currents received on the aerial are passed. The second bobbin round the wire is connected to a pair of telephones.

Varying Magnetism

"As soon as any high-frequency currents are received the hysteresis effect in the iron is partially destroyed and the magnetism either decreases or increases to quite an appreciable extent. This sudden change in the magnetism gives rise to a 'click' in the telephones, and in consequence of this, one is able to detect the signal received."

"It all sounds frightfully complicated," broke in the boy.

"Yes, that particular instrument was a little complex, but nevertheless it did work and it has a certain proportionality in its action so that it could be used, although perhaps not very successfully, for the reception of telephony."

Crystal Detectors

"Well, I should think after all these funny ideas the crystal detector was an absolute blessing," exclaimed Amp, with a laugh.

"It was," agreed Megohm. "An American called Dunwoody first suggested the use of a crystal detector, and various other forms of crystal combination were soon found which exhibited the same properties. I cannot go into the reason for their action now because, as a matter of fact, there has been a good deal of argument at various times as to the precise manner in which a crystal works.

"The facts are that a suitable combination of crystal and a metal, or two crystals, allows current to flow more easily in one direction than in the other Thus we get the well-known crystal characteristic, which is something like this." (see below) "You can see, of course, what effect this has on the oscillation."

Amp sat up and crossed his knees. He felt sure that he really did know, but the way the Professor barked the questions always made him feel a little flustered. However, he thought for a time, and said :

"Well, if you pass an oscillating current through a crystal and it lets more current flow in one direction than in the other you finish up with an excess of current one way which will cause a 'click' in your telephones '

Megohm nodded. "Yes,' he agreed, "I think that you have got something of the right idea. The average value of the current is usually zero because each oscillation is followed by an immediate oscillation in the opposite direction of equal strength.

"When you pass it through a crystal, however, the succeeding oscillation is not of the same strength, and therefore does not completely cancel out the first current, leaving us with a small balance of current in one direction This effect continues as long as the oscillations are being received, giving us what amounts to a steady current through the telephones."

Amp said nothing for a few moments, and the Professor watched him with an amused look on his face. Presently Megohm leaned forward and knocked his pipe against his boot preparatory to relighting it. "Well, my boy, what is it?"

Amp looked up with a smile. "I was just trying to think out," he said, "how a crystal detector works on a telephone signal."

Megohm nodded encouragingly.

Varying Current

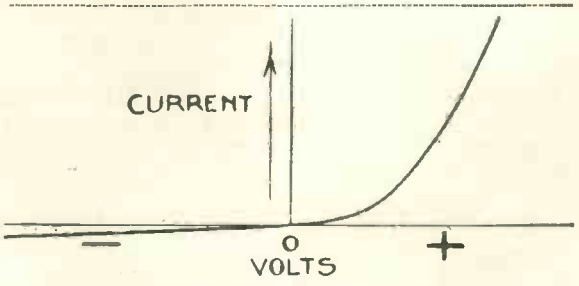
"I think I've got it," went on Amp. 'If you get a steady signal from the aerial the current through the telephones is steady, but if the aerial current is varying, then the rectifying current through the telephones will also vary in the same manner, so you get your telephony."

"Quite correct," agreed the Professor. "A crystal detector is one which *will* respond to changes in the applied signal. It is really this class of detector which we are interested in to-day from the point of view of broadcast reception."

Valves as Detectors

Amp thought things over for a moment. Finally he said, "And then I suppose it was only a short step to using valves?"

"It was, when valves became available, but, of course, that was not for some time after the development of the crystal. The first valve rectifier was the diode rectifier, which consisted of a simple rectifying valve, as we should call it to-day. There was a filament of wire which was heated to incandescence and around it was an anode of metal. When the anode was made positive to the filament, current flowed, while if the anode was negative, the current was very much less "



CHARACTERISTIC OF CRYSTAL DETECTOR

This curve shows the characteristics of a crystal detector which passes current more easily in one direction than the other

Professor Megohm and Young Amp At It Again!

"I thought you couldn't get any current if the anode was negative," interrupted Amp.

"That is only so if the valve is what we call hard, that it is with very little gas left inside. The presence of gas at a low pressure results in what is known as ionisation. When this happens the atoms of gas break up. Some of the electrons in the atom are removed, leaving us with

Sandy Powell, the well-known variety artiste

relatively massive positively charged nuclei. These positive charges drift towards the anode and give us a current in the opposite direction."

"Doesn't that destroy the rectifying action?"

"No, because this reverse charge is only relatively small, but it may occur at all sorts of odd moments and as a result the valves are quite unreliable in operation. All modern valves are made as near as possible dead hard to avoid any such effects."

"I see," said the boy. "Then what about modern valve rectifiers?"

Non-amplifying Detectors

"There you have quite a different action again. All the rectifiers so far discussed are of the non-amplifying type. They simply utilise the energy supplied to them and rectify it, so that we can detect the signals on a pair of telephones.

"The modern valve detector utilises the amplifying properties of the three-electrode valve. As you know, if we insert a grid between the filament and the anode we can cause the valve to amplify, voltage variations applied between the grid and filament giving rise to much larger variations in the anode circuit.

"We can combine this amplifying action with the rectifying action, and modern valve detectors are much more sensitive than any of the old forms, including the crystal or the diode. You know, of course, what the two principal forms are."

"Oh, yes," said Amp at once, "anode and grid."

"That phraseology is somewhat loose, but it is quite clear what you mean. The correct terms are anode bend, and cumulative grid. Tell me what happens, anyhow."

Amp pondered his reply for a few moments and he said, "Well, as far as I can see, the anode-bend scheme seems to me just the same as the diode rectifier you spoke of. You put negative volts on the grid until practically no current flows, and then when you make the grid positive you get the current, while if you make it negative you don't get any, so you are left with a certain average current."

"That is quite correct," agreed the other, "but you have forgotten the amplifying action. The process is much the same as in the diode valve, as you said, but due to the amplifying action of the valve the current you do get when the grid is made slightly positive is considerably greater than you would get

Gracie Fields, another popular stage star

Houston Sisters, famous variety stars

with a diode. Now for the cumulative grid rectifier. This action is very difficult to explain in a few words. I wonder if you can do it."

Amp thought this over for some time, and then he said: "Well, Professor, that is rather a teaser. I think I shall put it this way. First of all we put a fixed condenser in the grid circuit, and then we arrange the grid voltage to be just about zero, or perhaps a little positive. Then every time a signal comes along, it first of all makes the grid more positive and some grid current flows into the condenser. This happens every time there is an oscillation so that the condenser goes on building up more and more charge."

"Yes. What then?"

Reduced Anode Current

"Eh? Oh, I see. Oh, well, the charge on the condenser is negative because we have been drawing negative electrons from the filament, and consequently the grid builds up to a negative voltage and reduces the anode current."

"I think you can consider that a very good explanation in a few words. You left out one or two little things, of course, such as the leak which must be placed across the condenser, or between grid and filament, to allow the charge to leak away after the signal has passed, but nevertheless you have the right idea."

The International Peacemaker!

RADIO! What a wonderful word, and how much it stands for to-day! The greatest peacemaker of all time!

Yes, it would be interesting to have the individual opinion of every listener in order to ascertain just how much this new medium of peace-making is appreciated. I think we should find that people would give answers of annoyance; hasty answers, without deep thought.

I mean, thousands of listeners write to the B.B.C. giving their criticisms as to programmes, etc., without seriously thinking how much they owe to this powerful institution in encouraging world peace.

Untold Millions Hear One Speech

Our own Premier, Mr. Ramsay Macdonald, used the radio in America for his inaugural speech on world peace; I believe something approaching twenty millions in America alone heard it; it would be impossible to calculate how many more millions outside that great sphere listened to the eloquence of such a great advocate of peace as the Prime Minister of England.

The ceremony accompanying his arrival in the United States was also broadcast, giving an additional thrill to countless people all over the world. Surely this epoch-making radio institution is doing its share in fostering the valuable element sympathy between the various nations of the world? Those people who are ready to write to the B.B.C. will readily admit this, I am certain.

By no other method could this embracing of the world and its potentially belligerent peoples have been possible.

An Adequate Broadcasting Balance

Whenever we are tempted to take up the pen to protest against some little details in programmes which annoy us, but which must delight thousands of other people, we should think for a moment. It is easy to decry and complain; to criticise and say what you do not want; it is another matter to give a logical opinion, a constructive opinion as to programme arrangement.

Now do not think I am holding the candle to the B.B.C. Far from it. All institutions have their faults, but it is only fair to weigh values, and I do not doubt for a moment that if people would pause before complaining, they would find more than adequate balance in the fair broadcast for their education, well-being and entertainment, against one or two minor annoyances sometimes experienced over the wireless.

Radio was started much as other novelties are begun. We first had jokes and songs, entertainers and musicians. We then settled down to orchestras and talks, and so the idea grew until to-day we have a vast field of novelty, entertainment, and music, tempered by an excellent method of education for which we should all be thankful. And now we are bound to enjoy the benefits to be gained from this wonderful exchange of international sympathies, through the medium of radio.

There is practically no limit to the powers of radio in bringing countries closer together. Time, as well as patience and blood, are saved by the co-operative facilities of this latest and most efficient peacemaker.

It is our duty to applaud it; we must!

When I speak of radio, I do not imply the B.B.C. alone. I refer to the hundreds of wireless stations throughout the world which are all contributing their fair share in using the enormous power at their command to bring about the amity and concord of the various countries.

We all know the part our own ministers are playing at the Geneva Conferences to get the world in a state of peace; to create a true and sincere feeling of fraternity between the members of the younger generation. The radio has come to their assistance, and I do not hesitate to state that the lion's share has been done by this valuable method.

In sport, too, wireless has played its useful part: who can forget those thrilling Saturday afternoon broadcasts of football, the boat races, Schneider Cup race, and countless others?

Friendship Between Nations

I have no doubt that radio will be used to link up internationally, so that we shall be able to hear commentaries of games or sports played in other countries. This idea would, I believe, play no small part in encouraging the spirit of friendship between boys and men of many nations. Sport is a wonderful incentive to peace; nobody loves to be dubbed a "no sport," therefore broadcasts of sporting events fought out in any country would prove ideal in this "war for peace."

The world has grown to accept wireless as a novelty and entertainment; it is time the world looked upon it as the greatest of peacemakers.

Every sane-minded person will, I am sure, be ready to admit the wonderful value of wireless in this new sphere of activity. It is true we have many benefits to be thankful for in the conducting of our affairs; benefits to which we have become accustomed to a point of neglect. I sincerely hope we are not going to be guilty of this error with regard to radio.

We all desire peace; we all know the horrors of war and its attendant poverty; poverty in morale as well as kind. It is our sacred duty, therefore, to be ready with our ears as well as our pens; ready to understand the valuable trend of thought behind those talks and general efforts for peace and good-will.

An Opportunity Not to Be Missed

Sincerity in listening is as important as sincerity in anything else, and we cannot afford to lose the opportunity of hearing the strugglers for peace expounding their views and opinions on vital questions which have a direct bearing on our lives as a whole.

Radio is an institution to be proud of; it is a powerful weapon with which to combat those incongruities ever present in a scheme where individual interests are at stake. The time is not far distant when we shall all realise just how much it is doing to destroy those differences which exist between the nations of the world to-day.

When we do realise and understand this fact I do not doubt we shall all regard radio with a reverence it so justly deserves.

DUDLEY BARRINGTON.

BROADCAST MUSIC of the MONTH

Reviewed by STUDIUS.

FROM an orchestral standpoint, the only concerts of any importance during the month have been the new series of Northern "Promenade" Concerts given in the Free Trade Hall, Manchester, by the famous Hallé Orchestra, conducted by Sir Hamilton Harty. The opening evening was devoted to Wagner's works, with two noted soloists in Francis Russell and Oda Slobodskaya.

Well-known Names That Need No Comment

Olga Haley, Walter Widdop and Harold Williams were the soloists in the concert broadcast on June 18. The work of all concerned is too well known to need comment.

Considerable work has also been done by the Birmingham Wireless Orchestra, conducted by Joseph Lewis, and heard through the Midland and London regional stations, while to equal advantage were featured the miniature orchestras and smaller bodies of players.

Deserving Special Mention

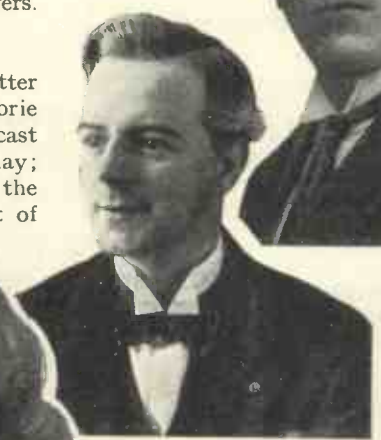
Special mention must be made amongst the latter of the Virtuoso String Quartet, led by Marjorie Hayward; the Norris Stanley Sextet, which broadcast from the Midland regional studio on Whit Sunday; the Lockyer String Orchestra, relayed from the Exhibition of French Arts at the Royal West of England Academy; and the fine orchestra led by Reginald King.

An orchestral concert which, however, might almost come under a "surprise" heading, was that announced for June 16, a special orchestra being recruited from among the Chinese colony in London for a Chinese programme of national music and dialogue.

Doris Gambell, soprano

Francis Russell, tenor

Thomas Case, baritone (below)



Olga Haley, vocalist

Burton Harper, bass-baritone

The vocal art is, of course, always abundant and well varied. We still seem to hear too many German songs, but undoubtedly a stern effort is being made to familiarise the public with British compositions as well as foreign works.

Amongst the singers who may be generally relied upon to introduce at least one English work in their repertoires is Ethel Williams. A fine contralto voice and exceedingly clear diction make her microphone appearances particularly welcome, and for these qualities she is a frequent broadcaster in the Children's Hour concerts in the national programmes.

Many of the very earliest broadcast stars have been heard during this month and their performances prove that their microphone experience is adding still further to their technical skill as vocalists—Thomas Case, a fine baritone, Harry Hopewell, Burton Harper, and Doris Gambell. Olga Haley was a recruit from the classical concert stage, as also were Dorothy Helmrich and George Baker, who joined forces recently in the Foundations of Music series, with a week's singing of Hugo Wolff's *lieder*.

One was glad to hear Paul Molchanoff again, a fine Russian singer; Herbert Thorpe, whose operatic experience always makes him a valuable addition to any

Reginald King, violinist

Broadcast Music of the Month—*Cont.*

Ethel Williams, contralto

programme; Heddle Nash, who appeared in another of the Northern "Proms" on June 17; Doris Vane and John Rorke.

Among the instrumentalists we have had some excellent work, the violin being well represented,

J. H. N. Craigen, a well-known actor

firstly by the string quartets of Brosa, J. H. Squire, Slydel, and Frank Walker. As soloists, we have had Arthur Catterall, the late leader of the Hallé Orchestra; Paul Belinfante; Eda Kersey, who played a week's Foundations of Music series; and Spiero, the well-known violinist, now conductor of a large orchestra at Blackpool.

A. Spiero, Palace Orchestra, Blackpool

Albert Sammons Recitals

Mention must be made of the excellent recital given by Albert Sammons, who was accompanied at the piano by Sir Granville Bantock.

The pianists have included the world stars, Solomon, Myra Hess, William Murdoch, Fanny Davies, and Irene Scharrer.

One thing which is to be credited to the B.B.C. is the revival of attention paid to the organ. At one time allowed to be used but sparingly, in fact, only, for religious ceremonies, the wireless and cinema have once more proved its true value. The names Reginald New; Reginald Foort; Pattman, at the Brixton Astoria organ; Edward O'Henry, at the Tussauds organ; and, from the cathedrals, Edgar T. Cook and Dr. Harold Rhodes, have all become household words.

One must not forget also the less hackneyed instruments that have been heard, such as the lute, on which Hans Neemann gave a special recital on June 6, or the harpsichord played by Marguerite Delcourt, and last, but by no means least, the recital of bag-pipe music on June 10 by Seton Gordon, of the Scottish Pipers Society.

More Lightness and Humour

Though there is still a superabundance of syncopated performances undoubtedly an effort is being made to infuse more lightness and humour into the programmes.

One still misses John Henry, though we have had his contemporaries in broadcast annals of Stainless Stephen and Norman Long, one of the very first star entertainers over the ether.

A recent variety programme included some excellent work from Leslie Weston, a clever comedian and cousin, I think, to George Weston of "The Roosters." Charles Tucker and his wife, Violet Essex, perhaps more familiar to us as "the singing violinist," with Betty Warren and her impersonations, made up for the syncopated noises also heard.

Famous Old Musical Comedies

Possibly some of the very best of the light programmes have been those organised and devised by Philip Ridgway. His "Old Time Music Hall," and "Music Hall in War Time," which have had to be repeated, are amongst the gems, while as a kind of sequel, and unfortunately the last for the present of this series, came a visit to some half dozen of the famous old musical comedies of 1917, such as *Chu Chin Chow*, *The Bing Boys*, *Maid of the Mountains*, *High Jinks*, and *My Lady Frayle*.

Mr. Ridgeway's success, however, is not to be wondered at; as a boy actor of sixteen in *Snow-White* at the Gaiety Theatre, Manchester, he followed up as actor and singer-dancer, acting himself in the musical comedies which he now burlesques so well.

Producer at Nineteen

He was an actual producer at nineteen, and will certainly be remembered for his creation of the Barnes Theatre and its work. He produced, also, *Tess of the D'Urbervilles* after Thomas Hardy had refused to see others, including Bernhardt and Duse.

His productions have been running three at a time in London theatres, and have figured in over fifteen West End theatres. Although only thirty-

Harry Hopewell, baritone

Eda Kersey, violinist

eight, Mr. Ridgeway has qualified in law, been adopted as Parliamentary candidate, been author, journalist and cavalry officer, and now, not satisfied with a career that would have filled a dozen lives, is now starting musical composition.

66P

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More Blue Spot Units have been sold throughout the world than of any other make and the opinion of the millions of satisfied Blue Spot listeners is the genesis of the world-wide reputation of Blue Spot units and speakers.

Those who have heard the 66K unit—and it therefore logically follows that they are Blue Spot enthusiasts—must appreciate the obvious difficulty of improving admittedly the foremost unit on the market. It can only be another Blue Spot unit that is an advance on the famous 66K.

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An entirely new method of moving the anchor between the four poles has been adopted and the precision of adjustment is so keen that it is now possible practically to place the anchor the exact distance from the poles as is theoretically necessary to obtain the best effects as yielded by a magnetic unit under the best conditions.

The noticeable result of this increased sensitivity is the larger range of frequencies obtainable. In addition to the powerful reproduction of the bass register with its full beauty, the higher frequencies which largely determine the character of speech and music are also reproduced faithfully.

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Our Tests of New Apparatus

✱ *Conducted by J. H. REYNER, B.Sc., A.M.I.E.E.* ✱

CELESTION TILTATONE

TONE CONTROL
This Celestion Tiltatone unit is well made and will undoubtedly appeal to many gramophone enthusiasts

IT is recognised that while a good pick-up used with a high grade amplifier will give very pleasant results, the use of some form of tone correction is desirable in order to compensate for defects in the reproducing system. These are of two kinds, the deficiencies in the record, such as the gradual cut-off in the lower frequencies below 200 cycles, and the defects in the amplifier.

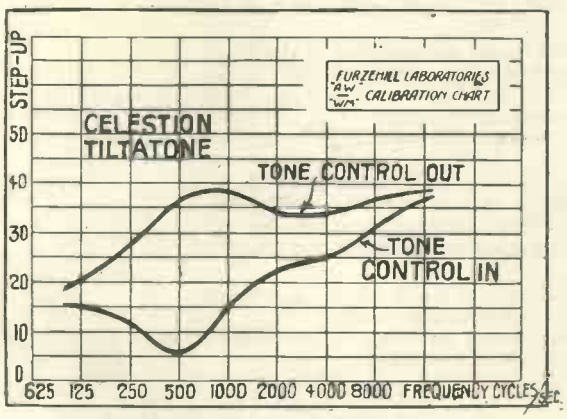
The use of a transformer between the pick-up and the amplifier will go a long way towards correcting these defects, but one often finds that certain other undesirable results are introduced. Celestion, Ltd., of loud-speaker fame, have just brought out a device called the Tiltatone, which has several novel features.

Step-up Transformer

It consists essentially of a step-up transformer with a tone-correcting device in the secondary circuit. The transformer steps up the voltage to a considerable extent and a choke is then inserted in series with the lead to the pick-up, which causes a large reduction of the middle frequencies.

The operation of this choke is controlled by a resistance shunted across it, while a second resistance across the whole output controls the general volume of sound.

The whole device is housed in a case measuring 6½ in. by 3⅜ in. by 3½ in. high. The top panel has two input and two output terminals and two controls, one operating the tone control just described and the other for adjusting the volume. On test the step-up in volume was immediately noticeable; indeed it was so large that we investigated the matter further and found that the voltage step-up was anything from 20 to 40 to 1.



EFFECT ON REPRODUCTION
These curves show the step-up effect of the Tiltatone at various frequencies with the tone control in and out

Two curves are given herewith which illustrate the order of step-up obtained with the tone control in and out of use. It will be seen that the middle frequencies can be cut down considerably without affecting the bass, and this is of great value with the average amplifier which, with its attendant loud-speaker, tends to accentuate the middle register.

We were not so impressed with the volume control, which seemed to cut off the bass. Probably the makers were endeavouring to correct the usual fault of volume controls which is to cut off the treble, which is well maintained in the Tiltatone. The device sells at £4 17s. 6d. and is an interesting and helpful novelty for gramophone users.

HEGRA DYNAMIC LOUD-SPEAKER

THE chief disadvantages of the normal magnetic loud-speaker unit are the limited movement possible and the varying sensitivity of the system according to the position of the reed. The Hegra loud-speaker is an ingenious attempt to overcome these defects.

Armature System

The armature is clamped at one end and is free to vibrate at the other. Approximately half-way along its length are two poles, one on each side, while at the end of the reed are two further poles placed close together and in such a position that they are very close to, but not actually touching, the reed.

The passage of current through the windings causes the reed to be attracted by one pole and repelled by the other, swinging in a sort of pendulum manner.

Ingenious Principle

The principle is ingenious, in that the air gap between the end of the reed and pole pieces is substantially constant. The movement is restricted by rubber buffers so that under no circumstances can any contact occur between the reed and the magnet

(*Continued on page 613*)

FOR HANDLING POWER
An ingenious principle is made use of in the Hegra Dynamic cone loud-speaker

Around the Turntable

REVIEWS of RECORDS by WHITAKER-WILSON, the "W.M." MUSIC CRITIC

Classical Orchestral Music

"Alcina" Suite (Handel), Philharmonic Symphony Orch., Part 1 and 2 (d.s.), 4s. 6d. **H.M.V. E548**
Part 3 and 4 (d.s.), 4s. 6d. **H.M.V. E549**
A record of very high standard. There is no need to describe a Handel suite to anyone who has ever heard one; this is Handel in his most characteristic vein. I admire the whole production immensely.

Concerto No. 3, in C Minor, Op. 37 (Beethoven), Mark Hambourg and Symphony Orch., conducted by Dr. Malcolm Sargent, Part 1 and 2 (d.s.), 4s. 6d. **H.M.V. 1865**
Part 3 and 4 (d.s.), 4s. 6d. **H.M.V. 1866**
Part 5 and 6 (d.s.), 4s. 6d. **H.M.V. 1867**
Part 7 and 8 (d.s.), 4s. 6d. **H.M.V. 1868**
A very fine production both from the orchestral point and from the general recording standpoint. Mark Hambourg's tone, which I have never admired, comes out rather as I expected it would—hard and unsympathetic. He interprets well—he always does—but he ruins everything by his heavy playing. The sound box, as I write, is rattling like a tin-kettle, and this is not a cheap machine! What a gorgeous concerto it is!

Damnation of Faust (Berlioz), Philadelphia Symphony Orch., conducted by Leopold Stokowski (d.s.), 6s. 6d. **H.M.V. D1807**
If you want an exciting orchestral work, get this; Berlioz will fire you when other things leave you dull. It is a splendid rendering; all the fierceness of Berlioz orchestration comes out to perfection. One of the best orchestral records I have heard recently. The Racoczy March takes some beating! On the other side is the *Bacchanale* from Saint-Saëns's *Samson and Delilah*. It may cost 6s. 6d.—but this record is worth having.

Hungarian Dance No. 2 (Brahms), Royal Opera Orch., Covent Garden, conducted by Dr. Malcolm Sargent, 4s. 6d. **H.M.V. C1874**
A very fine recording of one of Brahm's most popular orchestral works. Looking at it from the musical standpoint, I do not admire Sargent's reading very greatly; I have heard better. But the record is pleasing in many ways.

Rosamunde, Part 1 and 2 (overture), (Schubert), Symphony Orch., conducted by Dr. Malcolm Sargent, Parts 1 and 2 (d.s.), 4s. 6d. **H.M.V. C1873**
Part 3, 4s. 6d. **H.M.V. C1874**
One of Schubert's most delightful works; everyone who (like myself) is a Schubert-lover should possess this. It is well rendered, and on an electric machine produces a fine effect. It is in three parts, the fourth side containing Brahm's *Second Hungarian Rhapsody*.

Light Orchestral Music

Auguero, Athenaeum Salon Orch., 2s. **PIC 5026**
More pleasant lunch-time music. The cymbal used in the opening *phrases* is not a good specimen of an orchestral percussion instrument; otherwise the playing is quite good. The other side the same orchestra plays *Pierette's Wedding*.

Ben Hur, London Fire Brigade Band, 1s. 6d. **PIC 517**
For those who like military marches, I recommend this and *Colonel Bogey* on the other side. Both are well produced and vigorous in style.

"C. B. Cochran's 1930 Revue," Raie Da Costa, piano (d.s.), 3s. **H.M.V. B3418**
An excellent production. It includes *Piccadilly, Wind in the Willows, The Little Things You Do,* and *With a Song in My Heart*. Worth hearing!

Country Dance No. 1, Athenaeum Symphony Orch., 2s. **PIC 5025**
This and the *Merrymakers' Dance,* from the ever-popular *Nell Gwynn* suite should find a ready sale. The playing is good; the recording better than one or two others by this firm which I have heard to-day.

El Abanico, Band of H. M. Life Guards, 2s. **BRDCST 5160**
Very smart playing. A thoroughly good military band record. Other side *Light of Foot*.

Eugene Stratton Selection, Chenil Orch. (d.s.), 2s. **DEC F1745**
The vocal refrains (sung by Stratton, of course), are of the following: *The Coon Drum Major, My Little Ocoroon, Lousiana Lou, The Idler, The Dandy Coloured Coon, Little Dolly Daydream, Lily of Lugana,* and *I May be Crazy*. An admirable selection, some of which we have known all our lives. I think I should have preferred the whole *song* in each case instead of only the orchestra; he enlivens the procedure each time he sings.

House that Jack Built, Scala Salon Orch. (d.s.), 2s. **WIN 5120**
The recording is a bit fierce, but I recommend this charming little suite for open-air reproduction. Very pleasant.

Last Rose of Summer, John Cockerill, harp, with orch., 2s. 6d. **ZONO 5578**
Not too successful. I have altered the power of my electric machine this way and that, but I cannot get rid of a certain "tinny" tone which should be foreign to a harp. Something wrong in the recording condition I think; Zonophone would do well to recall this and do it again. Other side: *Annie Laurie*.

Light Cavalry (overture), Court Symphony Orch., conducted by Percy Pitt (d.s.), 4s. 6d. **COL DX42**
I have been examining the surface of this record under a strong light; Columbia is fast overcoming the greatest technical difficulties. This record is suberb. The resonance of the Central Hall, probably damped down, remains as a great asset to the effect. Suppé's *Light Cavalry* overture needs no description, of course; I unhesitatingly recommend this record as a production of a very high standard.

Manon, Roloff Ensemble (d.s.), 2s. **PIC 5027**
The surface of this is not quite perfect, but the playing of quite a charming little work is worth hearing. Good lunch-time music!

Marionettes, The, Black Dyke Mills Band, 1s. 3d. **RAD 1328**
I feared the worst when I read that there were two cornets as soloists—but was pleasantly surprised. This is an excellent record. *Paddy's Patrol* is on the other side. Both are excellent. As for the Black Dyke Mills Band, I have quite cottoned on to them, so to speak!

More War-Time Marching Songs, Band of H.M. Welsh Guards, with male chorus (d.s.), 1s. 3d. **BRDCST 551**
You will recognise all of these; the good Celtic Band plays them excellently, and the singing is full of vim.

Old and New, Herman Finck and his orch. (d.s.), 4s. 6d. **COL DX47**
Quite a good pot-pourri of well-known Finck melodies; very well rendered, the record bearing a first-class service.

Parade of the Tin Soldiers, Chenil Military Band, 2s. **DEC F1737**
I have listened to the *tin* soldiers and also the *leaden* ones (*March of the Leaden Soldiers*), on the other side; of the two I prefer the latter. I think this record will appeal to children, and if someone takes the trouble to explain something about the orchestration to the more musical ones, there would be an additional use for such a record as this. I believe in educating children in music while they are still very young!

Pavane, Hastings Municipal Orch., 2s. **DEC K518**
This is from Edward German's *Romeo and Juliette* and makes a charming record. What a great use there is for real light music of this kind! I sincerely hope Decca will sell enough of this to warrant their publishing more of the same kind—charming orchestration, melody in plenty, and something calculated to educate the uninitiated. On the other side is the third side of German's *Welsh Rhapsody* (see review).

Polonaise in A, Viennese Orch., 1s. 6d. **PIC 515**
This always comes out in an orchestra; it is one of Chopin's few orchestral conceptions. The other side is a good arrangement by Woodhouse of Weber's *Invitation to the Waltz*. A good record.

Students' Songs, Metropolitan Police Band (d.s.), 2s. **WIN 5121**
The Bobbies' Band plays admirably. Whether *Students' Songs* are satisfactory without their verbal context is a matter I cannot pretend to decide; but if you have this record you will recognise every item in it.

Three Bears, A Phantasy (Coates), Hastings Municipal Orch. (d.s.), 3s. 6d. **DEC K515**
This, like the Edward German records, was recorded at the White Rock Pavilion at Hastings. The work opens vigorously and has a certain charm about it, though it is not a great work by any means. I do not see the relevancy of the title, but I suppose that is of no great account. I am listening to it on the new electrical gramophone which some members of the staff have recently installed for me, and I certainly recommend this record for electrical reproduction.

Tommies' War Time Memories, Jack Hylton and his orch., 4s. 6d. **H.M.V. C1888**
Contains the following: *Pack Up Your Troubles, British Grenadiers, It's a Long Way to Tipperary, Goodbye-ee, There's a Long, Long Trail, Blighty*. On the other side in *Songs of the Officers' Mess,* the following are given: *Widows are Wonderful, Gilbert the Filbert, Tickle-toe, If You Were the Only Girl,* and *They Didn't Believe Me*. A good show for 4s. 6d.!

Traumerie, English Instrumental Sextet, 2s. **BRDCST 5158**
Should be spelt Traumerei, surely, or my German has gone west! This arrangement changes its general feeling because of the intrusion of the harp, but one rather looks upon it as common property in these days. Dvorak's *Humoreske* is on the other side. It is neither Schumann nor Dvorak—but quite pleasant lunch-time music!

Welsh Rhapsody (German), Hastings Municipal Orch., Part 1 and 2 (d.s.), **DEC K517**
Part 3, **DEC K518**
If you buy these two records you get *Pavane* as the fourth side (see review). The *Welsh Rhapsody* is one of German's most charming works; I congratulate Decca on such an excellent representation of it.

(*Continued on page* 608)

When you send your order don't forget to say you "saw it in the 'W.M.'"

There is a slight blemish in the tone of a clarinet on the first side, but I did not detect anything else worth pointing out.

Whistling Rufus, International Novelty Quartet, 2s. 6d.
ZONO 5566

This is an old favourite. I forgot that *Whistling Rufus* was its title. On the other side is an excellent rendering of *Down South.*

Rio Rita, Alfredo and His Band, with vocal chorus, (d.s.), 2s. **WIN 5116**

A typical modern dance orchestra, his! This is played very attractively—the sort of record for a portable on the river. Very pleasant light music with a touch of the ball-room about it.

Selection of Welsh Airs, Chenil Orch. (d.s.), 2s.
DEC F 1775

The singer in this case is Owen Bryngwyn, who nfuses a native atmosphere into the record, though whether he is singing in Welsh or English is not easy to determine at first. The band plays admirably throughout.

Scent of the Jasmine, J. H. Squire Celeste Octet, 3s.
COL DB107

Very pleasant lunch-time music with *The Song of the Waterfall* on the other side. Very well produced in Columbia's best style!

Grand Opera & Classical Arias

Hermann Lohr, vocal gems, Columbia Light Opera Company, with piano (d.s.), 4s. 6d. **COL DX52**

These include: *You'd Better Ask Me, Where My Caravan Has Rested, Chorus Gentlemen, The Little Irish Girl, Little Grey Home in the West, Rose of My Heart,* and *To My First Love.* All of which prove Lohr to have the divine gift of melody. A thoroughly good record.

O Quella Pizi, Lenghi Cellini, ten., with orch., 2s.
PIC 5032

A good operatic number with *Ah Si Ben Mio* on the other side. Both are from Verdi's *Il Trovatore* and are worth hearing; but a good machine is necessary to bring out all the tone.

Rigoletto, Sydney de Vries, bar., with orch., 2s.
PIC 5033

Piccadilly walks abroad! Here is a good rendering of an aria from Verdi's *Rigoletto* sung in Italian by De Vries with *Ballo in Marchera* on the other side, both accompanied by the Schauspiel orchestra. A very good operatic production.

Light Opera & Songs

Beside an Open Fireplace, Bert and Bob, with piano, 2s. **DEC F1750**

The diction is not quite as good as I have heard—words partly miss here and there—strange for them. But they always make a pleasant record—I wish they would sing better music; this is "tripe." On the other side is *We'll Build a Little World of Our Own,* which seems a trifle selfish. I am not impressed with it, I must admit. Come on, Bert and Bob, sing something worth hearing; you are boring me!

Bit, A Saddle, and a Horse, Foster Richardson, bass, with orch., 2s. 6d.
ZONO 5547

A vigorous type of song; very enjoyable. The diction is an outstanding feature; the recording also is good. On the other side: *The Leader of the Town Brass Band.*

Bundle of Old Love Letters (w), High Hatters, with vocal refrain, 3s. **H.M.V. B5791**

This, and its companion *Should I?* (foxtrot) are from the film "Lord Byron of Broadway!" The waltz is common place, but well played; the fox trot is vigorous enough, though not particularly original in design. Perhaps it is better in its place in the film.

By the Waters of Killarney, Ray Filme, with refrain, 2s.
DEC F1743

An Irish ditty in waltz rhythm, this is quite pleasant in its way, but not outstanding. *Just an Old Refrain* (on the other side) is in the same rhythm. I think this is a pity; I got tired of it and shut it off half-way!

Coon Town Wedding, G. H. Elliott, with Southern Coloured Singers (d.s.), 1s. 3d.
RAD 1340

I hate the harmonies in the opening bars—very forced; and the singing is not up to much. Not worthy of G.H.E.

Drinking, Foster Richardson, bass, with orch., 2s. 6d.
ZONO 5563

Very well sung. This old favourite has life in it yet. The other side contains a vigorous rendering of *Will o' the Wisp.*

Figaro (f), Debroy Somers Band, with vocal chorus, 3s. **COL CB50**

Columbia! With all due respects to your amazing recording; I do not approve of plagiarisms of this type! *Don't do it*; there is plenty of good music of the foxtrot kind without borrowing on classics.

Frankie and Johnny, Jimmie Rodgers, with guitar, 2s. 6d. **ZONO 5577**

The record has one of the roughest surfaces I have ever seen, but the result is surprisingly good. I am not keen on the song but I understand it to be popular. *Everybody Does It in Hawaii,* on the other side, is marred by the guitar which is not well in tune.

Go Down, Moses, Paul Robeson, bass, with piano, 3s.
H.M.V. B3381

His voice is full and rich, but I do uot consider, speaking as a voice-trainer, that his production is unassailable. On the other hand, he produces a good record. This is interesting from many points of view. The words are dignified and well written, and the music modal. On the other side he sings *I Stood on de Ribber* and *Peter, Go Ring Dem Bells* which are more ordinary in construction. Admirers of Robeson will not, I think, be disappointed in this record; his singing has such a native distinction about it. It is, of course, beautifully produced.

Goodbye to All That, Marie Burke, sop., with orch., 3s.
COL DB109

I expect most of you know this; I seem to have heard it a good deal recently. Very well sung, though Miss Burke's diction is not of the best. On the other side she sings *Shadow of a Rose.*

Harry Lauder Melodies, Jock MacGregor in song and story, with c...h. (d.s.), 2s.
WIN 4997

I wonder whether thought-association has anything to do with a slight sense of disappointment which I experienced on hearing these songs; I missed Lauder's personality and yet I have no quarrel with the good Jock MacGregor, who is Scotch enough for anyone! I should like the opinion of others on the point. For the rest, this record is excellently produced.

Has Anybody Here Seen Kelly? Florrie Forde, with Harry Hudson and His Melody Men, 1s. 3d.
RAD 1330

Musical memories is the order of the day here. *Down at the Old Bull and Bush* graces the other side. I do not know whether these revivals are wanted, but they are here if they are.

Hits of the Past, London Orch., Parts 1 and 2, 2s. 6d.
ZONO 5545

This includes the following: *Dream of Delight, Delilah, Old Fashioned Mother, Blue Bird, Night of Romance, Omaha, City of Laughter, Kingdom Within Your Eyes.* An excellent production.

Home Sweet Home, Dora Labbette and Hubert Eisdell, with string quartet, 3s. **COL DB101**

The song is not new, I believe, but the arrangement is decidedly so. Dora and Hubert—plus four strings—are very acceptable. Dora sings a charming descant while Hubert soulfully sings the theme. I have enjoyed it . . . I am now listening to them singing *Old Folks at Home* on the other side of the record. Very effective harmonies; a charming record of something I didn't exactly want to hear. I admit to having to listen intently

I'm Following You, Billy Marlow, with orch., 1s. 3d.
BRDCST 561

This is from "It's a Great Life." The tune is quite taking, though the sentiment of the song is a trifle irritating; the idea of "if you are going away don't think you will ever get rid of me," is more than I care to think about! The other side is quite a good version of *Singin' in the Bathtub.*

I'm on My Way to Heaven, Patrick Waddington, bar., with two pianos, 3s.
H.M.V. B3422

I wonder why Patrick Waddington must have *two* pianos to accompany him. Is one not enough? But I expect when a man is on his way to Heaven he feels like having two pianos. Well, his voice is moderate and the song is tosh. I don't honestly think I can say anything else about it. *Gee, it Must be Love* on the other side is a trifle more attractive; candidly I am not impressed with either.

Jus' Keepin' On, Morlais Morgan, bass-bar., with piano, 2s. **WIN 4998**

Not a bad type of light song. I like his voice very much—but what a piano! Edison Bell—please poleaxe that instrument and buy a piano; you are spoiling your records. It is such a pity because your recording is of the very best. The other side of this record is *The Driver of the 8.15.* Very well sung, too.

Just Can't be Bothered With Me, Lou Abelardo, with piano, 2s. **DEC F1751**

The piano accompaniment to this is a trifle too heavy in places but the song is very effective. The diction is moderate only. The other side contains *With You,* rather a sentimental effusion. My chief objection is that the singer has no tone in his voice, at least he does not use what he has. The accepted style of singing songs of this type is one to which I strongly object.

Less Than the Dust, Bernard Dudley, with orch., 2s.
PIC 5030

This has *Temple Bells* on the other side and with 5034 makes the cycle complete (see review of the other record).

Lonesome Melody, Bud and Joe Billings, singing with novelty acc., 2s. 6d.
ZONO 5549

Rather a fierce accompaniment, but a taking slow waltz tune. On the other side is *An Old-fashioned Sweetheart of Mine.* The general production and the recording is of the very best. I recommend this record as being entertaining.

Nou Gony, Dora Stroeva, sung in Russian, with guitar and piano, 2s. **PIC 5031**

A Russian folk song; rather interesting, but Dora Stroeva's voice is poor in quality. She is scarcely up to this kind of work.

Open up Dem Pearly Gates for Me, Carlton and Bailey, with instrumental acc., 1s. 3d. **BRDCST 549**

Of the negro spiritual type this misses me, but for those who know and like it, I suggest it because it is well produced. *She was Poor, but She was Honest* is the delicate classic on the other side.

Patience (sel.), soloists, chorus and orch., Part 1 and 2 (d.s.), 2s. **BRDCST 5156**
Part 3 and 4 (d.s.), 2s.
BRDCST 5157

Very well produced. I recommend the whole thing as a good "G. and S" record.

Selection of Boosey Ballads, Jack Hylton and His Orch., with vocal refrain (d.s.), 4s. 6d. **H.M.V. C1886**

This double-sided record includes: *Drake Goes West, I Hear You Calling Me, Gleaners Slumber Song, Glorious Devon, Kerry Dance, My Ain Folk, When You Come Home, Until,* and *The Yeoman's Wedding.* That should prove attractive enough for lovers of ballads. They are all well rendered.

Sincerity, Linda Hinde, with piano and 'cello, 1s. 3d.
RAD 1337

On the other side is *Sympathy,* effected by the same means. Both songs—which have rather had their day now, of course—are well sung and the 'cello makes a good effect.

(*Continued on page 610*)

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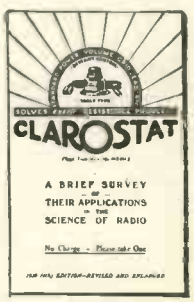

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Smuggler's Song, Joseph Farrington, bass, with orch., 2s. **PIC 5035**

This, with *Boots*, is a poem by Kipling. The music in either is not bad, though perhaps not quite up to the standard Kipling should demand. But Farrington always makes a success of a song. Here his diction is a delight to the listener.

Till I Wake, Bernard Dudley, with orch., 2s. **PIC 5034**

With the *Kashmire Song* on the other side, this is worth hearing, if you still admire the songs sufficiently. Dudley sings very appealingly.

Trundle Bed, McCravy Brothers, with orch., 2s. 6d. **ZONO 5576**

This is very well done in duet form. The phrases are very short and the diction is splendid The other side is *Hide Away*, which is much the same in style. It may appeal to lovers of light song.

Whistling Rufus, Emile Grimshaw's Banjo Quartet, with vocal refrain, 3s. **H.M.V. B3377**

Banjo's reproduce extraordinarily well. This is very effective and pleasant to listen to; the vocal refrain is well enunciated. *Swanee Sing Song* is on the other side, effected by the same means.

Wid de Moon, Moon, Moon, George Dosher, 2s. **PIC 5036**

Here are two splendid negro love songs, sung by G. Dosher, who has a fine, resonant tone. The other one is *The Banjo Song*, and both are pleasantly accompanied by an orchestra.

Sacred Music

St. Mary-le-Bow, Evening Service, rector, choir and organist (d.s.), 2s. **BRDCST 5155**

This begins with an organ prelude, followed by a short introit (*Lift up Your Hearts*). Then on, from *O Lord Open Thou Our Lips*, with Tallis' responses: *When Israel Came Out of Egypt* (Ps. 114) is sung to *Tonus Peregrinus*; a lesson, "Blessed be the God and Father," begins the second side; a collect follows, giving way to the hymn *As pants the hart*. The Grace finishes the record. It is well produced.

Organ Music

Organ Imitations, Terance Casey, Wurlitzer organ (d.s.), 3s. **COL DB100**

"Imitations" is a good title for this; it is certainly not the real thing. Although, all the same, it shows off the extraordinary resource of a Wurlitzer organ. I think there is a good deal in it that will appeal to a large public. The imitations are of a *church* organ (a total failure, in my opinion); a *hurdy-gurdy* (quite entertaining, as is that of a *steam* organ); a *mouth* organ and the recorder is honest at the end and imitates—a *cinema* organ. I am not certain whether the record should be put under organ music or *humour*; there is a bit of both about it.

Organ Medley of Song Hits, 1930, Quentin M. MacLean, organ, (d.s.), 4s. 6d. **COL DX43**

Those of you who have followed these reviews have read many derogatory remarks on organ records of this type. Letters of protest have come into this office because of some of them. *I maintain that my criticisms were just.* Now then; here is a splendid cinema-organ record. MacLean has the good taste not to vulgarise what he does. He gives you light music—even though on an instrument never intended for it—*but he is not cheap or vulgar.* I would never make a record of this type myself, but I honour him for his good playing and imaginary style. Now please; get it and compare it with some I have "slashed"—and see who is right!

Piano Solo

Wedding of the Painted Doll, T. d'Ehrmanns and M. de Varady, 2s. **WIN 5119**

For two pianos and played with admirable effect. The other side is suitable for the river in the English summer months; it is *Singin' in the Rain* which I had thought dried up for ever by this time. They play it splendidly.

Humorous Records

At the Bullfight, Amos and Andy, humorous duologue, 3s. **H.M.V. B3376**

Not a wonderful dialogue, but the manner of delivery rather "get's you." There are some amusing passages but it is not a "scream." *The Dairy* on the other side is not any worse, certainly; it is distinctly amusing *in places*. Perhaps I expected too much. Hear it and judge; it is the best way with these humorous records.

She Can't Make Up Her Mind, Jack Morrison, com., with Bidgood's Broadcasters, 1s. 3d. **BRDCST 545**

Nor can I, so far as the humour is concerned—but I found it amusing in parts. Others might think differently. There is nothing vulgar in it. The other side is *There's Hundreds, Thousands, Millions of Them Now.*

Swankers, The Sydney Howard and Vera Pearce, descriptive sketch (d.s.), 3s. **COL DB95**

Very amusing. I certainly recommend it as one of the most humorous records I have recently heard. Ask to hear it—three shillings is cheap for it!

Wedding of Sandy McKie, Sandy MacFarlane, Scottish com., with orch., 3s. **COL DB102**

This and *Bonnie Heilen Maggie* are two excellent Scotch humorous songs, which will appeal, I am sure, to many people. Clean humour is always worth having.

Spoken Record

Hums of Pooh, George Baker, bar., with piano, (d.s.), 3s. **H.M.V. B3387**

Evidently there are two complete records of this, of which I am listening to the third and fourth side. A very excellent specimen for the *Children's Hour*. George Baker is charming, and will appeal to the kiddies. The record is most strongly to be recommended.

Dance Music

Cuckoo in the Clock (f), Bidgood's Broadcasters, with vocal refrain, 1s. 3d. **BRDCST 555**

Quite a safe dance record. It has *Singin' in the Bath-tub* on the other side.

Do Ya' Love Me? (f), Cunard Dance Band, 1s. 6d. **PIC 524**

The orchestration is a bit fierce—but for dancing purposes this will be an asset. The tune is not particularly impressive; *Lucky Little Devil*, on the other side is fair, but not outstanding.

Duke of Ka-Ki-Ak (f), Arcadians Dance Orch., 2s. 6d. **ZONO 5561**

Another useful dance record. It was featured in the film "Hot for Paris." On the other side is another theme from the same film called *Sweet Nothings of Love.*

For the Likes of You and Me, Adolphe Jaxon, with orch., 1s. 6d. **PIC 521**

A sleepy type of foxtrot; quite pleasant. *Love is a Dreamer* on the other side is a fitting companion to it; both are from the film "Lucky in Love."

Go to Bed (w), Nat Lewis and His Dance Band, with vocal refrain, 1s. 3d. **BRDCST 557**

This is from "The Gold Diggers of Broadway," and very pleasant it is—a slow waltz. The other side is a foxtrot *Wouldn't it be Wonderful?* which is vigorous in style.

Have a Little Faith in Me (f), Manhattan Melodymakers, with vocal refrain, 2s. **BRDCST 2557**

Another good Manhattan record. It is from "Spring is Here." The other side contains *Cryin' for the Caroliner* from the same production. Rather entertaining. Ask to hear it!

I'm a Dreamer, Albert Sandler and His Orch., 3s. **COL DB98**

A beautiful rendering of a charming theme, well-known to you all. The other side is an equally good production of *Dance Away the Night.*

Jack o' Lanterns (f), Jack Payne and His B.B.C. Dance Orch., 3s. **COL CB47**

Beautifully recorded and played. Its companion is *Fancy You Falling for Me.* Both are well rendered and worth adding to your dance collection.

Jack o' Lanterns, Harry Hudson's Melody Men, with Max Klein, xylophonist, 2s. **WIN 5117**

There are dancing possibilities about this; the xylophone adds to the interest considerably. The tune is not particularly original; it is rather too fragmentary—but it has a good rhythm about it. The other side is *The Doll's House* in which there is a quaint sound like wood being planed; if it is intended I do not know what it is supposed to represent; if not the record is worth doing again.

Just a Night, a Song, and You (w), Allan Selby and His Band, 1s. 6d. **PIC 525**

A very pleasantly rhythmical waltz; I happen to be hearing it on a portable machine. It appears to me to be the sort of thing for an evening on the river. The other side is the *Dance of the Raindrops.*

Keepin' Myself for You, Al Benny's Broadway Boys, with vocal refrain, 2s. **BRDCST 2562**

From "Hit the Deck." Other side *Hallelujah* (not Handel's, of course). Good tunes, both of them.

Lonely Troubadour (f), Sam Browne, with orch., 1s. 3d. **RAD 1334**

This will be found pleasant to dance to; the tune is worth hearing, also. *Dreamy Carolina*, on the other side, is equally attractive. Good recording, as usual with Radio.

Love Parade (sel.), Arcadians Dance Orch., with vocal refrain, 2s. 6d. **ZONO 5582**

This includes: *My Dream Lover, Love Parade,* and *March of the Grenadiers,* with vocal refrain. The other side is a foxtrot *What Can I Do?* which seems new to me. Rather attractive!

Lucky Me, Lovable You Harry Hudson's Melody Men, 1s. 3d. **RAD 1329**

This has been deservedly popular; it is an excellent melody and the Melody Men seem to enjoy singing it. The other side is *Happy Days are Here Again*, very well produced.

Molly (w), Al Benny's Broadway Boys, with vocal refrain, 2s. **BRDCST 2560**

A pleasant waltz from "The Grand Parade"; the other side is a good rendering of *Sweet Nothings of Love* from "Hot for Paris." Both are well produced.

Arcadians Dance Orch., with vocal refrain, 2s. 6d. **ZONO 5581**

This is from the film "The Grand Parade," and is quite an outstanding tune. The other side is the foxtrot *Sunshine of Marseilles*, which I like very much. I consider the whole record, with its admirable surface, excellent for electric reproduction.

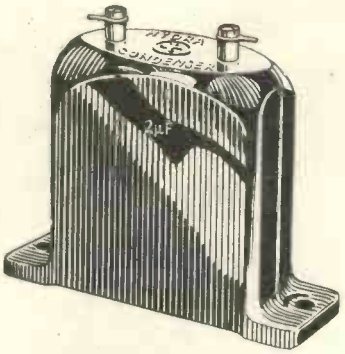
Mona (f), Manhattan Melodymakers, with vocal refrain, 2s. **BRDCST 2559**

From "Happy Days." It is a safe record, as all the Manhattan records are. The other side is a foxtrot — quite good — called *Congratulations.*

Night of Happiness (f), Bidgood's Broadcasters, with vocal refrain, 1s. 3d. **BRDCST 554**

Apparently there are twenty-four happy hours here for 1s. 3d.; the other side has *Happy Days Are Here Again.* Both are suitable for foxtrotting to, the vocal part, especially, being clear and distinct.

(*Continued on page 612*)



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Advertisement of K. Raymond, Ltd.

Punch and Judy Show (f), Rhythmic Eight, 2s. 6d. **ZONO 5559**

This is a very good dance record which, with a loud needle, will be useful for large rooms. It is a good, vigorous tune. On the other side is *Sweetheart's Holiday*, which is rather ordinary. But both sides are excellently produced.

San (f), Ted Lewis and His Band, 3s. **COL CB63**

This is really clever. It ought to sell by the thousand; I have never heard a dance-production to come up to it. *Get it at once, before it is out of print!* The other side is *Lonesome Road*, which is less vigorous. Admirable for electrical reproduction.

Smiling Irish Eyes, Alfredo and His Band, 1s. 3d. **RAD 1331**

This is from the film of that name. The recording is admirable—one of the best records I have reviewed this morning.

Sometimes I'm Happy, Patrick York, with instrumental acc., 1s. 3d. **BRDCST 548**

Well recorded and sung. Not a bad tune as these things go. You had better hear it; I find it difficult to describe accurately. The other side is the well-known *Body and Soul.*

Stein Song (six-eight one-step), Riverside Dance Band, with vocal refrain, 1s. 3d. **BRDCST 567**

This, I understand, has a great vogue in America; it is certainly stirring in style and makes an excellent one-step. On the other side is *Ro-rollin' Along*, with which I am not greatly impressed

Jack Payne and His B.B.C. Dance Orch., with vocal trio, 3s. **COL CB62**

Rather a refreshing change of rhythm; one gets a little tired of foxtrots. This is a trifle military bandish, but probably none the worse for that. The other side is *Moonshine is Better than Sunshine.* While not agreeing with the statement, I recommend the foxtrot for its vigour and general melodic line. It is also well-scored.

There Will Never be Another Mary (w), Will Osborne and His Orch., with vocal chorus, 3s. **COL CB61**

I am sorry about that because I like the tune of *this* Mary; the singer is rather slow over his consonants, but the song part is sung appealingly. The other side is an effective rendering of *Watching My Dreams Go By*, which is decidedly a good tune. A good record!

Wallah-Malaka-Lucy (six-eight one-step), Debroy Somers Band, with vocal chorus, 3s. **COL CB56**

This is an excellent tune, with plenty of life in it. On the other side is *There's Something About You That's Different.* Both are well sung—the latter is a fairly fast-moving foxtrot—and the words in both cases are well written.

We'll Build a Little World of Our Own (slow f), Nat Lewis' Dance Band, with vocal refrain, 1s. 3d. **BRDCST 556**

And we'll sing a nice tune in it! Quite a fascinating melody The other side, called *Melancholy*, is naturally less hopeful, but it is worth hearing. I imagine it may become popular in the ball-rooms.

What Have I Done? (w), Al Benny's Broadway Boys, with vocal refrain, 2s. **BRDCST 2561**

A rhythmical waltz with *Melancholy* (foxtrot) on the other side. A good dance record.

Wine, Women and Song (w), London Orch., 2s. 6d. **ZONO 5567**

This is a well-known waltz tune, of course; a fitting companion to the ever-popular *Blue Danube*, which is on the other side. A good record.

With a Song in My Heart (f), Manhattan Melodymakers, with vocal refrain, 2s. **BRDCST 2558**

Quite a good production; it is from C. B. Cochran's 1930 Revue. The other side is *Bottoms Up* from an English version of *De La Folie.*

Our Tests of New Apparatus

Continued from page 604

system. Hence a large volume can be handled without difficulty.

The makers say that up to 4 watts can be handled and this appears from our tests to be a reasonable claim.

The loud-speaker was tested behind a 3-ft. baffle and was supplied from our standard amplifier. There are three tappings on the winding, and we chose that best suited to the particular output stage. Apart from the capability of handling large volume, already referred to, there was a noticeable absence of resonance.

Better Than Average Cone

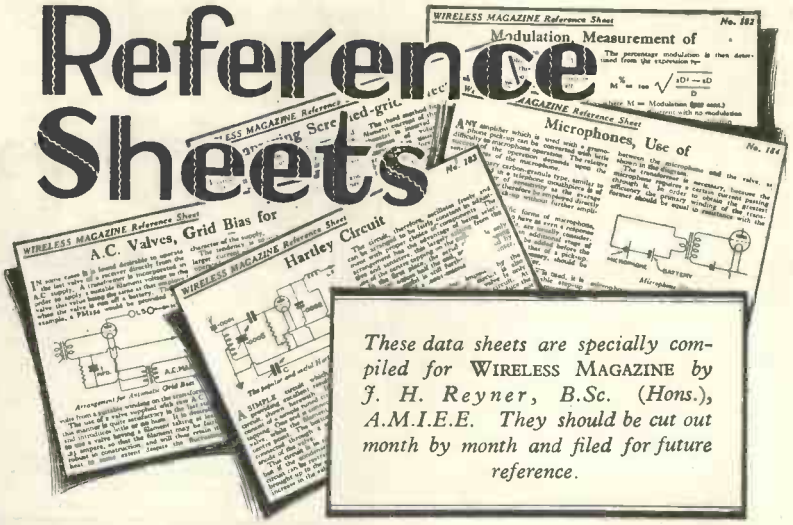
Reproduction was still some way behind that obtainable from a moving-coil loud-speaker, but was superior to the average cone quality. We gained the impression that the damping was too heavy to allow the best use to be obtained from the new principles involved, but even as it stands, it constitutes a distinct step forward in loud-speaker design.

It's not by your good nights your set is known, but by your friend's visits

Spare the volts and spoil reception !

If at first you don't receive, turn, turn again.

Reference Sheets



These data sheets are specially compiled for WIRELESS MAGAZINE *by J. H. Reyner, B.Sc. (Hons.), A.M.I.E.E. They should be cut out month by month and filed for future reference.*

WIRELESS MAGAZINE Reference Sheet **No. 191**

L.F. Transformers, Inductances of

WITH the increasing use of parallel-feed circuits it has become of interest to know the inductance of the primary winding of inter-valve transformers so that, if necessary, some sort of resonance effect can be obtained between the primary winding and the coupling condenser. (See Sheet No. 177.)

The table given herewith contains the inductance values of some of the transformers on the market to-day. The list is not complete, but it will serve to give an indication of the order of inductance which may be expected.

The figures are given with zero polarising current and with 2 milliamperes direct current flowing through the primary winding. For parallel-feed purposes, of course, the first set of figures is required, but the second series has been given as a matter of interest.

Where one is only using a relatively small anode current prior to the transformer, the advantage of using the parallel-feed system becomes small and nearly as good results may be obtained by the usual methods. Whether this is likely to be so or not can be determined by reference to the figures themselves.

Make	*Inductance in henries*	
	No polarising current	*2 ma. polarising current*
Brown	220	140
Ediswan 2 : 1 ..	160	80
,, 4 : 1 ..	60	35
Ferranti AF3 ..	130	90
,, AF5 ..	200	150
Igranic Type J (3:1)	75	40
,, ,, (6:1)	45	30
Lissen Super ..	150	80
Lewcos	120	90
Marconiphone Universal 2.7 : 1 ..	40	30
,, ,, 4 : 1 ..	20	18
Varley Nicore II ..	40	30

WIRELESS MAGAZINE Reference Sheet **No. 192**

S.G. Valves, Negative Resistance of

THE use of a screened-grid valve as a dynatron, an oscillator circuit which makes use of the negative-resistance portion of the characteristic, was described in Sheet No. 186. The operation of this form of circuit depends upon the fact that the presence of the valve across the tuned circuit introduces a negative resistance instead of the customary damping. Thus, instead of power being absorbed from the system and wasted, energy is actually supplied to the oscillating circuit, tending to overcome the losses due to the resistance.

If this energy exceeds the amount lost due to resistance, the circuit will oscillate continuously. The condition for this to obtain is that the negative resistance of the valve shall be less than $\frac{L}{CR}$, C and R being the inductance, capacity and resistance of the tuned circuit in question.

The negative-resistance characteristic depends upon the conditions under which the valve is used, and the slope of the negative portion tends to become steeper as a small positive bias is placed on the inner grid. The curves given in Sheet No. 193 illustrate the form of characteristic with representative valves, while the data given below indicate the extent of the negative-resistance characteristic of various forms of power.

Make of Valve	*Inner Grid Volts (outer grid volts = 80)*	*Average Negative Resistance*
Cossor 220SG ..	—3	—
	0	45,000
	+1½	30,000
	+4½	14,500
	+7½	8,000
Marconi and Osram S215	—3	85,000
	0	57,000
	+1½	43,000
	+4½	26,000
Mazda SG215 ..	—3	44,000
	0	19,000
	+1½	16,000
	+4½	11,000
Mullard PM12 ..	—3	180,000
	0	100,000
	+1½	80,000
	+4½	60,000

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Special One	WM116
The A.1	WM153
Hartley Single One-Valver	WM198
B.B.C Official One	AW208

TWO-VALVE SETS

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Crusader (D, Trans)	WM69
Flat-dweller's 2 (HF, D)	WM76
Key-to-the-Ether Two (D, Pentode)	WM107
Clipper Two (D, Trans)	WM135
Twinflex (Reflex)	WM138
Continental Two (D, Trans)	WM143
Ether Ranger (D, Trans)	WM156
A.B.C. Two (D, Trans), 1s. 3d., with copy "W.M."	WM160
Brookman's Two (D, Trans)	WM168
A.C. Two (D.Trans)	WM175
Programme Two (D, Trans)	WM177
New Crusader (D Trans)	WM182
Radio-Record Two (SG, D)	WM187
★**Gleaner Two (D. Trans)**	**WM201**
Long Distance Two (HF, D)	AW110
Ace of Twos (D, Pentode)	AW143
All-Main Two (D, Trans)	AW180
Loud-speaker America 2 (D, Pentode)	AW190
Talisman Two (D, Trans)	AW194
Hyper-Selective Two (D, Pentode)	AW198
Pentector Two (P. det., RC)	AW213
British Broadcast Two (D, Trans)	AW215
Easy-tune Two (D, Trans)	AW226
Wavelets Two (D, Trans)	AW229
No Battery Mains (A.C.) Two (D, trans)	AW230

THREE-VALVE SETS

All these 1s. each, post free.

Five-guinea 3 (HF, D, Trans)	WM29
Britannia (D, RC, Trans)	WM67
Aladdin Three (HF, D, LF)	WM95
All-wave Screened-grid Three (HF, D, Pentode)	WM110
Standard Coil Three (HF, D, Trans)	WM117
Festival Three (D, 2LF-Dual Imp)	WM118
The Q3 (D, RC, Trans)	WM124
Lodestone Three (HF, D, Trans)	WM129
Simple Screen Three (HF, D, Trans)	WM131
At Home Three (D, 2RC)	WM141
Short Wave Link (D, RC, Trans)	WM142
Fanfare (D, 2Trans)	WM157
Brookman's Three (SG, D, Trans)	WM161
Community Three (D, RC, Trans)	WM164
New Q3 (SG, D, Pentode)	WM167
Brookman's Push-pull Three (HF, D, Trans), 1s. 6d.	WM170
Celerity Three (SG, D. Trans)	WM173
All-nations Three (D2, Trans)	WM178
Inceptordyne (SG, D, Pen.)	WM179
Brookman's A.C. 3 (SG, D, Trans)	WM184
Music Marshal (D, 2 Trans)	WM190
Gramo-Radio D.C.Three (SG, D, Trans)	WM196
Concert Three (D, 2 Trans)	WM199
Simplicity Screen-grid Three (HF, D, Trans)	AW132
All-purpose Short-wave Three (D, RC, Trans)	AW147
All Round Three (D, RC, Trans)	AW155
All Britain Three (HF, D, Trans)	AW158
Binowave Three (D, RC, Trans)	AW172
Clarion Three (SG, D, Trans)	AW175
Local and Continental Three (HF, D, Trans and D, RC, Trans)	AW189
Broadcast Three (SG, D, Trans)	AW192
James Dual-range Three (HF, D, Trans)	AW196
All-wave High-mag Three (D, 2 Trans)	AW199
Clarion All-electric Three (SG, D, Trans,—A.C. Rectifier), 1s. 6d.	AW200
Knife-edge Three (D, RC, Trans)	AW201
Talisman Two-Three (D, RC, Trans)	AW203A
World-Wide Short-wave Three (HF, D, Trans)	AW207
Everybody's Three (SG, D, Trans)	AW209
1930 Ether Searcher (SG, D, Trans)	AW211
New All-Britain Three (H.F. D. Trans)	AW214
Best-by-Ballot Three (SG, D, Trans) Price 4d. free with copy of "AW"	AW217
Brookman's By-pass Three (D, 2 Trans)	AW220
Everybody's All-electric Three (SG, D, Trans)	AW221
1930 Clarion Three (SG, D, Trans)	AW223
Auto-Coupler Three (D, 2 LF)	AW225
Beginner's Regional Three (D, 2 Trans)	AW233

FOUR-VALVE SETS

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Touchstone (HF, D, RC, Trans)	WM109
Standard-coil Four (HF, D, 2RC)	WM122
Dominions Four (2SG, D, Trans)	WM134
The Drum Major (HF, D, RC, Trans)	WM137
Music Player (HF, D, RC, Trans)	WM144
Arrow Four (SG, HF, D, Trans)	WM154
1930 Monodial (2SG, D, Trans)	WM158
All-electric Four (SG, D, RC, Trans)	WM162
Outpost Four (SG, D, 2 Trans)	WM165
Brookman's Four (2SG .D, Trans)	WM174
Transportable Four (SG, D, 2RC)	WM180
Super Q (SG, D, 2 Trans)	WM189
Lodestone Four (HF, D, RC, Trans)	WM193
Searcher's Four (SG, D, RC, Trans)	WM194
★**Invitation Four (SG, D, RC, Trans)**	**WM200**
Facility Four (HF, D, 2RC—Q-coil)	AW154
Broadcast Picture Four (HF, D, 2RC)	AW163
The Orchestra Four (D, RC, Push-pull)	AW167
All Europe Four (2HF, D, Trans)	AW173
Stability Four (HF, D, RC, Trans)	AW182
Music Lover's Gramo-Radio (SG, D, RC, Trans)	AW202A

FIVE-VALVE SETS

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Fidelity Five (HF, D, 2RC-parallel)	WM130
All-wave Lodestone Five (HF, D, Push-pull)	WM146
1930 Five (2HF, D, RC, Trans)	WM171
Dual-screen Five (2SG, D, RC, Trans)	WM185
Radio-Record Five (SG, D, Trans-Parallel	WM188
Overseas Five (3SG, D Trans)	WM191
James Quality Five (2SG, D, RC, Trans)	AW227

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Wayfarer Portable (Super-het)	WM139	1/6
1929 Chummy (SG, D, Trans, RC)	WM145	1/6
Picnic Portable (D, RC, Trans)	WM148	1/-
Pedlar Portable (D, Trans)	WM195	1/-
Pedlar Portable (D, 2 Trans)	WM197	1/-
★**James Portable SG3 (SG, D, Trans)**	**WM203**	1/-
£5 5s. Portable (D, Trans)	AW101	1/-
Holiday Portable Three (D, RC, Trans)	AW18	
Music Leader (SG, D, RC, Trans), with copy "A.W."	AW	
Merry-maker Portable (D, 2 Trans)	AW228	1/-
Sunshine Three (SG, HF, SG, D, Trans)	AW235	1/-

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Auditrol Amplifier	WM132
Concentrator (HF Unit)	WM169
Radio-Record Amplifier (DC Mains)	WM183
One-valve L.F. Unit	AW79
Hook-on Short-waver	AW104
Purity Amplifier	AW108
Add-on Distance-getter	AW117
Screened-grid H.F. Amplifier	AW138
"A.W." Gramophone Amplifier (3RC)	AW162
Searcher Unit (HF)	AW176
"A.W." Gramophone Amplifier	AW205
Beginner's Amplifier (9d.)	AW210
Brookman's Separator (H.F. Unit)	AW212
Two-valve Amplifier	AW216
"Mag" Gramo Unit	AW224

MISCELLANEOUS

James H.T. Unit for D.C. Mains	WM133	1/-
Two-ampere Low-tension Unit	WM147	1/-
A.C. Mains Amplifier	WM149	1/-
A.C. Mains Unit for All-wave Lodestone Five	WM151	1/-
H.T. Unit for A.C. Mains	WM159	1/-
"W.M." Linen-diaphragm	WM172	1/-
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Brookman's "Wipe Outs" (Wave-traps)	WM186	1/-
Short-wave adaptor for Overseas Five	WM192	1/-
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H.T. Eliminator for A.C. (200v. output)	AW102	1/-
All-metal Eliminator for H.T.	AW135	1/-
Pedestal Cone Loud-speaker	AW164	1/-
D.C. Unit (HT)	AW178	1/-
Short-wave Adaptor (IV)	AW183	1/-
High-tension Battery Charger	AW191	1/-
Mains Unit for S.8 Valves	AW193	1/-
Simplest H.T. Unit (A.C.)	AW197	1/-
Music Lover's Linen-diaphragm Loud-speaker	AW202B	
B.P. Wavetrap	AW204	-/6
By-pass Unit (wavetrap) with copy of "A.W."	AW218	-/4
Home-constructors' pleated paper Loud-speaker	AW219	1/-
"Twin" Brookman's By-Pass	AW222	-/6
"A.W." Paper Loud-speaker	AW231	1/-
James H.T. and L.T. Charging Unit	AW232	1/-
Simplest H.T. Eliminator for DC Mains	AW234	
Simple Battery Eliminator for A.C. Mains	AW236	

A blueprint of any one set described in the current issue of the "Wireless Magazine" can be obtained for half-price up to the date indicated on the coupon (which is always to be found on page iii of the cover) if this is sent when application is made. These blueprints are marked with an asterisk (★) in the above list and are printed in bold type. An extension of time will be made in the case of overseas readers.

Each blueprint shows the position of each component and every wire and makes construction a simple matter. Copies of "Wireless Magazine" and of "Amateur Wireless" containing descriptions of all these sets can be obtained at 1s. 3d. and 4d. respectively, post free. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine" sets.

Send, preferably, a postal order (stamps over sixpence in value unacceptable) to

Wireless Magazine

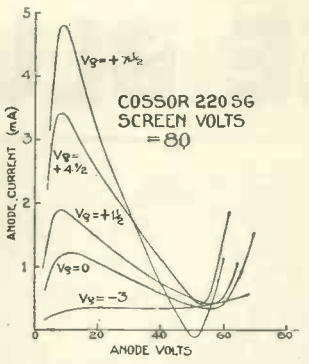
BLUEPRINT DEPT. 58/61 FETTER LANE, LONDON, E.C.4

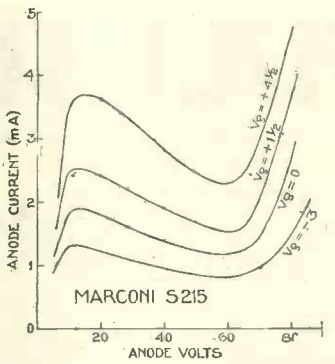
Look Out for the August "Wireless Magazine" on Thursday, July 24

INDEX TO ADVERTISERS

WIRELESS MAGAZINE Reference Sheet — *No. 193*

S.G. Valves, Negative Resistance of

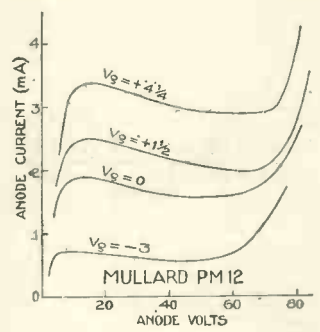


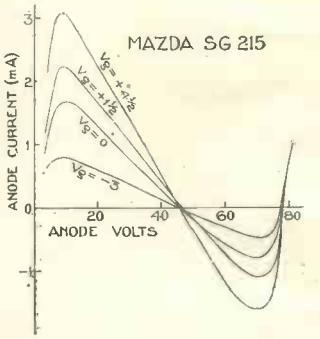


THE curves given herewith illustrate the characteristic obtained using two standard makes of valve as a dynatron. It will be seen that the Cossor valve is particularly suitable for this work, it being possible to obtain a very steep negative slope by placing a small positive voltage on the inner grid. The second curve is not so suitable, although it possesses quite a distinct negative resistance portion.

WIRELESS MAGAZINE Reference Sheet — *No. 194*

S.G. Valves, Negative Resistance of





FURTHER curves for two other makes of screened-grid valve are given herewith. The Mullard valve has relatively poor dynatron characteristic, which in ordinary use is an advantage rather than the reverse. The Mazda valve is very good as a dynatron, the peculiar feature being that the current actually reverses over a large part of the range.

WIRELESS MAGAZINE Reference Sheet — *No. 195*

Volume Control

IN these days of powerful stations anyone living within an "A" service area must have an effective form of volume control to prevent the receiver from overloading. It is not only the low-frequency stages which will overload, but in particular the detector stage will not handle more than a certain input.

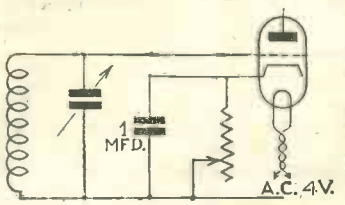
This is more marked when one is using a grid detector, as is often done, and the most modern forms of receiver are using a grid detector with specially high voltages on the anode, so that the valve can handle a large high-frequency swing.

To avoid the detector overloading it is essential to control the volume before the detector. This may conveniently be done with a screened-grid valve by varying the voltage on the screen. Alternatively the filament current of the valve may be varied if it is a battery-driven valve.

This latter method may be used in some cases with a neutralised triode, but instability is liable to occur if this is done, and in such cases, as also where A.C. valves are being used, it is preferable to use grid-bias. The grid bias on the high-frequency valve should be increased to an abnormal value (3 or 4 volts is usually sufficient), when the volume will be found to be considerably reduced.

The circuit shows the application of this to an indirectly heated A.C. high-frequency valve, the resistance providing the grid bias being made variable. As this resistance is increased in value the grid bias increases and the volume is cut down.

Still another method of pre-detector volume control is to shunt a variable high-resistance across the tuned circuit. The lower this resistance the less the magnification of the circuit, and consequently the less the voltage applied to the valve. This, of course, reduces the sharpness of tuning, but in most cases this is not a disadvantage on a strong signal.



Grid bias for A.C. high-frequency valve